



Annotated Bibliography of Tef

[*Eragrostis tef* (Zucc.)
Trotter]

Zerihun Tadele

2011

Annotated Bibliography of Tef

[*Eragrostis tef* (Zucc.) Trotter]

Zerihun Tadele
Institute of Plant Sciences
University of Bern
Switzerland

September 2011

Correct citation: Zerihun Tadele. 2011. Annotated Bibliography of Tef [*Eragrostis tef* (Zucc.) Trotter]. Institute of Plant Sciences, University of Bern, Switzerland. Printed at Stämpfli AG, 3001 Bern, Switzerland, September 2011. ISBN: 978-3-033-03119-7

Preface

For long time, I have been interested to improve under-studied or commonly known orphan crops of Africa. Orphan crops which represent a variety of cereals, legumes and root crops play key role in feeding the population of Africa. These under-researched crops are also better adapted to extreme climatic and soil conditions than major crops of the world. Research in my group implements genetic and genomic tools in order to improve tef [*Eragrostis tef* (Zucc.) Trotter], an orphan crop predominantly grown in the Horn of Africa. The crop is annually cultivated on about 2.8 mio ha of land in Ethiopia, which is equivalent to over 25% of the area allocated for cereals. Research on tef began in mid-1950s in Ethiopia. Since then, many studies were made in different disciplines and representing diverse agro-ecological regions. However, most studies were neither completed nor published. In this annotated bibliography an attempt has been made to gather all available information about tef research, development and production.

The bibliography presents some comments or major findings for each literature unless the information is not currently available or accessible. The bibliography is divided into 28 chapters. The general information on the importance of the crop and research plans are presented in the first two chapters. The third chapter indicates some environmental conditions suitable for tef cultivation. Information on the history, taxonomy and germplasm are shown in Chapter 4 and 5. Studies on morphological and mechanical properties of tef are indicated in Chapter 6. Research on genetics, cytogenetics, breeding and variety development are presented in Chapters 7 and 8. The limited number of studies on physiology is shown in Chapter 9. A recent study on genomics and mapping including markers are presented in Chapter 10. Few investigations on transformation and regeneration are shown in Chapters 11 and 12. Agronomic research which includes crop management, tillage and soils studies are dealt in Chapters 13 to 15. Limited research on implements and mechanization are indicated in Chapter 16. Information on biotic and abiotic stresses are provided from Chapter 17 to 20. Studies or information related to human and animal nutrition are available in Chapter 21 and 22. Socioeconomic studies and farming systems surveys are dealt in Chapters 23 and 24. Information on production and marketing of tef is available in Chapters 25 and 26. Published information regarding closely related *Eragrostis* species are also provided in Chapter 28. The bibliography also contains the author index.

Sites mentioned in the bibliography particularly those with extensive farming systems studies are shown in the introduction part of the Bibliography. Throughout the literature, unless otherwise mentioned yield refers to seed yield, and all literature are in English unless indicated.

Research in my group is supported by Syngenta Foundation for Sustainable

Agriculture and University of Bern. My group collaborates with international group of scientists in the area of crop improvement and genome sequencing. Our key partner is the Ethiopian Institute of Agricultural Research with whom we established strong collaboration in promoting the development of new cultivars and training the Institute's scientists at short- and long-term. At this juncture, I would like to thank all stakeholders and enthusiastic tef team in Bern.

Zerihun Tadele
September 2011

Table of Contents

Preface.....	iii
Literature Citation Guide.....	vii
List of Acronyms.....	viii
Names of tef.....	xi
Trend of Tef Cultivation in Ethiopia.....	xii
Locations Indicated in the Bibliography	xiii
1. General Importance.....	1
2. Research Plans and Programs.....	17
3. Agro-ecology	23
4. History, Origin and Taxonomy	27
5. Germplasm Collection and Conservation	33
6. Morphology, Anatomy and Mechanics	39
7. Cytogenetics.....	41
8. Genetics, Breeding and Cultivars.....	45
9. Physiology and Biochemistry	81
10. Genomics, Mapping and Markers.....	87
11. Biotechnology and Transformation	93
12. Regeneration and Growth Regulators	95
13. Crop Management and Cropping System.....	98
14. Tillage and Drainage	113
15. Soils and Fertility Studies	119
16. Farm Implements and Mechanization	141
17. Weeds and Control Measures.....	145
18. Pests and Control Measures.....	165
19. Diseases and Control Measures	179
20. Abiotic Stresses.....	191
21. Human Nutrition and Food Value	199
22. Animal Nutrition and Feed Value.....	215
23. Farming Systems Studies.....	233
24. Socio-economic Studies.....	245

25. Production and Marketing	251
26. Extension and On-farm Research	265
27. Biofuel or Bioenergy	279
28. Genus <i>Eragrostis</i> , Excluding <i>E. tef</i>	281
Author Index	291

Literature Citation Guide

Throughout the bibliography, the same system of literature citation is used. However, the sequences followed for articles in different types of publications (e.g., journals, newsletters, progress reports, proceedings, etc.) are indicated below:

1. For articles in Journal, Bulletins or Newsletters: author(s), year of publication, title, bulletin or journal name, volume (and number), page number.

Examples:

Journals

Jones BMG. 1988. Endemic crop plants of Ethiopia. I. Tef (*Eragrostis tef*). *Walia: Journal of the Ethiopian Wildlife and Natural History* 11:37-43.

Bulletin

Ebba T. 1979. Tef: the grass that provides injera. *Ethiopian Grain Review* 5(1):3-5.

2. For articles in Progress Report, or Book: author(s), year of publication, title of the article, page (range), editors (if any), title of the book, Publisher, place of publication.

Examples:

Progress Reports:

Anon. nd. Summary of some recommendations on tef production for Debre Zeit and its vicinity. pp. 123. In: *Tef Annual Reports, 1977-1982*. Addis Ababa University (AAU), Debre Zeit Agricultural Research Center (DZARC), Debre Zeit, Ethiopia.

Book Chapter:

Cheverton M, Chapman GP. 1989. Ethiopian tef: a cereal confined to its center of variability. pp. 235-238. In: Wickens GE, Haq N, Day P. (eds.) *New Food Crops for Food and Industry*. Chapman and Hall, London.

3. Articles in Proceedings: author, year of publication, title of the article, page in the proceeding, editors (if any), title of the proceeding, date and place of the conference or workshop, publisher and place of publication.

Example:

Ketema S. 1989. Food self sufficiency and the role of tef (*Eragrostis tef*) in Ethiopian agriculture. pp. 276-296. In: *Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 Dec. 1986*, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia.

List of Acronyms

AAASA	Association for the Advancement of Agricultural Sciences in Africa
AAU	Addis Ababa University
ADD	Agricultural Development Department under Ministry of Agriculture
ADDP	Ada District Development Project
ADF	Acid Detergent Fiber
AFLP	Amplified Fragment Length Polymorphism
a.i.	active ingredient
AMC	Agricultural Marketing Corporation
ARDU	Arsi Rural Development Unit
ARNAB	African Research Net-work for African By-products
ASE	Agri-Service Ethiopia
asl	above sea level
ATDF	African Technology Development Forum
AUA	Alemaya University of Agriculture
BBF	Broad-bed and farrow
BBM	Broad-bed maker
CABI	Common-wealth Agricultural Bureau International
CADU	Chilalo Agricultural Development Unit (later named ARDU)
CCC	chloroethyl triemthyl ammonium chloride
CEE	Committee of Ethiopian Entomologists
CIMMYT	Centro Internacional de Mejemamernto de Maiz Y Trigo, based in Mexico
CISPs	Conserved-intron scanning primers
CNN	Children's Nutrition Institute, Ethiopia
CP	crude protein
CPSE	Crop Protection Society of Ethiopia
CSA	Central Statistical Authority
CSCE	Crop Science Committee of Ethiopia (later named CSSE)
CSO	Central Statistical Office, later named CSA
CSSE	Crop Science Society of Ethiopia
DANINDA	Danish International Development Agency
DEEP	Development Educational Exchange Papers, FAO, Rome
DLCO	Desert Locust Control Organization
DZARC	Debre Zeit Agricultural Research Center
EARO	Ethiopian Agricultural Research Organization (later named EIAR)
EC	Emulsifiable Concentrate
EIAR	Ethiopian Institute of Agricultural Research
EJAS	Ethiopian Journal of Agricultural Science
ELWL	excised-leaf water loss
ENI	Ethiopian Nutrition Institute
EPC	Ethiopian Pathology Committee
EPID	Extension and Project Implementation Department
ESC	Ethiopian Seed Corporation
ESSP II	Ethiopia Strategy Support Program II
ESSS	Ethiopian Society of Soil Science

EST	Expressed Sequence Tag
EST-SSR	Simple Sequence Repeats derived from Expressed Sequence Tags
EWSC	Ethiopian Weed Science Committee (later named EWSS)
EWSS	Ethiopian Weed Science Society
FAO	Food and Agriculture Organization of the United Nations
FFHC	Freedom from Hunger Campaign
FNUE	Fertilizer N Use Efficiency
FSR	Farming Systems Research
GDP	Gross Domestic Product
HPC	High Potential Cereal
HPP	High Potential Perennial
HRC	Holetta Research Center
HSIU	Haile Selassie I University (latter named AAU)
HSIU	Haile Selassie I University, later named Addis Ababa University
IAEA	International Atomic Energy Agency, Vienna, Austria
IAR	Institute of Agricultural Research, Ethiopia
IBC	Institute of Biodiversity Conservation
IBCR	Institute of Biodiversity Conservation and Research (later named IBC)
IDRC	International Development Research Center, Ottawa, Canada
IFLP	Intron Fragment Length Polymorphism
ILCA	International Livestock Center for Africa
INDEL	insertion and deletion
IRAT	Institute de Recherche des Agronomique Tropicale (France)
ISNAR	International Service for National Agricultural Research (The Netherlands)
ISSR	Inter-Simple Sequence Repeat
LPC	Low Potential Cereal
MoA	Ministry of Agriculture (Ethiopia)
MSFD	Ministry of State Farm Development (Ethiopia)
NCIC	National Crop Improvement Conference
NDF	neutral detergent fiber
NFID	National Field Trials Programs (MoA)
NFIU	National Fertilizer Inputs Unit (under Ministry of Agriculture, Ethiopia)
NGOs	Non-Governmental Organizations
NRDC	National revolutionary Development Campaign
NYT	National Yield Trial
OCR	On-Center Research
ONCCP	Office of the National Committee for Central Planning (Ethiopia)
PANESA	Pasture Network for Eastern and Southern Africa
PEG	polyethylene glycol
PGPR	Plant Growth Promoting Rhizobacteria
PGRC/E	Plant Genetic Resource Center/Ethiopia (later named IBC)
PNYT	Pre-National Yield Trial
PPRC	Plant Protection Research Center (the former SPL)
PROTA	Plant Resources of Tropical Africa
QTL	Quantitative trait loci
RAPD	Random Amplified Polymorphic DNA
RFLP	Restriction Fragment Length Polymorphism

RIL	Recombinant Inbred Lines
RRC	Relief and Rehabilitation Commission (Ethiopia)
S&C	Soil & Crop Improvement BV, Assen, The Netherlands
SEBIL	Bulletin of Crop Science Society of Ethiopia
SIDA	Swedish International Development Agency
SINET	Ethiopian Journal of Science
SNP	Single Nucleotide Polymorphism
SPL	Scientific Phytopathological Laboratory (Ambo, Ethiopia)
SPSW	Swiss Plant Science Web
TDSI	Trials Demonstration and Seed Increase (under RRC, Ethiopia)
TRAP	targeted region amplified polymorphism
ULV	Ultra Low Volume
UNDP	United Nations Development Program
VAM	Vesicular-Arbuscular-Mycorrhiza
WADU	Wolaita Agricultural Development Unit
WP	Wettable Powder
WUE	Water-use efficiency

Short names

Anon.	anonymous
Birr	Ethiopian currency
ha	hectare
nd	no date
q	quintal (100 kg)

Names of tef

Botanical name:

Current name: *Eragrostis tef* (Zucc.) Trotter

Old names: *Eragrostis abyssinica* (Jacq.) Link
Poa tef Zucc.
Poa abyssinica Jacq.

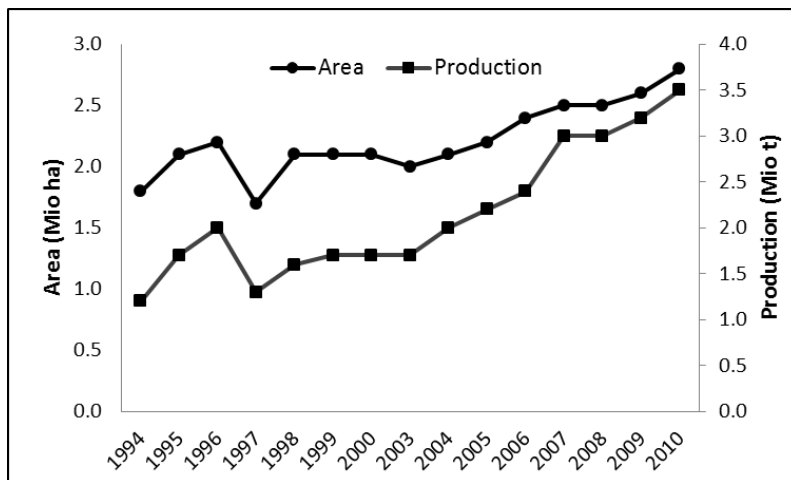
Common names:

Tef
 Teff
 T'ef
 Lovegrass
 mil éthiopien (French)
 Zwerghirse (German)

Names in Ethiopian languages:

ṭēf ጤፍ (Amharic)
 Ṭaffi/xaffi (Afan Oromo)
 ṭaff ጣፍ (Tigrigna)

Trend of Tef Cultivation in Ethiopia



The total area (mio ha) and production (mio t) of tef in Ethiopia from 1994 to 2010

Source: CSA (Central Statistical Agency) publications (1995 – 2011). Addis Ababa, Ethiopia

Locations Indicated in the Bibliography

IAR Sites

Adet
Awasa
Bako
Ginchi
Holetta
Illala
Jimma/Melko
Kobbo
Kulumsa
Mekele
Melka Werer
Nazret/Melkasa
Pawe
Quiha (Mekele)
Sheno
Sinana

DZARC sites

Adulala
Akaki
Chefe Donsa
Debre Zeit
Godino
Koka
Ziway

IAR/ADD sites:

Bichena
Bure
Debre Tabor
Endibir
Goha Tsion
Gumaye Daye
Harbu
Hurumu
Inewari
Mota
Robe
Shambu
Shashemene
Tefki

Watcho

Woldia

TDSI sites:

Anger Gutin
Asossa
Dana valley
Deramalo
Dimtu
Gambella
Gode
Harawa
Harole
Hoha
Humera
Tedelle

CADU Sites

Asassa
Asella
Chebi
Deneba
Etaya
Gonde
Huruta
Sagure

WADU sites

Abella
Ajeja
Areka
Bele
Humbo
Kokate
Wolaita Soddo

ADDP sites

Bekojo
Demnkak
Dire
Dukem
Godino

Holetta sites (in 1970's)

Bedi
Chencha
Dorze
Endibir
Sendafa

State Farms

Birr
Cheffa
Nura Era

Termite studies (in Wellega area)

Ghimbi
Gobo Sayo
Jarso
Menesibu
Sassiga

Other sites

Abay Gorge
Addis Alem
Ajje
Aleltu
Ambo
Becho
Berfeta
Butajira
Chacha
Dabat
Debre Berhan
Dejen
Dhera
Didessa
Digellu
Enewari
Fitche
Ghimbi

Giraram Community	Meki	Sodo
Gobo Sayo	Mendi	Suba
Gumaye Daye	Menesibu	Tulu Bollo
Haik	Mojo	Wereilu
Hosana	Nedjo	Woldia
Jarso	Nekemt	Wollencomi
Jirem/Jimma IAR	Sassiga	Yetnora
Kembata	Sawla	Yirga-alem
Kofele	Serbo/Jimma	
Kuyera	Shewa Robit	

Areas with extensive Farming Systems Research

- Ada/Debre Zeit/ (Shewa)
- Adet area (Gojam)
- Areka area (Sidamo)
- Asendabo-Sokoru area (Keffa)
- Bahir Dar area (Gojam)
- Bako area (Shewa and Wollega)
- Debre Tabor area (Gondor)
- Holetta-Addis Alem areas (Shewa)
- Kulumsa area (Arsi)
- Manna-Gomma area (Illubabor)
- Nazret area (Shewa)
- Sendafa-Aleltu (Shewa)
- Sidama area (Sidamo)
- Sinana area (Bale)
- Vertisol areas (Central Highlands)
- Wolaita area (Sidamo)

Areas where tef is grown in Belg season

- Bale: Goro, Ginir, Lehida
- Gamu Gofa: Dara Malo, Gardula, Gomaide, Gofa
- Kefa: Kersa, Gera, Bonga, Ufa
- Shewa: Silti, Kondaliti, Ankober, Angacha
- Sidamo: Damot Gale, Damot Woyde, Sodo Zuria, Ofa, Fsha Genet, Wonago, Bonsa, Hagre Mariam, Burgi
- Wollega: Nekemte, Arjo
- Wello: Urgesa, Kewori Dhar

1. General Importance

Abplanalp VM. 2007. Tef is too tall. Uniaktuell: Online Magazine of University of Bern. 13.09.2007.[in German].

<http://www.uniaktuell.unibe.ch/content/umweltnatur/2007/orphancrops/> accessed August 25, 2011. *Indicates about the benefits of tef and research being carried out on tef improvement at the University of Bern.*

Acland JD. 1971. East African Crops. An introduction to the production of field and plantation crops in Kenya, Tanzania and Uganda. Longman Group Ltd, London. 252pp. *Indicates about the importance of tef and where it is widely grown. Also, presents information on plant characteristics, ecology, varieties, field operations, harvesting, yields, pests and diseases.*

American Embassy. 1989. A humble seed holds big promise. Special Report Marc. 29, 1989, American Embassy, Addis Ababa, Ethiopia. *Reports the progress of tef cultivation in Caldwell, Idaho, USA, and explains how Carlson, American farmer, becomes a successful commercial farmer of tef in Idaho by growing on 20 acres and also grinding and packing the flour.*

Anon. 1887. Tef. Kew Bulletin 1:2-6.

Anon. 1969. Tef in Ethiopia. Afrika Heute 9:135-137. [in Italian].

Anon. 1993. Improving tef in Ethiopia. DEEP (Development Education Exchange Papers). Sept. 1993. pp. 15. Food and Agriculture Organization (FAO), Rome. *Briefly indicates the importance and improvement work on tef in Ethiopia. According to the report, tef is grown on approximately 14 million ha and supplies nearly 2/3 of the protein in the Ethiopian diet. A project to promote collection was initiated and some 2500 accessions were characterized and evaluated.*

Anon. 1993. Recommendations of the second international small millet workshop. pp. 555-557. In: Riley KW, Gupta SC, Seetharam A, Mushonga JN (Eds.) Advances in Small Millets. Second International Small Millets Workshop, 8-12 April 1991, Bulawayo, Zimbabwe. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India. *Presents the recommendations and resolutions passed at the Workshop. Crops grouped under small millets were finger millet, foxtail millet, proso millet, tef, fonio, little millet, barnyard millet and kodo millet.*

Anon. 2001. Group discussion: reports. In: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M (Eds), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 309-313. *Presents reports and recommendation of different groups held during the international tef workshop. Groups were divided into genetics & breeding, crop management, crop protection and utilization.*

- Anon.** 2005. Crop has deep roots for black Kansas Farmers. USA Today Dec. 13, 2005. http://www.usatoday.com/news/nation/2005-12-13-black-farmers-teff_x.htm accessed July 4, 2011. *Indicates the acceptance of growing tef by farmers in Kansas USA especially in Nicodemus area due to its high drought-tolerance characteristics.*
- Anon.** 2006. Small grain with big future [in German]. <http://www.mercur.org/?p=6395&l=0> accessed July 5, 2011. *Indicates that tef which has been grown for 5000 years in north east Africa can be cultivated in non-traditional growing regions due to its merits.*
- Anon.** 2007. Improving tef. University of Neuchatel, Switzerland. Plant Survival No 15, p19. [in English, German and French]. http://www2.unine.ch/files/content/sites/nccr/files/shared/documents/newsletters/PlantSurvivalNews/PS_news_15.pdf accessed August 25, 2011. *Mentions about the research carried-out on tef improvement at the University of Bern which implements the TILLING technique.*
- Anon.** 2007. A dwarf plant to help fight hunger in Africa. University of Neuchatel, Switzerland. Plant Survival, Press Release 13.09.2007. [in English, German and French]. http://www2.unine.ch/nccr/page-6717_de.html;jsessionid=7921332289EEFE4F46C2D2A95AAD35B4.corvus1 accessed August 25, 2011. *Indicates about the tef research carried-out at the University of Bern and also about the orphan crops conference organized at the University.*
- Anon.** 2007. Biotechnology research for the Ethiopian cereal tef. Institute of Plant Sciences, University of Bern. Annual Reports for 2006. [in German]. *Briefly mentions about the status of tef research at the University of Bern.*
- Anon.** 2008. Biotechnology research for the Ethiopian cereal tef. Institute of Plant Sciences, University of Bern. Annual Reports for 2007. [in German]. *Indicates about the status of tef research at the University of Bern.*
- Anon.** 2008. Teff, Amazing Grain! Lissan Magazine January 15th, 2008. <http://lissanonline.com/blog/?p=92> accessed July 4, 2011. *Mentions about the importance of tef especially regarding to nutritional and health benefits.*
- Anon.** 2009. Biotechnology research for the Ethiopian cereal tef. Institute of Plant Sciences, University of Bern. Annual Reports for 2008. [in German]. *Indicates about the status of tef research at the University of Bern.*
- Anon.** 2010. Biotechnology research for the Ethiopian cereal tef. Institute of Plant Sciences, University of Bern. Annual Reports for 2009. [in German]. *Mentions about the status of tef research at the University of Bern.*
- Anon.** 2010. Partnering to improve tef. New Agriculturist, Public-Private Partnership. May 2010. <http://www.new-ag.info/en/focus/focusItem.php?a=1590> accessed August 25, 2011. *Presents the interview made with Zerihun Tadele, Leader of the Tef Improvement Project at*

the University of Bern regarding the goals and achievement of the project and also about the public-private partnership.

Anon. nd. Brighter prospects for improving *Eragrostis tef* by mutation breeding. pp. T16-T25. In: Debre Zeit Agric. Research Center Progress Report for 1975/76. Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Presents the efforts made to improve tef using conventional and mutation breeding methods. In the case of mutation breeding, radiation treatments of 150 KRADS from 60°C source have been found to be effective for treating air dry seeds of tef. Dosages of 200 KRADS and above were extremely damaging.*

Atnafseged G. nd. "Teff" imported from USA. Ethiopian Herald (Newspaper), Addis Ababa, Ethiopia. *A letter to the editor of the Newspaper from Canefield, Ohio, USA, indicates the progress made in tef production by Carlson and his wife, Elisabeth in USA, from more than 800 acres (which was only from 30 acres before 5 years).*

Baldrati I. 1904. Plants, food and cereals. Boll. Agric. E. Comm della Colonia Eritrea. Ann 2, nn. 6-7. pp. 8. [in Italian].

Baldrati I. 1950. Treatise for tropical and subtropical cultivations. U. Hoppli Milano. pp. 245-256. [in Italian].

Bawza Staff. 2011. Dr. Ozzie Abaye promotes the benefits of teff to Virginia farmers. Bawza Newspaper. August 4, 2011. <http://bawza.com/2011/08/04/dr-ozzie-abaye-promote-the-benefits-of-teff-to-virginia-farmers/> Accessed August 25, 2011. *Describes how Virginia Tech agronomist Ozzie Abaye outlined some of her latest research on tef at the annual field day at the Shenandoah Valley Agricultural Research and Extension Center, at McCormick Farm in USA.*

Belton PS, Taylor JRN. 2004. Sorghum and millets: protein sources for Africa. Trends in Food Science & Technology 15: 94-98. *Indicates the need to enhance nutritional and functional properties of sorghum and millets since they account for half of the total cereal production in Africa.*

Bid J. 1940. Cereal cultivation in East Africa. VI. teff. Ital. Agri. 77:170-176. (Sic.).

Biellmann F. 2010. Scientists from «Plant Growth» are involved in a project to improve crop quality in Ethiopia. SystemsX.ch Newsletter # 20, pp 6-7. March 2010. [in English, German and French]. http://www.systemsx.ch/fileadmin/SystemsX/pdf/newsletter/SystemX.ch_Newsletter_20_English.pdf accessed August 25, 2011. *Mentions about the tef project hosted at the University of Bern especially with regard to the TILLING technique implemented in the project.*

Books Group (ed). 2010. Underutilized Crops: Canna, Flax, Cassava, Cannabis, Amaranth, Typha, Eragrostis Tef, Guar, Turnip, Breadfruit, Sorghum, Plantain, Kudzu). Llc Books. ISBN: 1157040446. 182pp.

Braun A. 1841. Comments about the Flora of Abyssinia. Flora 24(1): 279. [in German].

Braun A. 1848. Contribution to the knowledge of Abyssinian plants. *Flora* 31(6):92. [in German].

Burt-Davy J. 1913. Tef (*Eragrostis abyssinica*). *Agri. J. Union of South Africa* 5:27-37.

Burt-Davy J. 1913. Tef (*Eragrostis abyssinica*). *Kew Bull.* 1913:32-39.

Camis M. 1930. Contribution to the knowledge of food materials used in the colony of Eriteria. *Miss. Scient. per l'Eritrea* 289-302. [in Italian].

Castellani E, Ciccrrone A. 1939. Malariae crittogamiche del teff. pp. 73-104. In: R. Ciferri I *Cereali dell'Africa Italiana* Vol. 2. [in Italian].

Cheverton M, Chapman GP. 1989. Ethiopian tef: a cereal confined to its center of variability. pp. 235-238. In: Wickens GE, Haq N, Day P. (eds.) *New Food Crops for Food and Industry*. Chapman and Hall, London. *Reports on the nutritional value, growth habit, pests, diseases, agronomy, and improvement of tef.*

Chioventa E. 1903. *Eragrostis abyssinica* (Jacq.) Schrad. *Annuario del R Istituto Botaico di Roma.* 8:64. [in Italian].

Ciferri R, Baldrati I. 1939. African cereals for bread making. II "teff" (*Eragrostis tef*). cereale da panificazione dell'Africa Orientale Italiana Montana. *Regio Istituto Agronomico per l'Africa Italiana, Firenze, Italy.* 106pp. [in Italian].

Ciferri R, Baldrati I. 1940. Cereals of Eastern Africa. VI "teff" (*Eragrostis tef*). *Italia Agric.* 77(3):170-176. [in Italian].

Ciferri R, Baldrati I. 1944. Proceedings of the botanical Institute of the R. University. *Laboatorio Criptogamico. Pavia. Ser. 5 Vol. 2,* pp. 166-169. [in Italian].

Ciferri R, Bartolozzi E. 1938. Cereal production in Eastern Africa. *L'Agricoltura colniale* 33(11 & 12). [in Italian].

Ciferri R. 1944. Economic-agrarian and systematic observations on plants cultivated in Ethiopia (Guizotia, Linum, Avena, Sorghum, Eragrostis, Eleusine, Pennisetum, Hordeum, Triticum). *Atti dell'Institute Botanica della Universita e Laboritorio Cittogamico. Pavia Series 5, 2.* pp. 121-232.

Ciferri R. 1944. Translation of Ciferri, 1944, Observation of agricultural ecology. *Agriculture and economics working papers 9. Ethiopia-US Cooperative Program for water resources.*

Clark JD. 1962. The spread of food production in sub-saharan Africa. *Journal of African History* 3:211-228.

Clayton WD. 1974. Eragrostis. pp. 188-244. In: Polhill, P.M. (Ed.) Flora of Tropical East Africa. Graminea. Part 2. White Friars Press, London.

Coulbeaux E. 1887. Teff. Kew Bulletin No. 1, pp. 2-6.

Cufodontis G. 1968. Enumeration of Ethiopian monocotyledon plants. Bulletin du Jardin Botanique National de Belgique 38(4):1258-1259.

De Winter B. 1955. Eragrostis. pp. 132-184. In: The Grasses and Pasture of South Africa. Cape Time, Parrow, South Africa.

Dendy DAV. 1993. Opportunities for non-traditional uses of the minor millets. pp. 259-270. In: K.W. Riley, S.C. Gupta, A. Seetharam and J.N. Mushonga (Eds.) Advances in Small Millets. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India. *Indicates the various forms of human food prepared from small millets including composite flours, wheat less bread, unleavened bread, porridges and snack foods.*

Desalegn T. 1998. Production limitations and research achievements of tef and wheat in Northwestern Ethiopia. EARO, Addis Ababa, Ethiopia.

Desta K, Mohammed YA, Ali MS, Klatt AR, Mosali J, Roberts S. 2009. Growing tef as dual purpose alternative crop in Oklahoma. International Meetings ASA, CSSA, and SSSA International Annual Meetings, November 1-5, 2009, Pittsburgh, USA, 4 pp. *Indicates the prospects of growing tef both as human food and livestock feed. Based on the experiments made in Oklahoma USA, tef produces 1.6-2.3 tons ha⁻¹ of grain and 3-4 tons ha⁻¹ of forage.*

Doggett H. 1989. Small millets—a selective overview. pp. 3-7. In: Seetharam A, Riley KW, Harinarayana G (Eds.) Small Millets in Global Agriculture, Proceedings of the First International Small Millets Workshop, 29 Oct. to 2 Nov. 1986, Bangalore, India. Oxford & IBH, New Delhi. *Presents the list of small millets grown in Africa and India, and possibilities for further improvement. According to the author, tef has never been adopted as grain crop outside Ethiopia, although it maintains an important place in Ethiopia.*

Doggett H. 1993. Introduction. pp. 3-8. In: K.W. Riley, S.C. Gupta, A. Seetharam and J.N. Mushonga (Eds.) Advances in Small Millets. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India. *According to the report, tef is the first millet that comes to the people's mind whenever African millets are mentioned, especially in conjunction with Ethiopia.*

DZARC (Debre Zeit Agricultural Research Center). 1973. Guide to research activities of Debre Zeit Agricultural Experiment Station. Haile Selassie I University (HSIU), College of Agriculture, Debre Zeit, Ethiopia. 17pp. [in Amharic and English]. *Presents brief report on activities of Debre Zeit Agricultural Research Center (DZARC) for 15 years. Studies on tef include primary and micro observations, date and rate of sowing, fertilizer and herbicide application, etc.*

DZARC (Debre Zeit Agricultural Research Center). 1981. Summary of tef research, 1967-1981. Addis Ababa University, DZARC, Debre Zeit, Ethiopia.

DZARC (Debre Zeit Agricultural Research Center). nd. Activities of Debre Zeit Agricultural Research Center, Alemaya University of Agriculture, 1955-1986. DZARC, Debre Zeit, Ethiopia. [in Amharic]. 90pp. *Presents summary of activities at Debre Zeit Agricultural Research Center (DZARC) from 1955 to 1986 regarding crops and livestock research. Experiments reported for tef include variety trials, planting time, seed rate, fertilizer studies, and crop protection studies. Improved tef cultivars developed by selection are DZ-01-354, DZ-01-196, DZ-01-99, and DZ-01-787 while those developed by crossing are DZ-Cr-44, DZ-Cr-82, and DZ-Cr-37.*

DZARC (Debre Zeit Agricultural Research Center). nd. Tef annual reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. 127pp. *Presents annual research reports for tef conducted by Debre Zeit Agricultural Research Center for six years.*

Ebba T. 1969. Tef: the cultivation, usage and some of the known diseases and insect pests. Part I. Experiment Station Bulletin 60. Haile Selassie I University (HSIU), College of Agriculture, Dire Dawa, Ethiopia. 56pp. *Provides information on cultural practices, diseases and pests of tef in Ethiopia. Also gives 27 illustrations for cultural practices and implements.*

Esfeld K. 2011. Africa's millet in Bern. Nachhaltigkeit.org [in German]. <http://www.nachhaltigkeit.org/201104137148/natur-landwirtschaft/beitrage/afrikas-getreide-im-berner-labor> accessed August 25, 2011. *Indicates about the goals and progress of tef project and also about the expert meeting in Bern.*

FAO (Food and Agriculture Organization). 1988. Eragrostis tef. In: Traditional Food Plants. Food and Nutrition Paper 42. FAO, Rome. *Gives the highlights on description, distribution, food value, ecology and cultivation of tef.*

Feleke A. 1965. Progress report on cereal and oilseed research, 1955-1963. Imperial Ethiopian College of Agricultural and Mechanical Arts. Branch Experiment Station, Debre Zeit, Ethiopia. Experiment Station Bulletin 39. 60pp. *Presents summary of yield data and other agronomic information obtained from experiments on cereals and oilseeds at Debre Zeit Station. For tef, desirable characters are straw strength, long panicle length and high yield.*

Fessehaie R, Tadele Z. (Eds.). Holetta Research Center Annual Report for 1995. Institute of Agricultural Research, Holetta Research Center, Holetta, Ethiopia.

Frohlich G. 1982. Some useful plants of local significance in Ethiopia. Beitrage Zur Tropischen landwirtschaft und Veterinaredizin 20(2):109-124. [In German].

Galperin G. 1981. Ethiopia: population, resources and economy. Progress Publishers, Moscow. 286pp. *Presents information on Ethiopian population, resources and economy. In chapter 10, discusses about the major crops including tef. According to the author, tef occupies about 30% of the area allocated for cereals but only 25% of the total production. Due to the lack of gluten, the tef has a prospect to be developed as an export item.*

Gebre H, Giorgis K. 1988. Sustaining crop production in the semi-arid areas of Ethiopia. *Ethiopian Journal of Agricultural Science* 10:99-107. *Reviews agronomic techniques developed to produce sustainable yield in semi-arid areas of Ethiopia. These include, i) soil moisture conservation using stubble or plant cover, tied-ridge, or early tillage, ii) efficient utilization of moisture using proper choice of crops, planting date, plant population, seedling emergence, or cropping systems, and iii) optimum soil fertility management.*

Gebre H. 1974. Progress in cereal production and research in Ethiopia. pp. 249-255. In: D. R. B. Manda (Ed.) *Proceedings of the Fifth Eastern African Cereals Research Conference.* Zomba, Malawi Govt. Printer.

Gelaw B. 1968. Progress report on cereals, oil seeds and pulses at the College of Agriculture, Alemaya. *Experiment Station Bulletin* 64. Haile Selassie I University (HSIU), College of Agriculture, Dire Dawa, Ethiopia. 12pp. *Presents summary of yield data, uses and other related information obtained from experimentations on cereals, oil seeds, and pulses at the College of Agriculture, Alemaya, from 1957 to 1967. Tef experiments are mainly variety trials. The author suggested to concentrate tef research at Debre Zeit not at Alemaya since the crop is not common crop and low yielder at Alemaya.*

Hansen R. 2011. Teff.

http://www.agmrc.org/commodities_products/grains_oilseeds/teff.cfm accessed July 4, 2011. *Indicates the increasing interest of consuming tef in USA especially due to its nutritional and health advantages.*

Hederg O. 1983. Ethiopian flora project. *Bothalia* 14:571-574.

Heiniger U. 2009. Tef: an ancient and unknown grain becomes a choice. Projektarbeit des Zertifikationsstudienganges, Ethnobotanik und Ethnomedizin, Univ. Zürich, Switzerland. [in German]. *Indicates the prospects of utilizing tef in Europe and USA due to its health and nutritional benefits.*

Hesselbach D. 1970. Tef cultivation in Ethiopia. Diplomarbeit, Tropeninstitut, Universität Giessen. [In German].

Huffnagel HP. (Complier). 1961. *Agriculture in Ethiopia.* Food and Agriculture Organization (FAO), Rome.

IDRC. 1988. Small Millets: Recommendations for a Network. *Proceedings of the Small Millets Steering Committee Meeting, Addis Ababa, Ethiopia, 7-9 October 1987.* IDRC, Canada. 75pp. *Presents recommendations forwarded from Small Millets Network which include finger millet, foxtail millet, proso millet, kodo millet, little millet, barnyard millet, fonio and tef.*

Imhasly P. 2007. There is much to improve. *Der Bund* (Newspaper from Switzerland) 32. September 21, 2007. [in German]. *Presents the interview made with Zerihun Tadele, Leader*

of the Tef Improvement Project at the University of Bern and co-organizer of the orphan crops conference regarding the tef project and the conference.

Jessee D. 2009. Putting tef to the test.

http://www.southernstates.com/articles/eq/pasture/spring2009_puttingtefftothetest.aspx

accessed July 4, 2011. *Shows the economic advantages of growing tef for hay production in USA. Additional benefits of tef are palatability of the hay and tolerance of the plant to drought and heat.*

Jonckheere M. 1985. Biology and cultivation of *Eragrostis tef*. M.Sc. Thesis, University of Ghent, Belgium. 132pp. [in Dutch]. *Presents ecology of tef, and crop management practices including land preparation, time of sowing, seed rate, weeding, and time of harvesting recommended for the crop.*

Jones BMG. (Unpublished). The ideal cereal. A seminar presented at Holetta Research Center, Ethiopia, June 6, 1988. *Briefly indicates the importance of tef in Ethiopian agriculture. Also reveals the nutritional quality and potential for improving minor cereals such as tef.*

Jones BMG. 1987. A tale of two crops: coffee and tef. In: Institute of Agricultural Research (IAR) Newsletter Agric. Research (Ethiopia) Vol. 2, No. 1, pp. 4-7, Mar. 1987. *Discusses the acceptance and successes of tef and coffee, the two Ethiopian indigenous crops, in other countries. According to the author, coffee has a "success story" but tef failed to get the world's attention.*

Jones BMG. 1988. Endemic crop plants of Ethiopia. I. Tef. *Walia: Journal of the Ethiopian Wildlife and Natural History* 11:37-43. *Presents history, use, biology, genetics and agronomy of tef; and also nutritional value and preparation of injera.*

Ketema S. 1988. Status of small millets in Ethiopia and Africa. pp. 6-15. In: Proceedings of Small Millets Steering Committee Meeting: Recommendations for a network, 7-9 October 1987, Addis Ababa, Ethiopia. International Development Research Center (IDRC), Ottawa, Canada.

Ketema S. 1988. Tef basics of its taxonomy, morphology, cytology, genetics and breeding. *SEBIL (Bulletin of Crop Science Society of Ethiopia)* Vol. 1, pp. 19. *Indicates that tef is a nutritious cereal that originated, domesticated and used as a staple food crop only in Ethiopia. Also shows the pollination behavior and other characters of the plant.*

Ketema S. 1989. Food self-sufficiency and the role of tef in Ethiopian agriculture. pp. 276-296. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 Dec. 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Presents short-term strategy options for increasing food production, role of tef in Ethiopian agriculture, food self-sufficiency and food security. Also provides information on nutrient composition of different grains including tef and efforts made to improve the crop.*

Ketema S. 1989. Production trends, germplasm resources, breeding and varietal improvement of small millets with special emphasis on tef in Ethiopia. In: Seetharam A, Riley KW, Harinarayana G. (Eds.) *Small Millets in Global Agriculture, Proceedings of the First International Small Millets Workshop, Bangalore, 29 Oct. to 2 Nov. 1986.* Oxford and IBH, New Delhi. pp. 167-172. *Indicates many reasons for the preference of tef by farmers. The most important reasons are, high price of the grain, tolerance of the plant to moisture scarcity, prolonged storage under local conditions, and feed value the straw for livestock.*

Ketema S. 1993. Tef: breeding, genetic resources, agronomy, utilization and role in Ethiopian agriculture. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 102pp. *Provides information on breeding, genetic resources, agronomy, nutrition and utilization of, and food self-sufficiency and the role of tef in Ethiopian agriculture.*

Ketema S. 1993. Teff crop improvement, nutrition and utilization. pp. 61-65. In: K.W. Riley, S.C. Gupta, A. Seetharam and J.N. Mushonga (Eds.) *Advances in Small Millets.* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India. *Briefly presents some of the achievements made in crop improvement and nutrition, and new aspects for the utilization of tef.*

Ketema S. 1997. Tef. In: *Promoting the conservation and use of underutilized and neglected crops—12.* Institute of Plant Genetics and Crop Plant Research, Gatersleben/International Plant Genetic Resources Institute, Rome, Italy. 50pp. *Presents highlights on genetic resources, breeding and agronomy activities, bottlenecks of production, and area of future research for tef.*

Kokeb Y. nd. If we do not consume tef. *Yekatit Magazine, Ethiopia.* [in Amharic]. *Discourages the consumption of tef due to problems related to tef production, for example, low seed yield and laborious cultural practices.*

Korobko AP. 1988. An annotated bibliography of the Scientific Phytopathological Laboratory (SPL) on phytopathology and crop protection (1976-1987). SPL, Ambo, Ethiopia. 110pp. *Shows the titles of the experiments conducted and published by Scientific Phytopathological Laboratory (SPL) staff from 1967 to 1987 (with their abstracts) in alphabetical order. The total number of experiments indicated are 204.*

Ladewig K. 1976. *Eragrostis tef* in the German Federal Republic. *Gottinger Floristische Rundbriefe* 10(2):24-27. [in German].

Loret V. 1888. The flora of Pharoas after Hieroglyphics document and specimen found in tombs. A.S.B. Lyon, L. 1887-1888. pp. 1-64. [in French].

Makari F. 2007. Scientists discuss abandoned crops. *Agricultural Review (April/June) 2007,* pp 4-6. *Presents the interview made with Zerihun Tadele, Project Leader of Tef Research at the University of Bern and Co-organizer of the Orphan Crops Conference regarding the status the tef research and the importance of the orphan crops conference.*

Marathee JP. 1993. Structure and characteristics of the world millet economy. pp. 159-178. In: K.W. Riley, S.C. Gupta, A. Seetharam and J.N. Mushonga (Eds.) *Advances in Small Millets*. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India. *Indicates the utilization and production of millet (including tef). Also presents the scope, constraints and future outlook on these crops.*

Masefield GB. 1949. *A handbook of tropical agriculture*. The Clarendon Press, Oxford.

Mengesha MH. 1968. Debre Zeit Agricultural Research Station. Haile Selassie I University (HSIU), College of Agriculture. 59pp. [in Amharic]. *Reports the major findings and activities of Debre Zeit Agricultural Research Station in 1968 in the area of field crop, horticulture, crop protection and animal science. For tef, the research was focused on identifying high yielding and lodging tolerant varieties.*

Mengiste T. Fifty quintals of tef per hectare? Addis Zemen Newspaper, Addis Ababa, Ethiopia. [in Amharic]. *Indicates the highest grain yield of 5 ton ha⁻¹ was recorded for tef at the on-station research.*

Meredith DBD. (Ed.). 1955. *The grasses and pastures of South Africa*. Grasses and Pastures Book Fund, Central News Agency.

Moruzzi G. 1932. la prolamina del *Eragrostis tef*. Bollentino della Societa Italiano Biologia Sperimentale pp. 1248. [in Italian].

Mulugeta Y. nd. Suicidal attack (Atfto metfat). Berhane Selam Printing, Addis Ababa. 292pp. [in Amharic]. *The book describes the behaviour of the ex-president of Ethiopia (Mengistu Hailemariam) during his presidancy. On page 152, presents the conversation made between the president and his higher officials about the importance of tef in Ethiopian economy during the visit to Arsi Region. According to the book, the president indicated that tef should be totally replaced by other crops within three years.*

Murdock GP. 1960. Staple subsistence crops of Africa. *Geog. Rev.* 50(4):523-540.

Nyberg G. 1969. Chilalo Agricultural Development Unit (CADU) evaluation studies: training of modal farmers (baseline study). Chilalo Agricultural Development Unit (CADU) Publication No. 31. Asella, Ethiopia. 23pp. *Presents detailed descriptions of the methods used in survey. According to the author, model farmers growing tef in the study area were 19%.*

Obilana AB. Overview: importance of millets in Africa. <http://www.afripro.org.uk/papers/Paper02Obilana.pdf> accessed July 10, 2011. *Indicates that millets are cultivated on 18.5 million ha of land in the semi-arid areas of Africa. Although millets are many in number the major ones in Africa are pearl millet (76% area), finger millet (19%), tef (9%) and fonio (4%).*

Ouattara M. The benefits of locally based food security.

<http://www.pan-uk.org/pestnews/Issue/pn33/pn33p20.htm> accessed July 5, 2011. *Indicates local crops like tef are important in food security.*

Oubrecht J. 1967. Technological procedures in the cultivation of tef. *Beitrage Tropischen und Subtropischen Landwirtschaft Tropenventerinar Medizin* 5(1):15-21. [in German].

Payne W. Evaluation of teff, lupins, sorghum and other new potential dryland crops in Northeastern Oregon.

<http://pnwsteep.wsu.edu/directseed/conf99/dspropWP.htm> accessed July 5, 2011.

Indicates the benefits of growing tef in USA due to its adaptation to environments ranging from drought-prone to water-logged.

Phanacharoensawad R. The potential of growing tef in Thailand. International Conference on the Role of Universities in Hands-On Education, Rajamangala University of Technology Lanna, Chiang-Mai, Thailand 23-29 August 2009. *Investigates agronomic performance of six tef accessions in Thailand.*

Pinstrup-Anderson P. 1989. Policy options for short run expansion of food consumption among food deficient households. pp. 518-544. In: *Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 Dec. 1986*, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Reports on the consumption, nutrition, food and price, and feeding programs. According to the author, tef is as one of the major staple foods both for rural and urban areas of Ethiopia.*

Pinto FF. 1969. Cereals in perspective in Ethiopia. Information Bulletin for Near East wheat and barley improvement and production Project. Food and Agriculture Organization (FAO) 6:7-16.

Pinto FF. 1978. Report on the highlands agronomy program, Institute of Agricultural Research (IAR), Ethiopia. Food and Agriculture Organization (FAO), Rome.

Pinto FF. 1978. Research aims at packages for cereal productivity. *Ethiopian Grain Review* 4:9-14. *Presents production packages for tef, wheat, barley, maize, and sorghum. According to him, tef benefits from high level of husbandry, and produced under adverse soil and climatic conditions.*

Porteres R. 1958. The use of cereals in Africa. V. teff of Abyssinia. *Journal d'Agriculture Tropicale et de Botanique Appliquee* 5:454-463. [in French].

Purseglove JW. 1972. *Tropical crops: monocotyledons*. Longman, Essex, England. 607pp. *Presents the botany and agronomy of tropical monocotyledonous crops including tef.*

Quenemoen ME. 1965. The teff producing area south of Addis Ababa. pp. 9-30. In: *Potential Returns from Commercial Farming Systems in Three Areas of Ethiopia. Part I. Experiment Station Bulletin 56*. Haile Selassie I University, College of Agriculture, Dire Dawa, Ethiopia. *Evaluates the status of tef production in the south of Addis Ababa, from*

Debre Zeit to Mojo. According to the author, the study area has abundant rainfall, fertile soil, and ability to produce good quality tef.

Rachie KO. 1974. The millets and minor cereals. 202pp. *Presents a bibliography of the world literature on millets pre 1930 and 1964-1969, and of all literature on other minor cereals including tef.*

Rachie KO. 1975. The millets: importance, utilization and outlook. International Crops Research Institute for Semi-arid Tropics, Hyderabad, India. 61pp. *Indicates the difficulties in categorizing millets based on common characteristics and utilization.*

Rassetti GE. nd. Abyssinian tef in Southern Africa. *L'Agric. Colon.* 5:453-454. [in Italian].

Reilly PM. (Compiler). 1978. Land resource bibliography. 10: Ethiopia. Land Resource Division, Ministry of Overseas Development, Surrey, England. 280pp. *Presents bibliography on Ethiopian agriculture, animal science, botany, crops, cultural studies, economics, etc.*

Robison RG. 1986. Amaranth, quinoa, ragi, tef and niger: tiny seeds of ancient and modern interest. *Agric. Experiment Station, University of Minnesota, Station Bulletin.* 23pp.

Ryffel M. 2011. African plant against drought. *Der Bund* (Newspaper from Switzerland) August 15, 2011. [in German]. *Mentions about objectives of the Tef Improvement Project that is hosted at the University of Bern especially with regard to developing drought tolerant cultivars.*

Rouk HF. 1962. Progress report for the central experiment station. Imperial College of Agricultural and Mechanical Arts, Haile Selassie I University (HSIU), Dire Dawa, Ethiopia. 48pp. *Presents progress report for the Central Experiment Station (now, Debre Zeit Agricultural Research Center). The Center was established in 1953; the common name was Bishoftu Expt. Station while the official name was Central Expt. Station. According to the author Bishoftu tef receives a premium price. Advantages of growing tef are due to: i) wide adaptation, ii) equal yield to wheat, iii) one of the most nutritious grains.*

Sauer P, Sullivan P. 2000. Alternative agronomic crops. *Agronomy Series. Appropriate Technology Transfer for Rural Areas* 800-346-9140. <https://attra.ncat.org/attra-pub/PDF/altcrops.pdf> accessed July 4, 2011. *Provides overview about the alternative crops for USA where tef is also indicated as one of the alternative crops.*

Scaefter AE. 1964. Agriculture in Ethiopia. *Deutsche Tropenlandwirt* 65:24-30, 55-62. [in German].

Schipper O. 2009. New perspectives for forgotten cereal. [in German and French]. National Swiss Foundation, *Horizonte* March 2009, pp 28-29. [in German and French]. http://www.snf.ch/SiteCollectionDocuments/horizonte/80/80_02_d.pdf accessed August 25, 2011. *Indicates the goals of the Tef Improvement Project and presents some achievements made.*

Schnedler W. 1977. Plants in the Central European literature that are rare or hard to find. I. *Eruca sativa*, *Eragrostis tef*, *Solanum rostratum*, *S. sisymbriifolium*, *S. sodomaeum*. Gottinger Floristische Rundbriefe 10:85-91.

Selinus R. 1971. The traditional foods of the central Ethiopian highlands. Scandinavian Institute of African Studies Research Report 7/1971, Uppsala, Sweden.

Shewry PR. 2002. The major seed storage proteins of spelt wheat, sorghum, millets and pseudocereals. In: Belton P, Taylor J. Pseudocereals and Less Common Cereals: Grain Properties and Utilization Potential. Springer, Berlin. pp.1-24.

Siegenthaler IE. (nd.) Useful plants of Ethiopia. Imperial Ethiopian College of Agricultural and Mechanical Arts, Jimma Experiment Station, Experiment Station Bulletin No. 14, Vol. 1, Jimma, Ethiopia. 40pp. *Presents a list and description of useful plants in Ethiopia. According to the author, tef seed is used to make injera, porridge, kita, tela and muk; while the straw is used for plastering, fodder, bedding for cattle and as nests for chicken.*

Siemonsma JS, Lemmens RHMJ. 2008. Underutilized cereals, pulses and vegetables in tropical Africa and their threats: conclusions from PROTA 1 and 2. ISHS Acta Horticulturae 806: International Symposium on Underutilized Plants for Food Security, Nutrition, Income and Sustainable Development. *Provides information about the program of PROTA (Plant Resources of Tropical Africa) on generating detailed information about underutilized crops including tef.*

Stalknecht GF, Gilbertson KM, Eckoff GL. 1993. Teff: food crop for humans and animals. pp. 231-234. In: **J. Error! Bookmark not defined.** Janik and J.E. Simon (Eds.) Proceedings of the Second National Symposium, New Crops: Exploration, Research and Commercialization, 6-9 Oct. 1991, Indianapolis, Indiana. John Wiley & Sons, New York. *Indicates the botany, agronomy and future prospects of as feed and food value.*

Stroud A, Mekuria M. 1992. Ethiopia's agricultural sector: an overview. pp. 9-27. In: S. Franzel and H. Van Houten (Eds.) Research with Farmers: Lessons from Ethiopia. CABI, UK. *Provides information on natural setting, socio-political and policy environment and structure of agricultural sector and services in Ethiopia. From 1979-87, tef was the first in area and second in production from the cereals. Grain yield for tef in 1987 were 795 for small holder, 738 for producers' cooperative, and 172 for state farms q ha⁻¹.*

Tadele Z, Esfeld K, Plaza S. 2009. Employing Green Revolution Genes to improve orphan crop tef. In: Tadele Z. (ed.) New Approaches to Plant Breeding of Orphan Crops in Africa: Proceedings of an International Conference, 19-21 September 2007, Bern, Switzerland. pp. 139-145. *Indicates the goal and progress of the Tef Biotechnology Project hosted at the University of Bern in Switzerland. The main goal of the project is to develop semi-dwarf tef cultivars which are tolerant to lodging, the major yield limiting factor in tef production. In order to obtain candidate lines, TILLING (Targeting Induced Local Lesions IN Genome), the reverse genetics approach is implemented.*

Tadele Z. (Ed.). 1996. Tef Commodity Research Annual Report for 1995. Institute of Agricultural research, Holetta, Ethiopia. 15pp.

Tadele Z. (Ed.). 1996. Tef Commodity Research Progress Report for the Period April 1995 to March 1996. Institute of Agricultural Research, Holetta, Ethiopia. 57pp.

Tadele Z. 2009. Orphan crops of Africa: their significance and need for improvement. *In*: Tadele Z. (ed.) New Approaches to Plant Breeding of Orphan Crops in Africa: Proceedings of an International Conference, 19-21 September 2007, Bern, Switzerland. pp. 1-9. *Indicates the names and importance of selected orphan- or understudied-crops belonging to cereals, legumes, roots and fruits. Also shows the need for applying modern breeding techniques such as marker-assisted breeding and TILLING (Targeting Induced Local Lesions IN Genome) to these disadvantaged crops in terms of improvement.*

Tadele Z. 2010. Application of modern improvement techniques to African crops. SPSW (Swiss Plant Science Web) Summer School: the global food crisis—how can plant sciences contribute? Mürren 26 June 2010. *Presents the prospects of African under-researched crops in food security.*

Tadele Z. 2010. Role of orphan crops in enhancing and diversifying food production in Africa. ATDF Journal Special issue on ‘African Orphan Crops: their significance and prospects for improvement’ 6(3/4):9-15. *Indicates the importance of African orphan crops in food security. Also mentions the need for genetic improvement of under-researched crops in order to boost food production in the continent.*

Tadele Z. 2011. Designing African future crops using biotechnological and genomic tools: the case of Tef Project. International Conference on Agricultural Biotechnology in Africa: Fostering Innovation, May 12-15, 2011, Addis Ababa, Ethiopia. *Presents strategies for the Tef Improvement Project hosted at the University of Bern in Switzerland. The project implements a modern improvement technique called TILLING (Targeting Induced Local Lesions IN Genomes) in order to obtain semi-dwarf and lodging tolerant tef lines from over 6000 mutagenized population. The project has also initiated the whole genome sequencing for tef.*

Tefera H, Ayele M. 1995. Tef improvement Programme: review of resaerch activities. *In*. Bechere E (Ed.) Forty Years of Research Experience, 1955-1994. Debre Zeit Agricultural Research Center, Alemaya University of Agriculture, Ethiopia. pp. 10-15.

Tefera H, Belay G. 2006. Eragrostis tef (Zucc.) Trotter. *In*: Brink M, Belay G. (Eds.) Prota (Plant Resources of Tropical Africa) 1: Cereals and pulses, Prota, Wageningen, Netherlands.pp 68-72.

http://database.prota.org/PROTAhtml/Eragrostis%20tef_En.htm accessed July 4, 2011. *Presents information on origin and distribution, and crop management practices for tef.*

Tefera H, Ketema S. 2001. Production and importance of tef in Ethiopian agriculture. *In*: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19

October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 3-7. *Indicates the significance of tef in Ethiopian agriculture especially related to acreage, production and contribution to GDP.*

Tuwafe S. 1971. Some aspects of teff research. Haile Selassie I University (HSIU), Debre Zeit Agric. Expt. Station. Paper Presented at the Fourth East African Research Conference, 1971, Addis Ababa, Ethiopia.

UNDP/FAO (United Nations Development Program/Food and Agriculture Organization). 1975. Institute of Agricultural Research, Ethiopia. Interim Report. Food and Agriculture Organization (FAO), Rome. 89pp. *Presents status of national research programs and and recommendations.*

University of Bern. 2009. Berner agricultural scientist receives additional grant to promote tef research. Press Release, Communication Department, University of Bern 28.10.2009. [in German]. *Indicates about the new grant from Syngenta Foundation for tef research at the University of Bern.*

<http://www.kommunikation.unibe.ch/content/medien/medienmitteilungen/news/2009/teff/> accessed August 25, 2011.

University of Bern. 2011. Bern biologists improve Ethiopia's most important cereal crop. Press Release, Communication Department, University of Bern 13.04.2011. [in German].

<http://www.kommunikation.unibe.ch/content/medien/medienmitteilungen/news/2011/zwerghirse/> accessed August 25, 2011. *Indicates about the progress made on tef research at the University of Bern and also about the planned expert meeting on April 18, 2001.*

Vaughan JG, Geissler C. 2009. Wheats and teff. In: The New Oxford Book of Food Plants. pp4-5. 2nd ed., Oxford University Press ISBN-10: 019954946X, ISBN-13: 9780199549467.

Wentworth-Sykes J. 1911. Teff. Agricultural Journal of the Union of South Africa. 1(3):443-446 and 2:220.

Wikipedia. Eragrostis tef. http://en.wikipedia.org/wiki/Eragrostis_tef accessed 10 June 2011. *Indicates tef names in different languages and also some information about the domestication and origin of the crop.*

Zegeye T. 1991. The contribution of cereals to food security in Ethiopia. pp. 311-322. In: Gebremariam H, Tanner DG, Hulluka M. (Eds.) Wheat Research in Ethiopia: a Historical Perspective. Institute of Agricultural Research (IAR) and CIMMYT. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Discusses the conceptual framework of food security, i.e., contribution of cereals to food security. According to the author, the daily per capita calorie in Ethiopia from tef was 195 in 1984, 201 in 1985, 209 in 1986, 196 in 1987, 240 in 1988, and 191 in 1989.*

Zeller FJ. 2003. Utilization, genetics and breeding of small-seeded millets: 5. Tef [Eragrostis tef (Zucc.) Trotter] [in German]. Journal of Applied Botany 77:47-52. *Indicates some useful agronomic traits needs to be investigated for tef.*

2. Research Plans and Programs

Anon. 1968. A Summary of the 1967 experimental work at Kulumsa and demonstration farm. pp. 7-10. In: Results of Trials and Observations on Field and Forage Crops at Kulumsa Farm and in Asella, 1967/68. Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Reports the summary of research activities in 1967 at Kulumsa under different disciplines*

Anon. 1968. Review of experimental work: cereals. pp. 18-20. In: Bako Agricultural Experimental Station Progress Report for Jul. 1965 to Mar. 1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the summary of research activities for different cereals at Bako. According to the report, since the cultivation of tef is expanding in the western plateau region, some works were done at the station.*

Anon. 1969. Plant study: teff. pp. 18. In: Agric. Research and Exp. Station of Awasa Report for 1968. Part I - General Review. Ministry of National Community Development, IRAT. *Presents the summary of tef trials conducted at Awasa in 1968 which include variety, cultural practice and herbicide trials.*

Anon. 1975. Summary of the results of all trials carried out during 1974/75. pp. 11-18. In: Report on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit Publication No. 111. Asella, Ethiopia. *Presents the summary of the results for the trials carried out by Chilalo Agricultural Development Unit (CADU) in 1974/75 on different crops and disciplines.*

Anon. 1977. Crop research activities (Wolaita Agricultural Development Unit (WADU)). pp. 321-332. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports research activities at six development centers under Wolaita Agricultural Development Unit (WADU) in 1975.*

Anon. 1979. Results of experimental program, Illala, 1975/76: Tef. pp. 101-102. In: Mekele Research Station Progress Report Apr. 1975 to Dec. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1979. Review of experimental work, cultural trials (Mekele, 1973-1975). pp. 87-91. In: Mekele Research Station Progress Report Apr. 1975 to Dec. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1979. Review of experimental work, Mekele, 1973-1975: Crop variety trials. pp. 91-94. In: Mekele Research Station Progress Report Apr. 1975 to Dec. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1981. Research needs and priorities in state farms. pp. 240-248. In: Proceedings of the Twelfth National Crop Improvement Conference, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the status, major problems, research needs and priorities in state farms. Tef was grown in State farm on 1016 ha in 1979/80 and 948 ha in 1980/81 at Chefa and Wollega where the average yield was 6 q ha⁻¹.*

Anon. 1982. Basic/general crop protection program for 1982/83. pp. 79-88. In: Research Programs for 1982/83. Addis Ababa, Ethiopia. *Lists research programs for 1982/83 under crop protection (weed, pathology, pests, rodents).*

Anon. 1982. Tef research programs for 1982/83. pp. 16-18. In: Research Programs for 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Provides research programs for tef in 1982/83.*

Anon. 1982. Tef research. pp. 178-181. In: Proceedings of the Thirteenth National Crop Improvement Conference. 23-25 Mar. 1981. Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Gives the highlight on tef research in Ethiopia.*

Anon. 1982. Teff. pp. 30-31. In: Wolaita Agricultural Development Unit (WADU) Summary of Crop Trials, 1970-1981. WADU Publication No. 64. Wolaita Soddo, Ethiopia. *Indicates the importance of tef in Wolaita Awraja where early maturing black tef is grown in the highlands during the short rains.*

Anon. 1983. Basic/general crop protection programs for 1983/84. pp. 86-94. In: Research Programs for 1983/84 (by Titles). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1983. Tef research programs for 1983/84. pp. 15-18. In: Research Programs for 1983/84 (by Titles). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Lists experiments on tef in 1983/84 under different disciplines. The total number of experiments indicated are 38.*

Anon. 1984. Basic/general crop protection programs for 1984/85. pp. 108/119. In: Research Programs for 1984/85 (by Titles). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1984. Tef research program for 1982/83. pp. 164-173. In: Proceedings of the Fifteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1983, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the results of 30 tef projects executed in 1982/83 in different disciplines.*

Anon. 1984. Tef research programs for 1983/84. pp. 18-21. In: Research Programs for 1984/85 (by Titles). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates experiments on tef in 1983/84 under different disciplines.*

Anon. 1985. Tef research report for 1983/84. pp. 139-178. In: Proceedings of the Sixteenth National Crop Improvement Conference, 16-18 Apr. 1984, Addis Ababa, Ethiopia. Institute

of Agricultural Research (IAR), Addis Ababa. *Presents the results of different tef yield trials in 1983/84 and two agronomy and four pathology completed experiments.*

Anon. 1995. Tef Research Strategy. Institute of Agricultural Research, Tef Commodity Research Program, Holetta, Ethiopia. 26pp.

Anon. nd. Highlights of 1977-1982 tef research activities. pp. 125-126. In: Tef Annual Reports, 1977-1982. Addis Ababa University (AAU), Debre Zeit Agricultural Research Center (DZARC), Debre Zeit, Ethiopia. *Presents the highlights of tef research at Debre Zeit from 1977 to 1982 in the area of germplasm collection, breeding and selection, and cultural practices.*

Anon. nd. Other highlights of the year's work. pp. 57. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989. *Briefly indicates some of the significant discoveries made in 1988/89 by tef team at Holetta. Among these, i) Striga hermonthica was found on tef in Gojam, and ii) Semi-sterile tef was found in Shewa associated with a fungus which occurs in humid conditions.*

Asefa A, Mulugeta W. 1998. Crop improvement research in North Shewa. EARO, Addis Ababa, Ethiopia.

Beyene T, Tamrat T. (Eds.). 1980. Register of current research on Ethiopia and the horn of Africa. No. 8: ongoing research in Ethiopia. Institute of Ethiopian Studies, Addis Ababa University, Addis Ababa, Ethiopia. *Lists ongoing research activities in different disciplines including agriculture in Ethiopia in 1970's.*

Gebremariam H. 1985. The activities of crop research teams in 1983/84. pp. 8-11. In: Proceedings of the Sixteenth National Crop Improvement Conference, 16-18 Apr. 1984, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa Part I. [in Amharic]. *Presents summary of the research activities in 1983/84 cropping year. With regard to tef, three varieties were released and 7 experiments on agronomy were completed.*

Getahun A, Birke L, Worku Z, Hailemariam S. 1979. Agricultural research system in Ethiopia. pp. 43-53. In: Proceedings of the Workshop on Agricultural Research Administration. 27-30 Jun. 1977, Nairobi, Kenya. AAASA, Addis Ababa, Ethiopia. *Gives highlight information on history of Ethiopian agricultural research system. Also indicates that Debre Zeit Agricultural Experiment Station (established in 1955) is responsible for tef research.*

IAR (Institute of Agricultural Research). 1977. Crop protection research program, 1977/78. IAR, Addis Ababa, Ethiopia. 176pp. *Indicates research programs for 1977/78 in crop protection for different crops including tef.*

IAR (Institute of Agricultural Research). 1977. Research program for 1977/78 by titles. IAR, Addis Ababa, Ethiopia. *Presents titles of research programs for different crops and disciplines in 1977/78.*

IAR (Institute of Agricultural Research). 1978. Crop Protection Department, research program of 1978/79, Part IV: weed control. IAR, Addis Ababa, Ethiopia. 216pp. *Indicates proposals of weed control trials in 1978/79 under Crop Protection Department among which one proposal is on tef weed control.*

IAR (Institute of Agricultural Research). 1978. Crop Protection Department research program (1978/79), titles. Part I: Entomology. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 77pp. *Presents research programs by Entomology Section under Crop Protection Department; four programs on tef.*

IAR (Institute of Agricultural Research). 1981. Crop protection research in Ethiopia (1977/78 to 1980/81). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates research projects in entomology, rodent control, plant pathology and weed control from 1977/78 to 1980/81 in Ethiopia. Also provides coding systems for documenting research activities (7pp.) in appendix. For tef, number of projects indicated are 7 on entomology, 9 on pathology, and 2 on weed science.*

IAR (Institute of Agricultural Research). 1981. Research program for 1981/82. IAR, Addis Ababa, Ethiopia. 85pp. *Lists the titles of experiments for different disciplines. For tef, (on pp. 15-17), 35 trials were indicated.*

IAR (Institute of Agricultural Research). 1981. Soil science research and general agronomy research in Ethiopia, 1977/78-1980/81. IAR, Addis Ababa, Ethiopia. *Lists research programs in soil science and general agronomy in Ethiopia from 1977/78 to 1980/81 for different crops including tef. Tef projects were effects of first plowing, seed preparation methods, crop sequence, drainage studies, NP rate, bone meal, etc.*

IAR (Institute of Agricultural Research). 1985. Research programs for 1985/86, by titles. IAR, Addis Ababa, Ethiopia. *Lists the titles of research programs for 1985/86 for different crops including tef. Tef projects were 27 ongoing, and 4 completed and discontinued.*

IAR (Institute of Agricultural Research). 1985. Research programs for 1985/86. IAR, Addis Ababa, Ethiopia. 151pp. *Lists the titles of research in Institute of Agricultural Research (IAR) for different crops and disciplines. Number of tef projects indicated are 31.*

IAR (Institute of Agricultural Research). 1986. 1986/87 research programs. IAR, Addis Ababa, Ethiopia. 757pp. *Lists experiments in 1986/87 in each Zone, Center/Sub-Center and Discipline.*

IAR (Institute of Agricultural Research). 1986. New and modified research programs with full write-up. IAR, Addis Ababa, Ethiopia. 402pp. *Presents full write-up of new and modified research proposals in Ethiopia.*

IAR (Institute of Agricultural Research). 1987. Research programs for 1987. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 731pp. *Presents research programs for 1987/88 by Institute of Agricultural Research (IAR). The total number of projects indicated are 1694.*

IAR (Institute of Agricultural Research). 1988. Research program directory 1988. IAR, Addis Ababa, Ethiopia. 783pp. *Shows research programs for 1988 by Institute of Agricultural Research (IAR), Debre Zeit Research Center and Ambo Scientific Phytopathological Laboratory.*

IAR (Institute of Agricultural Research). 1989. Research Program directory 1989. IAR, Addis Ababa, Ethiopia. 369pp. *Presents research programs in the Institute of Agricultural Research (IAR) for 1989. For tef, 20 ongoing and 1 new experiments are indicated.*

IAR (Institute of Agricultural Research). 1991. Research Program directory 1991. IAR, Addis Ababa, Ethiopia. 314pp. *Lists research programs for commodity and zonal research in Institute of Agricultural Research (IAR). Tef research programs indicated are 23 ongoing, and 24 new.*

IAR (Institute of Agricultural Research). 1992. Mode of collaboration between the Department of Agronomy and the Department of Agric. Economics and Farming Systems Research. pp. 265-266. In: Franzel S, Van Houten H (Eds.) *Research with Farmers: Lessons from Ethiopia*. CABI, UK. *Indicates the areas of collaboration between the Departments of Agronomy, and Agric. Economics and Farming Systems Research (DAEFSR) in Institute of Agricultural Research (IAR). According to the paper, areas of collaboration are, in planning and scheduling activities, informal and formal surveys, and on-station and on-farm trials.*

IAR (Institute of Agricultural Research). 1992. Research program directory for 1992. IAR, Addis Ababa, Ethiopia. *Presents list of new and ongoing research programs for 1992. Includes a total of 1022 ongoing and 306 new programs from which tef has 16 ongoing and 9 new trials.*

ISNAR (International Service for National Agricultural Research). 1987. Review of research program management and man power planning at the Institute of Agricultural Research in Ethiopia. ISNAR, The Hague, The Netherlands. 92pp. *Reviews research program, and man power planning in the Institute of Agricultural Research (IAR). For tef, time allocation of 169 research staff was 2.72 man years, where as time allocation of 132 research staff (in man years by centers) was 0.14 for Awasa, 0.96 for Bako, 1.89 for Holetta, 0.43 for Jimma, 2.70 for Nazreth, and 0.50 for Pawe; the total being 4.9.*

Ketema S. (unpublished, 1990). Tef research: a long-term strategic plan. Institute of Agricultural Research, Addis Ababa, Ethiopia. 177pp. *Presents a long-term strategic plan for tef improvement for 20 years (1990-2010) focusing on environment, research needs, gap analysis, etc.*

Shawel S, Negewo A. 1985. The impact of collaboration between the international agricultural research system and national agricultural research system in Ethiopia. GFA Company for agric. Projects Overseas, Hamburg, Germany.

Shekour G. 1984. Organization of team research for crop improvement in Ethiopia. pp. 106-108. In: *Proceedings of Crop Improvement in Eastern and Southern Africa: Research*

Objectives and On-farm Testing, 20-22 July 1983, Nairobi, Kenya. IDRC, Ottawa, Canada. *Discusses the research program coordination in the Institute of Agricultural Research (IAR), Ethiopia, and indicates four stages of program development: i) NCIC, ii) Pre-preview, iii) Preview, and iv) review. The author also indicates that tef grows in cool highland zone in the altitude ranging from 2500 to 4000 m.*

SPL (Scientific Phytopathological Laboratory). nd. Checklist, research papers from SPL (1976-1987). SPL, Ambo, Ethiopia. 36pp. *Lists research programs by Scientific Phytopathological Laboratory (SPL) on yearly basis since the establishment of SPL in 1976 to 1987 on subjects related to fungal, bacterial and viral diseases, pests and noxious weeds of cereals, pulses, and horticultural crops.*

3. Agro-ecology

Abebe A, Adnew H, Tsegaye S. (Compilers). 1991. Meteorological data for Institute of Agricultural Research (IAR) Centers, Sub-centers and Trial Sites. Institute of Agricultural Research (IAR) Miscellaneous Publication No. 1, Addis Ababa, Ethiopia.

Adjei-Twum DC. 1987. Manual on a computerized land evaluation system with special reference to the highlands of Ethiopia: 2. the influence of environmental conditions on plant growth and development. FAO Field Document No. 17, Addis Ababa, Ethiopia.

Alkamper J. 1974. The influence of altitude on yield and quality in cereals in Ethiopia. *Z. Acker-Pflanzenbau* 140(3):184-198. [in German].

Araya A, Keesstra SD, Stroosnijder L. 2010. A new agro-climatic classification for crop suitability zoning in northern semi-arid Ethiopia. *Agricultural and Forest Meteorology* 150: 1057-1064. *Assesses the agro-climatic resources of Giba catchment in the northern Ethiopia based on length of growing period (LGP). Assessment was made for tef and barley.*

Bechtold GK. 1987. Manual on a computerized land evaluation system with special reference to the highlands of Ethiopia: 3. geographical information and land evaluation system. FAO Field Document No. 25, Addis Ababa, Ethiopia.

Brown LH, Cocheme J. 1969. Technical report on a study of the agroclimatology of the highlands of Eastern Africa. Food and Agriculture Organization (FAO), Rome. 330pp.

Brown LH, Cocheme J. 1970. Agrometeorology survey of the highlands of Eastern Africa. *Nature and Resources, UNESCO* 6(3):2-10.

Chamberlin J, Schmidt E. 2011. Ethiopian Agriculture: A Dynamic Geographic Perspective. Development Strategy and Governance Division, International Food Policy Research Institute, Ethiopia. Strategy Support Program II (ESSP II). ESSP II Working Paper No. 17. March 2011. 29pp.

<http://essp.ifpri.info/files/2011/02/esspwp17.pdf> Accessed September 4, 2011. *Indicates crop production systems, decisions and dynamism in Ethiopian agriculture. According to authors, although tef is traditionally grown in the highlands, it can be grown under a wide range of agro-climatic conditions.*

De Pauw E. 1987. A summary of the agricultural ecology of Ethiopia. Consultant's Final Report. FAO, Rome.

Debushe LK. 2008. Ridge regression technique to determine the environmental influences on tef grain yield. *South African Journal of Plant and Soil* 25:135-138. *Investigates the effects of eleven environmental variables on tef yield. Grain yield is positively correlated to*

rainfall, average monthly minimum temperatures, and silty soils while negatively influenced by average monthly maximum temperatures and clay soils.

Hewett R. 1989. Assessment of irrigation potential in the Ethiopian highlands. pp. 340-359. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 Dec. 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Presents the highlights for sustainability of irrigation, assessment methodology and analysis of sample data to estimate potentially irrigable areas, costs of small-scale irrigation and agricultural benefits from small-scale irrigation. According to the author, tef is a major crop in LPC, HPC, and HPP zones.*

Hurni H. 1998. Agroecological belts of Ethiopia explanatory notes on three maps at a scale of 1:1,000,000. Centre for Development and Environment University of Bern, Switzerland in association with The Ministry of Agriculture, Ethiopia. Wittwer Druck AG, Bern, Switzerland. 43pp. *Presents agro-ecological maps based on field observations, altitudinal differentiation and geo-referenced application of the model based on a digital elevation model for the whole country. According to altitudinal differentiation tef is mainly grown in the Weyna Dega Belt.*

Mamo G, Takele A. 1996. Determination of length of growing period for tef in selected dry rainfed locations. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Nyssen J, Poesen J, Haile M, Moeyersons J, Deckers J, Hurni H. 2009. Effects of land use and land cover on sheet and rill erosion rates in the Tigray highlands, Ethiopia. *Zeitschrift fur Geomorphologie* 53:171-197. *Evaluates the effects of various land uses and covers on soil erosion. The cover-management for tef was lower than in central Ethiopia.*

Radcliffe DJ, Bechtold GK, Estifanos T. 1988. Land evaluation of the Hosaina area, Shewa. FAO Project Field Document No. 22, Addis Ababa, Ethiopia.

Radcliffe DJ, Bechtold GK, Estifanos T. 1989. Land evaluation of Menagesha Awraja, Shewa. FAO Project Field Document No. 32, Addis Ababa, Ethiopia.

Radcliffe DJ. 1989. Manual of reconnaissance physical land evaluation in Ethiopia. Land Use Planning and Regulatory Department, Ministry of Agriculture, Ethiopia, UNDP, FAO, Addis Ababa, Ethiopia. *Presents land evaluation methodology for Ethiopia with regard to some concepts, planning, recommendations, and land suitability for crops. For tef, indicative maximum achievable yield is 11 q ha⁻¹ for low input, 14 q ha⁻¹ for intermediate input, and 18 q ha⁻¹ for high input. According to the author, tef is moderately sensitive to frost, tolerant to poor drainage, moderately tolerant to flood (but sensitive to flash flood), moderately sensitive to salinity and medium to sodicity, and high requirements for workability.*

Rosell S, Holmer B. 2007. Rainfall change and its implications for Belg harvest in South Wollo, Ethiopia. *Geografiska Annaler Series A* 89:287-299. *Assesses the rainfall variation in*

South Wollo and its influence on growing tef during the Belg or short growing season which covers the time from February to May.

Rosell S. 2011. Regional perspective on rainfall change and variability in the central highlands of Ethiopia, 1978-2007. *Applied Geography* 31:329-338. *Analyses 30 years variations in seasonal and annual precipitation in the central highlands of Ethiopia. During the study time, the amount of Kiremt rains increased while Belg rains decreased.*

Stiehler W. 1948. Studies on agriculture and demography in Ethiopia. *Erdkunde* 2:257-287.

Suzuki H. nd. Some aspects of Ethiopian climates. *Ethiopian Geog. J.* 5(2):19-22.

Tadele Z. 1996. The agro-ecology and production technology of tef. *In: Technology Generation, Transfer and Gap Analysis Workshop, Nazret (Ethiopia), 25-27 Dec 1995. IAR, Nazret, Ethiopia. Presents the agro-ecological regions where tef is extensively cultivated in Ethiopia and recommendations given for growing the crop. These include optimum sowing date, seed rates, fertilizer type and rate, frequency of weeding or type of herbicide.*

Woldetatos T. 1974. Agroclimatology of tef in Ethiopia. pp. 152-160. *In: Proceedings of Agroclimatology of the Highlands of Eastern Africa. 1-5 Oct. 1973, Nairobi, Kenya. World Meteorological Organization, Geneva. Indicates the climatic classification of Ethiopia and climatic requirements for tef plant. The author indicates the effects of different moisture levels, temperature and altitude on growth and yield of tef. He considered Debre Zeit area as the center of tef belt in Ethiopia.*

Yizengaw T, Verheye WH. 1993. Growth requirements and approach to yield prediction for barley and tef in the central highlands of Ethiopia. *Pedologie* 43:357-372. *Investigates growth and adaptability requirements for barley and tef. Since the yield of crops from the current production levels are much lower than the yield potential, adjustment of farming systems and better management is necessary. These management inputs include the use of improved varieties, fertilizers and practices such as proper drainage.*

Yizengaw T, Verheye WH. 1992. Impact of decade versus monthly input data on the reliability of growing period analysis. *Pedologie* 42:227-243. *Presents growing period and water balance for some areas in Ethiopia with various growing period. The study sites are, Hosana, Holetta, Addis Ababa, Awasa, Bako, Nazareth, Debre Berhan, Kulumsa, Zway, and Awash.*

Yizengaw T, Verheye WH. 1994. Modelling production potentials of tef (*Eragrostis tef*) in the Central Highlands of Ethiopia. *Soil Technology* 7:269-277. *Predicts the production potential of tef for areas in the Central Highlands of Ethiopia. According to the authors, the simulated potential dry matter of tef are high, with radiation-limited yields over 6500 kg ha⁻¹ and rainfed yields ranging from 3600 to 4500 kg ha⁻¹.*

Yizengaw T, Verheye WH. 1995. Application of computer captured knowledge in land evaluation, using ALES in central Ethiopia. *Geoderma* 66:297-311. *Describes an approach to expert system in land evaluation for Central Ethiopia using the model known as LEV-CET*

(Land Evaluation System for Central Ethiopia). The model is applied to evaluate land use potentials for barley, maize and tef.

Yizengaw T. (Unpublished). A computer aided decision support system in land evaluation--a case study. Seminar Presented at International Training Center (ITC), University of Gent, Belgium, Apr. 27, 1994. 19pp.

Yizengaw T. 1994. An approach towards a macro scale land evaluation as a basis to identify resource management option in Central Ethiopia. PhD Thesis, University of Gent, Belgium.

4. History, Origin and Taxonomy

Anon. Tef—Whole Grain of the Ancients.

<http://sistahintheraw.wordpress.com/recipies/ingredients/> Accessed July 5, 2011. *Indicates the benefits of tef related to the nutrition. According to the report, tef is believed to have originated in Ethiopia between 4000 and 1000 BC. The seeds were discovered in a pyramid thought to date back to 3359 BC.*

Bekele E, Lester RN. 1981. Biochemical assessment of the relationships of *Eragrostis tef* with some wild *Eragrostis* species (Gramineae). *Annals of Botany* 48:717-725. *Evaluates 11 cultivars of tef and 14 accessions of wild Eragrostis species for taxonomic relationships using biochemical assessment. According to the authors, great variation was found in tef, and different cultivars showed similarities to several different wild Eragrostis species, suggesting the possibility of many species, particularly E. pilosa but also E. aethiopica and E. barrelieri and possibly also E. curvula and E. cilianensis, being involved in the evolution of tef.*

Bekele E. 1978. Biochemical and morphological studies of the relationship of *Eragrostis tef* and some other *Eragrostis* species. M.Sc. Thesis, University of Birmingham. 49pp.

Bekele E. 1986. The relationship between wild and cultivated species of *Eragrostis* (Poaceae) using flavinoid patterns, seed and pollen morphology as markers. *SINET: Eth. J. Sci.* 9:189-213.

Clark JD. 1976. Prehistoric populations and pressures favoring plant domestication in Africa. pp. 67-105. In: Harlan JR, deWet JMJ, Stemler ABL (Eds.) *Origins of African Plant Domestication*. Mouton Pub., The Hague, Netherlands. *Presents some accounts on domestication and possible causes of adoption for various crops. According to the author, tef was domesticated from Eragrostis pilosa in northern Ethiopia.*

Clayton WD, Renvoize SA. 1986. *Genera Graminum: grasses of the world*. Kew Publishing. 389pp.

Costanza SH, deWet JMJ, Harlan JR. 1979. Literature review and numerical taxonomy of tef. *Economic Botany* 33:413-424. *Reviews literature on the evolution of tef and numerical taxonomy of the plant (collection and measurement, group formation, analysis, etc.).*

Costanza SH. 1978. Literature and numerical taxonomy of tef. M.Sc. Thesis, University of Illinois (USA). *Studies 36 accessions of tef, Eragrostis pilosa, E. aethiopica and some other Eragrostis species for 34 metrical characters from which nineteen characters are vegetative. According to the author, prior to this work, no chemo-taxonomic work was made on tef.*

D'Andrea AC. 2008. T'ef in ancient agricultural systems of highland Ethiopia *Economic Botany* 62:547-566. *Studies the domestication of tef based on the tef grains preserved on archaeological sites and the charring experiments. According to the findings, tef may not*

survive high temperatures tolerated by larger cereal grains, such as wheat and barley. Hence, the domestication of tef might be different from other cereals.

deWet JMJ. 1989. Origin, evolution and systematics of minor cereals. pp. 19-30. In: A. Seetharam, K.W. Riley and G. Harinarayana (Eds.) *Small Millets in Global Agriculture, Proceedings of the First International Small Millets Workshop, Bangalore, India, 29 Oct. to 2 Nov. 1986.* Oxford & IBH, New Delhi.

Ebba T. 1969. The structure, classification, culture and uses of *Eragrostis tef*. pp. 39. In: Mengesha MH (Ed.) *Progress Report on Agricultural Research Activities.* Haile Selassie I University (HSIU), College of Agriculture. 78pp. *Standardizes classification and cultivar nomenclature for tef based on 140 tef samples collected from different parts of Ethiopia and grown in field at Alemaya, Ethiopia.*

Ebba T. 1975. Tef cultivars. Part II. Experiment Station Bulletin 66. Addis Ababa University, College of Agriculture, Dire Dawa, Ethiopia. 73pp. *Describes botanical characters for 35 cultivars of tef. The description of each cultivar include root, culm, leaf per culm, sheath, ligule, lamina, inflorescence, panicle branches, spikelet, glume, rachilla, floret lemma, palea, stamen, pistil and caryopsis.*

Edwards SB. 1990. Herbaceous crop with important genetic resources in Ethiopia. pp. 123-134. In: *Proceedings of the First Natural Resources Conservation Conference, 8-10 Feb. 1989, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Indicates herbaceous crops in Ethiopia according to their utilization. According to the author, the wild relative of tef is Eragrostis pilosa.*

Edwards SB. 1991. Crops with wild relatives found in Ethiopia. pp. 42-74. In: Engles JMM, Hawkes JG, Werede M (Eds.) *Plant genetic Resources of Ethiopia.* Cambridge University Press, Camb, U.K. *Gives some accounts on the wild relatives of crops grown in Ethiopia; also provides common name and usage for each crop.*

Espelund M, Bekele E, Holst-Jensen A, Jakobsen KS, Nordal I. 2000. A molecular genetic analysis of *Eragrostis tef*: non-coding regions of chloroplast DNA, 18S rDNA and the transcription factor VP1. *Hereditas* 132:193-202. *Studies the non-coding chloroplast DNA, the coding sequences of nuclear 18S rDNA, and the transcription factor Vp1 in tef. According to the authors, tef has a number of unique traits compared to other grasses. Phylogenetic analysis of the chloroplast DNA gave three grass clades, joining Eragrostis with sorghum and maize in one.*

Harlan JR. 1969. Ethiopia: a center of diversity. *Economic Botany* 23:309-314.

Harlan JR. 1986. African millets. Food and Agriculture Organization (FAO) Plant Production and Protection Paper 76. pp. 21-22.

Harlan JR. 1989. The tropical African cereals. pp. 335-343. In: Harris HR, Hillman GC (Eds.) *Foraging and Farming: the Evolution of Plant Exploitation.* One World Archaeology No. 13. (London), Unwin Hyman Ltd. *Indicates the domestication, probable areas of origin*

and agronomic and cultural contexts for sorghum, pearl millet, finger millet, tef, and other crops of Africa.

Harlan JR. 1989. Wild grass seeds as food in the Sahara and Sub-sahara. *Sahara* 2:69-74.

Harlan JR. 1989. Wild grass-seed harvesting in the Sahara and Sub-Sahara of Africa. pp. 79-98. In: Harris DR, Hillman GC (Eds.) *Foraging and Farming: the Evolution of Plant Exploitation*. Unwin Hyman, London.

Hudricourt AG. 1941. History of tef. *Revue de Botanique Appliquee et d'agriculture Tropicale* 21:128130. [in French].

Ingram AL, Doyle JJ. 2003. The origin and evolution of *Eragrostis tef* (Poaceae) and related polyploids: Evidence from nuclear waxy and plastid rps16. *American Journal of Botany* 90:116-122. *Studies the origin of tef using phylogenetic analysis of sequence data from the nuclear waxy gene and the plastid locus rps16. According to the authors, tef is closely related to Eragrostis pilosa and E. heteromera.*

Ingram AL, Doyle JJ. 2004. Is *Eragrostis* (Poaceae) Monophyletic? Insights from Nuclear and Plastid Sequence Data. *Systematic Botany* 29:545-552. *Investigates whether the genus of Eragrostis is a monophyletic using plastid locus rps16 and the nuclear gene waxy. According to the authors, the genus Eragrostis is a monophyletic group with the inclusion of four segregate genera: Acamptoclados, Diandrochloa, Neeragrostis, and Pogonarthria.*

Ingram AL, Doyle JJ. 2001. Polyploid origin of *Eragrostis tef* (Poaceae): preliminary data from the waxy locus. In: *Narrowing the Rift: Tef Research and Development*. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 59-65. *Studies the origin of tef using information from a waxy gene. According to the authors, Eragrostis pilosa is considered as a sister to tef due to its closeness to cultivated tef.*

Jackman ND. 1999. Tef and finger millet: archaeobotanical studies of two indigenous east African cereals. MA thesis, Simon Fraser University, Canada. 170pp. *Develops criteria for archaeobotanical identification of tef and finger millet using analytical methods such as light microscopy and scanning electron microscopy. According to the author, tef is difficult to identify from its wild progenitor, Eragrostis pilosa using caryopsis morphology.*

Jones BMG, Ponti JA, Tavassoli A, Dixon PA. 1978. Relationship of the Ethiopian cereal tef: evidence from morphology and chromosome number. *Ann. Bot.* 42:1369-1373. *Investigates the degree of affinity of 41 Eragrostis species to tef plant. Also studies whether these species are of interest to the plant breeder.*

Jones BMG, Tavassoli A. 1991. The origin of *Eragrostis tef*. *SEBIL (Bulletin of Crop Science Society of Ethiopia)* Vol. 3, pp. 11. *Discusses how Eragrostis species related to tef. On the evidence of grass morphology, leaf anatomy and grain type four Eragrostis species namely E.cilianesis, E.minor, E.pilosa and E.macilentata are closely related to tef.*

Lyons D, D'Andrea AC. 2003. Griddles, ovens, and agricultural origins: An ethnoarchaeological study of bread baking in highland Ethiopia. *American Anthropologist* 105:515-530. *Presents an ethnoarchaeological study of highland Ethiopian on griddle technology by comparing to bread-baking technologies in Africa and the Near East. According to the authors, there is a functional relationship between the use of ovens and griddles and the presence or absence of gluten in bread ingredients. Based on the findings, the authors concluded that indigenous species were exploited in highland Ethiopia before Near Eastern cereals were introduced.*

Mekuria T. 1949. From idolatry to christianity ('Ketaot Amlko Wede Kiristna'). Artistik Printing Press, Addis Ababa, Ethiopia. [in Amharic]. *The book presents a legend about the origin of tef. According to the legend, the first Ethiopian king and god was a dragon. One day a shrewd man killed the dragon and became the new king. At the place where the blood was shed from the dragon's head, tef originated and grew. According to the legend, this happened in Aksum, north Ethiopia.*

Pillay M. 1997. Variation of nuclear ribosomal RNA genes in *Eragrostis tef*. *Genome* 40:815-821. *Studies genetic variability among 314 plants representing 28 accessions of tef using ribosomal RNA genes (rDNA). Considerable size variation of rDNA repeats was present among accessions, between individual plants within some accessions, and within single plants. Hence, rRNA is a useful tool for studying genetic diversity in tef.*

Ponti JA. 1978. The systematics of *Eragrostis tef* (Gramineae) and related species. Ph.D. Thesis, University of London, Royal Holloway College (UK). 177pp. *Investigates morphological characteristics for tef and 38 wild species of Eragrostis. Also studies floral biology of tef.*

Porters R. 1976. African cereals: Elusine Fonio, black Fonio, tef, *Brachiaria paspalum* and African rice. pp. 409-. In: Harlan JR, deWet JMJ, Stemler ABL. (Eds.) *Origins of African Plant Documentation*. Mouton Pub., The Hague, Netherlands. *Presents the origins and local names for six crops, namely Elusine Fonio, black Fonio, tef, Brachiaria paspalum and African rice. Regarding tef (on page 426-427, under "Teff Millet of Abyssinia") indicates place of origin, names given including local names, and efforts made some people to describe varieties.*

Purseglove JW. 1976. The origins and migrations of crops in tropical Africa. pp. 291-309. In: Harlan JR, deWet JMJ, Stemler ABL. (Eds.) *Origins of African Plant Documentation*. Mouton Pub., The Hague, Netherlands. *Gives a list of crops domesticated, crops moved between Africa and Asia, and introduces crops and brief details of selected crops. According to the author, plants domesticated in Ethiopia include, tef, ensete, niger seed and Catha edulis.*

Shaw T. 1976. Early crops in Africa: a review of the evidence. In: Harlan JR, DeWet JMJ, Stemler ABL (Eds.) *Origins of African Plant Domestication*. Mouton Pub, The Hague. pp. 107-153. *Indicates that tef might have been domesticated in Ethiopia before wheat and barley were introduced.*

- Simoons JF.** 1965. Some questions on the economic pre-history of Ethiopia. *Journal of African History* 6:1-13.
- Trotter A.** 1918. *Eragrostis tef*: the *Poa teff* Zuccagni and *Eragrostis abyssinica*. *Bulletin of Italian Soc. Bot.* No. 4.
- Trotter A.** 1919. The *Poa teff* Zuccagni and *Eragrostis abyssinica*. *Bulletin of Royal Colonial in Palermo* 5:63-65.
- Trotter A.** 1938. Zuccagni and the first botanical description of Ethiopian tef. *Ann. Fac. Agri. R. Univ. Napoli. Ser. 3, Vol. 9*, pp. 1-20. [in Italian].
- Vavilov NI.** 1951. The origin, variation, immunity and breeding of cultivated plants. Translated by K.S. Chester. Ronald Press, New York. pp. 37-38. *Indicates that tef is originated in Ethiopia.*
- Wanous MK.** 1990. Origin, taxonomy and ploidy of the millets and minor cereals. *Plant Varieties and Seeds* 3:99-112. *Presents the characteristics and history of millets with specific reference to synonyms, common names, distribution, breeding characteristics and taxonomy. The species indicated under this group are Coix lacryma-jobi, Digitaria, Brachiaria deflexa, Echinochloa, Eragrostis tef, Oryza glaberrima, Panicum miliaceum and P. sumatrense, Paspalum scrobiculatum, Eleusine coracana, Pennisetum glaucum [P. americanum] and Setaria italica.*
- Zuccagni A.** 1774. History of Abyssinian plant for bread making, known by Abyssinians as tef. Firenze, Stamp. G. Vanni, MDCCL XXV. Op.in 8 picc. di VIII 45pp.

5. Germplasm Collection and Conservation

Agafonov N. 1989. Cultivated plants of Ethiopia. *Sbornik Nauchnykh Trudov po Prikladnoi Botanike, Genetike i Selektivii*. 126:71-79. [in Russian]. *Presents the results of the three year study from 1975 to 1977 on varietal diversity of cereal and other crops in Ethiopia, during which about 2000 local forms were collected as breeding material. Ethiopia is considered as the major centre of origin and diversity for many crop plants.*

Anon. 1981. Plant Genetic Resources Center/Ethiopia (PGRC/E). pp. 249-250. In: *Proceedings of the Twelfth National Crop Improvement Conference*. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the objectives, resources, activities and major accomplishments of PGRC/E since its establishment in 1976. According to the paper, 130 accessions of tef were collected.*

Anon. 1982. Tef germplasm collection. pp. 195. In: *Proceedings of the Thirteenth National Crop Improvement Conference*, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the collection made for tef in 1980/81 from Gojam and Northern Shewa regions. 84 tef samples were collected and 16 selected samples were also taken for some special interest in breeding work.*

Anon. 1987. Tef germplasm collection, purification, maintenance, characterization and evaluation. pp. 2-3. In: *Department of Field Crops, Tef Progress Report for 1985/86*. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates 2175 tef germplasm accessions and established 2318 homogenous lines.*

Anon. 1990. Tef germplasm collection, purification, maintenance, characterization and evaluation. pp. 141-142. In: *Holetta Progress Report for 1986*. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates 2313 homogenous lines of tef grown at Debre Zeit Agricultural Research Center for single pure line selection.*

Anon. nd. Introduction of *Eragrostis* species. pp. T8. In: *Debre Zeit Agric. Research Center Progress Report for 1975/76*. Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Lists 14 species of Eragrostis introduced from South Africa (3) and England (11) which can be used for wide crosses.*

Anon. nd. Tef germplasm collection and maintenance in 1981/82. pp. 88. In: *Tef Annual Reports, 1977-1982*. Debre Zeit Agricultural Research Center, Addis Ababa University, Debre Zeit, Ethiopia. *Indicates that 110 collections of tef collections made from Gojam, Gonder, Shewa, Tigray, Wellega and Illubabor Regions. This raised the total collections to 1710.*

Anon. nd. Tef germplasm collection and maintenance. pp. 119-121. In: *Tef Annual Reports, 1977-1982*. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit,

Ethiopia. *Tef collections in 1982/83 from Keffa, Illubabor and Wellega were 103 and number of maintained samples were 184.*

Anon. nd. Tef germplasm collection in 1980/81. pp. 67-71. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Presents the number of tef materials collected in 1980/81 from Gojam and Northern Shewa Regions of Ethiopia.*

Chiovenda E. 1912. Cereal collection in Eritrean colony for international exhibition in 1911. Osservazioni botaniche, agrarie ed industriali fatte nell' Abbyssinia settentr. Nell Anno 1909. Monografia e rapporti coloniali No. 19 e 24. Roma. [in Italian].

Demissie A, Tadesse Y. 1992. Crop plant genetic resources: collection, conservation and evaluation in Ethiopia. pp. 105-115. In: Proceedings of the Second Natural Resources Conservation Conference, 10-13 May 1990, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reviews the efforts made to salvage, conserve and evaluate crop plant genetic resources in Ethiopia for different crops. Tef accessions possessed by the Plant Genetic Resources Center/Ethiopia (PGRC/E) are 3287.*

Demissie A. 1991. A decade of germplasm exploration and collecting activities by the Plant Genetic Resources Centre/Ethiopia. pp. 202-217. In: Engles JMM, Hawkes JG, Werede M (Eds.) Plant Genetic Resources of Ethiopia. Cambridge University Press, Camb., UK. *Shows the efforts made by Plant Genetic Resources Center/Ethiopia (PGRC/E) in exploring and collecting various crops including tef from different regions. Also presents the altitudinal range and frequency of occurrence of various crops. For tef, total collection is 1067, from the altitudinal range of 1120 to 2950m.*

Demissie A. 2001. Tef genetic resources in Ethiopia. In: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M. (Eds), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 27-31. *Presents the activities of IBCR in tef germplasm collection, conservation and characterization. According to the author, a total of 4395 tef accessions were collected from different regions in Ethiopia with the altitude ranging from below 1000 to above 3000 m asl. Characterization for morphological and phenotypic parameters were made for 60% of the accessions.*

Demissie A. nd. A decade of germplasm exploration and collection activities by Plant Genetic Resources Center/Ethiopia (PGRC/E). pp. 28-41. In: Proceedings of International Symposium on the Conservation and Utilization of Ethiopian Germplasm, 13-16 Oct. 1986, Addis Ababa, Ethiopia. PGRC/E, Addis Ababa. *Presents the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in germplasm exploration and collection. Tef collections from 15 regions were 1067 from altitudes ranging from 1120 to 2950m.*

Ebba T. 1976. Ethiopian crop genetic resources: a building block for prosperous agriculture. pp. 64-70. In: Proceedings of the Sixth Annual Research Seminar, 12-14 Nov. 1975, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Discusses problems*

associated with crop genetic resources, and the dwindling of Ethiopia's genetic resources wealth.

Engels JMM, Goettsch E. 1991. Konso agriculture and its plant genetic resources. pp. 169-186. In: Engles JMM, Hawkes JG, Werede M (Eds.) Plant genetic Resources of Ethiopia. Cambridge University Press, Camb, U.K. *Presents agricultural system and plant genetic resources for major crops in Konso area, South-West Ethiopia.*

Engels JMM, Hawkes JG, Worede M. (eds.) 1991. Plant genetic resources of Ethiopia. Cambridge University Press, United Kingdom. 398pp.

Engels JMM, Hawkes JG. 1991. The Ethiopian gene centre and its genetic diversity. pp. 23-41. In: Engles JMM, Hawkes JG, Werede M (Eds.) Plant genetic Resources of Ethiopia. Cambridge University Press, Camb, U.K. *Provides information on the status of the Ethiopian center for each crop in terms of whether it is a primary or secondary center of diversity, and also whether the crop in question is endemic.*

Feyissa R. 1991. Germplasm conservation at Plant Genetic Resources Center/Ethiopia (PGRC/E). pp. 226-234. In: Engles JMM, Hawkes JG, Werede M (Eds.) Plant Genetic Resources of Ethiopia. Cambridge University Press, Camb, U.K. *Indicates the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in germplasm conservation for crop species in Ethiopia. Also presents the procedures for preparing seeds for long-term storage which include registration and cleaning, sample size, seed drying, viability test, storage and distribution.*

Feyissa R. nd. Germplasm conservation at the plant genetic resources center/Ethiopia (PGRC/E). pp. 49-57. In: Proceedings of the International Symposium on the Conservation and Utilization of Ethiopian Germplasm, 13-16 Oct. 1986, Addis Ababa, Ethiopia. PGRC/E, Addis Ababa. *Reports the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in germplasm conservation including facilities, sources of germplasm for long-term storage. Number of tef accessions kept by Plant Genetic Resources Center/Ethiopia (PGRC/E) are 2270.*

Guarino L. 1993. Sorghum and millet collecting in southern Arabia. Plant Genetic Resources Newsletter No. 91-92, pp. 45-49. *Reports on the collection mission undertaken in six main zones in the southern half of the Arabian Peninsula (Oman, Yemen Democratic Republic, Saudi Arabia and Yemen Arab Republic) where tef is considered as a minor crop.*

Harlan JR. 1993. Genetic resources in Africa. pp. 64-65. In: Janik J, Simon JE (Eds.) Proceedings of the Second National Symposium, New Crops: Exploration, Research and Commercialization, 6-9 Oct. 1991, Indianapolis, Indiana. John Wiley & Sons, New York. *Indicates some of the indigenous crops of Africa which have impact in the world (such as coffee and sorghum), or those considered as new crops in other world (tef, fonio, etc.). The author considered injera made up tef as the first class food because of its demand and interest in United States restaurants. Moreover, injera is vitamin enriched by yeast from a short fermentation of the dough.*

- Hawkes JG.** 1991. Theory and practice of collecting germplasm in a center of diversity. pp. 189-201. In: Engles JMM, Hawkes JG, Werede M (Eds.) Plant genetic Resources of Ethiopia. Cambridge University Press, Camb, U.K. *Presents a methodology of collecting germplasm propagated by seed and vegetatively.*
- Hunduma T.** 2006. Local crop genetic resource utilization and management in Gindeberet, west central Ethiopia. MSc thesis, Norwegian University of Life Sciences (UMB), Ås. 126pp.
- Kebebew F.** 1988. The activities of the Plant Genetic Resource Centre/Ethiopia (PGRC/E) on teff and minor millets. pp. 21-22. In: Proceedings of Small Millets Steering Committee Meeting: Recommendations for a network, 7-9 October 1987, Addis Ababa, Ethiopia. International Development Research Centre, Ottawa, Canada.
- Mekbib H, Demissie A, Hailemariam G, Tadesse D.** 1990. The role of land-races in crop production in Ethiopia. pp. 43-47. In: Proceedings of the Twenty First National Crop Improvement Conference, 10-12 Apr. 1989, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the strategy operation, characterization and preliminary evaluation of land races collected from drought stricken and drought-prone areas of Ethiopia. Cereal Collection from drought prone areas were 1432 and tef germplasm distributed to breeders and institutions for basic research from 1984 to 1988 were 2340.*
- Mekbib H.** 1991. Crop germplasm multiplication, characterization, evaluation and utilization at Plant Genetic Resources Center/Ethiopia (PGRC/E). pp. 258-267. In: Engles JMM, Hawkes JG, Werede M (Eds.) Plant genetic Resources of Ethiopia. Cambridge University Press, Camb, U.K. *Presents the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in crop germplasm multiplication, characterization, evaluation and utilization. For tef, number of accessions planted and characterized at Debre Zeit from 1983 to 1986 were 3258; whereas the number of descriptors employed were 20.*
- Mekbib H.** nd. Crop germplasm multiplication, characterization and utilization at Plant Genetic Resources Center/Ethiopia (PGRC/E). pp. 170-178. In: Proceedings of International Symposium on the Conservation and Utilization of Ethiopian Germplasm, 13-16 Oct. 1986, Addis Ababa, Ethiopia. PGRC/E, Addis Ababa. *Provides the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in germplasm multiplication, rejuvenation, characterization, evaluation, and utilization. Tef accessions planted were 350 in 1983, 2400 in 1984, 36 in 1985, and 472 in 1986, and number of descriptors were 20. The site of characterization was Debre Zeit.*
- Mohammed D, Giorgies H.** 1987. Tef germplasm research program for 1987/88. pp. 5. In: Plant Genetic Resources Center/Ethiopia (PGRC/E) Crop Germplasm Research Program for 1987/88, by titles. PGRC/E, Addis Ababa, Ethiopia. *Lists tef germplasm development programs at Debre Zeit.*
- Mulat G, Damesa D.** 1996. Collecting germplasm in the North and West Shewa administrative regions of Ethiopia. Plant Genetic Resources Newsletter (IPGRI/FAO); Addis Ababa, Ethiopia. No. 105, p. 39-41.

PGRC/E (Plant Genetic Resources Center/Ethiopia). 1982. Activity report for PGRC/E, phase II. pp. 61-68. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in collection, conservation, evaluation, documentation and distribution of plant materials. Tef collections from 1977 to 1980 were 180 and collections at base and active were 39.*

PGRC/E (Plant Genetic Resources Center/Ethiopia). 1982. PGRC/E, activity report, phase 2. pp. 49-55. In: Proceedings of the Fourteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1982, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in collection, seed processing, evaluation, documentation and evaluation. With regard to tef, 347 samples were collected.*

PGRC/E (Plant Genetic Resources Center/Ethiopia). 1985. The activities of PGRC/E in 1983/84. In: Proceedings of the Sixteenth National Crop Improvement Conference, 16-18 Apr. 1984, Addis Ababa, Ethiopia. Institute of Agricultural Research, Addis Ababa. (in Amharic & English). *Presents the activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in 1983/84 in seed collection, multiplication, evaluation, documentation, etc. Tef collections in 1983/84 were 210.*

PGRC/E (Plant Genetic Resources Center/Ethiopia). 1986. Ten years of collection, conservation and utilization (1976-1986). PGRC/E. Addis Ababa, Ethiopia. 40pp. *Reports ten years activities of Plant Genetic Resources Center/Ethiopia (PGRC/E) in germplasm collection, conservation and utilization. Tef materials collected were 1050 while donated were 1203.*

Sakamoto S, Fukui K. 1972. Collection and preliminary observation of cultivated cereals and legumes in Ethiopia. pp. 181-225. In: Umesao T (Ed.) Kyoto University African Studies. *Reports plant species collected from Ethiopia when the expedition was made from Dec. 1967 to Mar. 1968. Tef is classified into two categories based on seed color: white and red. According to the authors, the white seeded tef is extremely variable with respect to plant size, glume color and time of maturity.*

Sendek E, Engels JMM. 1991. Documentation at Plant Genetic Resources Center/Ethiopia (PGRC/E). pp. 235-244. In: Engles JMM, Hawkes JG, Werede M (Eds.) Plant genetic Resources of Ethiopia. Cambridge University Press, Camb, U.K. *Presents the documentation system followed by Plant Genetic Resources Center/Ethiopia (PGRC/E). For tef, number of collected germplasm were 1067, while donated accessions were 1203.*

Sendek E, Engels JMM. nd. Documentation at Plant Genetic Resources Center/Ethiopia (PGRC/E). pp. 87-96. In: Proceedings of the Second Natural Resources Conservation Conference, 10-13 May 1990, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the documentation system of germplasm at Plant Genetic Resources Center/Ethiopia (PGRC/E). Documentation is based on electronic data*

processing technology. Tef materials collected by Plant Genetic Resources Center/Ethiopia (PGRC/E) were 1067, donated 1203, and total was 2270.

Smithson JB. 1991. Evaluation methods and utilization of germplasm of crop species. pp. 268-277. In: Engles JMM, Hawkes JG, Werede M (Eds.) *Plant Genetic Resources of Ethiopia*. Cambridge University Press, Camb., UK. *Discusses the techniques which can be used in evaluating germplasm for genotype x environment interactions. Designs implemented to control environmental effects are: i) regular check entries, ii) augmented design, and iii) nearset neighbour analysis.*

Tadesse D. 1993. Study on genetic variation of landraces of teff in Ethiopia. *Genetic Resources and Crop Evolution* 40:101-104. *Evaluates 70 accessions of tef collected from seven regions in Ethiopia for 10 morphological and yield-related traits. Significant and highly significant variation was observed between regions, within regions and between individual plants within accessions for most of the characters considered. Regions had shown variations for different characteristics indicating that every region may contribute valuable genotypes for tef improvement programs.*

Worede M. 1983. Crop genetic resources in Ethiopia. pp. 143-147. In: Holmes JC, Tahir WM (Eds.) *More Food from Better Technology*. Food and Agriculture Organization (FAO), Rome.

Worede M. 1988. Diversity and the genetic resource base. *Ethiopian Journal of Agricultural Science* 10:39-52. *Discusses the diversity and distribution of major cultivated crops, developments and utility of germplasm, and developing genetic resource base in Ethiopia. According to the author, tef provides estimates of crop diversity; it expands due to higher demands and adaptability to conditions under which many other crops fail to grow.*

6. Morphology, Anatomy and Mechanics

Anon. nd. The IAR/ODA collaborative research project. pp. 56. In: Holetta Research Center progress Report for Apr. 1988 to Mar. 1989. *Studies characteristics which are correlated with lodging resistance in tef, and lodging susceptibility for 26 varieties. According to the report, lodging resistance is related by mathematical models to parameters such as height, panicle length, head weight, internal and external straw diameter.*

Bekele E. 1996. Morphological analysis of *Eragrostis tef*: detection for regional patterns of variation. SINET: Eth. J. Sci. 19:117-140.

Chapman GP. 1992. Alternative pathways in grass spikelet development. Plant Growth Regulators 11:33-36. *Reviews spikelet development in the Poaceae [Gramineae] with particular reference to Zea mays, Phragmites australis, Eragrostis tef, Rottboellia exaltata, Bambusa arundinacea, Dendrocalamus brandisii and Cenchrus ciliaris.*

Cheverton M, Pullan M, Didehvar F, Greig A, Chapman G. nd. Models for improvement: genetic advancement of *Eragrostis tef* with particular regard to lodging. pp. 431-448. In: Riley KW, Gupta SC, Seetharam A, Mushonga JN (Eds.) Advances in Small Millets. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India. *Presents the genetic diversity, hybridization and production constraints of tef. Detailed discussion was made on mechanics of lodging and models of lodging resistance.*

Cheverton M, Pullan M, Greig A. 1990. Comparing the forces which can cause lodging. pp. 42-59. In: The Improvement of Tef; Final Report for GTZ Contract with Wye College, UK.

Cheverton M, Pullan M, Greig A. 1990. Studies on the flexural properties of tef stems. pp. 22-41. In: The Improvement of Tef; Final Report for GTZ Contract with Wye College, UK.

Cheverton M, Pullan M, Greig A. 1990. The improvement of tef; Final report for GTZ contract with Wye College. 59pp.

Gebre E, Kunert KJ, Schluter U. 2009. Induction of dwarfism in Tef. South African Journal of Botany 75: 401.

Gebremariam E. 1994. A comparative study of the leaf ultrastructure of wheat (C₃), maize (C₄) and tef (C₄). MSc Thesis, Wye College, University of London.

Hundera F, Nelson LA, Baenziger PS, Bechere E, Tefera H. 2000. Association of lodging and some morpho-agronomic traits in tef [*Eragrostis tef* (Zucc.) Trotter]. Tropical Agriculture 77:169-173. *Investigates the relationship between lodging and morphological parameters for 30 tef genotypes.*

Jöst M. 2010. Helical tef: a twisted phenotype leads to semi-dwarfism in the Ethiopian cereal tef. MSc Thesis, University of Bern, Switzerland. *Characterizes the semi-dwarf kegne mutant using molecular, morphological and hormonal parameters. The response of kegne plants to microtubule depolymerization and stabilizing drugs imply that the underlying mutation is related to microtubules.*

Kebede Y. nd. Morphological studies of some tef, *Eragrostis tef*, cultivars. Senior Research Project Report. pp. 194-195. In: Plant Sciences Annual Research Report. 1973, Vol. 3. Haile Selassie I University (HSIU), College of Agriculture, Ethiopia. *Presents the abstract of the research project of senior student at College of Agriculture, Alemaya. Parameters studied were leaf length, number of nodes, plant height, days to heading, tillering, etc.*

Kleeberg A, Richter C. 2002. Root growth of eight different varieties of the grain tef from Ethiopia. In: Deininger A. (ed.): Deutscher Tropentag, Witzenhausen: International Research on Food Security, Natural Resource Management and Rural Development. Challenges to Organic Farming and Sustainable Land Use in the Tropics and Subtropics. Kassel University Press, Germany, p. 68, ISBN 3-89958-000-1. http://www.tropentag.de/2002/abstracts/links/Kleeberg_uLaURXdt.pdf accessed July 5, 2011. *Evaluates diverse root related parameters for eight varieties of tef. The mean values for length of root hairs varied between 0.86mm for DZ-Cr-37 and 1.06mm for Ambo White.*

Krecek RC, Van Nieuwenhuizen LC, Guthrie A, Robbertse PJ. 1993. Pollen grains of grasses in horse faecal analysis. Journal of the South African Veterinary Association 64(2):59. *Examines pollen grains of grasses at microscopic level especially tef and E. curvula.*

Pullan M. Unpublished. Report on the development of transducer for the measurement of bending moments induced in tef stems under field conditions. Tef Improvement Project, Wye College. *Develops a transducer capable of measuring the bending moments induced in the internodes of tef stems under the influence of wind, rain and plants' own weight.*

Van Delden SH, Brouwer G, Stomph TJ, Vos J. 2009. Understanding the causes of lodging of the Ethiopian cereal teff. Comparative Biochemistry and Physiology A-Molecular & Integrative Physiology 153A; S213-S213.

Van Delden SH, Vos J, Ennos AR, Stomph TJ. 2010. Analysing lodging of the panicle bearing cereal teff. New Phytologist 186: 696-707 2010. *Investigates the causes of lodging in tef using biomechanical models. Since tef is more susceptible to root lodging than to shoot lodging, breeding for improved root anchorage and shoot strength is required.*

Zewdu AD. 2007. Aerodynamic properties of tef grain and straw material. Biosystems Engineering 98:304-309. *Determines terminal velocities for tef grains and straws using the suspension velocity method.*

7. Cytogenetics

Admas S, Dagne K. 2008. Meiotic behaviour of *Eragrostis tef* and *Eragrostis pilosa*. African Crop Science Journal 16: 237-241. *Examines meiotic behavior and pollen fertility of the F₁ hybrid between tef and E. pilosa. The hybrid plant showed a regular meiotic cell division and high level of pollen fertility.*

Anon. nd. Developing chromosome techniques for tef. pp. 55-56. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Establishes protocols for preparing and staining tef chromosomes during mitosis and meiosis phases.*

Anon. nd. Establishing, rejuvenating and maintaining a collection of *Eragrostis* species for strategic tef cytogenetic research. pp. 52-53. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989. *Reports the activities of rejuvenating Eragrostis species at Holetta Research Center.*

Assefa M, Drolsom PN. 1976. Genotypic variability and preliminary cytological studies of *Eragrostis tef*. Agronomy Abstracts pp. 45.

Assefa M. 1972. Preliminary nuclear observation and developing staining technique for tef. Plant Science Annual Research Report, College of Agriculture, Ethiopia.

Assefa M. nd. Preliminary nuclear observations and developing staining technique for teff. pp. 69-77. In: Plant Science Annual Report, 1972, Vol. 2, Haile Selassie I University (HSIU), College of Agriculture, Alemaya, Ethiopia. *Develops staining technique for white and purple tef. Cytological investigations are not improved in tef due to the presence of high number and small chromosomes.*

Ayele M, Dolezel J, VanDuren M, Brunner H, Zapata-Arias FJ. 1996. Flow cytometric analysis of nuclear genome of the Ethiopian cereal Tef. Genetica 98:211-215. *Determines the genome size of nuclear DNA for tef. According to the flow cytometry reading, the 2C DNA content of ranged from 1.48 to 1.52 pg (IC genome size: 714 Mbp-733 Mbp).*

Chennaveeraiah MS, Hiremath SC. 1991. Cytogenetics of minor millets. pp. 613-627. In: Gupta PK, Tsuchiya T. (Eds.) Chromosome Engineering in Plants: Genetics, Breeding, Evolution, Part A. Developments in Plant Genetics and Breeding, 2A. Elsevier Science Publishers, Amsterdam, Netherlands. *Reviews the available data on basic chromosome number, karyomorphology, cytology, aneuploidy, genome relations and breeding for Eleusine coracana, Setaria italica, Panicum miliaceum, P. sumatrense, Paspalum scrobiculatum, Echinochloa frumentacea and tef.*

Gugsa L, Belay G, Ketema S. 2001. The cytogenetics of tef. In: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 49-57. *Reviews*

some studies made on tef cytogenetics and provides a protocol for somatic cell preparations for tef. Information on the hybrids between tef and wild relatives is also presented.

Gugsa L, Kumlehn J, Tadesse A, Tefera H, Guzmann M, Zapata-Arias FJ, Afza R, Mba C, Touraev A, Forster BP, Jain SM. 2009. Haploidy in tef gynogenesis and androgenesis. In: Touraev A, Forster BP, Jain SM (Eds.) *Advances in Haploid Production in Higher Plants*. Springer, ISBN 978-1-4020-8853-7. pp. 265-284. *Describes the gynogenesis and androgenesis methods developed for tef.*

Gugsa L, Sarial AK, Lörz H, Kumlehn J. 2006. Gynogenic plant regeneration from unpollinated flower explants of *Eragrostis tef*. *Plant Cell Rep.* 25:1287-93. *Investigates the efficiency of in vitro regeneration for the explants of tef and E. Mexicana derived from immature pistils.*

Gugsa L. 1993. Chromosome and spikelet studies on tef and pennisetum. M.Sc. Thesis, University of London, Wye College, UK.

Gugsa L. 1996. Improving the chromosome staining technique for tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. IAR, Tef Commodity, Holetta, Ethiopia.

Gugsa L. 1996. Preliminary evaluation of techniques for the induction of polyploidy in tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Hundera F, Arumuganathan K, Baenziger PS. 2000. Determination of relative nuclear DNA content of tef using flow cytometry. *J. Genet. and Breed.* 54:54:165-168. *Determines the nuclear DNA content of ten tef cultivars. According to the flow cytometry reading, the 2C DNA content of individual tef varieties ranged from 1.34 to 1.92 pg (1C genome size: 647 to 926 Mbp).*

Jones BMG, Mengiste T. nd. Tef cytogenetics. pp. 51-57. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Briefly indicates the findings of experiments in tef cytogenetics under four projects: i) cytogenetics of Eragrostis species, ii) establishing relationship between tef and other species, iii) breeding system, and iv) cytology of tef.*

Kidd AD, Francis D, Bennett MD. 1989. Replicon size and rate of DNA replication fork movement are correlated in grasses. *Experimental Cell Research* 184:262-267. *Makes a correlation between replicon size and the rate of replicon fork movement from DNA fibre autoradiography in root meristem nuclei of 13 cereal species including tef.*

Longly B, Rabau T, Louant BP. 1985. A cytological method for detecting coexistence of sexual and diplosporic reproductive processes. pp. 157-159. In: Willemse MTM, Van Went JL (compilers) *Proceedings of the Eighth International Symposium, Sexual Reproduction in Seed Plants, Ferns and Mosses, 20-24 August 1984, Wageningen, the Netherlands*. Pudoc, Wageningen, The Netherlands.

Mengiste T. 1991. Cytogenetic research on tef. Institute of Agricultural Research (IAR) Newsletter Agric. Res. Vol. 5, No. 2/3, pp. 4-5. *Gives some accounts on tef cytogenetic study in Institute of Agricultural Research (IAR) at Holetta Research Center.*

Said M. 1990. Cytogenetics studies on tef. M.Sc. Thesis, University of London, Wye College (UK).

Tavassoli A. 1986. The cytology of *Eragrostis* with special reference to *E.tef* and its relatives. Ph.D. Thesis, University of London, Royal Holloway and Bedford New College (UK). 221pp. *Examines 37 Eragrostis species for characters such as chromosome number, karyotypes, pollen grain size, and hybridization.*

8. Genetics, Breeding and Cultivars

ADD (Agricultural Development Department). 1992. Results of variety trials, 1992. ADD Publication No. 5, Dec. 1992, Addis Ababa, Ethiopia. 52pp. *Presents the results of National Field Trials Programs (NFID) of the Agricultural Development Department (ADD) in the Ministry of Agriculture (MoA) for various crops, including tef, at different locations.*

Adnew T, Ketema S, Tefera H, Sridhara H. 2005. Genetic diversity in tef germplasm. *Genetic Resources and Crop Evolution* 52:891-902. *Evaluates 140 tef accessions collected from 10 major tef growing areas in Ethiopia for 18 quantitative traits. According to the findings, regions and altitudes of origin did not contribute for substantial genetic diversity in tef germplasm; but diversity within the regions was found to be significant.*

Agafonov N. 1978. Results of agro-biological and breeding estimation of wheat, barley, triticale, tef and oat varieties. pp. 119-127. In: Results of the National Crop Trials and Others (1976). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the agrobiological and breeding estimation for 110 local and introduced varieties of tef, triticale, wheat, oats, and barley. Regarding tef, the average height was 65-70 cm, panicle length 28-32 cm, and vegetative period 130-133 days.*

Agmas S, Desalegn T, Fufa F, Ketema S. 1997. Seed yield stability and adaptability to different soil types of some improved varieties of tef. 7th Annual Conference of the Crop Science Society of Ethiopia, Addis Ababa, Ethiopia, 27-28 Apr 1995. CSSE, Addis Ababa, Ethiopia. *Presents the performance of tef varieties on black and red soils at Adet Research Center. The highest grain yield was obtained from the local check followed by DZ-Cr-31 and the lowest grain yield was produced by DZ-Cr-44.*

Alkamper J. 1973. Effects and consequences of the national yield trials on the cereal production of Ethiopia. pp. 28-38. In: Proceedings of the Fourth Annual Research Seminar. 24-26 Oct. 1973, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports on the import and export of cereals, calculated yields, net production, and supply of calories/head/day for Ethiopia. Crops used for the study are tef, wheat, barley, maize, sorghum and pearl millet.*

Anon. 1968. National yield trial of teff varieties. pp. 34. In: Results of Trials and Observations on Field and Forage Crops at Kulumsa and Asella, 1967/68. Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Investigates the performance of six tef varieties in NYT in 1967/68 at Kulumsa.*

Anon. 1968. Tef varietal trial. pp. 31. In: Report for the Period Feb. 1966 to Mar. 1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates three tef selections, one of which was introduced from France, under observation plots.*

Anon. 1968. Tef. pp. 36. In: Report for Period Feb. 1966 to Mar.1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that local varieties of tef grown on three hectare plots at Bako produced only 5-6 q ha⁻¹.*

Anon. 1968. Tef: National yield trial. pp. 32-33. In: Holetta Guenet Research Station Progress Report for Feb. 1966 to Mar. 1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates eight varieties of tef in NYT at Holetta.*

Anon. 1969. National cultural practices trial. pp. 64-67. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of cultural practice trial on tef conducted at Holetta using four sowing dates, fertilizer, and two varieties, namely A-44 (early type), and DZ-01-196 (late type). Fertilizer and planting date brought for significant effect, while varieties and interactions did not contribute for significant effect on seed yield. Yield can be improved by at least 60% if tef is sown in early July with fertilizers.*

Anon. 1969. National tef variety trial. pp. 19. Results of Trials and Observations in 1968/69. Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 28, Addis Ababa, Ethiopia. *Investigates the performance of 15 tef varieties in NYT at Kulumsa in 1968/69.*

Anon. 1969. Tef variety trial. pp. 64-65. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests the performance of 15 tef varieties in NYT at Holetta.*

Anon. 1969. Teff national variety trial. pp. 29. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Evalauates the performance of 15 tef varieties in NYT for color of seeds, days to maturity, plant height, lodging, hectoliter weight and grain yield at Kulumsa. Variety DZ-01-354 was the best variety although the color of the seed is unattractive by market standards (but produces nice, and soft injera, and not significantly darker than injera baked from much whiter DZ-01-196).*

Anon. 1969. Teff: national cultural practice trial. pp. 49-51. In: Awasa Agro-Industrial Estate, Agricultural Research and Experiment, Report for 1968, Part II-Analysis Report. Ministry of National Community Development, IRAT. *Evaluates two tef varieties (DZ-01-196 and A-44) under two fertilizer levels, and four sowing dates.*

Anon. 1969. Teff: national cultural practices trial. pp. 28. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of cultural practices (fertilizer, planting date and varieties) on tef at Holetta. Yield increase due to fertilizer was 40%, due to planting date 29%, and due to varieties 5%.*

Anon. 1969. Teff: national yield trial. pp. 47-48. In: Awasa Agro-Industrial Estate, Agricultural Research and Experiment. Report for 968. Part II: Analysis Report. Ministry of National Community Development, IRAT. *Reports the results of 115 tef varieties tested at Awasa for their grain yield.*

Anon. 1969. Teff: nursery. pp. 28. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the performances of 125 tef lines at Holetta.*

Anon. 1969. Teff: nursery. pp. 64. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly reports the performance of 125 tef collections from Shewa Province.*

Anon. 1969. Teff: variety trials. pp. 28. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the performances of 15 tef varieties in NYT at Holetta. According to the report, tef is a poor yielder crop under Holetta condition.*

Anon. 1969. Teff: variety trials. pp. 51. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa. *Examines the performances of 30 teff varieties at Bako.*

Anon. 1970. Holetta Guenet: teff. pp. 39-40. In: Report for the Period Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly reports the results of two trials on tef, i) NYT on black soils at Holetta and Areka, ii) herbicide trial at Holetta.*

Anon. 1970. Jimma: teff. pp. 95. In: Report for the Period Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly shows the results of tef NYT conducted in Jimma using 15 varieties.*

Anon. 1970. Teff variety trial. pp. 11-13. In: Jimma Research Station Progress Report for Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the performances of 15 tef varieties at Melko, Jimma where the local selection was the highest yielder.*

Anon. 1970. Teff. pp. 109-111. In: Holetta Guenet Research Station Progress Report for Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the performances of 15 tef varieties at Areka.*

Anon. 1970. Teff. pp. 77-78. In: Holetta Guenet Research Station Progress Report for Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates 15 varieties of tef in NYT at Holetta.*

Anon. 1971. Bako teff selections. pp. 59. In: Report for Apr. 1970 to Mar. 1971. Addis Ababa, Ethiopia. *Tests the most promising tef varieties at Bako and Nekemt.*

Anon. 1971. National teff yield trial. pp. 43. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Compares 10 tef varieties in NYT at Kulumsa for various characters.*

Anon. 1971. Red and white teff selections. pp. 59. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the performances of five tef selections at Bako.*

Anon. 1971. Teff national cultural practices trial. pp. 59. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates at Bako the effects of two tef varieties, at four sowing dates, and with or without fertilizer. Early sowing gave the highest yield.*

Anon. 1971. Teff national yield trial. pp. 59. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly indicates the results of 10 teff varieties in NYT under Bako and Nekemt condition.*

Anon. 1971. Teff variety trial. pp. 39-40. In: Jimma Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of tef variety trial using 10 varieties where the highest yields were obtained from DZ-01-99 and local check.*

Anon. 1971. Teff. pp. 30. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the performances of 10 tef varieties in NYT at Holetta. The three years average yield of DZ-01-354 (19.4 q ha^{-1}) was 8.3 q ha^{-1} greater than the yield of the extra white variety DZ-01-196.*

Anon. 1971. Teff. pp.71-72. In: Holetta Guenet Research Station Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the performances of 10 tef varieties in NYT under Holetta condition.*

Anon. 1972. Tef variety observations. pp. 51. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the performances of 10 varieties of tef at Holetta.*

Anon. 1972. Tef variety trial at Gode. pp. 204. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests the performances of six varieties of tef at Gode whereby all varieties gave comparable yields. According to the report, the possibility of growing more than one crop in a year and high prices of the seeds makes tef very attractive even under irrigation.*

Anon. 1972. Teff cultural practices and variety trial on farmers' field. pp. 120. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of plowing (plowed by tractor or local) and varieties on farmers' field around Bako. Seed yield (in q ha^{-1}) was 12.0 using tractor plow, 7.0 using local plow, and 4.9 using improved plow.*

Anon. 1972. Teff variety observation. pp. 125. In: Holetta Guenet Research Station Progress Report for Apr. 197 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the performances of 10 varieties of tef in NYT at Wollencomi.*

Anon. 1972. Teff variety trial at Shashemene. pp. 224. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates five selections of tef at Aje, Kofele, and Kuyera (all around Shashemene, South Ethiopia).*

Anon. 1972. Variety trial "B". pp. 89. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Screens 10 tef selections at Bako to develop better lines by simple selection based on seed color.*

Anon. 1973. NYT on teff (Kulumsa). pp. 56. In: Report on Surveys and Experiments in 1972 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 87, Asella, Ethiopia. *Investigates the performances of eight tef varieties in NYT at Kulumsa.*

Anon. 1973. Tef national variety trial at Gode. pp. 277. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly indicates the performances of two NYT trials of tef conducted at Gode. Both trials were abandoned due to irregular stands followed by bird damage.*

Anon. 1973. Tef national variety trial. pp. 40. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the performances of eight varieties of tef in NYT on cambered dark grey soil of Holetta. The local check was the highest yielder.*

Anon. 1973. Tef variety trial at Gode. pp. 277. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of tef variety trial conducted at Gode where the yields were poor.*

Anon. 1973. Teff national yield trial. pp. 61-62. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly indicates the results of tef NYT conducted at Wollencomi using seven varieties and local check.*

Anon. 1973. Teff national yield trial. pp. 70-71. In: Jimma Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares seven tef selections with the local check, but no significant yield differences were obtained.*

Anon. 1973. Teff variety trial (Chebi). pp. 56. In: Report on Surveys and Experiments in 1972 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 87, Asella, Ethiopia. *Assesses the performances of five tef varieties at Chebi.*

Anon. 1975. Teff national variety trial. pp. 10-11. In: Mekele Sub-Station Progress Report for 1973-74. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1975. Teff national yield trial. pp. 201. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests seven varieties of tef in NYT at Wollencomi, near Holetta.*

Anon. 1975. Teff variety trial. pp. 29-30. In: Mekele sub-station Progress Report for Apr. 1974 to Mar. 1975. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1975. Teff. pp. 127-128. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of teff NYT at Holetta using eight varieties.*

Anon. 1975. Yield assessment trial on teff (Kulumsa, Deneba and Asassa). pp. 67-69. In: Reports on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 111, Asella, Ethiopia. *Compares six varieties of teff plus the local check at three locations for some characters including grain yield. Variety DZ-01-354 was the best yielder in all three locations in Chilalo Awraja, Arsi Region; and Kulumsa Sel./72 was promising in lodging resistance.*

Anon. 1976. Teff cultural practice trial (Bako). pp. 32. In: Annual Reports for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of cutting teff at different stages of vegetative growth (i.e., no-cutting, cutting at 30 cm height, cutting at 15 and 30 days from the first cut) on three varieties of teff (Jaji white, DZ-01-322 and DZ-01-172). High yield was obtained from no cutting.*

Anon. 1976. Teff national variety trial (Mekele). pp. 32. In: Annual Report for Apr. 1973 to Mar. 1974. IAR, Addis Ababa, Ethiopia. *Evaluates the performance of 10 teff varieties in NYT at Mekele and Quiha.*

Anon. 1976. Teff national yield trial (Kobbo). pp. 33. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates ten teff varieties in NYT at Kobo.*

Anon. 1976. Teff NYT. pp. 159. In: Holetta Guenet Research Station Progress Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the performances of nine teff selections in NYT and local check at Wollencomi.*

Anon. 1977. National teff observation trial—Ginchi, 1975. pp. 293-294. In: Holetta Guenet Research Station Progress Report for Apr. 1975 to Mar. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1977. National teff observation trial—Holetta, 1975. pp. 85-86. In: Holetta Guenet Research Station Progress Report for Apr. 1975 to Mar. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates 26 selections of teff at Holetta where variety DZ-01-99 was superior over all others in yield.*

Anon. 1977. Summary of findings from the meeting: research. pp. 5-117. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents summary of research for major crops including teff in 1975. For teff, the crossing program was under progress and mutation breeding was also continuing.*

Anon. 1977. Tef national observation. pp. 83-88. In: Results of the National Crop Trials and Others (1975). National Crops Improvement Committee. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of 1975/76 tef national observation consisting of 26 new selections grown in more than 15 locations. According to the report, low yields of tef were due to genetic, lodging, leaf rust, poor cultural practices, pests, and poor rainfall distribution. Out of 81 hand selections, three segregated for panicle and seed color. By planting chick pea after tef, about 12.7 q ha⁻¹ tef and 1.2 ha⁻¹ chick pea yield was obtained.*

Anon. 1977. Tef variety trial. pp. 77. In: Wolaita Agricultural Development Unit (WADU) summary and Field Crop Trial Results, 1971-1977. WADU Publication No. 55. Wolaita Soddo, Ethiopia. *Evaluates 13 varieties of tef at Areka where variety DZ-01-196 was well adapted to the area.*

Anon. 1977. Variety trials. pp. 10-22. In: Results of Extension and Project Implementation Department (EPID) trials and Demonstrations. EPID Publication No. 39, Ministry of Agriculture (MoA), Addis Ababa, Ethiopia. *Tests the performances of varieties for major crops in 1975/76. For tef, four varieties (local, DZ-01-99, DZ-01-196, and DZ-01-354) were tested at different sites in Bale, Begemeder, Gamu Gofa, Gojam, Keffa, Illubabor, and Shewa Regions.*

Anon. 1979. Comparison of teff yield results for the last four years. pp. 27. In: Wolaita Agricultural Development Unit (WADU) Annual Crop Sampling Survey, 1977/78. WADU Publication No. 63, Wolaita Soddo, Ethiopia. *Indicates summary of tef yield at the highland and lowland areas of Wolaita Awraja for four years (1974/75 to 1977/78).*

Anon. 1979. Tef variety observation trial. pp. 4. In: Institute of Agricultural Research (IAR)/Extension and Project Implementation Department (EPID) Cooperative Program, Nedjo Progress Report for 1978/79. IAR, Addis Ababa, Ethiopia. *Evaluates six varieties of tef at Nedjo where the local check significantly out-yielded all varieties except one.*

Anon. 1979. Teff national yield trial—Ginchi, 1977. pp. 15-16. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the performances of 14 varieties of tef in NYT at Ginchi.*

Anon. 1979. Teff national yield trial—Ginchi, 1977. pp. 15-16. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the performances of 14 varieties of tef in NYT at Ginchi.*

Anon. 1979. Teff national yield trial—Holetta, 1976. pp. 9-10. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Summarizes the performances of 14 varieties of tef in NYT at Holetta.*

Anon. 1979. Teff national yield trial—Holetta, 1976. pp. 9-10. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR),

Addis Ababa, Ethiopia. *Summarizes the performances of 14 varieties of tef in NYT at Holetta.*

Anon. 1979. Teff national yield trials. pp. 81-83. In: Wolaita Agricultural Development Unit (WADU) Agronomic Report 1977/78-1978/79. WADU Publication No. 62, Wolaita Soddo, Ethiopia. *Reports the results of 17 tef lines in the NYT at Areka, Soddo and Bele for two years (1977/78 and 1978/79).*

Anon. 1979. Teff national yield trials. pp. 81-83. In: Wolaita Agricultural Development Unit (WADU) Agronomic Report 1977/78-1978/79. WADU Publication No. 62, Wolaita Soddo, Ethiopia. *Reports the results of 17 tef lines in the NYT at Areka, Soddo and Bele for two years (1977/78 and 1978/79).*

Anon. 1979. Teff PNYT early and late set. pp. 77-80. In: Wolaita Agricultural Development Unit (WADU) Agronomic Report 1977/78-1978/79. WADU Publication No. 62, Wolaita Soddo, Ethiopia. *Evaluates two sets (early and late) of tef at PNYT at Areka, Bele and Soddo. The early set had 11 lines while the late set had 17.*

Anon. 1979. Teff PNYT early and late set. pp. 77-80. In: Wolaita Agricultural Development Unit (WADU) Agronomic Report 1977/78-1978/79. WADU Publication No. 62, Wolaita Soddo, Ethiopia. *Evaluates two sets of tef PNYT trials at Areka, Bele and Soddo. The early set had 11 lines while the late set had 17.*

Anon. 1981. Tef national yield trial, Soddo. pp. 36. In: Wolaita Agricultural Development Unit (WADU) Agronomic Report for 1980/81. WADU Publication No. 63, Wolaita Soddo, Ethiopia.

Anon. 1981. Teff national yield trial, Bele. pp. 37. In: Wolaita Agricultural Development Unit (WADU) Agronomic Report for 1980/81. WADU Publication No. 63, Wolaita Soddo, Ethiopia.

Anon. 1981. Teff pre-national yield trial, Bele. pp. 35. In: Wolaita Agricultural Development Unit (WADU) Agronomic Report for 1980/81. WADU Publication No. 63, Wolaita Soddo, Ethiopia.

Anon. 1982. Review and evaluation of tef research in 1981. pp. 189-223. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports activities made in tef improvement which include hybridization, nursery selection, primary yield trial, advanced observation, Pre-NYT and two sets of NYT.*

Anon. 1982. Teff NYT at Bele. pp. 51. In: Wolaita Agricultural Development Unit (WADU) Summary of Crop Trials, 1970-1981. WADU Publication No. 64, Wolaita Soddo, Ethiopia. *Evaluates the performances of nine tef lines at Bele with regard to seed yield, leaf and stem rust, plant height and lodging.*

Anon. 1982. Tef PNYT at Bele. pp. 52-53. In: Wolaita Agricultural Development Unit (WADU) Summary of Crop Trials, 1970-1981. WADU Publication No. 64, Wolaita Soddo, Ethiopia. *Evaluates 14 tef lines at Bele for yield, leaf and stem rust, shoot fly, plant height and lodging.*

Anon. 1983. Tef national yield trial. pp. 5. In: Institute of Agricultural Research (IAR)/Extension and Project Implementation Department (EPID) Cooperative Program, Endibir Progress report for 1979/80. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the result of 15 tef varieties grown at Endibir in 1979/80.*

Anon. 1983. Tef progress report for 1978/79. pp. 149-183. In: Field Crops Department Progress Report for 1978/79. Part I: Cereals. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the result of tef yield trials (Pre-NYT, NYT) at Endibir and Jimma areas.*

Anon. 1983. Tef research program for 1977/78. pp. 88-99. In: Field Crops Department Progress Report for 1977/78. Part I: Cereals. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents results of tef yield trials at four sites of Institute of Agricultural Research (IAR): Illala, Holetta, Ginchi and Suba.*

Anon. 1985. National yield at Harawa and Gambella. pp. 44-45. In: Review of Crop Research and Seed Multiplication Activities at Various Settlement Schemes of Ethiopia, 1980-1984. Trials Demonstration and Seed Increase (TDSI) Program, Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Evaluates the performance of some tef varieties at two TDSI sites.*

Anon. 1985. Pre-national yield trial at Harawa, Gambella and Dana. pp. 44. In: Review of Crop Research and Seed Multiplication Activities at Various Settlement Schemes of Ethiopia, 1980-1984. Trials Demonstration and Seed Increase (TDSI) Program, Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Briefly reports the results of pre-national tef yield trial.*

Anon. 1985. Tef. pp. 43-44. In: Review of Crop Research and Seed Multiplication Activities at Various Settlement Schemes of Ethiopia, 1980-1984. Trials Demonstration and Seed Increase (TDSI) Program, Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Reports the results of seven tef varieties grown at Asossa and Harole from 1980 to 1984.*

Anon. 1985. Variety trial at Dimtu, Harloe and Dana. pp. 45-47. In: Review of Crop Research and Seed Multiplication Activities at Various Settlement Schemes of Ethiopia, 1980-1984. Trials Demonstration and Seed Increase (TDSI) Program, Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Presents results of tef variety trial at Dimtu, Harole and Dana sites in 1982 and 1984.*

Anon. 1986. Tef report for 1984/85. pp. 205-246. In: Proceedings of the Seventeenth National Crop Improvement Conference, 16-18 Apr. 1985, Addis Ababa, Ethiopia. Institute

of Agricultural Research (IAR), Addis Ababa. *Reports the results of various tef yield trials conducted in 1984/85 by various institutions.*

Anon. 1987. Tef advanced observation trial. pp. 11-14. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates eleven tef entries in advanced observation nursery at five sites. The standard check (DZ-01-354) was the highest yielder at Chefe Donsa, whereas, the local check was the highest yielder at Koka.*

Anon. 1987. Tef breeding. pp. 5-6. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the progresses made in tef through conventional and mutation breeding. Also indicates number of lines advanced from F_2 to F_3 , from F_5 to F_6 , and from F_6 to yield trials.*

Anon. 1987. Tef national yield trial (early set). pp. 16. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the performances of ten tef entries in early set of NYT at 10 locations.*

Anon. 1987. Tef national yield trial (late set). pp. 17. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates eight entries of tef in late set NYT at 20 locations.*

Anon. 1987. Tef nursery of germplasm collection. pp. 4-5. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Characterizes 73 early maturing, 27 potentially drought tolerant, tef lines for green culm.*

Anon. 1987. Tef preliminary yield trial. pp. 6-10. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates seven entries of tef at five locations in un-replicated plots as preliminary yield trial.*

Anon. 1987. Tef pre-NYT. pp. 15. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Screens 12 entries of tef in pre-NYT at 15 locations.*

Anon. 1987. Tef report for 1985/86. pp. 136-166. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the results of tef yield trials in 1985/86. The trials reported are: Pre-NYT, NYT early and late sets, variety adaptation and demonstration.*

Anon. 1987. Tef variety trial (Institute of Agricultural Research (IAR)/Agricultural Development Department (ADD)). pp. 18-19. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of three tef variety trials conducted by Institute of Agricultural*

Research/Agricultural Development Department (IAR/ADD) which include variety adaptation trials phase I and II, and demonstration phase II.

Anon. 1987. Teff NYT (early set). pp. 23. In: Trial Demonstration and Seed Increase Project, 1985-86. Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Reports the performances of nine early maturing tef lines at Harawa.*

Anon. 1987. Teff NYT (early set). pp. 24. In: Trial Demonstration and Seed Increase Project, 1985-86. Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Evaluates 10 early maturing varieties of tef at Harole, Anger-Gutin, and Harawa.*

Anon. 1987. Teff NYT (late set). pp. 25. In: Trial Demonstration and Seed Increase Project, 1985-86. Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Reports the performances of 10 late maturing tef lines at Harawa settlement site.*

Anon. 1987. Teff variety adaptation. pp. 22. In: Trial Demonstration and Seed Increase (TDSI) Project, 1985-1986. Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Studies the performances of eight tef varieties at Anger Gutin, Harole, and Harawa.*

Anon. 1987. Teff: variety trials. pp. 20-21. In: Trial Demonstration and Seed Increase Project, 1985-86. Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Evaluates nine tef varieties at Gode and Assosa, and six varieties at Dimtu.*

Anon. 1988. Tef variety adaptation test. pp. 22-24. In: Pawe Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the adaptation of 10 tef varieties on black and red soils of Pawe. Improved varieties gave lower yield than the check on both soils due to shoot fly damage.*

Anon. 1988. Tef variety x sowing date trial. pp. 74-76. In: Pawe Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies the optimum planting time for three varieties of tef (DZ-01-354, Dabbi and local check), on two soil types (red and black). The sowing dates tested were: July 15, 25, August 4, and August 14.*

Anon. 1990. Tef advanced observation trial. pp. 144-145. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the performance of 11 tef entries at Debre Zeit (light and black soil), Akaki, Chefe Donsa and Koka. No entry out-yielded the local check.*

Anon. 1990. Tef breeding. pp. 143. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of tef breeding work in 1986/87 using standard procedure for crossing tef lines, i.e., conventional plus mutation breeding.*

Anon. 1990. Tef national yield trial (early set). pp. 146. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates*

the performance of 10 tef varieties in early set of NYT at four locations (Koka, Dhera, Robe and ARDU).

Anon. 1990. Tef national yield trial (late set). pp. 146-147. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the performance of eight tef varieties in NYT (late set) at 11 sites.*

Anon. 1990. Tef nursery of germplasm collection. pp. 142-143. In: Holetta Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates 95 early maturing and 27 potentially drought tolerant lines at Debre Zeit and Koka. A total of 35 accessions possessing a character of drought tolerance and/or mature seeds with green vegetative parts were selected and promoted to Pre Yield Observation (PYO).*

Anon. 1990. Tef preliminary yield observation. pp. 143-144. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of two trials conducted at Debre Zeit (light and black soil) and Akaki.*

Anon. 1990. Tef pre-NYT. pp. 145. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of 12 tef entries at pre-NYT stage at 11 locations. Variety DZ-01-354 showed better and wide adaptation than the other entries.*

Anon. 1990. Tef variety adaptation trial phase I—late set. pp. 153. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of variety adaptation trial (phase I - late set) using nine entries at five locations.*

Anon. 1990. Tef variety trial Phase I—early set. pp. 153-154. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the performances of seven entries at Harbu and Woldia, where no significant yield differences were obtained between the two locations.*

Anon. nd. Breeding work in tef in 1979/80. pp. 29. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Investigates the tef crosses and entries at various generations.*

Anon. nd. Crossing tef with related tetraploid species of *Eragrostis*. pp. 54. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Studies the possibility of crossing tef to *Eragrostis pilosa*. According to the report, two fertile hybrids were obtained from the crosses.*

Anon. nd. Demonstration (pre-release) trial for tef. pp. 85-87. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Evaluates five entries of tef in demonstration plots at five locations. The four year (1978-81) results are presented.*

Anon. nd. Determination of the degree of outbreeding in field-grown tef. pp. 55. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Measures the extent of outbreeding in tef under controlled conditions and assesses whether natural crossing can be used for planned hybridization in tef breeding program.*

Anon. nd. Effect of variety, seed rate and time of weeding on the yield of tef. pp. 64-69. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates two varieties of tef (DZ-01-354 and Adet local), using four seed rates (15, 25, 35, and 45 kg ha⁻¹), and four time of weedings (15, 30, 45, and 60 days after crop emergence). The Adet local variety gave the highest yield at the seed rate of 15 kg ha⁻¹ and weeding at 45 days after emergence.*

Anon. nd. Effect of variety, sowing date and fertilizer response on the grain yield of tef. pp. 78. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of two varieties of tef (DZ-01-354 and Adet local), four sowing dates (June 12, June 22, July 2, and July 12), and two fertilizer rates (0/0 and 60/60 N/P₂O₅ kg ha⁻¹) on tef seed yield. Adet local gave higher yield than the improved variety DZ-01-354 for 60/60 N/P₂O₅ fertilizer application.*

Anon. nd. Hybridization and selection in tef in 1981/82. pp. 85. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Indicates the number of tef materials planted in 1981/82 at different generations after introgression and mutation breeding.*

Anon. nd. Identification of the breeding systems of wild Eragrostis species. pp. 53. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Briefly reports the breeding systems for 33 Eragrostis species studied by direct observation of flowering and by control pollination which include bagging single heads and co-bagging heads from different individuals.*

Anon. nd. National yield and pre-national yield trials for tef. pp. 56. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Briefly reports the results of tef yield trials conducted at Holetta and Ginchi.*

Anon. nd. Outbreeding in tef. pp. 54-55. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Estimates the frequency of outbreeding in tef in farmers' field at Meki, Central Rift Valley.*

Anon. nd. Released varieties of tef. pp. 124. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Describes four released varieties of tef (DZ-01-354, DZ-01-196, DZ-01-99, and DZ-01-787) in terms of adaptation, plant height, days to maturity, panicle color, seed color, lodging percent and seed yield.*

Anon. nd. Results of tef experiments in the Ada area. pp. T9-T15. In: Debre Zeit Agric. Research Center Progress Report for 1975/76. Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Presents the results of two experiments (variety trials and breeding) in Ada Region.*

Anon. nd. Tef breeding activities during 1975. pp. T3-T7. In: Debre Zeit Agric. Research Center Progress Report for 1975/76. Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Reports the activities of Debre Zeit Agricultural Research Center (DZARC) in tef breeding using both conventional and mutation breeding methods. In 1975 alone, 17 single, double, three way and multiple introgressions were made. For mutation breeding, a dose of 150 KRADS was used to treat four varieties of tef with thick culm (DZ-01-566, DZ-01-418, DZ-01-186, and DZ-01-508).*

Anon. nd. Tef breeding and selection. pp. 95-96. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Reports the progresses made in tef breeding (conventional and mutation) and selection work during 1982/83.*

Anon. nd. Tef breeding in 1977/79. pp. 7. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Reports the results obtained using conventional and mutation breeding of tef.*

Anon. nd. Tef hybridization and selection in 1978/79. pp. 12. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Reports the hybridization and selection work for tef in 1978/79.*

Anon. nd. Tef hybridization and selection in 1980/81. pp. 47-48. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Presents the number of tef crosses made and entries tested at various generations. Crosses made in 1980/81 were 30.*

Anon. nd. Tef national observation trial. pp. T2. In: Debre Zeit Agric. Research Center Progress Report for 1975/76. Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Compares 26 new selections of tef at 15 locations for grain yield and/or quality of seed. No entry significantly out-yielded the standard check (DZ-01-354). According to the report, reasons given for the low national yield of tef are: i) the genetics of the plan are not explored, ii) lodging especially if high doses of N applied, iii) leaf rust, iv) poor cultural practices (tef demands careful management), v) pests, and vi) low rainfall and/or poor distribution.*

Anon. nd. Tef natural out-crossing study in 1977/78. pp. 7. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Indicates two techniques used for natural out-crossing study. Also disproved the long held theory which says that tef is strictly cleistogamous in its pollination.*

Anon. nd. Tef sowing date x variety trial in 1981/82. pp. 88-90. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Evaluates sowing dates and varieties for tef at six locations around Debre Zeit.*

Anon. nd. Tef sowing date x variety trial in 1982/83. pp. 114-116. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit,

Ethiopia. *Reports the results of sowing date by variety trial conducted at Chefe Donsa and Debre Zeit.*

Anon. nd. Tef variety x sowing date trial at Sinana in 1986. pp. 65. In: Sinana Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effect of three tef varieties (DZ-01-354, Dabbi, and local check), and four sowing dates (July 1, July 10, July 20, and July 30) on yield. Significant differences between sowing dates were obtained; the highest yield was from July 20 sowing at Sinana.*

Anon. nd. Tef yield trials for 1977/78. pp. 1-6. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Reports the tef yield trials which include: 12 varieties of NYT at two locations, 17 crossed lines from early set nursery at Debre Zeit, and 42 crossed line from late set nursery at Debre Zeit.*

Anon. nd. Tef yield trials in 1978/79. pp. 12-23. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Reports tef yield trials which include NYT (13 entries at 3 locations), Pre-NYT late set (17 entries at 3 locations), Pre-NYT early set (11 entries at 2 sites), and advanced yield trial (13 entries at 2 sites).*

Anon. nd. Tef yield trials in 1979/80. pp. 31-47. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Presents results of yield trials (NYT, Pre-NYT early and late, and advanced observation) conducted in 1979/80.*

Anon. nd. Tef yield trials in 1980/81. pp. 48-66. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Reports the results of tef yield trials conducted in 1980/81 which include NYT, Pre-NYT, advanced yield trial, primary observation, demonstration trial and nursery of germplasm materials.*

Anon. nd. Tef yield trials in 1981/82. pp. 71-84. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Presents the results of tef yield trials (2 sets of NYT, Pre-NYT, Advanced yield trial, primary observation and nursery germplasm) in 1981/82.*

Anon. nd. Tef yield trials in 1982/83. pp. 96-114. In: Tef Annual Reports, 1977-1982. Debre Zeit Agricultural Research Center (DZARC), Addis Ababa University (AAU), Ethiopia. *Presents the results of six yield trials conducted at various locations. NYT was conducted with and without the application of fertilizer.*

Anon. nd. Teff: cultural practices trial. pp. 55-56. In: Awasa Experiment Station Progress Report for 1970 Campaign. Part II. Analytical Report, IRAT. *Tests four sowing dates (Jul. 9, Jul. 24, Aug. 8 and Aug. 23) for two varieties of teff (A-44, and DZ-01-238). The best sowing date for Awasa is July 24.*

Anon. Tef: national yield trial. pp. 54-55. In: Awasa Experiment Station Progress Report for 1970 Campaign. Part III, Analytical Report, IRAT. *Evaluates the performance of nine tef varieties at Awasa.*

Araya W, Teklemichael A. nd. Tef variety trial. pp. 26-29. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of tef variety trials on two soil types (red and black) at Adet.*

Assefa K, Aliye S, Belay G, Metaferia G, Tefera H, Sorrells ME. 2011. Quncho: the first popular tef variety in Ethiopia. *International Journal of Agricultural Sustainability* 9:25-34. *Describes the properties of the new popular tef cultivar called Quncho. The cultivar was developed from an intra-specific hybridization between DZ-01-974 and DZ-01-196 and inherited at least one desirable trait from each parent: high seed yield from DZ-01-974, and white seed color from DZ-01-196.*

Assefa K, Belay G, Tefera H, Yu JK, Sorrells ME. 2009. Breeding tef: conventional and molecular approaches. In: Tadele Z. (ed.) *New Approaches to Plant Breeding of Orphan Crops in Africa: Proceedings of an International Conference, 19-21 September 2007, Bern, Switzerland.* Stämpfli AG, Bern. ISBN: 978-3-033-02012-2. pp. 21-41. *Presents efforts made for about 50 years to improve tef. According to the review, 24 tef cultivars (16 from pureline selection and 8 from hybridization) were released to the farming community. Also mentions about the development of breeder-friendly PCR-based genetic markers in tef improvement.*

Assefa K, Ketema S, Tefera H, Hundera F, Kefyalew T. 2001. Genetic diversity for agronomic traits in tef. In: *Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), *Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia.* Ethiopian Agricultural Research Organization, Ethiopia. pp. 33-48. *Reviews studies made on morphological, agronomic and molecular diversity of tef germplasm. Special emphasis was given to diversity in root morphology, seed size, and lodging.*

Assefa K, Ketema S, Tefera H, Kefyalew T, Hundera F. 2000. Trait diversity, heritability and genetic advance in selected germplasm lines of tef. *Hereditas* 133:29-37. *Investigates diversity in 320 tef germplasm for 17 pheno-morphic and agronomic traits. According to the authors, estimates of broad sense heritability and genetic advance were highest for panicle length and number of fertile tillers/plant, respectively.*

Assefa K, Ketema S, Tefera H, Nguyen HT, Blum A, Ayele M, Bai GH, Simane B, Kefyalew T. 1999. Diversity among germplasm lines of the Ethiopian cereal tef. *Euphytica* 106:87-97. *Evaluates the diversity of 320 tef lines for 20 morphological, phenological and agronomic characters at Debre Zeit and Melkassa. According to the findings, diversity exists in tef germplasm for many traits, and this suggests the potential for genetic improvement through hybridization and selection.*

Assefa K, Merker A, Tefera H. 2002. Qualitative trait variation in Tef germplasm from Western and Southern Ethiopia. *Euphytica* 127:399-410. *Characterizes morphological and anatomical properties of 60 tef populations from western and southern Ethiopia.*

Assefa K, Merker A, Tefera H. 2003. Multivariate analysis of diversity of tef germplasm from western and southern Ethiopia. *Hereditas* 138:228-236. *Evaluates 60 tef lines from western and southern Ethiopia for 17 pheno-morphic and agronomic traits at Debre Zeit. According to the authors, variation in tef germplasm exists based on regional and altitudinal differences.*

Assefa K, Tefera H, Merker A, Kefyalew T, Hundera F. 2001. Quantitative trait diversity in tef germplasm from Central and Northern Ethiopia. *Genetic Resources and Crop Evolution* 48:53-61. *Investigates the diversity in quantitative traits for over 1000 tef entries representing 36 populations collected from central and northern Ethiopia. According to the authors, tef has large diversity for quantitative traits.*

Assefa K, Tefera H, Merker A, Kefyalew T, Hundera F. 2001. Variability, heritability and genetic advance in pheno-morphic and agronomic traits of tef germplasm from eight regions of Ethiopia. *Hereditas* 134:103-113. *Evaluates diversity in pheno-morphic and agronomic traits for 120 tef germplasm lines. According to the authors, wide genetic variations were obtained for the genotypes tested.*

Assefa K, Tefera H, Merker A. 2002. Variation and inter-relationships of quantitative traits in tef germplasm from western and southern Ethiopia. *Hereditas* 136:116-125. *Investigates regional and altitudinal variations for 3000 tef lines representing 60 populations. The germplasm showed substantial phenotypic variation.*

Assefa K, Yu JK, Zeid M, Belay G, Tefera H, Sorrells ME. 2011. Breeding tef: conventional and molecular approaches. *Plant Breeding* 130:1-9. *Indicates the achievements and constraints of tef breeding during 50 years. The major constraints are low yield and susceptibility to lodging. In addition to 24 improved varieties, more than 1500 PCR-based molecular markers have been developed.*

Assefa K. 2003. Phenotypic and molecular diversity in the Ethiopian cereal, Tef. PhD thesis SLU, Sweden.

Assefa M. nd. National yield trial on teff, 1971/72. pp. 78-85. In: *Plant Science Annual Report, 1972, Vol. 2.* College of Agriculture, Haile Selassie I University (HSIU), Ethiopia. *Presents the results of tef NYT conducted at seven locations using 10 selections including the local.*

Assefa M. nd. National yield trial on teff, 1972. pp. 96-104. In: *Plant Science Annual Research Report 1973, Vol. 3.* College of Agriculture, Haile Selassie I University (HSIU), Ethiopia. *Reports the results of six years of tef NYT conducted at College of Agriculture, Alemaya, where eight selections were tested.*

Avezdzhhanov A, Anga M. 1980. Agrobiological and breeding evaluation of wheat, barley, sorghum, maize and tef. pp. 200-216. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Presents the results of agrobiological and immunological evaluations of cereals (wheat, tef, sorghum, maize and barley) at Ambo. The experiments made on tef pre-national and national yield trials.*

Avezdzhhanov R, Agafonov N, Anga M, Avezdzhhanov G. 1979. Results of studying wheat, barley, triticale and tef varieties in NYT and PNYT. pp. 52-60. In: Proceedings of the Eleventh National Crop Improvement Committee Meeting. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the performances of 97 varieties of cereals (i.e., 22 bread wheat, 29 durum wheat, 24 triticale, 11 barley, and 11 tef) at Scientific Phytopathological Laboratory (SPL), Ambo. For tef, the check variety (DZ-01-354) out-yielded the other varieties.*

Ayele M. 1999. Genetic diversity in tef for osmotic adjustment, root traits, and Amplified Fragment Length Polymorphism. PhD Thesis, Texas Tech University, USA. 152 pp. *Presents the results of the following three studies, i) screening tef germplasm for key drought resistant traits, ii) investigating the impact of osmotic adjustment and root depth on productivity of tef, and iii) assessing the diversity of tef germplasm using amplified fragment length polymorphism (AFLP) marker. According to the author, fingerprinting revealed that the three *Eragrostis* species, namely tef, *E pilosa* and *E curvula*, are distinctly separated where by *E pilosa* is more closely related to tef than *E. curvula*.*

Balcha A, Gretzmacher R, Vollmann J. 2003. Estimation of genetic parameters for grain yield and yield related traits in tef. *Journal of Genetics and Breeding* 57:251-257. *Investigates genetic variation and relationships among grain yield and yield related traits using twenty tef genotypes under three nitrogen rates. According to the findings, the grain yield and total biomass had high broad-sense heritabilities.*

Belay G, Tefera H, Getachew A, Assefa K, Metaferia G. 2008. Highly client-oriented breeding with farmer participation in the Ethiopian cereal tef. *African Journal of Agricultural Research* 3:22-28. *Describes the features of client-oriented breeding as it applies to enhance the development and release of a popular tef variety called Quncho.*

Belay G, Tefera H, Tadesse B, Metaferia G, Jarra D, Tadesse T. 2006. Participatory variety selection in the Ethiopian cereal tef. *Experimental Agriculture* 42:91-102. *Identifies farmers' selection criteria that enable them to assess the performances of improved tef varieties. For farmers, seed colour is the first selection criterion. Very white-seeded tef (Magna) is used for sale while the brown-seeded for home consumption.*

Belayneh H. 1986. Technical information on high performance varieties released from 1984 to 1986. In: Institute of Agricultural Research (IAR) Newsletter of Agric. Research. Vol. 1, No. 1, pp. 5-10, July 1986, Addis Ababa, Ethiopia. *Provides relevant information for crop varieties including tef that have been released in Ethiopia since 1984. Information include year of release, maturity cycle, yield, and recommended areas for cultivation.*

Berhe T, Miller DG. 1976. Sensitivity of tef to removal of floral parts. *Crop Science* 16:307-308. *Investigates the sensitivity of tef floral organs to mechanical manipulations. According to the author, artificial application of pollen to completely emasculated florets did not improve seed set.*

Berhe T, Miller DG. 1978. Studies of ethephon as a selective male gametocide in tef. *Crop Science* 18:35-38.

Berhe T, Nelson LA, Morris MR, Schmidt J. 1989. Inheritance of phenotypic traits in tef: I. Lemma color. *Journal of Heredity* 80:62-65. *Determines the number of genes responsible for lemma color inheritance along with their actions and interactions, and the presence or absence of maternal effects in tef by studying crosses among four cultivars possessing distinct colors.*

Berhe T, Nelson LA, Morris MR, Schmidt J. 1989. Inheritance of phenotypic traits in tef: II. Seed color. *Journal of Heredity* 80:65-67. *Studies the number of genes responsible for seed color inheritance in tef and the presence or absence of maternal effect in crosses among four cultivars.*

Berhe T, Nelson LA, Morris MR, Schmidt J. 1989. Inheritance of phenotypic traits in tef: III. Panicle form. *Journal of Heredity* 80:67-70. *Determines the number of genes involved in the inheritance of panicle form, presence or absence of maternal effects, and linkage of genes for panicle form by studying six crosses.*

Berhe T, Nelson LA, Morris MR, Schmidt J. 2001. The genetics of qualitative traits in tef. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 79-85. *Studies in tef the inheritance of qualitative traits such as lemma color, seed color and panicle form using six crosses within four cultivars with contrasting phenotype: Fesho, Bursa, Kay Murri and Trotteriana. According to the authors, all traits are controlled by a duplicate pair of genes.*

Berhe T. 1969. Preliminary studies in tef embryology and crossing trials. Senior Research Project Report. Haile Selassie I University (HSIU), College of Agriculture, Alemaya, Ethiopia.

Berhe T. 1972. Future prospects of mutation breeding on the improvement of *Eragrostis tef*. Haile Selassie I University (HSIU), College of Agriculture, Debre Zeit Experiment Station, Ethiopia.

Berhe T. 1973. Prospects for improving *Eragrostis tef* by mutation breeding. pp. 297-303. *In: Proceedings of a Research Coordination meeting: Nuclear Techniques for Seed Protein Improvement, 26-30 Jun. 1972, Munich, Germany.* International Atomic Energy Agency (IAEA), Vienna, Austria.

- Berhe T.** 1974. Studies of the problems associated with breeding tef. M.Sc. Thesis, Washington State University (USA). 59pp. *Investigates bottlenecks associated to developing an efficient breeding technique for tef. Some of the investigations made were on gametocidal effect of ethephon and effect of exogenous applications of growth regulators on stigma development.*
- Berhe T.** 1975. Breakthrough in tef breeding technique. Food and Agriculture Organization (FAO) Information Bulletin, Cereal Improvement and Production for Near East Project XII (3):11-13, FAO, Rome.
- Berhe T.** 1975. Gametogenesis in teff following applications of Ethephon. pp. 85-86. In: Proceedings of the Fifth Annual Research Seminar. 30 Oct. to 1 Nov. 1974, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Briefly indicates the effects of ethephon application of ethephon on gametogenesis in tef. According to the author, ethephon selectively induced male sterility but it also indirectly caused female sterility.*
- Berhe T.** 1976. Brighter prospects for improving *Eragrostis tef* by breeding. In: Proceedings on Evaluation of Seed Protein alternatives by Mutation Breeding, 5-9 May 1975, Vienna, Austria. International Atomic Energy Agency (IAEA), Vienna. pp. 129-135.
- Berhe T.** 1976. Summary of tef national yield trials. pp. 31-33. In: Results of the National crop Trials and Others (1974). National Crop Improvement Committee, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the performances of 12 tef varieties in NYT tested at 10 locations. The high yielding varieties were DZ-01-354, DZ-01-238, and DZ-01-99.*
- Berhe T.** 1976. The door is open for green evolution in tef. pp. 208-213. In: Proceedings of the Sixth Annual Research Seminar, 12-14 Nov 1975, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates the efforts made to improve tef by hybridization. According to the report, since the first successful crossing of tef in 1974, about 100 crosses have been made.*
- Berhe T.** 1978. Tef. pp. 105-110. In: Results of the National Crop Improvement Trials and Others (1976). National Crop Improvement Committee, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the performances of 14 tef varieties at 8 locations. Also provides summary of the improvement program where a total of 64 tef crosses have been made; and four mutagenic agents (gamma-rays, x-rays, sodium azide and ethyl-methyl-sulphonate) were used for treating tef seeds.*
- Berhe T.** 1981. Inheritance of lemma color, seed color and panicle form among four cultivars of *Eragrostis tef*. Ph.D. Thesis, University of Nebraska, Lincoln (USA). 84pp. *Determines the inheritance of lemma color, seed color and panicle form by studying, i) gene actions and interactions, ii) number of genes involved, iii) presence or absence of maternal effects, iv) presence or absence of linkage, and v) type of polyploidy in tef.*
- Boru G.** nd. Tef Variety adaptation trial at Sinana, 1986. pp. 63-64. In: Sinana Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa,

Ethiopia. *Evaluates the performance and adaptability of ten tef varieties at Sinana Research Center. Significant yield differences were obtained where the highest yield was obtained from the local check while the lowest from DZ-01-196.*

Busey P. 1976. Breeding and cytogenetics of love grasses (*Eragrostis species*). PhD Thesis, University of Arizona, USA. 157pp. *Investigates vegetative morphology and flowering, control of pollination, and interspecific hybridization in Eragrostis species.*

Chanyalew S, Tefera H, Singh H. 2009. Genetic variability, heritability and trait relationships in recombinant inbred lines of tef. *Research Journal of Agriculture and Biological Sciences* 5: 474-479. *Evaluates 196 recombinant inbred lines of tef developed from introgression between DZ-01-196 and DZ-01-2356 for multiple parameters. Genetic variability was obtained for important agronomic traits.*

Chanyalew S, Tefera H, Zelleke H, Singh H. 2006. Correlation and path coefficient analysis of yield related traits in recombinant inbred lines of tef. *Journal of Genetics and Breeding* 60: 209-216. *Investigates 190 F_8 recombinant inbred lines of tef developed from crosses between DZ-01-974 and DZ-01-196 at Melkassa and Debre Zeit. Grain yield was positively correlated with shoot biomass, plant height and panicle length.*

Chanyalew S. 2010. Genetic analyses of agronomic traits of tef genotypes. *Research Journal of Agriculture and Biological Sciences* 6: 912-916. *Studies genetic variation and heritability in 18 tef genotypes. Lodging index was negatively correlated with harvest index, shoot biomass, above ground plant biomass, plant height and panicle length.*

Cheverton M, Pullan M, Didehvar F, Jones BMG. 1992. Interim Report: Database of accessions on the *Eragrostis tef* germplasm collection at Wye. Tef Improvement Project. Wye College, University of London, Wye, Ashford, Kent, England. 68pp. *Presents both qualitative and quantitative characters for 950 accessions of tef. The qualitative characters include seed color, panicle form, lemma colour and marginal color, whereas, the quantitative characters consists of main tiller length, main panicle length, main panicle weight, main tiller weight, number of tillers, position of the center of gravity, branching pattern, etc.*

Cheverton M, Pullan M, Greig A. (Unpublished, 1990). Improvement of teff: Final report for GTZ contract with Wye College, University of London.

Cheverton M, Pullan M, Greig A. 1990. Developing non-surgical methods of hybridization. pp. 10-19. In: *The improvement of Teff. Final Report for GTZ Contract with Wye College, University of London.*

Cheverton M, Pullan M, Greig A. 1990. Improving manual methods of hybridization. pp. 20-21. In: *The Improvement of Teff. Final Report for GTZ Contract with Wye College, University of London.*

Cheverton M. 1985. Breeding tef: lodging, weed control and other aspects of *Eragrostis tef*. M.Sc. Thesis, University of London, Wye College (UK).

Daba C, Geleta N, Lule D, Mengistu G, Temesgen A, Eticha F. 2009. Registration of Guduru teff variety. *East African Journal of Sciences* 3(2). *Presents the performance and registration of a teff cultivar called Guduru. The new cultivar has the following desirable traits: high yielding, wide adaptation, high biomass, thick stalk with low lodging problem, very white seeds, and disease resistance.*

Dimitriev A, Avezdjanov R, Anga M. 1980. Agrobiological and breeding evaluation of cereal crops varieties. pp. 36-38. In: Scientific Phytopathological Laboratory (SPL) Progress Report for the Period Jan. 1979 to Dec. 1979. SPL, Ambo, Ethiopia. *Reports the results of NYT at SPL site, Ambo for wheat, barley, teff and maize. Regarding teff, 15 varieties were tested; and immunological diversity of DZ-01-787 was proved with respect to rust.*

Eckoff JLA, Wichman DM, Scheetz WJ, Majerus M, Welty LE, Stallknecht GF, Ditterline RL, Dunn RL, Sands DC. 1997. Registration of 'Bridger' Teff. *Crop Science* 37:1671. *Describes the properties of new teff cultivar called 'Bridger' that was released by the Montana Agricultural Experiment Station in 1994. Some of the properties of Bridger are, early maturing, short and weak stem, very lax and flexible panicle, and brown seed color.*

Esfeld K, Plaza S, Tadele Z. 2009. Bringing high-throughput techniques to orphan crop of Africa: highlights from the Tef TILLING Project. *Gene Conserve* 8:783-788. *Presents highlights and future perspectives of the Tef Biotechnology Project that employs modern improvement technique called TILLING (Targeting Induced Local Lesions IN Genome).*

Esfeld K, Tadele Z. 2010. The improvement of African orphan crops through TILLING. ATDF Journal Special issue on 'African Orphan Crops: their significance and prospects for improvement' 6(3/4):42-47. *Describes detailed procedure and application of TILLING technique to teff improvement. TILLING is a non-transgenic and reverse-genetics approach of mutation detection in the trait of choice.*

Felleke A. 1967. The effects of several nitrogen levels, population densities and genotypes on morphological characters, lodging resistance and yield in *Eragrostis teff*. PhD Thesis, Purdue University, USA. 127pp. *Presents the results of five experiments in teff: i) investigate tillering in 123 lines, ii) study bulk emasculation with ethyl alcohol, iii) evaluation of three methods of lodging resistance (scoring, breaking of internode by machine, coefficient of lodging resistance), iv) study effects of three population densities (448, 224 and 112 thousand plants ha⁻¹), and v) investigate effects of nitrogen level and population density on 20 teff lines.*

Gugsa L, Desalegn T, Gebeyehu G, Alemu T, Takele A, Kassaye Z, Mulugeta W. 1996. Tef pre-national yield trial, Intermediate set. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L, Desalegn T, Gebeyehu G, Mulugeta W, Kassaye Z, Alemu T, Takele A. 1996. Tef national yield trial (early set). Tef Commodity Research Progress report for the Period

April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L, Desalegn T, Kassaye Z, Gebeyehu G, Takele A, Alemu T, Mulugeta W. 1996. Tef national yield trial (intermediate set I). Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L, Gebeyehu G, Alemu T, Takele A, Kassaye Z, Desalegn T, Mulugeta W. 1996. Tef national yield trial, late set. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L, Mengiste T. 1999. The crossability of *Eragrostis tef* with its wild close relatives. Sebil (Ethiopia) 8. *Investigates the compatibility of crossing tef to wild relatives such as E. pilosa, E. cilianensis, E. aethopica and E. minor. According to the authors, from crosses between tef and E. pilosa, the seed setting was 70-75% when E. pilosa was a pollen donor, but only 10-20% when tef is a pollen donor.*

Gugsa L, Takele A, Alemu T, Desalegn T, Gebeyehu G, Kassaye Z, Mulugeta W. 1996. Tef pre-national yield trial, early set. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L, Takele A, Alemu T, Desalegn T, Mulugeta W, Gebeyehu G. 1996. Tef pre-national yield trial (late set). Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L, Takele A, Alemu T. 1996. Advanced variety trial in tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L. 1996. Crossing tef with related tetraploid species of the genus *Eragrostis*. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L. 1996. Development of improved method of hybridizing tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L. 1996. Tef improvement through hybridization. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Gugsa L. 1996. Tef preliminary observation nursery. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Tef Commodity, Holetta, Ethiopia.

Haile A, Belayneh H. 1988. Influence of fertilizer and improved varieties on the seed yields of cereals, oil crops and pulses in the Institute of Agricultural Research (IAR)/Agricultural Development Department (ADD) sites. pp. 68-73. In: Beyene D (Ed.) Proceedings of Soil Science Research in Ethiopia, 11-14 Feb. 1986, Addis Ababa, Ethiopia. IAR, Addis Ababa. *Compares local and improved varieties of major crops with or without fertilizer at nine IAR/ADD sites. At Debre Tabor, Goha Tsion and Tefki improved tef varieties out-yielded local ones, whereas, at Robe and Shambu local varieties gave higher yield. At Bichena, Inewari and Mota no significant yield differences were obtained between improved and local tef varieties.*

Hundera F, Bechere E, Tefera H. 1999. Inter-relationships of grain yield, lodging and agronomic traits of tef. *Trop. Sci.* 39:63-69.

Hundera F, Tefera H, Assefa K, Tefera T, Kefyalew T. 1999. Genetic variability and correlation of morpho-agronomic characters in tef landraces. *Trop. Sci.* 39:140-146.

Hundera F, Tefera H, Assefa K, Tesso T, Kefyalew T, Girma T. 2000. Grain yield stability analysis in late maturing genotypes of tef. *Journal of Genetics and Breeding* 54:13-18. *Evaluates 13 tef genotypes for grain yield, stability and adaptation to 15 environments in Ethiopia. According to the findings, the higher yielding genotypes were sensitive to a change in environments and showed better adaptation to favorable environments, while lower yielding genotypes were resistant to a change in environments and showed better performance under unfavorable environments.*

Hundera F. 1998. Variations of morpho-agronomic characters and grain chemical composition of released varieties of tef. *Journal of Genetics and Breeding* 52:307-311. *Evaluates eight released tef varieties for morpho-agronomic characters and chemical composition.*

IAR (Institute of Agricultural Research). 1978. Tef: Chairman's report. pp. 7. In: Results of the National Crop Trials and Others (1976). National Crop Improvement Committee, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the activities of tef crossing since the crossing had started in 1975; also presents the work in mutation breeding.*

IAR (Institute of Agricultural Research). 1981. Tef: 1978-79 National Yield Trial. pp. 115-146. In: Proceedings of the Twelfth National Crop Improvement Conference, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the results of three sets of yield trials (NYT, early and late sets of Pre-NYT, and advanced observation).*

IAR (Institute of Agricultural Research). 1981. Tef: 1979-80 National Yield Trials. pp. 147-170. In: Proceedings of the Twelfth National Crop Improvement Conference, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the results of yield trials and advanced observation nurseries for tef in 1979-80.*

IAR (Institute of Agricultural Research). 1989. Annual report for 1987. IAR, Addis Ababa, Ethiopia. 44pp. *Provides summarized information on the activities of the Institute of*

Agricultural Research (IAR) during 1987. A brief report on tef (page 11) indicated that collection of wild Eragrostis species started at Holetta and 2313 local collections were made in the same year. The experiment on the out-breeding of tef is also mentioned.

IAR (Institute of Agricultural Research). 1990. Annual report for 1989. IAR, Addis Ababa, Ethiopia. 19pp. *Presents the highlight on technology transfer and resource development at the Institute of Agricultural Research (IAR). According to the report, meiosis in tef regularly begins at late boot stage and proceeds through emergence.*

IAR (Institute of Agricultural Research). 1992. Annual report for 1990. IAR, Addis Ababa, Ethiopia. 27pp. *Presents research highlights, technology transfer and resources development in the Institute of Agricultural Research (IAR). For tef, the outbreeding rate is 2.1 per thousand seeds. Co-bagging and shaking the inflorescence resulted in outbreeding of 0.5%; synchronization of flowering in variety DZ-01-354 occurred between 5:40am and 10:00am under glasshouse, and between 6:40 and 11:30am under field conditions at Holetta.*

Kassa LD, Smith MF, Hundera F. 2006. Stability analysis of grain yield of tef using the mixed model approach. *S. Afr. Tydskr Plant Grond* 23:38-42. *Investigates the stability in yield for 13 tef genotypes at 12 environments.*

Kassaye Z, Tafesse T. 1996. Effect of sowing dates and varieties on development of rust and yield of tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Kedir K, Jones BMG, Mekonnen D. 1992. Determination of outbreeding percentage in Eragrostis tef. *SEBIL* Vol. 4. pp. 19. *Investigates the percentage of outbreeding in tef using genetic marker in the field and greenhouse at Holetta. According to the authors, natural crossing of tef is 0.2% in the field and is 0.05-1.37% in the greenhouse.*

Kedir K, Jones BMG, Mengiste T. Unpublished. Outbreeding in field grown teff. Paper Presented at the Second International Small Millets Workshop, 8-12 Apr. 1991, Bulawayo, Zimbabwe.

Kedir K, Jones BMG, Mengiste T. 1994. Outbreeding in field grown teff. pp. 425-430. In: K.W. Riley, S.C. Gupta, A. Seetharam and J.N. Mushonga (Eds.) *Advances in Small Millets. 2nd International Small Millets Workshop. 8-12 Apr. 1991, Bulawayo, Zimbabwe.* Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, India. *Determines the frequency of outbreeding in tef using genetic markers. The rate of outbreeding was found to be 2.1 per thousand seeds, which is very low compared to other cereals.*

Kedir K, Jones BMG. 1992. Determination of outbreeding percentage in tef. pp. In: *Proceedings of the Fourth Annual Conference of Crop Science Society of Ethiopia, 26-27 Dec. 1991, Addis Ababa, Ethiopia.* *SEBIL (Bulletin of Ethiopian Crop Science Society) Vol. 4.*

Kedir K, Mengiste T, Jones BMG. 1991. Determination of the degree of outbreeding in field grown tef and co-bagging in glass house. pp. 61-63. In: *Holetta Research Center*

Progress Report for the Period Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Reports the out-breeding percentage for tef grown in the field and for those co-bagged. The Outbreeding in the field was 0.21% and for co-bagged 1.10%.*

Kedir K, Mengiste T, Jones BMG. 1991. Outbreeding in tef. pp. 60. In: Holetta Research Center Progress Report for the Period Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Investigates the presence of outbreeding in tef based on the study in farmers' field. According to the authors, tef in the field is heterogenous which suggests natural crossing between tef plants.*

Kedir K. 1991. Floral biology and determination of outbreeding in tef. M.Sc. Thesis, Alemaya University of Agriculture, Ethiopia. 128pp. *Studies the frequency of outbreeding for tef using genetic markers and floral biology and factors influencing flowering.*

Kefyalew T, Tefera H, Assefa K, Ayele M. 2000. Phenotypic diversity for qualitative and phenologic characters in germplasm collections of tef. *Genet. Resour. Crop Evol.* 47:73-80. *Evaluates 3600 entries of tef germplasm representing 36 populations for phenotypic diversity and phenologic characters. The results show that considerable variation has been observed for important traits.*

Kefyalew T. 1999. Assessment of genotype x environment interaction for grain yield and related traits in tef. MSc Thesis, Alemaya University of Agriculture, Ethiopia.

Kefyalew T. 2001. Genotype x environment interaction in tef. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 145-156. *Reviews the work made on tef genotype x environment interactions (GxE). Also indicates plant and environment factors contributing for G x E.*

Ketema S. (unpublished). Research review on the breeding and agronomy of tef. Paper Presented at the First Ethiopian Field Crops Research Conference, 1985, Addis Ababa, Ethiopia. *Presents the advantages of growing tef, major constraints and efforts made to improve tef. Also presents names of released tef varieties along with relevant information for cultivation.*

Ketema S. 1981. Summary of tef improvement in 1979 and 1980. pp. 25. In: Proceedings of the Twelfth National Crop Improvement Conference, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. [in Amharic]. *Indicates two varieties of tef which out-yielded the check (DZ-01-354) and prospects of yield increment by hybridization. According to the author, variety DZ-01-787 has a good resistance to rust.*

Ketema S. 1983. Studies of lodging, floral biology and breeding techniques in tef. Ph.D. Thesis, University of London, Royal Holloway College (UK). 122pp. *Studies lodging (types, losses, associations with other characters), floral biology and breeding techniques (use of hot water, dark treatment, or ethrel as a gametocide).*

Ketema S. 1986. Tef adaptation trial at Institute of Agricultural Research (IAR)/Agricultural Development Department (ADD) sites in 1983/84. pp. 23-33. In: IAR/ADD Joint Research

Program for 1983/84. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports results of tef variety trials for early and late sets at the Institute of Agricultural Research/Agricultural Development Department (IAR/ADD) sites in 1983/84.*

Ketema S. 1986. Tef adaptation trials at Institute of Agricultural Research (IAR)/Agricultural Development Department (ADD) sites in 1984/85. pp. 20-29. In: Haile A, Tesfa Z (Compilers) IAR/ADD Joint Research and Extension Program for 1984/85. IAR, Addis Ababa, Ethiopia. *Evaluates at 10 IAR/ADD sites the performance of tef varieties. Testing sites are Bure, Gumaye Daye, Hurumu, Mota, Robe, Shashemene, Tefki, Watcho, Woldia, and Harbu.*

Ketema S. 1988. Short note on the variation in morphological and agronomic characters in tef. pp. 24. In: Plant Genetic Resources Center/Ethiopia (PGRC/E), International Livestock Center for Africa (ILCA) germplasm Newsletter 18. Aug. 1988. Addis Ababa, Ethiopia. *Presents variations observed in 2000 tef accessions. Taxonomically tef belongs to family Poacea, tribe Eragrostideae, self-pollinated, chasmogamic and an allotetraploid ($2n=40$). Agronomically tef is drought and water logging tolerant, not attacked by weevils, grown both during long- and short-rainy seasons.*

Ketema S. 1991. Germplasm evaluation and breeding work on teff in Ethiopia. pp. 323-328. In: J.M.M. Engles, J.G. Hawkes and Melaku Werede (Eds.) Plant Genetic Resources of Ethiopia. Cambridge University Press, Cambridge, UK. *Present information on the importance, domestication and diversity, utilization and achievements of tef breeding in Ethiopia.*

Ketema S. 1991. Tef national yield trial in 1989/90 at Holetta and Ginchi. pp. 63-64. In: Holetta Research Center Progress Report Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Briefly presents the results of tef NYT using eight varieties tested at Holetta and Ginchi.*

Ketema S. 1991. Tef pre-national yield trial in 1989/90 at Holetta and Ginchi. pp. 64-65. In: Holetta Research Center Progress Report Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Reports the results of tef pre-national yield trial at Holetta and Ginchi using nine varieties including local checks.*

Ketema S. 1993. Phenotypic variations in tef germplasm. morphological and dynamic traits: a catalogue. Institute of Agricultural Research, Addis Ababa (Ethiopia). 96p.

Ketema S. 1993. Phenotypic variations in tef germplasm—morphological and agronomic traits, a catalog. Institute of Agricultural Research (IAR) Technical Manual No. 6. IAR, Addis Ababa, Ethiopia. 96pp. *Characterizes 2255 pure-line accessions of tef based on the study made at Debre Zeit Agricultural Center. Data collected for the characterization include days to germination, heading and maturity; culm, peduncle, panicle length; plant height; grain yield per panicle and per plant; straw yield per plant; total shoot biomass; harvest index; flag leaf area; and culm thickness.*

Ketema S. 2001. Floral biology and crossing techniques of tef. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 67-78. *Studies floral biology and different introgression techniques in tef. Flowering in tef is basipetal on the panicle and acropetal on each spikelet. According to the author, hot water treatment at 44-46°C for nine minutes and a chemical ethrel are effective as male gametocide.*

Kuzmichev A, Deiesa T, Tafesse T. 1982. Agrobiological and immunological estimation of tef varieties. pp. 77-81. *In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1981.* SPL, Ambo, Ethiopia. *Screens nine varieties of tef under national yield trials and 14 under pre-NYT for best agrobiological and immunological characteristics although no significant yield differences were obtained for both experiments.*

Loban V, Diksissa G, Tafesse T. nd. National and pre-national teff nurseries. pp. 221-224. *In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1987/88.* SPL, Ambo, Ethiopia. *Evaluates 20 varieties of tef in NYT and pre-NYT for disease resistance especially rust at Ambo, where all entries were infected by rust.*

Loban V. nd. National and pre-national teff nurseries. pp. 208-210. *In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1986/87.* SPL, Ambo, Ethiopia. *Evaluates tef varieties under national and pre-national yield trials at Ambo, Ethiopia for best agrobiological and immunological characteristics.*

Loban V. nd. Pre-released trial of teff. pp. 210-211. *In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1986/87.* SPL, Ambo, Ethiopia. *Evaluates four varieties of tef (DZ-01-354, local check, DZ-Cr-44, and DZ-Cr-79) at Ambo for agrobiological and immunological characteristics including days to tillering and maturity, plant height, diseases, grain yield and 1000 grain weight.*

Longly B, Rabau T, Louant BP. 1985. Floral development in *Eragrostis tef*, dynamics of gametophytogenesis. *Canadian Journal of Botany* 63:1900-1906. [in French].

Mengesha MH, Guard AT. 1966. Development of the embryo sac and embryo of teff. *Canadian Journal of Botany* 44:1071-1075. *Studies the basic information about tef reproduction. According to the author embryo sac and embryo development will be used in establishing breeding program.*

Mengesha MH, Pickett RC, Davis RL. 1965. Genetic variability and interrelationship of characters in teff. *Crop Science* 5:155-157. *Studies major agronomic characters of tef, estimates the range and magnitude of variation of major characters, and determine nature of character association and those associated with tef yield.*

Mengesha MH. 1964. *Eragrostis tef*, its embryo-sac development, genetic variability and breeding behaviour. PhD Thesis, Perdue University, USA. *Studies 124 heads of tef collected from major tef producing areas in Ethiopia for early vigor, leafiness, maturity, lodging*

resistance, plant height, panicle length, seed yield and test weight. Also describes the embryo-sac development for the plant.

Mengesha MH. 1969. Productivity parameter of diverse teff genotypes over a broad range of environment and management system. pp. 70. In: Mengesha MH (Ed.) Progress Report on Agricultural Research Activities. College of Agriculture, Haile Selassie I University (HSIU), Ethiopia. *Evaluates 15 diverse tef varieties at eight locations. Chemical analysis was also made for tef.*

Mengesha MH. 1975. Crop germplasm diversity and resources in Ethiopia. pp. 449-453. In: Frankel OH, Hawkes JG (Eds.) Crop Genetic Resources for Today and Tomorrow. Cambridge University Press, Cambridge.

Mengiste T, Gugsa L. 1996. Crossing tef with related tetraploid species of the genus *Eragrostis*. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

Mengiste T, Gugsa L. 1996. Tef pre-national yield trial, Intermediate set. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

Mengiste T, Jones BMG. 1991. Breeding systems of *Eragrostis* species closely related to tef. SEBIL (Bulletin of Crop Science Society of Ethiopia) Vol. 3, pp. 10. *Presents breeding systems studied for 30 Eragrostis species during 1987 to 1989. Also indicates flower opening time, pollination behaviour and self-compatibility in tef.*

Mengiste T, Ketema S, Gugsa L. 1996. Tef national yield trial (Intermediate Set I). Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

Mengiste T. unpublished. Determination of Isolation distances in *Eragrostis* tef. Holetta Research Center Progress Report for the period April 1992 to March 1993. Holetta, Ethiopia.

Mengiste T. unpublished. Determination of Isolation distances in *Eragrostis* tef. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Development of improved method of Hybridizing tef. Holetta Research Center Progress Report for the period April 1992 to March 1993. Holetta, Ethiopia.

Mengiste T. unpublished. Development of Improved method of Hybridizing tef. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Genotype X Environment Interaction in tef. Holetta Research Center Progress Report for the period April 1992 to March 1993. Holetta, Ethiopia.

Mengiste T. unpublished. Genotype x Environment Interaction in tef. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Studies on the variations in the pollination behaviours of tef cultivars. Holetta Research Center Progress Report for the period April 1992 to March 1993. Holetta, Ethiopia.

Mengiste T. unpublished. Studies on the variations in the pollination behaviours of tef cultivars. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Tef National Yield Trial (Early Set). Holetta Research Center Progress Report for the period April 1992 to March 1993. Holetta, Ethiopia.

Mengiste T. unpublished. Tef National Yield Trial (Early Set). Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Tef national yield trial (Late Set I). Holetta Research Center Progress Report for the period April 1992 to March 1993. Holetta, Ethiopia.

Mengiste T. unpublished. Tef national yield trial (Late Set I). Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Tef national yield trial Late Set II. Holetta Research Center Progress Report for the period April 1992 to March 1993. Holetta, Ethiopia.

Mengiste T. unpublished. Tef national yield trial Late Set II. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Tef pre-national yield trial, early set. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Tef pre-national yield trial, Intermediate set. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Tef pre-national yield trial, Late set I. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. unpublished. Tef pre-national yield trial, Late set II. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Mengiste T. 1996. Determination of isolation distances in *Eragrostis tef*. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

Mengiste T. 1996. Development of Improved method of Hybridizing tef. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

- Mengiste T.** 1996. Genotype x environment interaction in tef. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.
- Mengiste T.** 1996. Preliminary yield observation in tef. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.
- Mengiste T.** 1996. Tef advanced yield trial. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.
- Mengiste T.** 1996. Tef national yield trial (Late Set). Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.
- Mengiste T.** 1996. Tef pre-national yield trial (Late set-I). Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.
- Mengiste T.** 1996. Tef pre-national yield trial, early set. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.
- Mengiste T, Gugsu L.** 1996. Tef National Yield Trial (Early Set). Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.
- MoA/ADD** (Ministry of Agriculture/Agricultural Development Department). 1991. Tef variety trials. pp. 27-39. In: Results of Field Trials, 1989. ADD Publication No. 3, Addis Ababa, Ethiopia. *Reports the results of tef variety trial conducted at 20 sites covering seven agro-ecological zones in Ethiopia. The varieties tested include Cr-37, Cr-47, DZ-82, DZ-01-99, -196, DZ-01-354, and DZ-01-787.*
- Norberg S, Roseberg R, Charlton B, Smith J, Kugler J.** 2006. Teff variety performance. Malheur Experiment Station, Oregon State University, Ontario, OR. USA. (<http://www.cropinfo.net/AnnualReports/2006/TeffVariety2006.html> accessed 15 Sept. 2009). *Indicates the performance of tef as an alternative annual forage grass in Malheur County in Oregon State, USA.*
- Richardson WL.** 1958. A technique of emasculating small grass florets. Indian Journal of Genetics and Plant Breeding 18:69-73.
- SRC** (Seed Release Committee). 1985. Report on the activities of Seed Release Committee. pp. 55-63. In: Proceedings of the Sixteenth National Crop Improvement Conference, 16-18 Apr. 1984, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. Part I. [in Amharic]. *Presents the activities of Seed Release Committee including the*

organizational set up, objectives, policy on seed release and list of crop varieties approved for release. Regarding tef, varieties presented for release were DZ-Cr-37, DZ-Cr-26, and DZ-Cr-79 although the approval for release was made only for DZ- Cr-37.

SRC (Seed Release Committee). 1987. Activities of National Seed Release Committee. pp. 55-60. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. [in Amharic and English]. *Reports on varieties accepted for release, and policy of seed release. For tef, the only variety released by Debre Zeit Research Center since 1984 was Cr-37.*

Tadele Z, Esfeld K, Plaza S. 2009. Applications of high-throughput techniques to the understudied crops of Africa. In: Bruce et al. (Eds.) Agriculture: Africa's "Engine for Growth"-Plant Science & Biotechnology Hold the Key. AAB Rothamsted Research, Harpenden, UK. Aspects of Applied Biology 96:233-240. *Indicates the prospects of TILLING to orphan crops improvement. The progress made on tef is presented. TILLING is a reverse genetics method of mutation discovery.*

Tadele Z, Esfeld K. 2008. Applications of TILLING to the understudied crops from Africa: the case of tef. In: FAO/IAEA International Symposium on Induced Mutations in Plants, 12-15 August 2008, Vienna, Austria. IAEA/FAO, Vienna. pp. 102. *Presents the applications of TILLING technique in improving the stature of tef plant.*

Tadele Z, Gedil M, Mba C, Till BJ. 2008. Applications of high-throughput techniques to the understudied crops of Africa. First All Africa Congress on Biotechnology, 22-26 September 2008, Nairobi, Kenya. pp101. *Indicates the need and applications of high-throughput techniques such as TILLING and ecoTILLING in orphan- or understudied-crop improvement. The Tef TILLING Project is indicated as case example.*

Tadele Z, Mba C, Till BJ. 2009. TILLING for mutations in model plants and crops. Chapter 13. In: Jain SM, Brar DS (Eds.) Molecular Techniques in Crop Improvement. Springer Netherlands. pp. 307-332. *Presents detailed procedures of TILLING (Targeting Induced Local Lesions IN Genome) technique and its application to model plants and crops including tef.*

Tadele Z. 2011. Designing African future crops using biotechnological and genomic tools: the case of Tef Project. International Conference on Agricultural Biotechnology in Africa: Fostering Innovation, May 12-15, 2011, Addis Ababa, Ethiopia. *Presents the strategies of the Tef Improvement Project based at the University of Bern in Switzerland especially in breeding for lodging tolerant cultivars. The project implements a modern technique called TILLING (Targeting Induced Local Lesions IN Genomes) in order to obtain candidate lines from over 6000 mutagenized population. The project has also initiated the whole genome sequencing on tef.*

Tefera H, Assefa K, Belay G. 2003. Evaluation of interspecific recombinant inbred lines of *Eragrostis tef* x *E. pilosa*. Journal of Genetics and Breeding 57:21-30. *Investigates 16 morphological and agronomic traits for F₉ recombinant inbred lines of the cross between tef*

Cv Kaye Murri and E. pilosa. According to authors, panicle type and culm thickness are more important than plant height in influencing lodging in tef.

Tefera H, Assefa K, Hundera F, Kefyalew T, Tefera T. 2003. Heritability and genetic advance in recombinant inbred lines of tef. *Euphytica* 131:91-96. *Evaluates recombinant inbred lines of the cross between two tef lines (Kaye Murri and Fesho) for nine quantitative traits at three locations in Ethiopia. Grain yield showed a strong positive association with shoot biomass, lodging index, panicle length, plant height, panicle weight and yield per panicle.*

Tefera H, Assefa K, Hundera F, Kefyalew T, Teklu Y, Gugsu L, Ketema S, Adnew T. 2001. Progress of tef breeding research in Ethiopia. In: Tefera H, Belay G, Sorrells M (Eds.) *Narrowing the Rift: Tef Research and Development.*, Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 157-164. *Presents the history of tef breeding in Ethiopia and progresses made in three phases. According to the authors, a total of 12 tef cultivars have been released to the farming community until the year 2000.*

Tefera H, Ayele M, Assefa K. 1995. Improved varieties of tef in Ethiopia. Releases of 1970-1985. Research Bulletin No 1. Debre Zeit Agricultural Research center, Alemaya University of Agriculture, Debre Zeit, Ethiopia. 32 pp. *Presents information on breeding history, performance, adaptation and cultural practices of improved tef varieties developed at Debre Zeit Agricultural Research Center.*

Tefera H, Belay G, Assefa K. 2008. Genetic variation in F_2 populations and their potential in the improvement of grain yield in tef. *Euphytica* 164:105-111. *Evaluates the degree of genetic variation in 12 crosses of F_2 populations of tef. Eleven of the 12 crosses showed substantial genetic variation for grain yield and its components.*

Tefera H, Ketema S, Tesemma T. 1990. Variability, heritability and genetic advance in tef cultivars. *Tropical Agriculture* 67:317-320. *Indicates variations in morphological properties of tef germplasm. Cultivars with very loose, fairly loose and semi-compact panicle forms were found to be better yielding compared with the very compact forms.*

Tefera H, Peat WE, Chapman GP. 1992. Quantitative genetics in tef. pp. 283-296. In: *Desertified Grasslands: Their Biology and Management.* The Linnaean Society of London.

Tefera H, Peat WE. 1995. Genetic analysis of quantitative traits in teff. In: Annual Conference of the Crop Science Society of Ethiopia, Addis Ababa (Ethiopia), 3-4 May 1994. CSSE, Addis Ababa, Ethiopia. SEBIL pp 1-9. *Investigates epistasis and other quantitative traits in tef at early generations of the cross between DZ-01-2331 and DZ-01-186. According to the authors, selection should be delayed to a later generations with increased homozygosity, where additive and additive x additive variances are fixed.*

Tefera H, Peat WE. 1996. Evaluation of selection methods for grain yield in the F_2 and F_3 generations of tef. *Ethiopian Journal of Agricultural Science* 15:20-32. *Evaluates four selection methods (namely, primary panicle weight, total panicle weight per plant,*

productivity index, and selection index) as a selection criteria in identifying high yielding tef plants at F_2 and F_3 populations.

Tefera H, Peat WE. 1996. Gene action for some quantitative traits of tef. *Ethiopian Journal of Agricultural Science* 15:8-19. *Investigates gene action, degree of dominance and heritability in tef generations derived from the cross between two pure breeding lines (DZ-01-2331 x DZ-01-186). According to the findings, grain yield and other yield related traits showed epistatic gene action, degree of dominance and heritability; hence starting selection at early generations is not recommended.*

Tefera H, Peat WE. 1997. Genetics of grain yield and other agronomic characters in tef. 2. The triple test cross. *Euphytica* 96:193-202. *Investigates gene action in tef for grain yield and other useful agronomic characters using the triple test cross. Epistasis was detected for grain yield, yield per panicle, panicle weight, plant weight, harvest index, tiller number, panicle length, culm diameter, days to heading and days to maturity.*

Tefera H, Peat WE. 1997. Genetics of grain yield and other agronomic characters in tef. 1. Generation means and variances analysis. *Euphytica* 96:185-191. *Studies quantitative genetics for grain yield and other agronomic characters in tef using the F_1 , F_2 , BC_1 , and BC_2 of the cross between Fesho and Kay Murri. Significant additive and dominance \times dominance interaction effects were detected for grain yield.*

Tefera H. 1988. Variability and association of characters in tef. M.Sc. Thesis, Alemaya University of Agriculture, Ethiopia.

Tefera H. 1992. *In vitro* development of tef seeds within detached spikelets. pp. 305-307. In: *Desertified Grasslands: Their Biology and Management*. The Linnaean Society of London.

Tefera H. 1993. Genetic analysis and spikelet culture on tef. PhD Thesis, University of London, Wye College, UK.

Tefera H. 2001. The genetics of quantitative traits in tef. *In: Narrowing the Rift: Tef Research and Development*. Tefera H, Belay G, Sorrells M (Eds.), *Proceedings of the International Workshop on Tef Genetics and Improvement*, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 87-98. *Reviews studies made on quantitatively inherited traits especially yield and yield components. Tools such as Triple Test Cross and Heritability were applied in the analysis.*

Tefera H. 2002. Inheritance of morphological and agronomic traits in tef. *Journal of Genetics & Breeding* 56:353-358. *Investigates the inheritance of 18 morphological and agronomic traits for early generations (F_1 - F_3) of tef crosses. The additive gene effects were higher than the dominant in these traits. According to the author, since grain yield exhibited low additive gene effect and high dominance and dominance \times dominance, interaction effects might hinder improvement through direct selection in early generations.*

Teklu Y, Tefera H. 2005. Genetic improvement in grain yield potential and associated agronomic traits of tef. *Euphytica* 141:247-254. *Estimates the progress made from 1960 to*

1995 in tef improvement based on one farmers' variety and 10 improved varieties. Grain yield of tef was estimated to have risen for 35 years of breeding from 3425 to 4599 kg ha⁻¹.

Teklu Y. 1998. Genetic gain in grain yield potential and associated agronomic traits of tef. Msc Thesis, Alemaya University of Agriculture, Ethiopia.

Tesemma T. 1973. Preliminary trial on the effect of gamma irradiation of tef for mutation breeding. Paper Presented at the Second Research Coordination Meeting, Ibadan, Nigeria.

Tulu B. 1975. Teff national yield trial for 1973. pp. 45-49. In: Results of the National Yield Trials (1973). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the performances of 10 selections of tef at six locations. The high yielding locations were Debre Zeit light soil (30.4 q ha⁻¹), Debre Zeit black soil (23.4 q ha⁻¹), and Kulumsa (23.4 q ha⁻¹).*

Tuwafe S. 1973. Five years summary of teff national yield trials. pp. T1-T13. In: Results of the National Crop Trials (1967-1971). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of five years (1967-71) tef national trials carried out at 11 sites using 10 varieties.*

Tuwafe S. 1974. Teff national yield trial in 1972. pp. 33-34. In: results of the National Crop Trials (1972). Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of tef NYT at 11 locations using eight varieties including local checks.*

Veselovsky M, Kuzmichev A, Tafesse T. nd. National and pre-national teff nurseries. pp. 68-71. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1984/85. SPL, Ambo, Ethiopia. *Screens tef varieties in the national and pre-national yield trials at Ambo for best agrobiological and immunological characteristics.*

Veselovsky M, Kuzmichev A, Tafesse T. nd. Pre-released trial of teff. pp. 69-72. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1984/85. SPL, Ambo, Ethiopia. *Evaluates four varieties of tef in the pre-released trial at Ambo, Ethiopia, using agrobiological and immunological indicators.*

Veselovsky M. nd. National and pre-national teff nurseries. pp. 128-130. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1985/86. SPL, Ambo, Ethiopia. *Reports the performances of eight tef varieties in national and 12 varieties in pre-national yield trials at Ambo.*

Veselovsky M. nd. Pre-released trial of teff. pp. 130-131. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1985/86. SPL, Ambo, Ethiopia. *Tests three tef varieties at Ambo, West Ethiopia.*

Worku M, Atero B, Dessalegn Y. 1992. DZ-Cr-37: the most adapted tef variety around Assosa. Institute of Agricultural Research (IAR) Newsletter Agric. Res. 7(1):3-4. *Presents the results of the experiment conducted at Assosa in 1987 and 1988 where ten varieties were*

compared for days to maturity, plant height and grain yield. According to the results, variety DZ-Cr-37 gave the highest yield at both the research site and settlement farms.

9. Physiology and Biochemistry

Amare G, Negash L. 1984. Variations in nitrate reductase activity in four varieties of tef germinated in darkness. *SINET (Ethiopian Journal of Science)* 7(2):

Anon. nd. Growth controlling hormone trial in tef in 1978/79. pp. 26-27. In: Tef Annual Reports, 1977-1982. Addis Ababa University (AAU), Debre Zeit Agricultural Research Center (DZARC), Debre Zeit, Ethiopia. *Conducts growth control experiment where by camposan chemical was tested on tef at four rates.*

Anon. nd. The effect of CCC on lodging resistance of tef. pp. 50. In: Field Trials and Observations, 1968/69. Crop Production Department, Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Determines the effects of three levels of CCC chemical (no spray, 2000 cc ha⁻¹, and 4000 cc ha⁻¹), on two tef varieties (A-44 and DZ-01-186).*

Assefa M. 1978. Floral morphogenesis, temperature effect on growth and development and variation in nutritional composition and distribution among cultivars in *Eragrostis tef*. PhD Thesis, University of Wisconsin, Madison, USA.

Ayele M, Blum A, Nguyen HT. 2001. Diversity for osmotic adjustment and root depth in tef. *Euphytica* 121:237-249. *Evaluates osmotic adjustment and root depth for tef genotypes. Osmotic adjustment was significantly correlated across tef genotypes with delayed wilting and maintenance of higher relative water content under conditions of soil moisture stress.*

Ayele M, Ketema S. 1995. Potentials of physiological traits in breeding tef for drought resistance with emphasis on excised-leaf water loss. pp. 109-115. In: SEBIL—Proceedings of the Sixth Annual Conference of Crop Science Society of Ethiopia (CSSE), 3-4 May 1994, Addis Ababa, Ethiopia. CSSE, Addis Ababa. *Presents the results obtained from excised-leaf water loss (ELWL) on tef. There were significant differences among tef genotypes in excised-leaf water loss during vegetative stage. According to the authors, ELWL could be used as a selection criteria in breeding tef for low moisture area.*

Ayele M. 1999. Genetic diversity in tef for osmotic adjustment, root traits, and Amplified Fragment Length Polymorphism. PhD Thesis, Texas Tech University, USA. 152 pp. *Presents the results of the following three studies, i) screening tef germplasm for key drought resistance traits, ii) investigating the impact of osmotic adjustment and root depth on productivity of tef, and iii) assessing the diversity of tef germplasm using amplified fragment length polymorphism (AFLP) marker. According to the fingerprinting, the three Eragrostis species, namely E tef, E pilosa and E curvula, are distinctly separated where by E pilosa is more closely related to E tef than E. curvula.*

Ellis RH, Hong TD, Roberts EH. 1986. Quantal response of seed germination in *Brachiaria humidicola*, *Echinochloa turnerana*, *Eragrostis tef* and *Panicum maximum* to photon dose for the low energy reaction and the high irradiance reaction. *Journal of Experimental Botany*

37:742-753. *Investigates the response of seeds to various daily photon doses. In all species, germination was dependent on daily photon dose. According to the authors, the low energy reaction, in which increasing dose promotes seed germination, was observed in Echinochloa turnerana and tef but not in the Brachiaria humidicola and Panicum maximum.*

Ellis RH, Hong TD, Roberts EH. 1989. A comparison of the low-moisture-content limit to the logarithmic relation between seed moisture and longevity in twelve species. *Annals of Botany* 63:601-611. *Investigates the relation between seed longevity and seed storage moisture content in 12 species of Compositae, Cruciferae, Gramineae and Leguminosae.*

Fujii T, Yokohama Y. 1965. Physiology of light-requiring germination in Eragrostis seeds. *Plant and Cell Physiology* 65:135-145. *Determines the photo requirement for the germination of Eragrostis seeds. The dehydration of seeds or the puncturing of seed coats results in a decrease of photo requirement for germination. The rate of water absorption of seeds increases with the germination capacity under continuous dark condition.*

Fujii T. 1969. Photocontrol of development of excised Eragrostis embryos. *Development, Growth and Differentiation* 11:153-163. *Examines the photo requirement for the development of Eragrostis. The photo requirement for development of excised embryos is scarcely affected by oxygen concentrations and the embryo growth can take place equally in both light and darkness.*

Ghebrehiwot HM, Kulkarni MG, Kirkman KP, Van Staden J. 2008. Smoke-water and a smoke-isolated butenolide improve germination and seedling vigour of Eragrostis tef under high temperature and low osmotic potential. *Journal of Agronomy and Crop Science* 194:270-277. *Investigates the effect of smoke-wapolyter and smoke-isolated butenolide on tef seed germination and seedling growth at different temperatures, light conditions and osmotic potentials. According to the findings, tef seeds treated with smoke-water and butenolide had increased germination percentage. Hence, smoke can reduce seedling losses at elevated temperatures and water stress.*

Gough MC, Bateman GA. 1977. Moisture humidity equilibria of tropical stored produce. I. Cereals. *Tropical Stored Products Information* No. 33, pp. 25-40. *Reviews the relationship between the equilibrium RH (ERH) and moisture content for stored cereals such as maize, rice and tef.*

Harrouni MC, Marshall C. 1992. Leaf rolling in response to water stress in tef. *Actes de l'Institut Agronomique et Veterinaire Hassan 2.* 12:5-10. [in French]. *Investigates the effect of water deficit on the physiology of tef leaf.*

Harrouni MC. 1990. The effect of water stress on growth and development of barley and tef. Thesis, University College of North Wales, Bangor, (UK). 282 pp. *Investigates the effect of moisture stress on physiological and morphological parameters in barley and tef. During moisture deficit, the rate of net photosynthesis declined in both species, but while the decline was mainly due to stomatal control in barley, in tef the reduction was entirely non-stomatal. Recovery from severe water stress was characterized in tef by the production of new nodal roots and their rapid growth in the superficial soil layer.*

Jones CA. 1985. *C₄ grasses and cereals: growth, development and stress response.* John Wiley & Sons. New York. 419pp. *Describes C₄ grasses and cereals with regard to vegetative, reproductive, root growth and effects of environmental factors on them. Tef is one of the C₄ grasses with a fine-stemmed, tufted, annual, member of the sub family Eragrostoideae, tribe Eragrosteae.*

Jöst M. 2010. Helical tef: a twisted phenotype leads to semi-dwarfism in the Ethiopian cereal tef. MSc Thesis, University of Bern, Switzerland. *Characterizes the semi-dwarf kegne mutant using molecular, morphological and hormonal parameters. The response of kegne plants to microtubule depolymerization and stabilizing drugs imply that the underlying mutation is related to microtubules.*

Katayama TC, Nakagama A. 1972. Studies on the germination behaviour of tef seeds with the emphasis of storage condition. *Japanese Journal of Tropical Agriculture* 16:97-105. *Investigates parameters related to germination behavior in tef. According to the authors, seed dormancy was not remarkably recognized in tef. After 11 months of storage, germination percentages of seeds stored at the room condition drastically decreased, but those stored at -17°C gave more than 80% germination even after 15 months of storage.*

Kebede H, Johnson RC, Ferris DM. 1989. Photosynthetic response of *Eragrostis tef* to temperature (carbon isotope composition, C₄ photosynthesis). *Physiologia-Plantarum* 77:262-266. *Investigates the effect of temperature on the photosynthesis of tef leaves. The highest carbon exchange rates (CER) occurred between 36 and 42°C. At lower or higher temperatures, CER was reduced. Leaf CER rates increased hyperbolically with increased light.*

Kidanu S, Mamo T, Stroosnijder L. 2005. Biomass production of Eucalyptus boundary plantations and their effect on crop productivity on Ethiopian highland Vertisols. *Agroforestry systems* 63: 281-290. *Investigates the effect of eucalyptus boundaries and their effect on the productivity of adjacent crops of tef and wheat. According to the findings, significant depression of tef and wheat yields occurred over the first 12m from the tree line. However, in financial terms, the tree component adequately compensated for crop yield reduction and even generated additional income.*

Kleeberg A, Richter C. 2002. Root growth of eight different varieties of the grain tef from Ethiopia. In: Deininger A. (ed.): *Deutscher Tropentag, Witzenhausen: International Research on Food Security, Natural Resource Management and Rural Development. Challenges to Organic Farming and Sustainable Land Use in the Tropics and Subtropics.* Kassel University Press, Germany, p. 68, ISBN 3-89958-000-1. http://www.tropentag.de/2002/abstracts/links/Kleeberg_uLaURXdt.pdf accessed July 5, 2011. *Evaluates diverse root related parameters for eight varieties of tef. The mean values for length of root hairs varied between 0.86mm for DZ-Cr-37 and 1.06mm for Ambo White.*

Kreitschitz A, Tadele Z, Gola EM. 2009. Slime cells on the surface of *Eragrostis* seeds maintain a level of moisture around the grain to enhance germination. *Seed Science Research* 19:27-35. *Reports the presence of slime cells, a type of modified epidermal cell, covering the*

fruit in tef and its wild relative, *E pilosa*. The slime produced by *Eragrostis* belongs to the 'true' slime type, since it is exclusively composed of pectins. In the presence of water, pectins quickly hydrate, causing swelling of the slime cells. The ability of slime to absorb and maintain moisture around the grain may create conditions that are suitable for rapid germination.

Mengiste T. 1996. Duration and rate of grain filling in tef. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

Negash L, Bjoern LO. 1986. Stomatal closure by ultraviolet radiation. *Physiologia Plantarum* 66:360-364. *Investigates the effect of UV (255-325 nm) on stomatal closure of tef. The action spectrum showed that UV of 285 nm or shorter wavelengths was very efficient in causing stomatal closure.*

Negash L. 1987. Wavelength dependence of stomatal closure by ultra-violet radiation in attached leaves of *Eragrostis tef*: action spectra under backgrounds of red and blue lights (guard cells, stomatal resistance). *Plant Physiology and Biochemistry* 25:753-760.

Negash L. 1991. Tef stomata: possible targets for ultraviolet radiation. *SEBIL, Ethiopia* 3:14. *Indicates that the stomata of tef are direct targets for ultraviolet radiation which increase as the result of depletion of ozone layer. According to the author, the ultraviolet radiation induced stomatal closure in tef and inactivated photosynthetic machinery of guard cells.*

Nugent G, Gaff DF. 1989. Electrofusion of protoplasts from desiccation tolerant species and desiccation sensitive species of grasses. *Biochemie und Physiologie der Pflanzen.* 185:93-97. *Investigates the optimum electrofusion of protoplasts. The fusion was successfully applied in drought sensitive and drought tolerant species (*S. pyramidalis* and *S. pellucidus*, *E. tef* and either *E. hispida* or *E. paradoxa*) and between two desiccation-tolerant species (*E. invalida* and *E. nindensis*).*

Okwelogy TN. 1969. Maximum safe moisture content for tef and Sarawak illipe nut (*Shorea gysbertiana*). *Journal of Stored Products Research* 5:169-172.

Smirnoff N, Colombe SV. 1988. Drought influences the activity of enzymes of the chloroplast hydrogen peroxide scavenging system. *Journal of Experimental Botany* 39:1097-1108. *Studies the effect of drought on the activity of three enzymes that are components of the chloroplast hydrogen peroxide scavenging system in leaves of barley and tef. The three enzymes are ascorbate peroxidase (AP), glutathione reductase (GR) and monodehydroascorbate reductase (MDAR). Severe leaf water deficit resulted in increased activity of GR and MDAR in barley and of AP and MDAR in tef.*

Tadele Z, Adela A. 1996. Accumulated heat requirement for various growth stages of tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Tadele Z, Takele A. 1996. Germination behaviour and seedling growth of tef relative to other crops under waterlogged conditions. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Takele A, Kebede H, Simane B. 2001. Physiological research in tef. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 177-189. *Reviews the works made on tef physiology that include the responses of tef to abiotic stresses and photosynthetic characteristics and agro-ecology of tef.*

Takele A. 2001. Canopy temperatures and excised leaf water loss of tef cultivars under water deficit conditions at anthesis. *Acta Agronomica Hungarica* Hungary 492:109-117. *Evaluates during anthesis the canopy temperatures and excised leaf water loss (ELWL) for tef cultivars under water deficit conditions.*

Van Delden SH, Stomph TJ, Vos J, Brouwe G. 2009. The photo-thermal control of flowering in teff. *Comparative Biochemistry and Physiology Part A Molecular and Integrative Physiology* 153:S198. *Studies the effect of photoperiod and temperature on time to flowering and internode number in tef. The authors indicated that panicle initiation in tef started during the beginning of the photoperiod sensitive phase and not near the end like rice or even later like sorghum.*

Vohwinkel F, Piepho HP, Heiligtag B, Richter C. 2002. Comparative yield and nutrient concentration of six cultivars of tef. *Ethiopian Journal of Natural Resources.* pp. 21-36. ISSN 1563-3705. *Investigates nutrient uptake and translocation in six tef cultivars. Among the cultivars, DZ-Cr-37 gave the highest grain yield but lowest protein concentration. However, DZ-01-787 produced lowest yield but highest protein concentration. Compared to other cereals, all tef varieties contained high iron content (109-140 mg Fe Kg DM⁻¹) due to high iron uptake and translocation within the plant. The iron content between brown and white tef is similar.*

Wehrmann J, Woldeyohannes L, Kaheesay G, Parche H. 1965. Course of growth and nutrient absorption by crops. I. Tef. Haile Selassie I University (HSIU), Forestry Research Institute. Addis Ababa, Ethiopia. 13pp. *Investigates, i) the course of dry matter production during vegetative stage, ii) whether the nutrient supply affects the course of dry matter production, and iii) what amounts of the different nutrients are accumulated by tef at different growth periods and at the harvest. According to the authors, the mean daily production of dry matter was between 3 and 38 kg ha⁻¹. There was no loss of tef dry matter at the end of the vegetative time. A one ha tef field absorbs daily between 0.1 g Cu and 737 g N. The highest amounts are taken nearly 60 days after planting.*

Zewdie M, Ellis RH. 1991. Comparisons of seed longevity between tef and niger in similar storage conditions. *Seed Science and Technology* 19:303-308. *Compares seed longevity (time taken for normal germination to decline to 50%) for the tef and oilseed niger (Guizotia*

abyssinica). Longevity was 11- to 12-fold higher for tef than for niger seed when stored at the same temperature and similar moisture contents (11.2% and 10.8%, f.wt, respectively).

Zewdie M, Ellis RH. 1991. Response of tef and niger seed longevity to storage temperature and moisture. *Seed Science and Technology* 19:319-330. *Quantifies the effects of different levels of storage temperature (0-90 °C) and moisture content (4.4-26.2% f.wt) on four cultivars of tef and one cultivar of niger (Guizotia abyssinica). The effects of moisture and temperature on longevity did not differ among the tef cultivars. The values of the viability constants determined for tef and niger enable to estimate the expected loss in viability during storage in a wide range of environments.*

Zewdie M, Ellis RH. 1991. Survival of tef and niger seeds following exposure to sub-zero temperature at various moisture contents. *Seed Science and Technology* 19:309-318. *Evaluates the germination of tef and niger (Guizotia abyssinica) exposed to long-term hermetic storage. The normal germination of tef seeds at 22.4% and 24.4% moisture content was reduced following the immersion for three days in liquid nitrogen (-196°C).*

Zewdie M, Ellis RH. 1991. The upper moisture content limit to negative relations between seed longevity and moisture in niger and tef. *Seed Science and Technology* 19:295-302. *Investigates the upper seed moisture for niger (Guizotia abyssinica) and tef. Increases in seed moisture content above 22.1% and 24.1% to 27.7% moisture content (f.wt. basis) had little or no effect on seed longevity (time taken for normal germination to decline to 50%) in one seed lot of niger and one seed lot of tef, respectively, when stored hermetically at 20 °C.*

Zewdu AD, Solomon WK. 2007. Moisture-dependent physical properties of tef seed. *Biosystems Engineering* 96:57-63. *Studies moisture-dependent physical properties of tef at various moisture contents. With increase in moisture content from 5.6% to 29.6% w.b., the following seed parameters increased: length, width, equivalent sphere diameter, and thousand seed mass.*

10. Genomics, Mapping and Markers

Assefa K, Merker A, Tefera H. 2003. Inter-simple sequence repeat (ISSR) analysis of genetic diversity in tef. *Hereditas*. 139:174-1783. *Evaluates DNA polymorphism among 92 selected tef genotypes belonging to eight origin groups using inter simple sequence repeat (ISSR) primers. The eight primers were able to separate or distinguish all of the 92 tef genotypes based on a total of 110 polymorphic bands among the test lines.*

Ayele M, Nguyen HT. 2000. Evaluation of amplified fragment length polymorphism markers in tef and related species. *Plant Breeding* 119:403-409. *Investigates i) genetic diversity and relationship within and among three Eragrostis species (tef, E. pilosa and E. curvula), and ii) the relationship between tef, E. pilosa and E. curvula using AFLP markers. From a total of 630 AFLP markers, 58% were polymorphic, using 10 primer combinations. According to the finding, the three species were separated.*

Ayele M, Tefera H, Assefa K, Nguyen HT. 1999. Genetic characterization of two Eragrostis species using AFLP and morphological traits. *Hereditas* 130:33-40. *Investigates genetic diversity among four tef cultivars and 14 accessions of Eragrostis pilosa using radiolabelled and silver stained amplified fragment length polymorphism. From a total of 897 markers, 395 were polymorphic using 11 primer combinations.*

Ayele M. 1999. Genetic diversity in tef for osmotic adjustment, root traits, and Amplified Fragment Length Polymorphism. PhD Thesis, Texas Tech University, USA. 152 pp. *Presents the results of the following three studies, i) screening tef germplasm for key drought resistance traits, ii) investigating the impact of osmotic adjustment and root depth on productivity of tef, and iii) assessing the diversity of tef germplasm using amplified fragment length polymorphism (AFLP) marker. According to the author, fingerprinting revealed that the three Eragrostis species, namely E tef, E pilosa and E curvula, are distinctly separated where by E pilosa is more closely related to E tef than E. curvula.*

Bai GH, Ayele M, Tefera H, Nguyen HT. 1999. Amplified fragment length polymorphism analysis of tef. *Crop Science* 39:819-824. *Investigates the genetic relationships among 47 accessions of tef and one accession each of E. pilosa and E. curvula using amplified fragment length polymorphism (AFLP) technique. The level of polymorphism within tef accessions was low (18%).*

Bai GH, Ayele M, Tefera H, Nguyen HT. 2000. Genetic diversity in tef and its relatives as revealed by Random Amplified Polymorphic DNAs. *Euphytica* 112:15-22. *Evaluates genetic diversity of 47 accessions of tef, three accessions of E. pilosa, and six accessions of E. curvula using random amplified polymorphic DNA (RAPD) markers. The level of polymorphism among the wild species was extremely high, while low polymorphism was detected among tef accessions.*

Bai GH, Tefera H, Ayele M, Nguyen HT. 1999. A genetic linkage map of tef based on amplified fragment length polymorphism. *Theoretical and Applied Genetics* 99:599-604.

Constructs the first genetic linkage map of tef using amplified fragment length polymorphism (AFLP) markers. F₅ recombinant inbred lines (RILs) derived from single seed descent from the intraspecific cross of 'Kaye Murri' x 'Fesho' were used for the study.

Bennett MD. 1976. DNA amount, latitude and crop plant distribution. *Environ. Exp. Bot.* 16:93-108. *Determines the relationship between DNA amount and latitude for several angiosperm groups including Gramineae, Commelinaceae, Liliales, Polemoniales and the Leguminosae. The mean DNA amount per chromosome for the sample of cereal grain species showed about a 36-fold range from 0.033 picograms (pg) in tef to 1.186 pg in Secale cereale, while for the sample of pulse crops the range was about 70-fold from 0.032 pg in Lablab niger to 2.225 pg in Vicia faba.*

Bennetzen JL, Ayele M. 2001. Genetic characterization of tef in the context of overall studies of grass genome content, organization, evolution and function. In: *Narrowing the Rift: Tef Research and Development*. Tefera H, Belay G, Sorrells M (Eds), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 121-130. *Describes the application of comparative genomics to tef improvement. The authors studied in tef homologous of dwarfing genes such as Rht-1 from wheat and D8 from maize.*

Bennetzen JL, Smith SM, Yuan Y, Groth D. 2009. Comparative Plant Biology: opening new avenues for the improvement of orphan crops in a time of rapid and potentially catastrophic change in worldwide agriculture. In: Tadele Z. (ed.) 2009. *New Approaches to Plant Breeding of Orphan Crops in Africa: Proceedings of an International Conference*, 19-21 September 2007, Bern, Switzerland. pp. 11-19. *Presents the prospects of applying modern improvement tools to crops such as finger millet, foxtail millet, and tef. Also indicates the importance of developing semi-dwarf tef varieties.*

Degu HD, Fujimura T. 2010. Mapping QTLs related to plant height and root development of Eragrostis tef under drought. *Journal of Agricultural Science* 2:62-72. *Evaluates the effects of water-stress on root and shoot growth of tef using 94 recombinant inbred lines (RILs) derived from a cross between tef (cv. Kaye Murri) and E. pilosa. Quantitative trait loci (QTLs) were also mapped in relation to water-stress using traits of RILs.*

Drescher A, Hupfer H, Nickel C, Albertazzi F, Hohmann U, Herrmann RG, Maier RM. 2002. C-to-U conversion in the intercistronic ndhI/ndhG RNA of plastids from monocot plants: conventional editing in an unconventional small reading frame? *Mol Genet Genomics* 267:262-269. *Investigates editing site in the ndhI/ndhG intergenic region in a related group of monocot plants.*

Feltus FA, Singh HP, Lohithaswa HC, Schulze SR, Silva TD, Paterson AH. 2006. A comparative genomics strategy for targeted discovery of single-nucleotide polymorphisms and conserved-noncoding sequences in orphan crops. *Plant Physiology* 140:1183-1191. *Investigates whether completed genome sequences provide templates for the design of genome analysis tools in orphan species lacking sequence information. Conserved-intron scanning primers (CISPs) are effective means to explore poorly characterized genomes for both DNA polymorphism and noncoding sequence conservation on a genome-wide or*

candidate gene basis, and also provide anchor points for comparative genomics across a diverse range of species.

Graznak EV. 2003. Identification of agronomic traits associated with quantitative trait loci in a recombinant inbred line population of tef. Thesis, Cornell University, Columbia, Missouri. 56 pp. *Investigates quantitative trait loci associated with lodging resistance and potentially grain yield for future use in a marker assisted selection (MAS) program using 18 morphological and agronomic traits.*

Kantety RV, Graznak EV, Tefera H, Sorrells ME. 2001. Comparative mapping in tef. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 99-107. *Describes the linkage map constructed using 60 RI population and 190 markers. Also presents comparative map between tef and rice.*

Kisha T, Bradley V. 2011. Molecular characterization of the U.S. Eragrostis tef collection using TRAP markers derived from gibberilic acid genes. <http://www.cnr.uidaho.edu/crissp/reugrant.htm> accessed July 22, 2011. *Characterizes the genetic diversity in 371 tef accessions available at the National Plant Germplasm System in USA using targeted region amplified polymorphism (TRAP) molecular markers derived from genes involved in the GA pathway.*

Nelson RJ, Naylor RL, Jahn MM. 2004. The role of genomics research in improvement of “orphan” crops. *Crop Science* 44: 1901-1904. *Presents the importance of genomics in improving under-studied crops such as root and tuber crops, millets, legumes and indigenous crops (e.g. tef and quinoa).*

Plaza S, Bossolini E, Tadele Z. 2010. Significance of genome sequencing for African orphan crops: the case of tef. *ATDF Journal Special issue on ‘African Orphan Crops: their significance and prospects for improvement’* 6(3/4):53-57. *Indicates the importance of genome sequencing in improving under-researched crops of Africa. Also mentions about the progress of the Tef Genome Sequencing Initiative.*

Plaza S, Esfeld K, Jöst M, Assefa K, Tadele Z. 2010. Genomic tools for improving the cereal crop tef. *Second Symposium on Genomics of Plant Genetic Resources, 24-27 April 2010, Bologna, Italy.* SL 20. pp 81. *Presents highlights about the genome sequencing and TILLING project on tef.*

Sorrells ME. 2001. Comparative genomics for tef improvement. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 109-119. *Indicates the importance and applications of comparative genomics to crop improvement in general and tef improvement in particular.*

Tadele Z. 2011. Designing African future crops using biotechnological and genomic tools: the case of Tef Project. International Conference on Agricultural Biotechnology in Africa: Fostering Innovation, May 12-15, 2011, Addis Ababa, Ethiopia. *Presents strategies of the Tef Improvement Project hosted at the University of Bern in Switzerland. The project implements a modern improvement technique called TILLING (Targeting Induced Local Lesions IN Genomes) in order to obtain semi-dwarf and lodging tolerant tef lines from over 6000 mutagenized population. The project has also initiated the whole genome sequencing for tef.*

Yadav OP, Mitchell SE, Fulton TM, Kresovich S. 2008. Transferring molecular markers from sorghum, rice and other cereals to pearl millet and identifying polymorphic markers. Journal of SAT Agricultural Research 6. *Investigates the potential of using CISP primers or EST-SSR markers in pearl millet. According to the findings, Using CISP primers from sorghum and tef, 64% markers were amplified in pearl millet in comparison to average transfer rate of 13% in EST-SSR markers.*

Yu JK, Graznak EV, Breseghello F, Tefera H, Sorrells ME. 2007. QTL mapping of agronomic traits in tef. BMC Plant Biology 7:30. *Investigates agronomically important quantitative trait loci (QTL) using recombinant inbred lines (RIL) derived from inter-specific cross between tef and E. pilosa (30-5). According to the authors, the extensive QTL data generated for tef will provide a basis for initiating molecular breeding to improve agronomic traits.*

Yu JK, Kantety RV, Graznak EV, Benscher D, Tefera H, Sorrells ME. 2006. A genetic linkage map for tef. Theor Appl Genet. 113:1093-1102. *Maps 94 F₉ recombinant inbred lines (RIL) derived from the interspecific cross between tef cv. Kaye Murri and E. pilosa using diverse genetic markers: restriction fragment length polymorphisms (RFLP), simple sequence repeats derived from expressed sequence tags (EST-SSR), single nucleotide polymorphism/insertion and deletion (SNP/INDEL), intron fragment length polymorphism (IFLP) and inter-simple sequence repeat amplification (ISSR). The map covered 2,081.5 cM with a mean density of 12.3 cM per locus.*

Yu JK, Sun Q, Rota ML, Edwards H, Tefera H, Sorrells ME. 2006. Expressed sequence tag analysis in tef. Genome. 49:365-372. *Generates expressed sequence tags (ESTs) from 4 cDNA libraries: seedling leaf, seedling root, and inflorescence of tef and seedling leaf of E. pilosa. Clustering of 3603 sequences produced 530 clusters and 1890 singletons, resulting in 2420 tef unigenes. Approximately 3/4 of tef unigenes matched protein or nucleotide sequences in public databases.*

Zeid M, Belay G, Mulkey S, Poland J, Sorrells ME. 2011. QTL mapping for yield and lodging resistance in an enhanced SSR-based map for tef. Theoretical and Applied Genetics 122: 77-93. *Constructs a linkage map using 151 F₉ recombinant inbred lines obtained by single-seed-descent from a cross between tef and E. pilosa based on microsatellite (SSR) markers. The map consisted of 30 linkage groups and spanned a total length of 1,277.4 cM (78.7% of the genome) with an average distance of 5.7 cM between markers. According to the authors, this is the most saturated map for tef.*

Zeid M, Yu JK, Goldowitz I, Denton ME, Costich DE, Jayasuriya CT, Saha M, Elshire R, Benscher D, Breseghello F, Munkvold J, Varshney RK, Belay G, Sorrells ME. 2010. Cross-amplification of EST-derived markers among 16 grass species. *Field Crops Research* 118:28-35. *Develops 919 EST-based primers from seven grass species and assesses for amplification across a diverse panel of 16 grass species including cereals and forage crops. Only 5.2% of the primers tested produced clear amplicons in all 16 species.*

Zhang D, Ayele M, Tefera H, Nguyen HT. 2001. RFLP linkage map of the Ethiopian cereal tef. *Theoretical and Applied Genetics* 102:957-964. *Constructs the genetic linkage-map for tef using tef and heterologous cDNA probes. One hundred and sixteen F_8 recombinant inbred lines (RILs) from the cross of tef cv Kaye Murri and *E. pilosa* were used for mapping. The polymorphism level between parental lines was 67%. The linkage map defined 1,489 cM of the tef genome comprising 149 marker loci distributed among 20 linkage groups.*

11. Biotechnology and Transformation

Abraham A. 2009. Agricultural biotechnology research and development in Ethiopia. *African Journal of Biotechnology* 8:7196-7204. *Reviews agricultural biotechnology research and application in Ethiopia. The topics covered include tissue culture, biofertilizers, molecular markers, artificial insemination, vaccine production and molecular genetic analysis.*

Anon. nd. Conclusions and recommendations. In: *Plant Biotechnologies for Developing Countries*, 26-30 June 1989, Luxembourg. CTA/Food and Agriculture Organization (FAO) Symposium.

Assefa K, Tefera H, Gugsu L, Hundera F, Kefyalew T. 2001. In vitro manipulation of tef. In: *Narrowing the Rift: Tef Research and Development*. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 131-144. *Indicates limited research made on tef transformation. Attempts made in transformation are electroporation, particle bombardment and agrobacterium methods.*

Gressel J. 2008. Genetic glass ceilings: transgenics for crop biodiversity. Chapter 13: Tef—the crop for dry extremes. pp. 241-256. Johns Hopkins University Press. *Presents major uses, agronomic and nutritional benefits of tef. It also indicates the need for genetic engineering in improving tef. According to the author, priorities in tef genetic engineering should be given to the following traits: developing herbicide and insect resistance, increasing seed size, and decreasing plant height.*

Gugsu L. 2005. Biotechnological studies in tef with reference to embryo rescue, plant regeneration, haplodization and genetic transformation. Ph.D Thesis, Addis Ababa University and Universität Hamburg. *Presents the results of four studies made on tef, i) developing embryo rescue technique, ii) efficient plant regeneration system from immature embryos, iii) in-vitro haplodization through androgenesis or gynogenesis, and iv) transformation. The author developed haploid tef lines and also efficient in vitro regeneration method from immature embryos.*

Mekbib F, Buchanan-Wollaston V, Mantell SH. 2001. Attachment study of *Agrobacterium tumefaciens* to tef, yam and tobacco explant. *SINET: Ethiopian Journal of Science* 24:185-195. *Investigates the attachment of Agrobacterium tumefaciens in tef zygotic embryos, seeds, seedlings, leaf bases and embryogenic callus. Uniformity with bacteria binding was obtained with acetosyringone treatment.*

Mekbib F. 1991. In-vitro regeneration, somatic embryogenesis study in tef. *Agrobacterium mediated transformation of tef and yam*. MSc. Thesis, University of London, Wye College, UK.

Mengiste T. 1991. Genetic transformation of *Eragrostis tef* by direct DNA transfer. M.Sc. Thesis, University of London, Wye College, UK.

Mengiste T. 1992. Genetic transformation of by direct DNA transfer. SEBIL—Bulletin of Crop Science Society of Ethiopia) Vol. 4, pp. 18. *Briefly describes the study made to introduce foreign DNA into suspension culture cells, embryonic callus and zygotic embryos of tef using particle acceleration approach.*

Naylor RL, Falcon WP, Goodman RM, Jahn MM, Sengooba T, Tefera H, Nelson RJ. 2004. Biotechnology in the developing world: a case for increased investments in orphan crops. *Food Policy* 29:15-44. *Reviews the opportunities for using several forms of modern biotechnology to improve orphan crops including tef in developing countries.*

12. Regeneration and Growth Regulators

Alkamper J, Westphal A, Hesselbach D. 1970. Possibilities of chlormquat application in tef. *Zeitschrift für Acker- und Pflanzenbau* 132(4):257-266. [in German].

Anon. 1969. Cycocel and fertilizer levels trial. pp. 67-69. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests the effects of three levels of cycocel and three levels of fertilizer on three varieties of tef at Holetta mainly to see whether cycocel has effect in preventing lodging in tef under high levels of fertilization.*

Anon. 1969. Cycocel vs fertilizer levels trial. pp. 29. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of three varieties (A-44, A-71 and DZ-01-186), three levels of fertilization (0/40, 40/40, 40+40/40 N/P₂O₅ kg ha⁻¹), and three levels of cycocel (0, 1.5, and 3.0 l ha⁻¹) on tef yield. Significant effects due to fertilizer levels and varieties were obtained but no effect due to cycocel and interactions.*

Assefa K, Gaj MD, Maluszynski M. 1998. Somatic embryogenesis and plant regeneration in callus culture of tef. *Plant Cell Reports* 18:154-158. *Establishes in-vitro culture conditions for regeneration of two varieties of tef (DZ-01-354 and DZ-01-196). About 70% of calli displaying somatic embryos were converted into plants and all regenerated plants were fertile.*

Assefa K, Tefera H, Gugsu L, Hundera F, Kefyalew T. 2001. In vitro manipulation of tef. In: *Narrowing the Rift: Tef Research and Development*. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 131-144. *Reviews the studies made on in vitro culture and regeneration of tef. Optimum media explant and other conditions for in vitro manipulation are also indicated.*

Assefa K. 1991. Effects of some synthetic plant growth regulators on lodging and other agronomic and morphological characters of tef. MSc. Thesis, Alemaya University of Agriculture, Ethiopia. *Investigates the effects of three plant growth regulators (CCC, ethephon and PP333) on lodging, plant height, grain yield and grain yield components, and shoot biomass yield of tef. According to the findings, ethephon shortened plant height.*

Ayele M, Zapata F, Afza R, Van Duran M. 1996. Plant regeneration from seed derived calli of tef: effects of callus induction media and radiation treatment. *IAR Newsletter Agric. Res.* 11(4):3-4.

Bekele E, Klock G, Zimmermann U. 1995. Somatic embryogenesis and plant regeneration from leaf and root explants and from seeds of *Eragrostis tef* (Gramineae). *Hereditas* 123:183-189. *Studies in-vitro somatic embryogenesis and plant regeneration for eight tef genotypes*

using explants of root, leaf and seeds. The number of regenerants from leaf callus were higher than those from root callus at all tested hormone concentrations.

Bekele E. 1992. Electofusion and electoinjection studies on the protoplasts of *Sorghum bicolor* and *Eragrostis tef*. SEBIL (Bulletin of Ethiopian Crop Science Society) Vol 4, pp. 17. *Presents the appropriate method for genetic manipulation of sorghum and tef through reversible electrical breakdown and electrofusion of protoplasts.*

Bekele E. 1995. Electric field mediated fusion of *Eragrostis tef* and *Sorghum bicolor* protoplasts and their electroporation conditions. *Hereditas* 123:199-203. *Determines optimal conditions for the survival and division of cultured protoplasts and protoplast fusion products. Electroporation and heat shock treatments stimulated cell wall formation and cell division in both sorghum and tef.*

Getahun T. 2010. Regeneration of plants from unpollinated ovary cultures of Ethiopian wheat varieties and embryo rescue cultures of F₁ hybrids of tef with its wild relatives. MSc thesis, Addis Ababa University. *Determines optimum conditions for embryo rescue cultures for crosses between tef and wild species such as E. pilosa and E. curvula. From a total of 635 F₁ cultured florets, 21 somatic embryos were obtained.*

Gugsa L. 2005. Biotechnological studies in tef with reference to embryo rescue, plant regeneration, haplodization and genetic transformation. PhD Thesis, Addis Ababa University and Universität Hamburg. *Presents the results of four studies made on tef, i) developing embryo rescue technique, ii) efficient plant regeneration system from immature embryos, iii) in-vitro haplodization through androgenesis or gynogenesis, and iv) transformation. The author developed haploid tef lines and also efficient in vitro regeneration method from immature embryos.*

Mekbib F, Mantell SH, Buchanan-Wollaston V. 1997. Callus induction and in vitro regeneration of tef from leaf. *Journal of Plant Physiology* 151:368-372. *Studies in vitro regeneration for four tef genotypes (namely Ada, Deschanger, Gommadie and Zuccariagina) using immature leaf bases as explant. High frequency direct somatic embryogenesis was obtained using dicamba at a concentration of 1-5 mg/l.*

Mekbib F. 1991. In-vitro regeneration, somatic embryogenesis study in tef. Agrobacterium mediated transformation of tef and yam. MSc. Thesis, University of London, Wye College, UK.

Mengistu A. 1972. The effect of CCC (Cycocel) on tef. Report on Senior Research Project, College of Agriculture, Haile Selassie I University (HSIU), Dire Dawa, Ethiopia. 18pp.

Mengistu A. nd. The effect of CCC (Cycocel) on tef in Alemaya. Senior Research Project. pp. 178. In: Plant Science Annual Report, 1972, Vol. 2. College of Agriculture, Haile Selassie I University (HSIU), Dire Dawa, Ethiopia. *Evaluates three levels of CCC, at two application time, on two tef varieties, and at two experimental areas (greenhouse and lath-house). CCC had effectively reduced stem height and internode, increased the number of tillers per plant, and reduced lodging to a greater extent.*

Shiferaw B, Unger J. 1985. The influence of growth retardants on the lodging behaviour and agronomic characteristics of tef under Ethiopian conditions. *Beitrag zur Tropischen Landwirtschaft und Veterinärmedizin.* 23:301-306.

Shiferaw B. 1982. The influence of some growth retardants (cycocel, ethephon and phynazol) on the lodging behaviour and some agronomic characteristics of tef. MSc. Thesis, Addis Ababa University, College of Agriculture, Alemaya (Ethiopia). 99pp. *Evaluates three synthetic growth retarding chemicals (CCC, CEPA and phynazol) on lodging and other characters of tef under field and glasshouse condition. According to the author, the chemicals significantly affected plant height, internode length and internode diameter but not lodging. Grain yield was negatively correlated with plant height, stem height and panicle length but positively correlated with productive tillers.*

Tefera H, Chapman GP. 1992. In vitro normal and variant development of tef spikelets. *Plant Cell, Tissue and Organ Culture* 31:233-237.

Tefera H, Zapata-Arias FJ, Afza R, Codym A. 1999. Response of tef genotypes to anther culture. *Agritopia* 14:8-9.

Tekalign T. 2009. Growth, photosynthetic efficiency, rate of transpiration, lodging, and grain yield of tef as influenced by stage and rate of paclobutrazol application. *East African Journal of Science* 1:35-44. *Investigates the response of tef to foliar application of paclobutrazol. Paclobutrazol increased chlorophyll a and b content, reduced the rate of leaf transpiration, increased photosynthetic efficiency, reduced plant height, increased number of fertile tillers, and thousand seed mass there by increasing tef grain yield.*

Woldeyesus K. 1985. Some aspects of response of tef to 2-chloroethyl trimethyl ammonium chloride (CCC). MSc. Thesis, University of London, Wye College, UK. 60pp.

Woyessa D, Assefa F. 2011. Effects of plant growth promoting rhizobacteria on growth and yield of tef under greenhouse condition. *Research Journal of Microbiology* 6:343-355. *Investigates the effect of Plant Growth Promoting Rhizobacteria (PGPR) on growth and yield of tef. About 160 bacteria were isolated from rhizosphere of tef and characterized on the basis of PGPR and biochemical features. Four best isolates were inoculated to two tef varieties. The increase in mean root dry weight and yield of tef by two isolates suggests that the isolates have better potential for further field testing and application in improving yield of the tef varieties.*

Woyessa D. Characterization of plant growth promoting rhizobacteria (PGPR) and evaluation of their effects on performance of tef. VDM Verlag Dr. Müller 96 pp. ISBN-13:978-3-639-35116-3. *Investigates the best performing plant growth promoting rhizobacteria (PGPR) on various growth and yield performance of two tef varieties.*

Wright D, Weldeslassie A. 1996. Evaluation of the growth retardant paclobutrazol on tef growth. *Annals of Applied Biology* 128:68-69.

13. Crop Management and Cropping System

Agegnehu G, Ghizaw A, Sinebo W. 2006. Crop productivity and land-use efficiency of a teff/faba bean mixed cropping system in a tropical highland environment. *Experimental Agriculture*. 42:495-504. *Compares mixed cropping of teff with faba bean vs sole cropping. Considering the prices of the respective crops, up to 62 % of faba bean can be mixed in normal teff to get better total yield and income than sole culture of either species.*

Anon. 1968. Tef cultural practices. pp. 31-32. In: Report for the Period Feb. 1966 to Mar. 1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly shows the results of cultural practice trials (using sowing dates, soil types and different fertilizer levels) for two local selections of teff. Both teff selections showed good response to fertilizers especially at later sowing dates but there was 100% lodging.*

Anon. 1968. Teff: cultural practices. pp. 32-34. In: Holetta Guenet Research Station Progress Report for Feb. 1966 to Mar. 1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effects of fertilizers, sowing dates, soil types and varieties on teff yield at Holetta.*

Anon. 1969. Date of planting teff in relation to forage production. pp. 141. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46. Asella, Ethiopia. *Studies optimum planting date for teff produced as a forage at Kulumsa. The treatments were two sowing dates (Jul. 22 and Aug. 7), three cultivars (A-44, A-71, A-170) and three stages of cuttings (harvest for hay, second cut for seed, harvest for seed only). As a forage crop, teff produces around 4000 kg DM.*

Anon. 1969. National cultural practices trial. pp. 64-67. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of cultural practice trial on teff conducted at Holetta using sowing dates, fertilizer, and two varieties: A-44 (early type), and DZ-01-196 (late type). Fertilizer and planting date brought for significant effect, while varieties and interactions did not bring significant effect on seed yield. Yield can be improved by at least 60% if teff is sown in early July with fertilizers.*

Anon. 1969. Seeding date of teff. pp. 55-56. In: Results of Trials and Observations in 1968/69. Crop Production Department, Chilalo Agricultural Development Unit (CADU) Publication No 28. Addis Ababa, Ethiopia. *Investigates the effects of sowing dates on three varieties of teff (A-44, A-71, DZ-01-186) at Kulumsa.*

Anon. 1969. Tef monthly sowing observation. pp. 79. In: Melka Werer Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates two varieties of teff (white and brown) at 10 planting dates at Melka Werer. The brown variety out yielded the white; yield levels were progressively increased from March to July.*

Anon. 1969. Teff monthly sowing observation. pp. 73. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of 10 monthly sowings (Mar. to Dec., 1967) at Melka Werer for brown and white tef varieties. Brown variety out-yielded white variety. Progressive yield increases were obtained with successive plantings from March to July.*

Anon. 1969. Teff: cultural practices. pp. 51. In: Report for the Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of cultural practices on tef under Bako condition. Early planting in July gave better yields than August planting. According to the report, the seed rate higher than 10 kg ha⁻¹ is not important for tef.*

Anon. 1969. Teff: national cultural practice trial. pp. 49-51. In: Awasa Agro-Industrial Estate, Agricultural Research and Experiment, Report for 1968, Part II - Analysis Report. Ministry of National Community Development, IRAT. *Evaluates two tef varieties under two fertilizer levels, and four sowing dates.*

Anon. 1969. Teff: national cultural practices trial. pp. 28. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of cultural practices (fertilizer, planting date and varieties) on tef at Holetta. According to the report, yield increases were 40% due to fertilizer, 29% due to planting date and 5% due to varieties.*

Anon. 1970. General conclusions. pp. 114-115. In: Holetta Guenet Research Station Progress Report for Apr. 1969 to Mar., 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the suggested cropping calendar (Provisional) for Areka area for different crops including tef.*

Anon. 1971. Crop sequence trial. pp. 66. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of a second year crop sequence trial at Bako involving maize, tef, noug, sunflower, bean and buck wheat.*

Anon. 1971. Crop yield in relation to plant population. pp. 90-93. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of plant population or seed rates under two sowing dates and two soil types for different crops including tef.*

Anon. 1971. Crop yields in relation to sowing dates. pp. 87-89. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of sowing dates on yield and other characters of tef, barley, wheat, etc. on red and black soils of Holetta. For tef, cambering of black soil had little effect on seed yield.*

Anon. 1971. Date of planting teff in relation to forage production. pp. 127-128. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Studies date of planting for*

two varieties of tef (A-44 and A-170) in relation to forage production at Kulumsa. According to the report, if the farmer takes the first yield of tef as forage and harvest the regrowth for grain, he will lose 3340 kg seed ha⁻¹.

Anon. 1971. Tef national cultural practices trial. pp. 59. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of two varieties of tef, at four sowing dates, and with or without the application of fertilizer at Bako. Early sowing gave the highest yield.*

Anon. 1971. Tef seed-rate trial. pp. 59. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares seed rates of tef varying from 10 to 30 kg ha⁻¹ at Bako. But no significant yield differences were obtained between 15 to 30 kg ha⁻¹.*

Anon. 1972. Cereal yields in relation to plant populations. pp. 76-80. In: Holetta Guenet Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the influences of seed rates and soil types on different crop varieties including wheat, barley, and tef at Holetta.*

Anon. 1972. Crop sequence trial - I. pp. 100-102. In: Report for the period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the precursor-successor relationship between the major crops grown around Bako to find acceptable crop rotation for the locality. Crops used for the study were maize, tef, noug, sunflower, beans, chick pea and fallow.*

Anon. 1972. Crop sequence trial - II. pp. 103. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies crop rotation for six crops namely maize, tef, noug, beans, sunflower and pepper. According to the findings, there was response to fertilizer application by maize, pepper and bean; but no response by sunflower and noug; and slightly negative response by tef.*

Anon. 1972. Tef planting date and fertilizer observations at Shashemene. pp. 224-225. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of planting dates and fertilizer on tef around Shashemene at Ajje, Kofele and Kuyera for variety DZ-01-354. Fertilizer consistency increased yield at all sites, on average, at 2.8 q ha⁻¹ more than the unfertilized.*

Anon. 1972. The effect of sowing date. pp. 72-76. In: Holetta Guenet Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of sowing dates for wheat, barley, tef, triticale and oats in relation to soil types (red terraced and black cambered) and crop varieties at Holetta.*

Anon. 1973. Crop rotation trial. pp. 112. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the best rotation program for main crops at Bako including tef.*

Anon. 1973. Crop sequence trial. pp. 111. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies the best precursor-successor relationships among six major crops at Bako (pepper, sunflower, tef, maize and beans).*

Anon. 1973. The effect of soil type and management on the cultural requirements of cereals. pp. 41-43. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of time of sowing, method of sowing and fertilizer on two soil types at Holetta and for different crops including tef.*

Anon. 1974. Tef sowing date and shoot-fly control trial. pp. 64. In: Jimma Research Station Progress Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates four sowing dates and four seed dressing methods on the control of shoot fly. There was significant difference in tef seed yield between different sowing dates.*

Anon. 1975. Cereal yields in relation to plant population. pp. 136-141. In: Holetta Guenet Research station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Ethiopia. *Determines the effects of plant population or seed rates on wheat, barley, tef, triticale and oats at Holetta.*

Anon. 1975. Effect of cutting tef (Kulumsa). pp. 67-68. In: Report on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 111, Asella, Ethiopia. *Investigates whether topping tef at different stages of vegetative growth has effect on yield of tef. According to the report, the yield has been depressed at all stages of cutting compared to no cutting treatment. The treatments were: no cutting, one early cutting and two cuttings.*

Anon. 1975. Planting time trials. pp. 74-76. In: Results of Extension and Project Implementation Department (EPID) trials and Demonstrations 1974/75. EPID Publication No. 41, Addis Ababa, Ethiopia. *Evaluates three planting periods (early, normal, and late) for major crops in different regions and various altitudinal ranges. In most areas, early planting gave good yield.*

Anon. 1975. The effect of sowing date. pp. 129-136. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of sowing dates for wheat, food and malt barley, tef, triticale, and oats on red clay and dark clay soils of Holetta. The sowing dates were: Jun. 15, Jun. 25, Jul. 5, and Jul. 15. For tef, no significant yield differences were obtained due to sowing dates. However, the best dates were Jul. 5 for red and Jul. 15 for dark clay soils.*

Anon. 1976. Crop sequence trial. pp. 141. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly reports the results of crop sequence trial involving maize, noug, tef, sunflower, red pepper and beans. According to the result, noug and sunflower proved to be the best precursors for maize followed by tef, red pepper and beans.*

Anon. 1976. Teff cultural practice trial (Bako). pp. 32. In: Annual Reports for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of cutting tef at different stages of vegetative growth (i.e., no-cutting, cutting at 30 cm height, cutting at 15 and 30 days from the first cut) on three varieties of tef (Jaji white, DZ-01-322 and DZ-01-172). High yield was obtained from no cutting.*

Anon. 1976. Teff sowing date and shoot-fly control trial (Jimma). pp. 32. In: Annual report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of sowing dates and insecticides on the control of shoot fly at Melko, Jimma.*

Anon. 1977. Planting time trials. pp. 35-36. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations. EPID Publication No. 39, Addis Ababa, Ethiopia. *Evaluates three planting times in 1975/76 for major crops in various regions. Late planting was better in most regions due to late starting of the rain.*

Anon. 1977. Seeding rate trails. pp. 37-38. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations. EPID Publication No. 39. Addis Ababa, Ethiopia. *Evaluates three seed rates (low, medium, and high) for major crops at different regions in 1975/76 but no significant differences were obtained.*

Anon. 1977. Teff planting date trials. pp. 79. In: Wolaita Agricultural Development Unit (WADU) Summary and Field Crop Trial Results, 1971-1977. WADU Publication No. 55, Wolaita Soddo, Ethiopia. *Evaluates five planting dates (Jul. 21-31, Aug. 1-10, 11-20, 21-31 and Sept. 1-10) for tef at Areka, Abella and Humbo.*

Anon. 1977. Teff seed rate x fertilizer trial. pp. 78. In: Wolaita Agricultural Development Unit (WADU) Summary and Field Crop Trial Results, 1971-1977. WADU Publication No. 55, Wolaita Soddo, Ethiopia. *Determines the effects of seed rates (10, 15, 20, 25, 30 kg ha⁻¹) and fertilizer (0, 100 kg DAP, 100 kg DAP + 50 kg urea ha⁻¹) on yield of tef at Areka.*

Anon. 1979. Cropping sequence studies (Ghinchi, 1976). pp. 69. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of eight precursor crops (including tef) with or without fertilizer on successor crops. Tef yield (in q ha⁻¹) was 12.3 from fertilized and 9.3 from unfertilized plots.*

Anon. 1979. Cropping sequence studies (Ghinchi, 1976). pp. 69. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of eight precursor crops (including tef) with or without fertilizer on successor crops. Tef yield (in q ha⁻¹) was 12.3 from fertilized and 9.3 from unfertilized plots.*

Anon. 1979. Results of experimental program, Illala, 1975/76: Crop sequence studies. pp. 108-109. In: Mekele Research Station Progress Report Apr. 1975 to Dec. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1981. Results obtained from the investigated trial of tef regrowing effect in relation to sowing dates and effect of fertilizers rate on yield. pp. 38-39. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Investigates ways of getting a second harvest of tef from post harvested regrown plants, and determines optimum rate of fertilizers for maximum yield.*

Anon. 1982. Tef sowing date trial. pp. 194. In: Proceedings of the Thirteenth National crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the results of sowing date trial for tef (starting July 9 to August 6 at one week interval) at five locations (Debre Zeit black and light soils, Chefe Donsa, Denkaka and Akaki). At Debre Zeit, the highest yield was obtained from July 23 sowing on light soil, and July 6 soing on black soil.*

Anon. 1987. Tef harvesting stage trial to minimize shattering losses pp. 20-21. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of four harvesting stages (8, 12, 15 and 17 weeks after heading) for tef on the black soil of Debre Zeit.*

Anon. 1987. Tef seed rate x filler trial. pp. 21-23. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of seeding rates of tef (15, 25, 40, and 50 kg ha⁻¹) and three ratios of filler [0:1, 2:1, and 4:1 filler (sand) to tef ratio] at Debre Zeit (light and Black soil), Akaki and Chefe Donsa.*

Anon. 1987. Tef seed rate x sowing implements trial. pp. 23-24. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of seed rate by sowing implements trial conducted at Debre Zeit light soil.*

Anon. 1987. Tef seed rate x sowing method trial. pp. 24-25. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Detrmines the effects of four seed rates (15, 25, 40 and 55 kg ha⁻¹) and two sowing methods (broadcasting by hand and sowing in rows) on the yield of tef at Debre Zeit (black and light soils) and Akaki.*

Anon. 1987. Tef sowing date trial. pp. 26. In: Trial Demonstration and Seed Increase Project, 1985-1986. Relief and Rehabilitation Commssion (RRC), Addis Ababa, Ethiopia. *Studies the optimum sowing dates for tef at Assosa using variety DZ-01-354. The dates used were August 10, 17, 24, and 31.*

Anon. 1987. The effect of seeding rates and frequency of hand weeding. pp. 29. In: Department of Field Crops, Tef Progress Report for 1985/86. IAR, Addis Ababa, Ethiopia. *Evaluates the effects of four seed rates of tef (20, 30, 40, and 50 kg ha⁻¹) and frequency of hand weeding (unweeded check, handweeding once, and handweeding twice) on weeds and tef yield at farmer's field.*

- Anon.** 1987. The effect of sowing dates and frequency of hand weeding. pp. 29. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates two sowing dates (July 7 and August 7), and frequency of hand weeding (no weeding, one hand weeding, and two hand weedings).*
- Anon.** 1988. Effect of cropping sequence on sorghum growth and development. pp. 20-21. In: Kobo Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the sequence of crops in rotation which give the highest crop yield and can conserve moisture.*
- Anon.** 1988. Studies on crop rotation and successions with special emphasis on the significance of cereals in the rotation. pp. 9-10. In: Department of Agronomy and Crop Physiology Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the relative benefits of crop rotations and successions in Nazret area using two year and four year rotation. Crops in two year rotation were: maize, sorghum, tef, haricot bean, safflower, Delicos lablab and sweet potato.*
- Anon.** 1988. Tef variety x sowing date trial. pp. 74-76. In: Pawe Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies the optimum planting time for three varieties of tef (DZ-01-354, Dabbi and local check), on two soil types (red and black). The sowing dates tested were: July 15, 25, August 4, and August 14.*
- Anon.** 1990. Cropping sequence trial, Ginchi. pp. 175-177. In: Holetta Research Center Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the most beneficial preceding crops to wheat, a major food crop at Ginchi, using crops (tef, noug, wheat, vetch, lentil, and chick pea) as main plot; and fertilizer levels (nil, 18/20 N/P kg ha⁻¹, and optimum for all crops) as sub plots. Vetch and noug showed excellent crop vigor followed by tef and wheat; application of fertilizer has hastened maturity of vetch and tef. There was slight damage of tef due to rats.*
- Anon.** 1990. Seed rate x sowing method trial part (c) Debre Zeit. pp. 141. In: Holetta Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents major findings for tef seed rate x sowing method trial conducted on light and black soils of Debre Zeit.*
- Anon.** 1990. Seed rate x sowing method. pp. 150-151. In: Holetta Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the effects of four seed rates of tef (15, 25, 40, 55 kg ha⁻¹), and two methods of sowing (broadcasting and sowing in rows) on tef yield at Debre Zeit (black and light soil) and Akaki; but no significant yield differences were obtained.*
- Anon.** 1990. Studies on crop rotation and succession with special emphasis on the significance of cereals in the rotation. pp. 11-12. In: Nazret Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the relative benefit of crop rotation and succession at Melkassa (Nazret) for two experiments. In the first experiment, seven crops (maize, sorghum, tef, haricot bean, safflower, Delicos*

lablab, and sweet potato), and two fertilizer levels (0, 18/46 N/P₂O₅ kg ha⁻¹) are included. The second experiment consists of four crops (sorghum, maize, haricot bean, and safflower), and two fertilizer levels (0, 18/46 N/P₂O₅ kg ha⁻¹).

Anon. 1990. Tef harvesting stage trial at Debre Zeit black soil. pp. 148. In: Holetta Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates proper harvesting time for tef at Debre Zeit black soil using variety DZ-01-354. The treatments were harvesting 8, 12, 15, 17 weeks after heading although no significant yield differences were obtained due to the treatments.*

Anon. 1990. Tef seed bed preparation trial at Akaki. pp. 151. In: Holetta Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the effects of three land preparation methods, i) no packing, ii) packing using oxen, and iii) packing using ring roller, on the yield of tef variety DZ-01-354. The experiment was failed due to grasshopper damage.*

Anon. 1990. Tef seed rate x filler trial. pp. 149. In: Holetta Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates four seed rates (15, 25, 40, and 55 kg ha⁻¹), and three filler ratios (no filler, 10:1, and 20:1 sand:tef) for tef variety DZ-01-354 at four locations (Debre Zeit black and light soils, Akaki, and Chefe Donsa). At Akaki, grasshopper damage was occurred; and at Debre Zeit the yield was 33 q ha⁻¹ on light soil for 15 kg ha⁻¹ seed rate, and 40 q ha⁻¹ on black soil for 55 kg ha⁻¹ seed rate.*

Anon. nd. 1977. Teff sowing date trial (Ghinchi, 1975). pp. 293-295. In: Holetta Guenet Research Station Progress Report Apr. 1975 to Mar. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. nd. Date of planting teff in relation to fodder and seed production. pp. 110. In: Field Trials and Observations, 1968/69. Crop Production Department, Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Presents the field plan and treatments for the experiment on date of planting for tef in relation to fodder and seed production.*

Anon. nd. Double cropping trial in 1978/79. pp. 24. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Investigates the possibility of growing tef and chick pea in one growing season.*

Anon. nd. Double cropping trial on tef and chick pea. pp. 119. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Determines the possibility of growing two crops, tef and chick pea in one growing season.*

Anon. nd. Double cropping trial on tef and chick pea. pp. 93-94. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Presents the results of the experiment conducted for the third time which investigates the possibility of growing two crops (tef and chick pea) in one growing season on the same land.*

Anon. nd. Double cropping. pp. T7. In: Debre Zeit Agric. Research Center Progress Report for 1975/76. Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Studies the possibility of double cropping tef and chick pea. For tef, an early maturing variety Red Dabi was used; Seed yields were 12.7 q ha⁻¹ for tef and 1.2 q ha⁻¹ for chick pea. The yield of chick pea was ver low becuase the soil was dry when it was planted on (Oct. 14) and there was no rain after planting.*

Anon. nd. Effect of variety, seed rate and time of weeding on the yield of tef. pp. 64-69. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates two varieties of tef (DZ-01-354 and Adet local), at four seed rates (15, 25, 35, and 45 kg ha⁻¹), and four time of weedings (15, 30, 45, and 60 days after crop emergence). Variety Adet local gave the highest yield at the seed rate of 15 kg ha⁻¹ and weeding 45 days after emergence.*

Anon. nd. Effect of variety, sowing date and fertilizer response on the grain yield of tef. pp. 78. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of two varieties of tef (DZ-01-354 and Adet local), four sowing dates (June 12, June 22, July 2, and July 12), and two fertilizer rates (0/0 and 60/60 N/P₂O₅ kg ha⁻¹) on seed yield. Adet local gave higher yield than the improved variety DZ-01-354 for 60/60 N/P₂O₅ fertilizer application.*

Anon. nd. Rotation trial on cereals (tef and durum wheat) and pulses (lentil, chick pea, grass pea and fenugreek). pp. 121. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Reports the results of rotation trial in which different crops (tef, pulses, wheat) were studied.*

Anon. nd. Sowing date trial for tef in 1980/81. pp. 64-68. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Investigates different sowing dates for tef variety DZ-01-354 at five locations.*

Anon. nd. Tef harvesting stage trial in 1981/82. pp. 93-94. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Investigates whether time of harvesting has an effect on yield of tef and also determines proper time of harvesting.*

Anon. nd. Tef harvesting stage trial. pp. 116-119. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Investigates the effects of different harvesting stages on the yield of tef.*

Anon. nd. Tef seed rate trial in 1981/82. pp. 90-92. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Reports the results of seed rate experiment (seven rates from 20 to 50 kg ha⁻¹) using tef variety DZ-01-354 at five locations around Debre Zeit.*

Anon. nd. Tef seed rate trial in 1982/83. pp. 116-117. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia.

Determines the effects of seven seed rates on the tef variety DZ-01-354 (at five locations); but no significant seed yield differences were obtained.

Anon. nd. Tef sowing date x variety trial in 1981/82. pp. 88-90. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Evaluates sowing dates and varieties for tef at six locations around Debre Zeit.*

Anon. nd. Tef sowing date x variety trial in 1982/83. pp. 114-116. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Reports the results of sowing date by variety trial conducted at Chefe Donsa and Debre Zeit (on light and black soils).*

Anon. nd. Tef variety x sowing date trial at Sinana in 1986. pp. 65. In: Sinana Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effect of three varieties of tef (DZ-01-354, Dabbi, and local check), and four sowing dates (July 1, July 10, July 20, and July 30) on the yield of tef. Significant differences between sowing dates were obtained; the highest yield was from July 20 sowing.*

Anon. nd. Tef: cultural practices trial. pp. 55-56. In: Awasa Experiment Station Progress Report for 1970 Campaign. Part II. Analytical Report, IRAT. *Tests four sowing dates (Jul. 9, Jul. 24, Aug. 8 and Aug. 23) for two varieties of tef (A-44, and DZ-01-238). The best sowing was July 24 (i.e., end of July).*

Ayele M, Ketema S, Tefera H, Assefa K. 1994. Effects of seeding rate and filler ratios on grain yield and straw yield of tef. *Acta Agronomica Hungarica* 43:229-233.

Ayele M. 1992. Harvesting time of tef. *SEBIL (Bulletin of Ethiopian Crop Science Society)* Vol. 4. pp. 56-57. *Presents the abstract for harvesting stage study on tef.*

Bayu W, Addisu M, Tadesse B, Admassu L. 2007. Intercropping tef and sunflower in semi-arid areas of Welo, Ethiopia. *Trop. Sci.* 47: 16-21. *Evaluates the productivity of tef-sunflower intercropping, with or without fertilizer. Mixed planting of 10-50% of sunflower with tef had yield advantages of 20-39% and 58-77% at two different sites.*

Bedada W. 2009. Growth, lodging and yield of tef as influenced by seed size and depth of sowing. MSc thesis, Haramaya University, Ethiopia. 68pp. *Investigates the effect of four seed sizes and three sowing depths on tef performance. Planting at 2-cm depth seem good compared to surface sowing under moisture deficit areas.*

Belay G, Zemedu A, Assefa K, Metaferia G, Tefera H. 2009. Seed size effect on grain weight and agronomic performance of tef. *African Journal of Agricultural Research* 4:836-839. *Studies the effects of sieve-graded seeds on the grain weight of tef, and to investigate whether large seed size offers yield and agronomic advantages over using un-graded planting seed materials. According to the authors, under optimum production conditions, the added advantages of large seed size do not justify tef-seed grading.*

Beyene D, Dibabe A. 1979. Summary of the results from two crop sequence trials. pp. 9-25. In: Beyene D, Dibabe A (Eds.) Results of Soil Fertility Studies at Bako from 1970 to 1974). Soil Science Bulletin No. 2, Institute of Agricultural Research, IAR, Addis Ababa, Ethiopia. *Reports the results of crop sequence trials carried out from 1969 to 1971 and 1971 to 1973 for maize, tef, haricot bean, sunflower, noug and berbere. The worst precursors for tef were either maize or itself while the best precursors were noug or sunflower.*

Bogale T, Shekur G. 1987. Effect of seed rate on grain yield of tef. pp. 201-204. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Nazret, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of tef seed rate trial carried out from 1982 to 1985 at Melko, Jimma, West Ethiopia, using variety 75-DZ-Cr-82. The seed rates used were: 10, 15, 20, 25, 30, and 35 kg ha⁻¹); but none of the rates had significant effect on grain yield.*

Bogale T, Shekur G. 1987. Effect of sowing date on the grain yield of tef. pp. 198-201. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Nazret, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of sowing date trial conducted for tef from 1982 to 1985 (using variety 75-DZ-Cr-82) at Melko, Jimma, west Ethiopia, where by July sowing gave the highest seed yield.*

Chugonov V, Kassaye Z, Ergano S. nd. Influence of crop rotation and weeding methods on weed infestation and yield of following crop. pp. 460-468. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1986/87. SPL, Ambo, Ethiopia. *Investigates the influence of crop rotation and weeding methods on weed population for wheat, maize, tef and haricot bean. Hand weeding although reduced the number and mass of weeds in all crops, did not influence greatly the yield of all crops except tef as compared to the check.*

Debele T, Gedano G, Leul M. 1995. Relay cropping of different crops in short cycle maize Guto at Bako. pp. 75-79. In: SEBIL--Proceedings of the Sixth Annual Conference of Crop Science Society of Ethiopia (CSSE), 3-4 May 1994, Addis Ababa, Ethiopia. CSSE, Addis Ababa. *Investigates the effect of relay cropping of haricot bean, tef, sweet potato on yield of maize and identifies optimum time of planting for relay crops. With regard to tef, the best planting time as a relay crop in maize was found to be 15 to 30 days after 50% flowering of maize.*

Endo O, Nakayama M, Fujiwara T, Uehara T, Inoue K, Someya S. 1976. Studies on the continuous culture method of tef (pasture indigenous to south zone) in a short growing period by the use of solid materials derived from the dung as culture medium. Central Research Inst. of Electric Power Industry. 7 Nov. 1976. CRIEPI Report 476003, Abiko, Chiba, Japan. [in Japanese].

Evert S, Staggenborg S, Olson BLS. 2009. Soil temperature and planting depth effects on tef emergence. Journal of Agronomy and Crop Science 195:232-236. *Investigates optimal planting depths and soil temperatures for tef in the central Plains of USA. The best emergence was obtained when sown at depths between 0.6 and 1.3 cm.*

Felleke A. 1967. The effects of several nitrogen levels, population densities and genotypes on morphological characters, lodging resistance and yield in *Eragrostis tef*. PhD. Thesis, Purdue University, USA. 127pp. *Presents the results of five experiments, i) study tillering on 123 lines, ii) study bulk emasculation with four levels of ethyl alcohol, iii) evaluation of three methods of lodging resistance (scoring, breaking of internode by machine, coefficient of lodging resistance), iv) study effects of three population densities (448, 224 and 112 thousand plants ha⁻¹), and v) study 14 characters in split-split-plot arrangement of N (0, 100 and 200 lb ac⁻¹), population (896, 448 and 224 thousand plants ha⁻¹) and 20 lines.*

Gebre H. 1987. Towards high and stable grain yields: the agronomic approach. Institute of Agricultural Research (IAR) Newsletter Vol. 2, No. 2, pp. 6-8. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly discusses the agricultural resources and practices, research organization and research directions for agronomic research in Ethiopia. According to the author, tef culture has a wide range of altitudes with its tolerance to waterlogging and moisture stress.*

Gebre H. 1988. Crop agronomy research on Vertisols in the central highlands of Ethiopia: IAR's experience. pp. 321-334. In: Proceedings of Management of Vertisols in Sub-Saharan Africa, 31 Aug. to 4 Sept. 1987, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. ILCA, Addis Ababa. *Reviews crop agronomy research in Vertisols of central highlands of Ethiopia mainly at Sheno and Ginchi. Tef is the major crop on Vertisols of Ginchi area.*

Gebre H. 1988. Crop agronomy research on Vertisols in the central highlands of Ethiopia: IAR's experience. In: Proceedings of the Fifth Regional Wheat Workshop for Eastern, Central and Southern Indian Ocean, 5-10 Oct. 1987, Antsirabe, Madagascar, CIMMYT, Mexico, D.F. pp. 152-160. *Reviews the work of crop agronomy research on Vertisols in the Central Highlands of Ethiopia especially at Sheno and Ginchi. Tef is the major crop at Ginchi.*

Gedeno G, Tadios T. 1993. Cropping systems research in Ethiopia. In: Tolessa B, Ransom J (Eds.) Proceedings of the Fifth National Maize Workshop of Ethiopia, 5-7 May 1992, Addis Ababa, Ethiopia. CIMMYT, Mexico. *Indicates that tef is the best preceding crop for maize rotation study where the yield advantage of 41% was achieved.*

Giorgis K, Takele A. 1988. Two and four crop rotation trial. pp. 20. In: Kobo Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the best crop sequence using sorghum, tef, cow pea, and groundnut at Kobo, north Ethiopia, for two fertilizer levels (0, and 100 kg ha⁻¹ DAP) where the test crop is sorghum.*

Goldhamer D. 2010. Evaluation of a novel rotation of organically produced forage and a spring planted vegetable crop. MSc thesis, Colorado State University Fort Collins. 75 pp. *Investigates the usefulness of annual forage crops such as tef in rotation. Tef had higher crude protein (CP) content, neutral detergent fiber (NDF), acid detergent fiber (ADF).*

HRC (Holetta Research Center). 1996. Evaluation of compatible crop species for tef intercropping. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Hundera F, Bogale T, Tefera H, Assefa K, Kefyalew T, Debelo A, Ketema S. 2001. Agronomy research in tef. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 167-175. *Presents agronomic research and recommendations from seed-bed preparation to sowing and to harvesting of tef. Also indicates cropping systems commonly applied to tef cultivation.*

Jiru D. 1999. Integrated sustenance of feed, wood and food from traditional agroforestry tree inter-crop. CSSE, Addis Ababa (Ethiopia). Sebil (Ethiopia) vol. 8. *Investigates the influence of single Faidherbia albida tree on four major cereals namely sorghum, maize, wheat and tef grown in the vicinity. The findings show that the response was higher for bigger stalk crops like sorghum and maize while it was extremely small for smallest crops like tef.*

Juraimi AS, Begum M, Sherif AM, Rahim AA. 2009. Competition effects of date of sowing and nutsedge removal time on yield and yield contributing characters of tef. American Journal of Applied Sciences 6:1820-1825. *Studies the effects of sowing date and nutsedge removal on tef. Early sowing gave superior tef yield.*

Juraimi AS, Begum M, Sherif AM, Rajan A. 2009. Effects of sowing date and nutsedge removal time on plant growth and yield of tef. African Journal of Biotechnology 8:6162-6167. *Investigates the effects of three sowing dates and five weed removal time on tef yield. Nutsedge competition during the first six weeks after crop emergence reduced tef biomass by more than 30%.*

Kassaye Z, Tafesse T. 1996. Effect of sowing dates and varieties on development of rust and yield of tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Ketema S. 1989. Cropping systems, production technology, pests, diseases, utilization and forage use of millets with special reference on teff in Ethiopia. pp. 309-314. *In: Seetharam A, Riley KW, Harinarayana G. (Eds.) Small Millets in Global Agriculture, Proceedings of the First International Small Millets Workshop, 29 Oct. to 2 Nov. 1986, Bangalore, India. Oxford and IBH, New Delhi. Indicates that tef is dominantly cultivated under monocropping system although little multiple cropping with Brassica and safflower also exists.*

Molla A, Muhie K. 2011. Tef based cropping systems in the hot to warm moist valleys of North Shewa, Ethiopia. Scientific Research and Essays 6:1411-1416. *Studies informal survey to identify the major tef based cropping systems and production practices. The most important cropping system identified was tef based intercropping with sesame, safflower and sorghum.*

Molla A, Yilma Z. 1998. Agronomy research in North Shewa. EARO, Addis Ababa, Ethiopia.

Puelschen L. 1992. Effects of two underseed species, *Medicago polymorpha* and *Scorpiurus muricatus* on the yield of main crop (durum wheat) and subsequent crop (teff) under humid moisture regimes in Ethiopia. *Journal of Agronomy and Crop Science* 168:249-254. *Studies two leguminous weed species which are widely distributed in annual crops of the Ethiopian highlands in greenhouse in Ethiopia with regard to their suitability as underseeds with wheat as a main crop. According to the author, the residual effects of the underseed's root masses on the grain yield of the successive tef crop were significantly higher with Scorpiurus muricatus than with Medicago polymorpha.*

Refera A. Tef: Post-harvest operations. 60pp.

http://www.fao.org/fileadmin/user_upload/inpho/docs/Post_Harvest_Compndium_-_TEF.pdf accessed July 4, 2011. *Presents post-harvest operations for tef which include threshing, winnowing, etc. Also reports about the major bottlenecks related to tef cultivation.*

Rosenberg R, Norberg S, Smith J, Charlton B, Rykbost K, Shock C. 2005. Yield and quality of teff forage as a function of varying rates of applied irrigation and nitrogen. Klamath Experiment Station, Oregon State University. pp. 119-136. <http://extension.oregonstate.edu/catalog/html/sr/sr1069-e/teffyield.pdf> accessed July 5, 2011. *Presents highlights on the irrigation and nitrogen experiments for tef at Klamath Research Station in USA.*

Tadele Z, Adela A. 1996. Relative importance of management practices in tef production. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Tadios T, Bogale T. 1993. Double cropping of tef after beans and Irish potato in Illubabor and Kefa Regions. Institute of Agricultural Research (IAR), Addis Ababa. Newsletter Agri. Res. 8(2):5-6. *Studies the yield and monetary benefits from double cropping tef after Irish potato, bush haricot bean and climbing haricot bean at three locations in western Ethiopia (Melko, Gera, and Metu). At Melko, the total gross return (in Birr ha⁻¹ yr⁻¹) was 12520.38 for tef/Irish potato, and 7285.48 for tef/bush haricot bean. At Gera, the total gross return was 5373.81 for tef/bush haricot bean, and 5672.87 for tef/climbing haricot bean. The figures for Metu were 5998.48 for tef/bush haricot bean and 4797.40 for tef/climbing haricot bean.*

Takele A, Gebeyehu H. 1986. Effect of seeding rates and frequency of weeding on the seed yield of tef. In: Kobbu Agricultural Research center, Progress Report, Kobbu, Ethiopia.

Takele A, Gebeyehu H. 1988. Effect of seeding rates and frequency of weeding on the seed of teff. pp. 18-19. In: Kobo Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa Ethiopia. *Investigates the effects of three seeding rates (20, 25 and 30 kg ha⁻¹), and four frequencies of weeding (no, one, two and three) on local tef variety. No significant effects were obtained on seed yield.*

Tedla A, Mamo T, Klaij MC, Diedhiou ML. 1999. Effects of cropping system, seed bed management and fertility interactions on biomass of crops grown on a Vertisol in the central highlands of Ethiopia. *Journal of Agronomy and Crop Science* 183: 205-211. *Indicates that a legume-cereal rotation improves both the grain and fodder as opposed to cereal-cereal rotation.*

Tedla A, Mohammed-Saleem MA, Mamo T, Tadesse A, Duffera M. 1993. Grain, fodder and residue management. pp. 103-137. In: Mamo T, Astatke A, Srivastava KL, Dibabe A (Eds.) *Improved Management of Vertisols for Sustainable Crop-Livestock Production in Ethiopian Highlands: Synthesis Report 1986-1992.* Technical Committee of The Joint Vertisol Project, Addis Ababa, Ethiopia. *Studies about native pastures, crop residues, cropping patterns and calender of the Ethiopian Highland Vertisols. According to findings, tef is grown after pastures, and mixed cropped with safflower.*

Workayehu T, Elias E. 1986. Effect of sowing dates on growth and yield of tef. In: *Progress Report of Sinana Research Center.* IAR, Addis Ababa, Ethiopia. pp. 54-55.

Workayehu T, Mazengia W. 1993. Haricot bean double cropping with maize, wheat, tef and irish potato under rainfed conditions in the southern rift valley of Ethiopia. *Multidisciplinary Workshop on Bean Research in Eastern Africa, Thika (Kenya), 19-22 Apr 1993.* Centro Internacional de Agricultura Tropical, Network on Bean Research in Africa, Kampala, Uganda. pp 239-244.

Workayehu T. 1989. Investigation to the possibility of double cropping. pp. 117-123. In: *Awasa Progress report for 1986.* Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the possibility of growing two crops within one year under the available moisture condition at Awasa and Arsi Negele. The crops used for the study were maize, tef, Irish potato, haricot bean and wheat. Regarding tef, double cropping is more advantageous over single cropping at both locations. The best crop combinations were: tef-Irish potato, maize-tef, and haricot bean-tef.*

Workayehu T. 1994. Effect of crop rotation on weed control and grain yield of maize. *Annual Conference of the Ethiopian Weed Science Committee, Addis Ababa (Ethiopia), 9-10 Apr 1991.* EWSC, Addis Ababa (Ethiopia). *Investigates the effect of crop rotation (maize, tef, soyabean and sunflower) on weed control and grain yield of maize. The best crop sequence for maize was found to be sunflower, soyabean and tef which had a yield advantage of 41 percent over the monocrop.*

Worku W. 2004. Maize-tef relay intercropping as affected by maize planting pattern and leaf removal in southern Ethiopia. *African Crop Science Journal* 12:359-367. *Assesses the efficiency of maize-tef relay intercropping under different combinations of maize planting pattern and leaf removal. Improved performance of tef due to wider inter-row spacing and defoliation was associated with increased vigour and density*

14. Tillage and Drainage

Abebe M. nd. Minimum tillage for maize, sorghum, teff and wheat. pp. 127-137. In: Plant Science Annual Report, 1972, Vol. 2, College of Agriculture, Haile Selassie I University (HSIU), Alemaya, Ethiopia. *Determines tillage practices that can reduce compaction caused by equipment and least destructive to soil structure, provided adequate seedbed to promote good germination and produce yields that would be comparable to conventional methods. The test crops were maize, sorghum, teff and wheat.*

Alem G. 1989. A review of minimum tillage research in Ethiopia. pp. 57-63. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia. 14-15 May 1987, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Reviews research work on minimum and conventional tillage in Ethiopia involving crops such as maize, teff, wheat, and barley teff. The teff trial was conducted at Holetta on red and black soils, two fertilizer levels (with and without fertilizer), two sources of power (tractor and oxen), and five tillage treatments (0, 1, 2, 3 and 4 times of plowing).*

Anon. 1969. Fertilizers and widths of camber beds. pp. 49. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Determines the effects of fertilizers and camberbeds on the yields of wheat (Romany and Fronthatch), barley (Unitan), and teff.*

Anon. 1971. The effect of bedding on different crops. pp. 15-16. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publica. No. 63, Asella, Ethiopia. *Determines the effect of bedding (flat and bedded) for teff varieties on a soil prone to waterlogging. The beds were 5 m wide and 0.35 m high. According to the findings, the yields from bedded plots were superior than those from flat for both teff varieties.*

Anon. 1972. Teff cultural practices and variety trial on farmers' field. pp. 120. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of plowing (plowed by tractor or local) and teff varieties on farmers' fields around Bako. Seed yield (in $q\ ha^{-1}$) was 12.0 using tractor plow, 7.0 using local plow, and 4.9 using improved plow. Average yield (in $q\ ha^{-1}$) for varieties was 8.1 for Jaji White, 7.1 for DZ-01-257, and 8.1 for local.*

Anon. 1973. Effect of drainage and fertilization on crop yields. pp. 58-60. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the performances of ten crops (including teff) with or without fertilizer on cambered and adjacent non-cambered plots at Wollencomi, near Holetta using two varieties of each crop (local and improved). For teff, the highest yield was obtained from non-cambered (flat) plots.*

Anon. 1973. Stale seedbed-conventional seedbed in teff with different weeding practices (Kulumsa). pp. 184-186. In: Report on Surveys and Experiments in 1972 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 87, Asella, Ethiopia. *Investigates the effects of two land preparation methods (stale seedbed and conventional) and weeding practices on tef yield and weed species.*

Anon. 1975. Stale seed bed vs conventional seedbed preparation in teff (Kulumsa). pp. 173-174. In: Reports on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 111, Asella, Ethiopia. *Evaluates the effects of seed bed preparation methods (conventional and stale), and weeding practices (no weeding, hand weeding, MCPA and Dichlorprop) on grain yield of tef and weed population. The stale seedbed technique controlled 27% of broadleaved weeds and 76% of grasses. This effect was not observed in seed yield due to the dry spell after sowing tef which has disturbed the stand.*

Anon. 1975. The effect of drainage and fertilization on crop yields. pp. 194-198. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effects of drainage (cambered and not cambered), and fertilizer (with and without) on ten crops including tef. Tef variety DZ-01-354 gave only 9.5 q ha⁻¹ on the non-camber bed, which was 188% of its yield from the cambered bed.*

Anon. 1976. Teff cultural methods trial—I. pp. 117. In: Holetta Guenet Research Station Progress Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effects of crop residue disposal systems and tillage operations on grain yield and test weight of tef.*

Anon. 1976. Teff cultural methods trial—I. pp. 30-31. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of three crop residue disposal systems (carted away, incorporated, and burnt), and five tillage operations on tef at Holetta. No seed yield differences were obtained due to crop residue systems. Tillage operations could have a detrimental effect on yield of tef.*

Anon. 1976. Teff cultural methods trial—II. pp. 31. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the effects of mouldboard and chisel plows on yield of tef at Holetta. Yield from mouldboard was 3.7 q ha⁻¹, while that of chisel plow was 5.8 q ha⁻¹.*

Anon. 1976. Teff tillage practice and weed control trial (Kobbo). pp. 33. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests the effects of tillage practice (local and CADU plow), and weed control (herbicides and hand weeding) on tef at Kobbo.*

Anon. 1979. Field drainage studies (Ghinchi, 1976). pp. 61-65. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effect of early sowing of tef at Ghinchi.*

Anon. 1979. Seedbed preparation method studies (Ghinchi, 1976). pp. 66-68. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effects of seed preparation methods and fertilizer on the yield of wheat, tef and chick pea at Ghinchi.*

Anon. 1981. Studies on the efficiency of agro-technical and chemical means of weed control in wheat, tef and maize. pp. 165-177. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Determines the effect of different methods of soil preparation (local oxen plowing, plowing with tractor), seed rates, means of weed control (hand weeding and herbicide) on weed population and yields of tef, wheat and maize.*

Anon. 1982. Seedbed preparation trial for tef. pp. 195. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the results of seedbed preparation experiment carried out at Debre Zeit (light and black soil), and Kulumsa. At Debre Zeit, no significant yield differences were obtained due to treatments; but at Kulumsa significant yield differences were observed.*

Anon. 1987. Tef seedbed preparation trial at Akaki. pp. 27-28. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares three seedbed preparation methods for their effect on tef yield. The treatments were i) no packing, ii) packing using oxen, and iii) packing using ring roller.*

Anon. 1990. Tef NP trial and method of incorporation. pp. 423-425. In: Holetta Research Center Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Conducts fertilizer experiment using three levels of nitrogen, four levels of phosphorus, and two methods of incorporation.*

Anon. nd. On-farm verification of improved surface drainage. pp. 159-162. In: Holetta Research Center Progress Report for 1988 to Mar. 1989, Ethiopia. *Assesses the effects of animal drawn broad bed marker (BBM) and flat planting on different varieties of wheat, tef, and barley at Ginchi, Selale and Sheno. Crop yields were 125 and 500% higher than traditional practice. At Ginchi, flat planting of tef (local and improved varieties) yielded better than the BBM because of the cricket damage at early planted tef.*

Anon. nd. Seedbed preparation trial for 1978/79. pp. 24-26. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Presents the results of seedbed preparation trial for tef in 1978/79 conducted on black and light soils of Debre Zeit.*

Anon. nd. Seedbed preparation trial for tef in 1979/80. pp. 29-31. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Reports the results of the second year experiment on seedbed preparation for tef.*

Anon. nd. Seedbed preparation trial for tef in 1980/81. pp. 67-70. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit,

Ethiopia. *Provides the results of seedbed preparation trial on tef for the third time at Debre Zeit and Kulumsa.*

Anon. nd. Seedbed preparation trial for tef in 1981/82. pp. 90-91. In: Tef Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Presents the results of seedbed preparation trial conducted for the fourth time at Debre Zeit black soil.*

Assefa A, Liben M, Yeshalem B. 2008. **The effect of tillage frequency and weed control on yield of tef in Yielmana-Densa Area, Northwestern Ethiopia.** East African Journal of Sciences 2:35-40. *Determines optimum tillage frequency, time and weeding frequency for tef production in the Yielmana Densa area. Grain yield increased linearly as tillage frequency increased. Twice weeding increased yield by 39% over un-weeded.*

Belayneh H. 1986. The effect of drainage systems, drainage spacings and fertilizer on seed and other characters of wheat, tef and chick pea. Ethiopian Journal of Agricultural Science 8:85-94. *Investigates effect of drainage systems (surface and sub-surface), drainage spacings (4, 6, and 8 m), and fertilizer (with out and with recommended rate) on wheat, tef and chick pea. For tef, fertilizer increased seed yield by 114% on drained soils; the best drainage spacing was 4-6m.*

Burayu W, Chinawong S. 2005. Conservation tillage-alternative systems of tef production for a semi-arid, Central Rift Valley of Ethiopia. Kamphaengsaen Acad. J. 3:1-10. *Assesses the effects of conventional and conservation tillage systems on tef production.*

Debello A. 1992. Germination, yield and yield components of tef as affected by environment, tillage and weed control practices. PhD. Thesis, Oklahoma State University, USA. *Presents the results of four experiments (one field experiment in Ethiopia at three locations, and three greenhouse experiments in USA). Four studies were reported in the thesis: i) to investigate the effect of tillage and weed control practices on yield and yield components of tef, ii) to determine effect of temperature, light, planting depth and soil texture effect on germination of tef, iii) to investigate the effect of drought and salt stress induced by polyethylene glycol (peg 8000) sodium chloride on germination response of tef cultivars, and iv) to evaluate the effect of salt and salt free solutions on accelerated aging effect of germination.*

Erkossa T, Itanna F, Stahr K. 2006. Tillage effects on sediment enrichment, soil quality, and crop productivity in Ethiopian Highlands. Australian Journal of Soil Research 44:753-758. *Evaluates four tillage methods (broad bed and furrows, green manure, ridge and furrows, and reduced tillage) on three crops (wheat, lentil, and tef).*

Erkossa T, Stahr K, Gaiser T. 2006. Soil tillage and crop productivity on a Vertisol in Ethiopian highlands. Soil & tillage research 85: 200-211. *Investigates alternative land preparation methods on the performance of wheat, lentil and tef grown in rotation. Reduced tillage resulted in the highest grain yield of wheat and tef as compared to the control.*

Fessehaie R, Parker C. nd. Observation on herbicides for zero-tillage establishment of tef. pp. 130-131. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Evaluates performance of a non-selective herbicide glyphosate in the establishment of zero-tillage for tef cultivation.*

Gebretsadik H, Haile M, Yamoah CF. Tillage frequency, soil compaction and N-fertilizer rate effects on yield of teff in Central Zone of Tigray, Northern Ethiopia. MEJS Volume 1:82-94. *Determines the effects of plowing frequency, soil compaction and nitrogen on tef yields. Plowing frequency had no significant effect on most of the yield components. Nitrogen fertilizer significantly increased grain yield and yield components.*

Habtegebrial K, Singh BR, Haile M. 2007. Impact of tillage and nitrogen fertilization on yield, nitrogen use efficiency of tef and soil properties. Soil and Tillage Research 94:55-63. *Investigates the effect of two tillage methods (conventional and minimum tillage) and nitrogen fertilization on tef yield and weed infestation. The minimum tillage practice produced as high yields as conventional tillage. According to the author, the adoption of minimum tillage in the semiarid areas benefits soil and moisture conservations and reduce costs for resource poor farmers in Ethiopia without significantly affecting yield.*

Mitiku D, Regassa S. 2004. The Effect of conservation tillage on durum wheat, tef and chickpea for the year 2002/03. Sasakawa Global 2000/Ethiopia, SG-2000.

Pereira HC, Wood RA, Brzostowski HW, Hosegood PH. 1958. Water conservation by fallowing in semi-arid tropical East Africa. Empire Journal of Experimental Agriculture 26:213-229.

Rockstrom J, Kaurnbutho P, Mwalley J, Nzabi AW, Temesgen M, Mawenya L, Barron J, Mutua J, Damgaard-Larsen S. 2009. Conservation farming strategies in East and Southern Africa: yields and rain water productivity from on-farm action research. Soil & Tillage Research 103:23-32. *Presents evidence of increased yields of maize and tef and improved water productivity using conservation farming in semi-arid and dry sub-humid locations in Ethiopia, Kenya, Tanzania and Zambia.*

Srivastava KL, Astatke A, Mamo T, Regassa H, Kidanu S. 1993. Land, soil and water management. pp. 75-84. In: Mamo T, Astatke A, Srivastava KL, Dibabe A (Eds.) Improved Management of Vertisols for Sustainable Crop-Livestock Production in Ethiopian Highlands: Synthesis report 1986-1992. Technical Committee of the Joint Vertisol Project, Addis Ababa, Ethiopia. *Reports the hydro-physical properties and drainage improvement for Vertisols of Ethiopia where tef is the dominant crop.*

Tadele Z, Adela A. 1996. Effect of tillage systems on tef production. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Tadele Z, Haile M, Stroud A. 1996. Tillage effects on soil properties, crop growth and yield of tef. pp. 207-230. In: Soil—the Resource Base for Survival, Proceedings of the Second Ethiopian Society of Soil Science (ESSS), 24-25 September 1993, Addis Ababa, Ethiopia.

ESSS, Addis Ababa. *Investigates the effect of different tillage systems (including no-tillage) on soil properties, crop growth, yield and economics of tef production. The treatments did not influence the physical and chemical properties of the soil at planting and a month later.*

Tadele Z. Unpublished. Effects of waterlogging on some soil chemical properties, plant growth, nutrient content and uptake by tef plant. Paper Presented at the Second Annual Conference of Agronomy and Crop Physiology Society of Ethiopia, 30-31 May 1996, Addis Ababa, Ethiopia.

Tadious T, Bogale T, Eshetu T. 1996. Effect of tillage and handweeding frequency on weed control and yield of tef at Melko, Jimma. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Tadious T, Eshetu T, Bogale T. 1997. Effect of tillage and hand weeding frequency on weed control and yield of tef. In: Reda F, Tanner DG (Eds.) Proceedings of the Ethiopian Weed Science Society, Addis Ababa, Ethiopia, 15-16 Dec 1994. EWSS, Addis Ababa. Ethiopian Weed Science Society, Addis Ababa, AREM 2&3, pp 110-115. *Investigates the effects of tillage and weeding on tef performance at Melko, Jimma. The highest tef yields were obtained from four times oxen plowing and three times hand weeding.*

Temesgen M, Hoogmoed WB, Rockstrom J, Savenije HH. 2009. Conservation tillage implements and systems for smallholder farmers in semi-arid Ethiopia. Soil and Tillage Research 104: 185-191. *Tests the performance of different implements for conservation tillage. The implements tested were Subsoiler, Tie-ridger, and Sweep. The Sweep enabled deeper root growth of tef apart from accomplishing sowing operations faster. A reduced tillage system tested on tef resulted in higher grain yields as compared to conventional tillage.*

Temesgen M, Rockstrom J, Savenije HH, Hoogmoed WB, Alemu D. 2008. Determinants of tillage frequency among smallholder farmers in two semi-arid areas in Ethiopia. Physics and Chemistry of the Earth Parts A B C 33:183-191. *Investigates reasons for 4-5 plowings by farmers before tef sowing. According to the report, farmers plow repeatedly in order to completely disturb unplowed strips of land left between adjacent furrows.*

Tulema B, Aune J, Johnsen FH, Vanlauwe B. 2008. The prospects of reduced tillage in tef in Gare Area, West Shawa Zone of Oromiya, Ethiopia. Soil & Tillage Research 99:58-65. *Assesses agronomic and economic impacts of tillage [zero tillage, minimum tillage, conventional tillage, and broad bed furrows (BBF)] on the yield of tef. According to the finding, no significant differences in tef biomass and grain yields were observed between the treatments on both soils for the first year.*

Tulema B. 2005. Integrated plant nutrient management in crop production in the Central Ethiopian highlands. PhD thesis, Norwegian University of Life Sciences. 188pp. *Studies the effects of fertilizers and tillage on tef performance. Regarding tillage, no significant yield difference was obtained in tef due to one time and four time plowings on both Vertisol and Nitosol.*

15. Soils and Fertility Studies

Abebe A, Alem G. 1990. Run-off and soil loss study under different cover crops and management practices. pp. 218-219. In: Nazret Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies crops and management practices that are relatively effective in erosion control and applied in developing crop rotation studies. The treatments were: (i) bare fallowed, (ii) wheat broadcast, (iii) natural grass cover, and (iv) tef broadcast. According to the author, run-off (in $m^3 ha^{-1} yr^{-1}$) was 785a for (i), 684b for (ii), 145c for (iii), and 742b for (iv). Soil loss ($t ha^{-1} yr^{-1}$) was 32.0a, 26.0ab, 0.99c, and 17.0b for respective treatments.*

Abebe A. 1992. Assessment of run-off and soil losses under different cover crops and slope lengths. pp. 50-56. In: Proceedings of the Second Natural Resources Conservation Conference. 10-13 May 1990, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Assesses run-off and soil losses for different crops (wheat, tef, natural grass and bare soil), and different slope lengths (10, 15, 20, 25, 30, and 40 m). Using tef as a soil cover, soil erosion was $17.70 t ha^{-1} yr^{-1}$ in 1986, and $14.40 t ha^{-1} yr^{-1}$ in 1987. The respective run-off figures were $737.1 m^3 ha^{-1} yr^{-1}$ in 1986, and $466.3 m^3 ha^{-1} yr^{-1}$ in 1987.*

Abebe M, Jutzi S. 1993. The joint project on Vertisols management: retrospect and prospects. pp. 147-157. In: Mamo T, Astatke A, Srivastava KL, Dibabe A (Eds.) Improved Management of Vertisols for Sustainable Crop-Livestock Production in Ethiopian Highlands: Synthesis report 1986-1992. Technical Committee of the Joint Vertisol Project, Addis Ababa, Ethiopia. *Presents the scenario, achievements and lessons from the Joint Vertisol Project where tef is the major crop.*

Abebe M. 1980. State of soil science development for Ethiopia. Ethiopian Journal of Agricultural Science 2:139-157. *Presents the progress made in soil science in Ethiopia in the area of survey, drainage, camber-bed and soil burning.*

ADD/NFIU (Agricultural Development Department/National Fertilizer Inputs Unit). 1991. Results of fertilizer trials conducted on major cereal crops (1986-1989). ADD/NFIU Joint Working Paper No. 34. Ministry of Agriculture (MoA), Addis Ababa, Ethiopia. 88pp. *Reports the results of fertilizer trials conducted by Agricultural Development Department (ADD) and National Fertilizer Inputs Unit (NFIU). Also presents fertilizer recommendations for each crop. Regarding tef, productivity index for is 3.7-8.2 kg grain/kg for N, 2.6-6.7 kg grain/kg for P_2O_5 and 0.3-1.9 kg grain/kg for K_2O . In Shewa Region, economic optimum fertilizer for tef is 55-32 kg N- $P_2O_5 ha^{-1}$. Across the country, fertilizer recommendation (N- $P_2O_5 kg ha^{-1}$) is 25-30 for Vertisols, 30-40 for Nitosols, 40-35 for Cambisols, 50-30 for black soils, and 40-35 for brown soils.*

Alkamper J. 1973. The fertilization of teff. Journal of the Association for Advancement of Agricultural Science of Africa. Vol. 1 (Supplement), pp. 56-65. *Investigates the effects of different forms of fertilizer on grain and straw yield of tef. According to the author, nitrogen*

produces more straw while P gives a good grain production. Optimal dose is 0-40 kg ha⁻¹ N and 60-120 kg ha⁻¹ P₂O₅; split applications of N may result in increasing grain yields without influencing the straw yield.

Anon. 1968. Soils and soil fertility: field trials. pp. 21-23. In: Report for the Period Feb. 1966 to Mar. 1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of N-P fertilizer trials on wheat, barley and tef at Debre Zeit and Bako. Regarding tef, the average yields (in q ha⁻¹) were 7.6 from the control, 9.7 from N, 10.8 from P, 13.9 from NP, and 14.5 from NPK.*

Anon. 1968. Tef: cultural practices. pp. 32-34. In: Holetta Guenet Research Station Progress Report for Feb. 1966 to Mar. 1968. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effects of fertilizers, sowing dates, soil types and varieties on the yield of tef at Holetta.*

Anon. 1969. Bulk planting of teff. pp. 33. In: Jimma Research Station Progress Report for 1967 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the tef yield obtained from a two ha land at Jimma Research Station using fertilizer 15-15-15 (NPK). The average yield was 10 q ha⁻¹.*

Anon. 1969. Cycocel and fertilizer levels trial. pp. 67-69. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests the effects of three levels of cycocel and three levels of fertilizer on three varieties of tef at Holetta mainly to see whether cycocel has effect in preventing lodging in tef under high levels of fertilization.*

Anon. 1969. Cycocel vs fertilizer levels trial. pp. 29. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of three varieties (A-44, A-71 and DZ-01-186), three levels of fertilization (0/40, 40/40, 40+40/40 N/P₂O₅ kg ha⁻¹), and three levels of cycocel (0, 1.5, and 3.0 l ha⁻¹) on tef yield. Significant effects due to fertilizer levels and varieties were obtained but no effect due to cycocel and interactions.*

Anon. 1969. F.F.H.C. fertilizer trial (1967/68). pp. 81-84. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies effects of fertilizers on tef, wheat and barley at many locations. The equations developed for tef were: N = 88 - 6.48 x C.Y.; P = 96 - 5.62 x C.Y., and NP = 189 - 11.06 x C.Y.; where, C.Y. is control yield; N nitrogen; and P phosphorus.*

Anon. 1969. F.F.H.C. fertilizer trials (1968/69). pp. 85-96. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of fertilizer trials conducted throughout the country in 1968/69 for different crops including tef.*

Anon. 1969. Fertilizer trials (FFHC). pp. 15-17. In: Report for the Period Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results*

of fertility trials for wheat, barley and tef by FFHC. Regarding tef, the yield obtained ($q\text{ ha}^{-1}$) for maximum return to were 7 for N, and 8 for P and NP.

Anon. 1969. Fertilizers and widths of camber beds. pp. 49. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Determines the effects of fertilizers and camberbeds on the yields of wheat, barley, and tef.*

Anon. 1969. National cultural practices trial. pp. 64-67. In: Holetta Guenet Research Station Progress Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of cultural practice trial on tef conducted at Holetta using four sowing dates (Jul. 4, Jul. 18, Aug. 1 and Aug. 15), fertilizer (with or without), and two varieties: A-44 (early type), and DZ-01-196 (late type). Fertilizer and planting date brought for significant effect. According to the report, the yield can be improved by at least 60% if tef is sown in early July with fertilizers.*

Anon. 1969. Rate of phosphate and nitrogen application on teff. pp. 45. In: Report on Survey and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Investigates the effects of three levels of N (0, 40, and 60 kg ha^{-1}), and P_2O_5 (0, 40, and 60 kg ha^{-1}) on tef at Kulumsa. According to the report, tef gave good response to P where by 40 kg ha^{-1} P_2O_5 increased grain yield by 59%. N should not be applied for tef but 40-50 kg ha^{-1} P_2O_5 should be applied in soils with low phosphate.*

Anon. 1969. Rate of phosphorus and nitrogen on teff. pp. 38. In: Results of Trials and Observations in 1968/69. Crop Production Department, Chilalo Agricultural Development Unit (CADU) Publication No. 28, Addis Ababa, Ethiopia. *Determines the effects of three levels of N (0, 40, 60 kg ha^{-1} N) and three levels of P_2O_5 (0, 40, 60 kg ha^{-1} P_2O_5) on tef yield.*

Anon. 1969. Teff: national cultural practice trial. pp. 49-51. In: Awasa Agro-Industrial Estate, Agricultural Research and Experiment, Report for 1968, Part II - Analysis Report. Ministry of National Community Development, IRAT. *Evaluates two tef varieties (DZ-01-196 and A-44) under two fertilizer levels (Without fertilizer and 90 $\text{kg urea} + 90\text{ kg TSP}$), and four sowing dates (Jul. 26, Aug. 12, Aug. 27 and Sept. 10). Seed yields from the four sowing dates were 144.9a, 149.2a, 86.8b and 67.3b kg ha^{-1} for the 1st, 2nd, 3rd and 4th sowings, respectively.*

Anon. 1969. Teff: national cultural practices trial. pp. 28. In: Report for Mar. 1968 to Mar. 1969. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of cultural practices (fertilizer, planting date and varieties) on tef at Holetta. Yield increase was 40% due fertilizer, 29% due to planting date, and 5% due to varieties.*

Anon. 1970. FFHC fertilizer trials. pp. 6-11. In: Holetta Guenet Research Station Progress Report for Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of fertility trials conducted in many sites in Ethiopia for tef, wheat and barley.*

Anon. 1970. Holetta Guenet: Soils and Analytical Services. pp. 17-23. In: Report for the Period Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the activities of Soils and Analytical Services of the Institute of Agricultural Research (IAR) in conducting FFHC fertilizer trials and soil analyses. Fertilizer trials were conducted for tef, wheat and barley. Regarding tef, the lowest control yield was 2.4 q ha⁻¹ at Dejen while the highest control yield was 20.2 q ha⁻¹ at Haik. The highest yield with fertilizer was 42.7 q ha⁻¹ from Yirgalem.*

Anon. 1971. F.F.H.C. fertilizer trials 1969/70. pp. 19-29. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of 656 fertilizer demonstration trials in Ethiopia for tef (307), wheat (154), barley (47), sorghum (48), maize (27), and noug (11). The results indicated that clay soil has little effect on tef yields except for its depressing effect on the efficiency of applied phosphate.*

Anon. 1971. Fertilizer trial on camber-bed. pp. 14-15. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Investigates the effects of fertilizer and camber-bed on the yield of wheat and tef. The treatments include; six levels of fertilizer (0:0, 0:70, 18:46, 27:69, 46:46, and 56:46 kg ha⁻¹ N:P₂O₅), and three widths of beds (5.5, 8 and 10 m). The yields of both wheat and tef were raised by close spacing of camber-bed, the increase being close to 300 kg ha⁻¹ in each case. There was marked response to fertilizers.*

Anon. 1971. Rate of phosphate and nitrogen application on teff. pp. 42-43. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Investigates the effects of three rates of nitrogen (0, 40 and 60 kg ha⁻¹), and three rates of P₂O₅ (0, 40, and 60 kg ha⁻¹) on tef at Kulumsa. Both N and P increased lodging; N from 56 to 86% and P from 65 to 72%. Based on the findings 40 kg N and 60 kg P₂O₅ ha⁻¹ aer recommended for use.*

Anon. 1971. Teff fertilizer trials. pp. 64. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly shows the effects of NPK and time of application of NP fertilizer on tef at Bako.*

Anon. 1971. Teff national cultural practices trial. pp. 59. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of two varieties of tef, at four sowing dates, and with or without the application of fertilizer at Bako. Early sowing gave the highest yield.*

Anon. 1971. The effect of soil type and management on the cultural requirements of various crops—Holetta. pp. 34-35. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of sowing time, plant population and fertilizer on two soil types (red-terraced, and black cambered soils) of Holetta for 10 crops including tef. Regarding tef, recommendations for red and terraced soil is: sowing date (4 July), seed rate (10 kg ha⁻¹), fertilizer (30-90 or 30-0 N-P₂O₅), maximum yield (2443 kg ha⁻¹), and relative crop value (782 Birr ha⁻¹), where as for black cambered*

soil: sowing date (6 July), seed rate (30 kg ha^{-1}), fertilizer ($30\text{-}30 \text{ N-P}_2\text{O}_5$), maximum yield (2101 kg ha^{-1}), and relative crop value (672 Birr ha^{-1}).

Anon. 1971. The effect of soil type and management on the fertilizer requirements of various crops. pp. 93-95. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines economically optimum levels of nitrogen and phosphorus for different classes of soils and for main crops (wheat, barley, tef, oats, etc.) at Holetta. According to the report, tef gave the same performance on both soil types and its response to the fertilizer was generally evident only at the lower doses.*

Anon. 1971. The relationship between soil type and management and cultural requirements of crops. pp. 86-87. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies effects of soil type (red and black), and management (cambered and undrained) on time of sowing, plant population and fertilizer requirements for early and late maturing varieties of wheat, barley, tef, oats, broad bean, field pea, linseed, rape seed and noug.*

Anon. 1972. Exhaustion trials. pp. 100-101. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates the exhaustion trial at Bako where seven major crops (maize, sorghum, tef, noug, sunflower, beans and red pepper) were grown continuously on the same site using five fertilizer treatments (0, N, P, NP, NPK). All crops except tef and noug, responded significantly to the application of fertilizers.*

Anon. 1972. Fertilizer and variety observation. pp. 50. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of three levels of N and P on three varieties of tef at Holetta.*

Anon. 1972. Tef fertilizer trial—I (valley soil). pp. 139. In: Report for Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of fertilizer trial on tef at valley soil of Jimma using four levels each of N and P. At all rates, P increased significantly tef yield over the control.*

Anon. 1972. Tef fertilizer trial--II (hill soil). pp. 139-140. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates four levels of N and P on hill soils of Jimma for their effect on tef yield. At all rates, P fertilizer gave large and significant increases over the control. N had no effect on yield and there was no interaction between the two fertilizers.*

Anon. 1972. Tef response to residual and maintenance fertilization. pp. 50-51. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly reports the response of tef to residual and maintenance fertilization at Holetta.*

Anon. 1972. Teff fertilizer and variety study. pp. 125-126. In: Holetta Guenet Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR),

Addis Ababa, Ethiopia. *Investigates the effects of three levels of N and P₂O₅ (0, 30, and 60 kg ha⁻¹) on three varieties of teff (Wollencomi local, DZ-01-354, and DZ-01-257) at Wollencomi.*

Anon. 1972. Teff fertilizer trial—I. pp. 46-47. In: Jimma Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Conducts N and P fertilizer experiment on teff at Melko, Jimma, where significant yield increase was obtained due to P application.*

Anon. 1972. Teff fertilizer trial—II. pp. 47. In: Jimma Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of fertilizer trial for teff on hill soil at Melko, Jimma, where P fertilizer gave significant yield increase over the control.*

Anon. 1972. Teff planting date and fertilizer observations at Shashemene. pp. 224-225. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of planting dates and fertilizer on teff around Shashemene at Ajje, Kofele and Kuyera for variety DZ-01-354. According to the findings, fertilizer increased the teff yield at all sites, on average, at 2.8 q ha⁻¹ more than the unfertilized plots.*

Anon. 1972. Teff response to residual and maintenance fertilization. pp. 125-127. In: Holetta Guenet Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Describes the response of teff to residual and maintenance fertilization at Wollencomi.*

Anon. 1972. The effect of soil type and management on the cultural requirements of cereals. pp. 38-39. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of soil types, sowing dates, method of sowing and fertilizers on different crops at Holetta. According to the report, the optimum cultural practices were; i) for red terraced soil: sowing date (6 July), seed rate (10 kg ha⁻¹), fertilizer (maximum 60-90, best 30-0 N-P₂O₅), and maximum yield (1553 kg ha⁻¹), and ii) for black cambered soil: sowing date (6-15 July), seed rate (30 kg ha⁻¹), fertilizer (maximum 60-60, best 30-30 N-P₂O₅), and maximum yield (2193 kg ha⁻¹).*

Anon. 1972. The effects of fertilizers on cereal yields. pp. 80-82. In: Holetta Guenet Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines economically optimum levels of nitrogen and phosphorus for different soil classes and main crops (including teff) at Holetta.*

Anon. 1973. Effect of drainage and fertilization on crop yields. pp. 58-60. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the performances of ten crops (including teff) with or without fertilizer on cambered and adjacent non-cambered plots at Wollencomi, near Holetta using two varieties for each crop (local and improved). For teff, the highest yield was obtained from non-cambered (flat) plots.*

Anon. 1973. Exhaustion trial. pp. 110-111. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of the second year exhaustion trial at Bako for maize, sorghum, sunflower, beans, pepper and tef, however, no significant response to fertilization was observed by tef, sunflower and noug.*

Anon. 1973. Tef national yield trial. pp. 158. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the performances of eight tef varieties including the local check at Jimma. According to the report, no significant yield differences were obtained between the local check and other varieties.*

Anon. 1973. Tef national yield trial. pp. 97. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the performances of eight tef varieties in NYT at Bako.*

Anon. 1973. Tef NP fertilizer trial. pp. 158. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of three levels of nitrogen and three levels of phosphorus fertilizers on tef yield at Jimma. However, no significant yield difference was obtained due to both fertilizers.*

Anon. 1973. Tef residual phosphate fertilizer trial. pp. 158. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the residual effect of phosphatic fertilizer on tef at Jimma.*

Anon. 1973. Teff fertilizer trial. pp. 62. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the effects of N and P fertilizer trial on tef at Wollencomi.*

Anon. 1973. Teff fertilizer trial. pp. 71-72. In: Jimma Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Provides results of fertilizer experiment on red hill soil of Melko although no significant yield differences were obtained either due to N or P.*

Anon. 1973. Teff residual fertilizer trial. pp. 72-73. In: Jimma Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines whether there was any residual effect of P on tef.*

Anon. 1973. The effect of soil type and management on the cultural requirements of cereals. pp. 41-43. In: Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of time of sowing, method of sowing and fertilizer on two soil types at Holetta and for different crops including tef.*

Anon. 1974. Teff fertilizer trial. pp. 63. In: Jimma Research Station Progress Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates four rates of each P and N fertilizers on tef yield at Jimma. According to the report, significant yield difference was obtained only due to P.*

- Anon.** 1975. Farmers field fertilizer demonstrations. pp. 80-110. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations 1974/75. Extension and Project Implementation Department (EPID) Publication No. 31, Addis Ababa, Ethiopia. *Presents the results of fertilizer demonstrations on farmers' fields at various regions in Ethiopia for major crops in the respective regions.*
- Anon.** 1975. Fertilizer levels trial on teff. pp. 201. In: Holetta Guenet research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effect of different levels of N and P fertilizers on tef yield at Wollencomi.*
- Anon.** 1975. Results from fertilizer demonstration: tef. pp. 2-13. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations 1974/75. EPID Publication No. 31, Addis Ababa, Ethiopia. *Presents the results of a one hectare fertilizer demonstrations on farmers' fields for different crops including tef.*
- Anon.** 1975. The effect of drainage and fertilization on crop yields. pp. 194-198. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effects of drainage (cambered and not cambered), and fertilizer (with and without) on ten crops including tef. Tef variety DZ-01-354 gave 9.5 q ha⁻¹ on the non-camber bed, which was 188% of its yield from the cambered bed.*
- Anon.** 1975. The effect of fertilizers on cereal yields. pp. 142-146. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines economically optimum levels of nitrogen and phosphorus for different soil classes and for main crops (wheat, barley, tef, triticale and oats) at Holetta.*
- Anon.** 1976. Micronutrient investigations. pp. 41-43. In: Holetta Guenet Research Station Progress Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the micronutrient levels of soils and plants from five sites, namely Sendafa, Bedi, Dorze, Chench and Endibir for different crops including tef.*
- Anon.** 1976. Fertilizer level trials. pp. 115-116. In: Holetta Guenet Research Station Progress Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies four levels of each N and P on tef at Holetta. According to the report, on red soils high variations were observed due to years and treatments while on bottom soils high differences were due to years and treatments.*
- Anon.** 1976. Micronutrient investigations. pp. 138-140. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of screening trials to test whether micronutrient deficiencies are observed for different crops including tef at five sites: Sendafa, Bedi, Dorze, Chench and Endibir.*
- Anon.** 1976. Teff fertilizer trial (Jimma). pp. 32. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the*

effects of four rates each of urea and TSP on tef at Jimma. According to the report, linear response to N and no response to P were obtained.

Anon. 1976. Teff: general agronomy. pp. 30. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the influence of N and P on tef under red and bottom soils. There was higher response to N on red soil while P response was greatest on bottom soil. According to the findings, tef may not be profitable at levels much above 60 kg ha⁻¹ of each N and P₂O₅. The production function is; $Y = 10.0 + 0.22N + 0.13P$ for red soil; and $Y = 8.1 + 0.067N + 0.26P$ for bottom soil. The recommended fertilizer rates were 46 kg N ha⁻¹ and 46 kg P₂O₅ ha⁻¹ for red soil; and 30 kg N ha⁻¹ and 30 kg P₂O₅ ha⁻¹ for bottom soils.*

Anon. 1977. Results from fertilizer demonstrations on farmers' fields. pp. 41-47. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations. EPID Publication No. 39, Ministry of Agriculture (MoA), Addis Ababa, Ethiopia. *Presents results of fertilizer demonstrations carried out in farmers' fields for major crops including tef and soil types.*

Anon. 1977. Results from fertilizer demonstrations. pp. 1-9. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations. EPID Publication No. 39, Ministry of Agriculture (MoA) Addis Ababa, Ethiopia. *Reports the results of 143 fertilizer demonstrations for major crops including tef and various soil types.*

Anon. 1977. Teff fertilizer trial. pp. 80. In: Wolaita Agricultural Development Unit (WADU) Summary and Field Crop Trial Results, 1971-1977. WADU Publication No. 55, Wolaita Soddo, Ethiopia. *Investigates the effects of three levels of each N and P on the yield of tef at Abella, Ajeja, Areka, Bele, Humbo, Kokate and Soddo.*

Anon. 1977. Tef seed rate x fertilizer trial. pp. 78. In: Wolaita Agricultural Development Unit (WADU) Summary and Field Crop Trial Results, 1971-1977. WADU Publication No. 55, Wolaita Soddo, Ethiopia. *Determines the effects of seed rates and fertilizer level on tef yield at Areka.*

Anon. 1979. Seedbed preparation method studies (Ghinchi, 1976). pp. 66-68. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the effects of seed preparation methods and fertilizer on the yield of wheat, linseed, tef and chick pea at Ghinchi.*

Anon. 1979. Teff yield results. pp. 19-21. In: Wolaita Agricultural Development Unit (WADU) Annual Crop Sampling Survey, 1977/78. WADU Publication No. 63, Wolaita Soddo, Ethiopia. *Investigates the effect of management practices on tef yield at seven districts in Wolaita Awraja. The treatments were: i) improved seed with fertilizer, ii) improved seed without fertilizer, iii) local seed with fertilizer, and iv) local seed without fertilizer.*

Anon. 1981. Results obtained from the investigated trial of tef regrowing effect in relation to sowing dates and effect of fertilizers rate on yield. pp. 38-39. In: Scientific Phytopathological

Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Investigates ways of getting the second tef harvest from post harvested regrown plants, and determines optimum rate of fertilizers for maximum yield.*

Anon. 1982. Investigation on the fertilizer requirement of tef in Yerer and Kereyu Awraja. pp. 182-183. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Studies response of tef to fertilizers at three locations (Akaki, Denkaka and Chefe Donsa) in Yerer and Kereyu Awraja. Significantly higher response to nitrogen than phosphorus were obtained.*

Anon. 1982. Nitrogen and phosphorus trial on tef at Jimma (Melko). pp. 183-184. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Evaluates the effect of four rates of each N and P on the yield of tef at Jimma. The response of tef was non-significant to N but significant to P.*

Anon. 1987. Effect of time and rates of nitrogen fertilizer application on yield of tef grown on Koticha soils of Ada Region. pp. 32-35. In: Department of Field Crops tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the best time of urea application for tef grown on koticha soils around Ada Region. Also studies the effect of time and rate of urea application.*

Anon. 1990. Cropping sequence trial, Ginchi. pp. 175-177. In: Holetta Research Center Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the most beneficial preceding crops to wheat among the following: tef, noug, wheat, vetch, lentil, and chick pea. According to the findings, vetch and noug showed excellent crop vigor followed by tef and wheat. Application of fertilizer has hastened maturity of vetch and tef.*

Anon. 1990. Studies on crop rotation and succession with special emphasis on the significance of cereals in the rotation. pp. 11-12. In: Nazret Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the relative benefit of crop rotation and succession at Melkassa (Nazret) where seven crops (maize, sorghum, tef, haricot bean, safflower, Delicos lablab, and sweet potato) and two fertilizer levels (0, 18/46 N/P₂O₅ kg ha⁻¹) were tested.*

Anon. nd. Effect of different time of urea application on yield of tef variety grown on soils of Ada Region. pp. 121-122. In: Tef Annual Reports, 1977-1982. Addis Ababa University (AAU), Debre Zeit Agricultural Research Center (DZARC), Debre Zeit, Ethiopia. *Investigates the appropriate time of N fertilizer application on tef yield at four locations (Debre Zeit light and black soils, Akaki and Chefe Donsa). According to the report no significant yield differences were obtained due to treatments.*

Anon. nd. Effect of variety, sowing date and fertilizer response on the grain yield of tef. pp. 78. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of two varieties of tef (DZ-01-354 and*

Adet local), four sowing dates (June 12, June 22, July 2, and July 12), and two fertilizer rates (0/0 and 60/60 N/P₂O₅ kg ha⁻¹) on tef seed yield. *Adet local* gave higher yield than the improved variety DZ-01-354 at 60/60 N/P₂O₅ fertilizer application.

Anon. nd. Fertilizer trial on tef at Adet. pp. 93-94. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests three levels of each N and P for tef yield. The highest fertilizer level of 46 kg ha⁻¹ N and 20 kg ha⁻¹ P gave the best yield of 1.3 ton ha⁻¹.*

Anon. nd. Rate of phosphate and nitrogen application on teff. pp. 48. In: Field Trials and Observations, 1968/69. Crop Production Department, Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Presents the field layout and treatments for the experiment aimed at determining the optimum rate of phosphate and nitrogen application in tef.*

Anon. nd. Teff: fertilizer trial. pp. 56-58. In: Awasa Experiment Station Progress Report for 1970 Campaign. Part II. Analytical Report. IRAT. *Evaluates four levels of N (0, 25, 50 and 75 kg ha⁻¹) and three levels of P (0, 50 and 100 kg ha⁻¹) for tef in a factorial arrangement but no significant yield differences were obtained due to the treatments.*

Atanasiu N, Westphal A. 1975. The effect of different forms of fertilizer on the crop yield in Ethiopia. pp. 309-315. In: Proceedings of the Conference on Agricultural Research and Production in Africa, Sept. 1971. Vol. 2, Supplement 2. Supplement to Journal of Association for the Advancement of Agricultural Sciences in Africa (AAASA), Addis Ababa, Ethiopia. *Evaluates the efficacy of different types of N, P, and K fertilizers on various soil types and crops including tef in pot experiments in Giessen (Germany) and field trials in Ethiopia. There was no significant yield differences due to the use of different forms of N (ammonium, nitrate and urea), and P (MCP and DCP), K (K₂SO₄ and KCL) fertilizers.*

Atanasiu N. 1970. Response to potassium by cereals on different Ethiopian soils. pp. 249-257. In: Potassium Symposium: Role of Fertilization in the Intensification of Agricultural Production. International Potash Institute.

Ayele G, Mamo T. 1995. Determinants of fertilizer demand in Ada and Lume areas of Ethiopia. *Tropical Agriculture*. 72:165-169. *Investigates fertilizer demand analysis for wheat and tef grown on Vertisols of Ada and Lume in Central Ethiopia. In all cases, sub-optimal use of fertilizer was being practiced with different methods of application, both deviating from the recommended rates and practices. During fertilizer shortage, crop rotation was practiced to maintain soil fertility.*

Aynalem A, Gebre H. 1986. Use of fertilizer and related inputs in Ethiopia. In: Proceedings of the Second Regional Seminar on Crop Production Techniques and Fertilizer Management in Rainfed Agriculture in Southern Asia, 22-25 Jan. 1986, New Delhi. International Phosphate Institute. *Reports the use, marketing, distribution, research, and extension of fertilizers in Ethiopia. According to the authors, area under tef cultivation was 1.4 mio ha while the average tef yield was only 0.9 ton ha⁻¹.*

Balcha A, Gretzmacher R, Vollmann J. 2005. Genotypic variation for nitrogen utilization efficiency in tef seedlings. *Journal of Genetics and Breeding* 59:27-32. *Investigates in pot experiments genotypic variability in N utilization efficiency for 20 tef genotypes. According to the authors, selection for shoot total N could be used to improve shoot dry matter accumulation in tef seedlings at limited N supply.*

Balcha A, Gretzmacher R, Vollmann J. 2006. Genetic variation in nitrogen-use efficiency of tef. *Journal of Plant Nutrition and Soil Science* 169:704-710. *Investigates genetic variation in 20 tef genotypes in nitrogen-use efficiency in field experiments at three environments in Ethiopia. Although improved cultivars gave higher grain yield than the landraces, no significant differences were obtained for Nitrogen-use efficiency.*

Bekele M, Haile B, Hassen Y. 1996. Major fertilizer studies conducted on Ethiopian soils and crops. pp. 89-108. In: *Soil—the Resource Base for Survival, Proceedings of the Second Ethiopian Society of Soil Science (ESSS), 24-25 September 1993, Addis Ababa, Ethiopia.* ESSS, Addis Ababa. *Reviews fertilizer studies made for the major crops including tef by the Ministry of Agriculture from 1967 to 1990. Regarding tef, the response to nitrogen was slightly higher than the phosphate response.*

Bekele T, Beyene D. 1990. System for evaluating and correcting nutrient stress. pp. 65-71. In: *Proceedings of the Twenty First National Crop Improvement Conference, 10-12 Apr. 1989, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Presents a methodology for developing the national fertilizer recommendation. For tef, results of fertilized and unfertilized plots for three varieties on drained and undrained soils are indicated.*

Belaineh G, Ryan R, Sap D. 1971. The Food and Agriculture Organization (FAO) fertilizer programme in Ethiopia. pp. 5-9. In: *Proceedings of the Third Conference on Soil Fertility and Fertilizer Use in Ethiopia, Improving Soil Fertility in Africa, 3-7 Nov. 1970, Addis Ababa, Ethiopia.* Food and Agriculture Organization (FAO) Soils Bulletin 14, Rome. *Reports the activities of Food and Agriculture Organization (FAO) fertilizer programme in Ethiopia. Regarding tef, yield increase due to NP was 6.3, 8.1, and 7.3 q ha⁻¹ in 1967, 1968, and 1969, respectively. Net return for the respective years were 135.2, 188.6, and 164.0 birr; and value/cost ratio was 3.5, 4.4, and 4.0. Price of tef at harvest was 30 Birr q⁻¹, and fertilizer cost was 55 birr q⁻¹.*

Belayneh H. 1986. The effect of drainage systems, drainage spacings and fertilizer on seed and other characters of wheat, tef and chick pea. *Ethiopian Journal of Agricultural Science* 8:85-94. *Investigates drainage systems (surface and sub-surface), drainage spacings (4, 6, and 8 m), and two fertilizer levels (with out and with recommended rate) for wheat, tef and chick pea. Fertilizer had increased the seed yield of tef by 114% on drained soils. The best drainage spacing is 4-6m.*

Beyene D, Dibabe A. 1979. Summary of the exhaustion trial, 1971-74. pp. 26-. In: *Beyene B, Dibabe A (Eds) Results of Soil Fertility Studies at Bako (1970-74).* Soil Science Bulletin No. 2. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates exhaustion trial established in 1971 for maize, sorghum, tef, noug, sunflower, haricot bean and berbere*

at five fertilizer levels. In the first year, all crops except tef and noug responded significantly to the application of fertilizers. In the second year, tef, sunflower and noug did not respond significantly. In the third year, no response for tef.

Beyene D, Dibabe A. 1979. Summary of the results of fertilizer trials at Bako. pp. 2-8. In: Beyene D, Dibabe A (Eds.) Results of Soil Fertility Studies at Bako (1970-74). Soil Science Bulletin No. 2, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of fertilizer trials at Bako from 1970 to 1974 for maize, sorghum, tef, haricot bean, potato and berbere. Tef did not well adapted at Bako and had small response to P.*

Beyene D. 1988. Soil fertility research on some Ethiopian Vertisols. pp. 223-231. In: Proceedings of Management of Vertisols in Sub-Saharan Africa, 31 Aug. to 4 Sept. 1987, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. ILCA, Addis Ababa. *Reviews soil fertility studies on Vertisols at different locations in Ethiopia and indicates future research directions. The yields of tef from 0, 46, 90 kg ha⁻¹ N were 720, 730 and 1120 kg ha⁻¹, respectively; the respective yields from 0, 20 and 40 kg ha⁻¹ P were 380, 970 and 1220 kg ha⁻¹.*

Birch HF, Hamito D. 1971. The fertility status of Ethiopian soils. pp. 1-4. In: Proceedings of the Third Conference on soil Fertility and Fertilizer Use in Africa, Improving Soil Fertility in Africa, 3-7 Nov. 1970, Addis Ababa, Ethiopia. Food and Agriculture Organization (FAO) Soils Bulletin 14, Rome. *Indicates fertility trials conducted in Ethiopia for tef, wheat and barley on red and black soils. Based on 672 trails done for tef, a very significant inverse relationships was found between yield and percentage of clay in the soil.*

Debele B. 1978. The physical criteria used for land evaluation in the highland regions of Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents land evaluation system for agricultural purposes based on environmental factors applied on mixed farming and unit B land. For tef, regression for fertilizer use was: $Y = 11.3 + 0.01 N$. Tef yields (in q ha⁻¹) were, 8.1 without fertilizer on drained soils; 7.4 without fertilizer on undrained soils; 17.9 with 100% fertilizer efficiency on drained soils; and 16.3 with 100% efficiency on undrained soils.*

Debele B. 1985. The Vertisols of Ethiopia: their properties, classification and management. pp. 31-54. In: The Fifth Meeting of the Eastern Africa Soil Correlation and Land Evaluation Sub-Committee, 4-10 Dec. 1983, Wad Medani, Sudan. World Soil Resources Report 56, Food and Agriculture Organization (FAO), Rome.

Debele B. nd. The physical criteria used for land evaluation in the highland regions of Ethiopia. pp. 145-171. In: Proceedings of the Third Eastern Africa Sub-Committee Meeting on Soil Correlation and Land Evaluation, 24-29 April 19, Lusaka, Zambia. *Indicates the criteria used in land evaluation and their application. These include: land qualities such as climate, relief, soil conditions, special endemic conditions.*

Erkossa T, Teklewold H. 2009. Agronomic and economic efficiency of manure and urea fertilizers use on Vertisols in Ethiopian Highlands. Agricultural Sciences in China 8:352-360. *Studies the economic optimum amount of farm yard manure and nitrogen on Vertisols under*

cereal-pulse-cereal rotation system. According to the findings, the economic optimum rate for tef is 4.5 t ha⁻¹ manure and 37 kg ha⁻¹ N.

Felleke A. 1967. The effects of several nitrogen levels, population densities and genotypes on morphological characters, lodging resistance and yield in *Eragrostis tef*. Ph.D. Thesis, Purdue University (USA). 127pp. *Presents the results of five experiments, i) study of tillering on 123 lines, ii) study bulk emasculation with 4 levels of ethyl alcohol, iii) evaluation of three methods of lodging resistance (scoring, breaking of internode by machine, coefficient of lodging resistance), iv) study effects of three population densities (448, 224 and 112 thousand plants ha⁻¹), and v) study 14 characters in split-split-plot arrangement of N (0, 100 and 200 lb/ac), population (896, 448 and 224 thousand plants ha⁻¹) and 20 lines.*

Gebretsadik H, Haile M, Yamoah CF. Tillage frequency, soil compaction and N-fertilizer rate effects on yield of teff in Central Zone of Tigray, Northern Ethiopia. MEJS Volume 1:82-94. *Determines the effects of plowing frequency, soil compaction and N application on tef yields. Plowing frequency had no significant effect on most of the yield components. Nitrogen fertilizer significantly increased grain yield and yield components.*

Habtegebrail K, Singh BR, Haile M. 2007. Impact of tillage and nitrogen fertilization on yield, nitrogen use efficiency of tef and soil properties. Soil and Tillage Research 94:55-63. *Investigates the effect of two tillage methods (conventional and minimum tillage) and of N-fertilization on tef yield and weed infestation. The minimum tillage practice produced as high yields as conventional tillage. Hence, the adoption of minimum tillage in the semiarid conditions could benefit soil and moisture conservations and reduce costs for resource poor farmers in Ethiopia without significantly affecting yield.*

Habtegebrail K, Singh BR. 2006. Effects of timing of nitrogen and sulphur fertilizers on yield, nitrogen, and sulphur contents of tef. Nutrient Cycling in Agroecosystems 75:213-222. *Investigates the effect of the timing of combined nitrogen and sulfur fertilization on the yield and yield components of tef. Tef responded significantly to both split (one-third at planting and two-thirds at late tillering) and whole (all at planting) applications of N and S.*

Haile A, Belayneh H. 1988. Influence of fertilizer and improved varieties on the seed yields of cereals, oil crops and pulses in the Institute of Agricultural Research (IAR)/Agricultural Development Department (ADD) sites. pp. 68-73. In: Beyene D (Ed.) Proceedings of Soil Science Research in Ethiopia, 11-14 Feb. 1986, Addis Ababa, Ethiopia. IAR, Addis Ababa. *Compares local and improved varieties of major crops with or without fertilizer at nine IAR/ADD sites. At Debre Tabor, Goha Tsion and Tefki improved varieties of tef out-yielded local ones, where as, at Robe and Shambu local varieties of tef gave higher yield. At Bichena, Inewari and Mota no significant yield differences were obtained between improved and local varieties.*

Haile M. 1987. Genesis, characterization and classification of soils of the highlands of Ethiopia. PhD Thesis, State University of Ghent, Belgium. 399pp.

Haileselassie B, Hoffland E, Oenema O, Mamo T, Itanna F. Mitigation of Zinc deficiency in Ethiopia: how can zinc uptake by tef grown on Vertisols be increased?

http://zinc-crops.ionainteractive.com/ZnCrops2007/PDF/2007_zinc crops2007_haileselassie_abstract.pdf Accessed September 1, 2011. *Assesses availability of zinc for the tef plant grown on Vertisols.*

Haileselassie A, Priess JA, Veldkamp E, Lesschen JP. 2006. Smallholders soil fertility management in the central highlands of Ethiopia: implications for nutrient stocks, balances and sustainability of agroecosystems. *Nutrient Cycling in Agroecosystems* 75:135-146. *Assesses the effect of different soil fertility management on enset and tef based farming. The watershed with the enset-based system had higher soil N and K stocks than the watershed with the tef-based system.*

Hamito D. 1982. The status of fertilizers in Ethiopia. National Chemical Corporation, Addis Ababa, Ethiopia. 170pp. *Provides data related to fertilizer development and activities which affect fertilizer use in Ethiopia.*

Hamito D. 1983. Results of fertilizer response data in Ethiopia. National Chemical Corporation. Addis Ababa, Ethiopia. 28pp. *Collects the existing data of crop response to fertilizers and fits to response curves. Also determines whether the application of fertilizer pays in Ethiopia, and estimates the total fertilizer requirements of the country. For tef, response to P was, $Y = 758.8 + 10.7P - 0.09P^2$; response to N: $Y = 820 + 14.2N - 0.18N^2$; and response for combined N and P: $Y = 755 + 7.64x - 0.0219x^2$.*

Haque I, Abebe M, Mamo T, Dibabe A. 1993. Nutrient management. Pp. 51-53. In: Mamo T, Astatke A, Srivastava KL, Dibabe A (Eds.) *Improved Management of Vertisols for Sustainable Crop-Livestock Production in Ethiopian Highlands: Synthesis Report 1986-1992.* Technical Committee of the Joint Vertisol Project, Addis Ababa, Ethiopia. *Reports the 133oloni-chemical characteristics of Ethiopian Vertisol. According to the author, at Ginchi tef yields for 0, 20 and 40 kg ha⁻¹ P were 380, 970 and 1220 kg ha⁻¹, respectively. The respective figures for 0, 46 and 90 kg ha⁻¹ N were 720, 730 and 1120 kg ha⁻¹.*

Haque I, Beyene D, Sahlu M. 1985. Bibliography on soils, fertilizers, plant nutrition and general agronomy in Ethiopia. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. 55pp. *Presents a comprehensive bibliography of research in Ethiopia on soils, fertilizers, plant nutrition and general agronomy for major crops including tef.*

Haque I, Jutzi S, Nnadi LA. 1988. Management of Vertisols for increased and stabilized food and feed production in Ethiopian highlands. Pp. 120-127. In: Beyene D. (Ed.) *Proceedings of Soil Science Research in Ethiopia, 11-14 Feb. 1986, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Indicates that the climate of the highland Vertisols in Ethiopia is characterized by favorable temperatures and variable rainfall. The major crops are tef, barley, durum wheat, faba bean, chick pea, lentil, noug and linseed. According to the study made on farmers' fields at Debre Zeit, tef grain yield was increased by 25% on broad-bed and farrow (BBF) over the traditional and the dry matter of the straw was also increased by 23% on BBF.*

Haque I, Pathak P, Lupwayi NZ, Amare T, Dibabe A. 1994. Vertisols and associated soils: bibliographic database with special reference to sub-saharan Africa. 83pp.

Hawando T. 1982. Problems of soils and its implications on crop improvement program in Ethiopian context. Pp. 548-580. In: Proceedings of the Fourteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1982, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents reports on the current status of soils and its implications on crop improvement in Ethiopian context. Local varieties of tef out yielded improved ones.*

Haylett DG. 1970. Fertilization of summer crops in a four course rotation. *Agroplanta* 2(2):67-75.

Hesselbach D, Westphal A. 1976. Effects of fertilization on development, dry matter production and nutrient uptake of tef. Pp. 214-225. In: Proceedings of the Sixth Annual Research Seminar, 12-14 Nov. 1975, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Investigates the effects of fertilizers on development, dry matter production and nutrient up take of tef. According to the findings, P and K showed very little effect on tef but N influenced significantly growth, development, uptake of nutrients and tef yields.*

Hesselbach D. 1975. The influence of fertilizer on growth, development, yield and nutrient uptake in different tef varieties in Ethiopia. Tropeninstitut, Justus-Liebig University, Giessen, Inagural Dissertation (in German). *Presents the results of 11 fertilizer experiments conducted at Debre Zeit for three tef varieties. Tef responded to N fertilization in a typical way for primitive cereals. The susceptibility of lodging was increased by N application. Yields of straw were affected more than yields of grain. Removal of nutrients by straw was higher than by grains.*

Huluka G, Evans CE. 1991. Correlation of solution and extractable phosphorus with vegetative growth of teff. *Communications in Soil Science and Plant Analysis* 22:1489-1502. *Determines phosphorus sorption and desorption isotherms for three soils where tef is grown. Plant-available P was significantly correlated with tef dry matter yield.*

Huluka G, Evans CE. 1992. Correlation of potassium extracted by different methods with vegetative growth of teff. *Communications in Soil Science and Plant Analysis* 23:1427-1437. *Determines plant available K for tef grown in the greenhouse. Soil available K was significantly correlated with relative yield of tef.*

Isak S. 1982. The effect of different soils on the growth and yield of some tef cultivars. MSc Thesis, Addis Ababa University, Ethiopia.

Kebede T, Laktionov HI. 1996. Quantitative change of humus on some soils around Ginchi and Holetta. Pp. 231-240. In: Soil—the Resource Base for Survival, Proceedings of the Second Ethiopian Society of Soil Science (ESSS), 24-25 September 1993, Addis Ababa, Ethiopia. ESSS, Addis Ababa. *Determines the humus status of cultivated and uncultivated soils at Holetta on Nitosol and Ginchi on Vertisol where tef is the major crop.*

- Kejela K.** 1996. The soils of the Ethiopian highlands and aspects of their degradation. Pp. 159-190. In: *Soil—the Resource Base for Survival, Proceedings of the Second Ethiopian Society of Soil Science (ESSS), 24-25 September 1993, Addis Ababa, Ethiopia.* ESSS, Addis Ababa. *Presents qualitative view on soils of the highlands and their degradation so that demarcation will be made on the extent and severity of degradation. Different sub agro-ecological and sub-zones were identified. Tef is one of the major cereals in most of the regions.*
- Kena K.** 1988. Distribution and characteristics of red soils of Ethiopia. Pp. 119-121. In: *Proceedings of an International Symposium on Red Soils of East and Southern Africa, 24-27 Feb. 1986, Harare, Zimbabwe.* IDRC, Canada. *Reports on the distribution and physical and chemical characteristics of red soil. Due to high Fe and Al content, P fixation is high in these soils.*
- Kena K.** 1999. Effect of DAP and urea fertilizers on grain yield of three tef varieties in Awasa and Areka. In: Gebreselassie T, Sertsu S (Eds.) *Proceedings of the Fourth Conference of the Ethiopian Society of Soil Science, 26-27 February 1998, Addis Ababa, Ethiopia.* Pp. 122-127.
- Kidanemariam A, Assen Y.** 2008. Recommendation of phosphorus fertilizer based on soil-test and response of tef to nitrogen and phosphorus fertilizers. *Ethiopian Journal of Natural Resources* 10:103-122. *Determines the calibration of soil-test based fertilizer recommendation for tef. Grain yield of tef increased significantly as a result of applying nitrogen and phosphorus fertilizers.*
- Kidanu S, Abebe M, Mamo T, Erkossa T.** 1996. The effect of core size and soil disturbance on the hydraulic conductivity of a pellic Vertisol. Pp. 78-87. In: *Soil—the Resource Base for Survival, Proceedings of the Second Ethiopian Society of Soil Science (ESSS), 24-25 September 1993, Addis Ababa, Ethiopia.* ESSS, Addis Ababa. *Measures the hydraulic conductivity of fine monmorillonitic Pellic Vertisol of Debre Zeit Research Center where tef is grown in rotation with legumes and wheat.*
- Kidanu S, Tanner DG, Mamo T.** 2000. Residual effects of nitrogen fertilizer on the yield and N composition of succeeding cereal crops and on soil chemical properties of an Ethiopian highland Vertisol. *Canadian Journal of Soil Science* 80:63-69. *Investigates the residual effects of nitrogen fertilizer on wheat and tef. According to the authors, the residual fertilizer N benefit was equivalent to 41% of the response to current season N application for wheat and tef.*
- Kidanu S.** 1992. Hydrological characterization and soil-water-air interactions of Ethiopian highland Vertisols. M.Sc. Thesis, University of Ghent, Belgium. 102pp.
- Konstapel CD, Bechtold GK.** Manual on a computerized land evaluation system with special reference to the highlands of Ethiopia: 1. Land evaluation methodology. FAO Field Document No. 16, Addis Ababa, Ethiopia.

- Liben M, Assefa A, Tadesse T, Marye A.** 2004. The response of tef to nitrogen and phosphorus applications at Bichena and Yilmana-Denssa areas, northwestern Ethiopia. Crop Science Society of Ethiopia, Addis Ababa, Ethiopia, CSSE, Addis Ababa. *Conducts a multi-location fertilizer trial on farmers' fields in northwest Ethiopia to determine economic optimum rate of nitrogen and phosphorous fertilizers for tef production. The partial budget analysis showed that 80-40 for Bichena and 40-60 kg N-P₂O₅ ha⁻¹ were the most profitable rates.*
- Mamo K, Killham K.** 1986. Response of tef to vesicular arbuscular mycorrhizal infection. SINET : Ethiopian Journal of Science 9 :41-54.
- Mamo T, Erkossa T, Tulema B.** 2001. Soil fertility and plant nutrition research on tef in Ethiopia. In: Tefera H, Belay G, Sorrells M (Eds.) *Narrowing the Rift: Tef Research and Development. Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia.* Ethiopian Agricultural Research Organization, Ethiopia. Pp. 191-200. *Presents research conducts on tef regarding soil fertility and plant nutrition. According to the authors the application of nitrogen fertilizer is critical for tef cultivation while phosphorus fertilizer is important at the second level.*
- Mamo T, Killham K.** 1987. Effect of soil liming and vesicular-arbuscular-mycorrhizal inoculation on the growth and micro nutrient content of the tef plant. *Plant and Soil* 102:257-259. *Investigates the influence of vesicular-arbuscular-mycorrhizal (VAM) on the tolerance of tef to acidity. According to the findings, tef growth increased by liming and to a lesser extent by VAM fungal 136olonizatio. Shoot micro nutrient content increased by 136olonizatio and decreased by increased lime applications.*
- Mamo T, Parsons JW.** 1987. Iron nutrition of teff. *Tropical Agriculture* 64:313-317. *Determines the iron content of the seeds two tef varieties (DZ-01-354 and DZ-01-99). According to the authors, tef does not have an exceptionally higher Fe content than other cereals but it is an iron efficient plant.*
- Mamo T, Parsons JW.** 1987. Phosphorus-micronutrient interactions in tef. *Tropical Agriculture* 64:309-312. *Evaluates the effects of periodic P applications on micro nutrient status of tef. Plant growth was not increased by P fertilization on two soils containing high native P. Plant micronutrient content was reduced by increased P application.*
- Mamo T, Richter C, Hoppenstedt A.** 1996. Phosphorus response studies on some varieties of durum wheat and tef grown in sand culture. *Journal of Agronomy and Crop Science* 176:189-197. *Investigates the response of durum wheat and tef to P application. According to the findings, plant height, shoot and root dry weights, and plant P uptake were increased by increasing levels of P application from 0 to 5 mg P 100 g⁻¹ for tef.*
- Mamo T.** 1984. Nutrient relations in teff and the effect of vesicular arbuscular mycorrhiza on its growth and elemental composition. PhD Thesis, University of Aberdeen, Scotland. 208pp.
- Michelsen A, Lisanework N, Friis I.** 1993. Impacts of tree plantations in the Ethiopian highland on soil fertility, shoot and root growth, nutrient 136olonizatio and mycorrhizal

colonization. *Forest Ecology and Management* 61:299-324. *Studies the ecological effects of plantation at Montane forest on soil properties, mycorrhizal colonization and annual crops. In the bioassay, growth of tef was reduced in soils under all plantations most strongly in Eucalyptus.*

MoA (Ministry of Agriculture). 1991. Results of fertilizer trials conducted on major cereal crops by Agricultural Development Department (ADD)/National Fertilizer Inputs Unit (NFIU) (1986-1989). MoA Working Paper No. 34, Addis Ababa, Ethiopia. *Presents the result of fertilizer experiments conducted by the National Field Trials Program (NFTP) and recommendations for major crops. Regarding tef, across country fertilizer recommendations (in kg ha⁻¹ N-P₂O₅) are 55-30 for Vertisols, 30-40 for Nitosols, 40-35 for Cambisols, 50-30 for black soils, 25-35 for red soils, and 40-35 for brown soils.*

MoA (Ministry of Agriculture). 1970. Fertilizer guide for 1970. Ministry of Agriculture (MoA), Addis Ababa, Ethiopia.

Moeyersons J. 2006. Stone bunds for soil conservation in the northern Ethiopian highlands: Impacts on soil fertility and crop yield. *Soil and Tillage Research* 90:1-15. *Evaluates the effect of soil fertility gradients on progressive terraces and their influence on crop yield, in order to evaluate the long-term sustainability of stone bunds in the Ethiopian Highlands. According to the author, tef yield was improved using stone bunds.*

Mohammed YA, Desta K, Bekele T. 2009. Phosphorus critical value and requirement factor determination for tef production in Ethiopia. 2009 International ASA, CSSA, and SSSA Annual Meetings, November 1-5, 2009, Pittsburgh, USA. *Determines critical value and requirement factor for phosphorus application in tef production. According to the findings from the soils test, the critical value of 10 ppm P and requirement factor of 6.7 kg P ha⁻¹yr⁻¹ can be used for phosphorus fertilizer recommendation in tef production.*

Ochtman LHJ, Debele B. 1977. Reddish brown soils of Holetta Region, Ethiopian Highlands. Pp. 48-62. In: Proceedings of the Second Meeting of Eastern African Subcommittee for Soil Correlation and Land Evaluation, 25-30 Oct. 1976, Addis Ababa, Ethiopia. Food and Agriculture Organization (FAO), Rome. *Presents the morphology, soil physical and chemical properties and land use suitability of red soil at Holetta where tef is the major crop. According to the authors, tef is affected by the frequent night and ground frost in November and December.*

Oicha T, Cornelis W, Verplancke H, Nyssen J, Deckers J, Behailu M, Haile M, Govaerts B. 2010. Short-term effects of conservation agriculture on Vertisols under tef in the northern Ethiopian highlands. *Soil and Tillage Research* 106:294-302. *Evaluates the changes in soil quality and effects on soil erosion and tef performance due to conservation agriculture. According to the authors, appropriate rate of herbicides must be used while growing tef using conventional tillage practices.*

Olsvig-Whittaker L, Morris JW. 1982. Comparison of certain Nylsvley soils using a bioassay technique [Properties in terms of radish, *Raphanus sativus* and *Eragrostis tef*

production, comparison of thorn savanna and broad-leaf savanna soils, mineral elements, South Africa]. *South African Journal of Botany* 1:91-96.

Regassa H, Dibabe A, Atlabachew W. 1996. Soil type and climatic variation in some Vertisol areas of Ethiopia. Pp. 34-45. In: *Soil—the Resource Base for Survival, Proceedings of the Second Ethiopian Society of Soil Science (ESSS), 24-25 September 1993, Addis Ababa, Ethiopia.* ESSS, Addis Ababa. *Analyzes climatic data for seven Vertisol areas (Ginchi, Sheno, Gorebella, Enewari, Deneba, Mendida and Ankober) especially rainfall and temperature data where tef is the major crop.*

Regassa H, Dibabe A. 1992. Properties and management of Vertisols in the Central Zone of Ethiopia. Pp. 26-33. In: *Proceedings of the Second Natural Resources Conservation conference, 10-13 May 1990, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Presents the properties of Vertisols and their management in the central zone of Ethiopia where tef is the major crop.*

Rosenberg R, Norberg S, Smith J, Charlton B, Rykbost K, Shock C. 2005. Yield and quality of teff forage as a function of varying rates of applied irrigation and nitrogen. Klamath Experiment Station, Oregon State University. Pp. 119-136. <http://extension.oregonstate.edu/catalog/html/sr/sr1069-e/teffyield.pdf> accessed July 5, 2011. *Presents the highlights on irrigation and nitrogen experiments on tef at Klamath Research Station in USA.*

Srivastava KL, Abebe M, Astatke A, Regassa H. 1993. Distribution and importance of Ethiopian Vertisols and location of study sites. pp. 13-27. In: Mamo T, Astatke A, Srivastava KL, Dibabe A (Eds.) *Improved Management of Vertisols for Sustainable Crop-Livestock Production in Ethiopian Highlands: Synthesis report 1986-1992.* Technical Committee of the Joint Vertisol Project, Addis Ababa, Ethiopia. *Describes the distribution, use and importance of Vertisols in the country. Vertisols occupy 12.6 million ha in Ethiopia. Crop yields (in kg ha⁻¹) under Vertisol were 530 for tef, 860 for barley, 610 for durum wheat, 290 for noug, 600 for chick pea, and 500 for lentil.*

Tsegaye T, Abebe M, Mamo T. 1996. Vertisols of the central highlands, Ethiopia: physical and chemical characterization and classification. pp. 46-77. In: *Soil—the Resource Base for Survival, Proceedings of the Second Ethiopian Society of Soil Science (ESSS), 24-25 September 1993, Addis Ababa, Ethiopia.* ESSS, Addis Ababa. *Characterizes the physical and chemical properties of Vertisols at five sites namely Akaki, Chefe Donsa, Debre Zeit and Ejere in the central highland of Ethiopia where tef is the major crop.*

Tulema B, Aune J, Breland TA. 2007. Availability of organic nutrient sources and their effects on yield and nutrient recovery of tef and on soil properties. *Journal of Plant Nutrition and Soil Science* 170: 543-550. *Conducts on-farm experiments on Nitisol and Vertisol to study the effects of organic and synthetic fertilizers on tef performance. According to the authors, tef is more responsive to FYM on Vertisol, while more responsive to compost on Nitisol.*

Tulema B, Tsgie A, Asmamaw B, Fita T. 1996. Effect of mustard seed meal on the growth and yield of tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Tulema B, Zapata F, Aune J, Sitaula B. 2005. N fertilisation, soil type and cultivars effects on N use efficiency in tef. *Nutrient Cycling in Agroecosystems* 71:203-211. *Investigates fertilizer N use efficiency (FNUE) for four tef varieties using 15 N isotopic dilution technique. The mean FNUE was 61 % for the Nitosol and 28% for the Vertisol.*

Tulema B, Zapata F, Aune J. 2005. Evaluation of mustard meal as organic fertiliser on tef under field and greenhouse conditions. *Nutrient Cycling in Agroecosystems* 73:49-57. *Evaluates the potential use of mustard meal as organic fertilizer for tef production. Grain yield increases due to increased mustard meal N. Application of mustard meal in powder form was more effective than granular.*

Tulema B. 2005. Integrated plant nutrient management in crop production in the Central Ethiopian highlands. PhD thesis, Norwegian University of Life Sciences. 188pp. *Presents the following conclusions under five sections: i) nutrient balance at farm, soil fertility class and crop levels: nutrient balance on all the crops, including tef was negative due to low nutrient input, high biomass removal and N losses; ii) comparative effect of urea and organic nutrient sources on tef: tef is more responsive to FYM on Vertisol and to compost on Nitosol; iii) mustard meal N uptake by tef, iv) fertilizer Nitrogen use efficiency (FNUE) of tef: the FNUE of tef was 61% on the Nitosol and 28% on the Vertisol. v) tillage studies on tef and wheat: On both Vertisol and Nitosol, the tef yield obtained from one time and four time plowings were similar.*

Westphal A, Beyene D. 1973. Relations between nitrogen fertilizer effects and nitrate status of the soil at Bako. pp. 1-9. In: *Proceedings of Annual Research Seminar, 25-27 Oct. 1972, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Investigates effects of fertilizers and exhaustion trials at Bako for different crops including tef.*

Woldeab A. 1990. The role of soil fertility management in crop production. pp. 65-72. In: *Proceedings of the First National Resources Conservation Conference, 8-10 Feb. 1989, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Reviews research works on soil types, fertility, acidity, salinity, soil burning ("Guie"), and the overall soil and water conservation work in Ethiopia. According to the author, tef benefits from improved practices at Inewari. The yields (in q ha⁻¹) under farmers' practice were 5.5 for variety Cr-44 and 5.3 for local variety; under improved condition, the yields were 10.0 for improved and 8.8 for local varieties.*

Yirga C, Hassan RM. 2010. Social costs and incentives for optimal control of soil nutrient depletion in the central highlands of Ethiopia. *Agricultural Systems* 103: 153-160. *Analyzes trade-offs between short- and long-term objectives of soil use by smallholder tef farmers in Ethiopia. There is evidence of high social gains from better utilization of soil resources through appropriate policy such as tenure security, to improve incentives for smallholder farmers to adjust input use towards socially desirable dynamic optimization levels.*

16. Farm Implements and Mechanization

Anon. 1976. Teff cultural methods trial—II. pp. 118. In: Holetta Guenet Research Station Progress report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the effects of mouldboard plow against that of chisel plow on the growth and yield of tef. Yield from chisel plow was higher than yield from mouldboard plow. The report recommended to use chisel plow for tef cultivation.*

Anon. 1976. Teff cultural methods trial—II. pp. 31. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the effects of mouldboard and chisel plows on yield of tef at the bottom soils of Holetta. Yield from mouldboard was 3.7 q ha^{-1} , while that of chisel plow was 5.8 q ha^{-1} .*

Anon. 1983. The single ox: an innovation for the small farmer. International Livestock Center for Africa (ILCA) Newsletter Vol. 2, No. 2, pp. 1-2. Apr. 1983. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Reveals how plowing with single ox at Debre Zeit was effective.*

Anon. 1987. Effect of using different threshes on the grain yield of tef. pp. 25-26. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of three threshers (pulman-head-thresher, pullman-plot-thresher, and hand threshing) on grain yield of tef. Also provides, mandays required for accomplishing the practices.*

Anon. 1990. Effect of using different threshers on the grain yield of tef. pp. 152. In: Holetta Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates three threshing methods (pulman-head-thresher, pullman-plot-thresher, and hand threshing) for tef variety DZ-01-354.*

Anon. 1990. Tef sowing implement trial. pp. 150. In: Holetta Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares broadcasting by hand with Hego-500 seed driller at Debre Zeit light soil for variety DZ-01-354 but no significant yield differences were obtained for two years.*

Astatke A, Kelemu F. 1993. Modifying the traditional plough-maresha for better management of Vertisols. pp. 85-101. In: Mamo T, Srivastava KL, Dibabe A (Eds.) Improved Management of Vertisols for Sustainable Crop-livestock Production in Ethiopian Highlands: Synthesis Report 1986-1992. Technical Committee of the Joint Vertisol Project, Addis Ababa, Ethiopia. *Provides a description of relevant farmers' practices, the traditional implements used and experience of the Joint Vertisols project in developing simple and low-cost implements for Vertisols in the highland agricultural system in Ethiopia. For tef, the annual input of animal power (pair of oxen) at Ada Woreda was 165 hr ha^{-1} .*

Beyene H, Negassa A, Dadi L, Mulatu T. nd. Crop production and agricultural implements in the Bako, Holetta and Nazret areas. Institute of Agricultural Research (IAR) Research Report No. 11, Addis Ababa, Ethiopia. 30pp.

CADU (Chilalo Agricultural Development Unit). 1971. Progress report No. III, implements research section. CADU Publication No. 79, Asella, Ethiopia. 75pp. *Reports the results of various experiments conducted at Kulumsa for implements used in land preparation, crop handling (harvesting, threshing, store), transportation, etc for different crops.*

Ellis G. 1972. Man or machine; beast or burden: a case study of the economics of agricultural mechanization in Ada district, Ethiopia. Thesis, University of Tennessee, Knoxville, USA. *Determines the increases in yield attributable to mechanization of seedbed preparation in Ada district, Ethiopia. Surveys were made to determine costs of methods of seedbed preparation. According to the author, private and social costs of mechanization differed substantially. Mechanization of tef did not appear to increase yields or relieve bottlenecks.*

Gryseels G, Anderson FM, Durkin JW, Asamenew G. 1986. Draught power and smallholder grain production in the Ethiopian Highlands. International Livestock Center for Africa (ILCA) Newsletter Vol. 5, No. 4, pp. 5-7, Oct. 1986, Addis Ababa, Ethiopia. *Investigates the impact of draught power availability on crop production on small-holder farms in two areas of Central Ethiopian Highlands: i) Debre Berhan, where the major crops are barley, wheat, oats, faba bean, field pea, and lentil, and ii) Debre Zeit where the major crops are tef, wheat, maize, sorghum, faba bean, chick pea, and field pea.*

Jutzi S, Anderson FM, Astatke A. 1987. Low-cost modifications of the traditional Ethiopian tine plough for land shaping and surface drainage of heavy clay soils: preliminary results from on-farm verification trials. International Livestock Center for Africa (ILCA) Bulletin No. 27, pp. 28-31. ILCA, Addis Ababa, Ethiopia.

Pathak BS. 1988. Agricultural mechanization options for Ethiopia. Ethiopian Journal of Agricultural Sciences 10:53-60. *Presents two mechanization options (animal and mechanical) for intensification of agriculture for cooperatives and private farmers in Ethiopia. According to the author, in long run, a more versatile combination of a four wheel-drive medium tractor and a small tractor are more advantageous.*

Temesgen M, Hoogmoed WB, Rockstrom J, Savenije HH. 2009. Conservation tillage implements and systems for smallholder farmers in semi-arid Ethiopia. Soil and Tillage Research 104: 185-191. *Tests the performance of different implements for conservation tillage. The implements tested are the Subsoiler, the Tie-ridger, and the Sweep. The Sweep enabled deeper root growth of tef apart from accomplishing sowing operations faster. A reduced tillage system tested on tef resulted in higher grain yields as compared to conventional tillage.*

Temesgen M. 1996. Testing and improvement of a rolling type compacter for tef seedbed preparation. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Woldesenbet S. 1996. Improvement and evaluation of IAR thresher for tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Woldesenbet S. 1996. Improvement and evaluation of Kotebe sickles for harvesting tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Zewdu AD. 2008. Simulation of tef seed broadcasting. CIGR Ejournal. PM 07 027. Vol. 10. *Determines simulation for seed broadcasting in tef. This investigation showed the possibility of using a spinning disc spreader in order to broadcast tef seed, which could replace broadcasting of tef seed by hand manually.*

17. Weeds and Control Measures

Admasu A. 1993. Plant quarantine: background and potential problems of food grain introduction. pp. 36-40. In: Rezene Fessehaie (Ed.) Proceedings of the Seventh Annual Conference of the Ethiopian Weed Science Committee, 13-14 Apr. 1989, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Lists the most problematic weed species imported with food grains from different countries such as France, USA, Switzerland, Canada, etc. According to the author, the most serious weeds which were difficult to eradicate once they are established are: *Cirsium arvense*, *Ipomoea purpurea*, and *Amaranthus retroflexus*.*

Alkamper J, Manig W. 1972. Weed control in teff. pp. 65-80. In: Proceedings of the Symposium Arbeitsgruppe Unkrautprobleme Warmer Klimate im Arbeitskreis Herbologie der DPG, Stuttgart Hohenheim. Berichte aus der Abteilung für Herbologie an der Universität Hohenheim. No. 3. [in German]. *Presents about the weed control practice in teff in Ethiopia. According to the findings, hand-weeding at a labour cost of 30-40 birr ha⁻¹ showed marginal profitability but two weedings resulted in 94% yield increase and a satisfactory profit margin. Herbicides such as MCPA, diuron and linuron were economically justifiable to use.*

Anon. 1968. Hand weeding in broadcast and row drilled teff. pp. 55. In: Results of Trials and Observations on Field and Forage Crops at Kulumsa Farm and in Asella, 1967/68, Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Investigates the effects of weeding and methods of sowing on teff yield, 1000 seed weight and hectolitre weight.*

Anon. 1969. Chemical control in teff. pp. 70-71. In: Results of Trials and Observations in 1968/69. Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 28, Addis Ababa, Ethiopia. *Assesses chemical weed control in teff using post-emergence herbicides such as phenoxyacetic acids, mecoprop and dicamba.*

Anon. 1969. Chemical control of *Avena* species in teff. pp. 79-80. In: Results of Trials and Observations in 1968/69. Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 28, Addis Ababa, Ethiopia. *Presents the results of experiments on chemical control of *Avena* species from teff fields.*

Anon. 1969. Handweeding of teff. pp. 77. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Compares three weeding treatments (no weeding, weeding twice and weeding twice) for their effect on teff yield and cost:benefit ratio. According to the report, one weeding had increased the yield by more than 100% and was highly profitable.*

Anon. 1969. Handweeding-herbicides in teff. pp. 86-88. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Evaluates herbicides (three substituted ureas and three chlorinated phenoxy acids), handweeding and no weeding for their effect on*

grain yield of tef and benefit:cost ratio. Benefit cost ratio was favorable for MCPA, 24-D and C 2242.

Anon. 1969. Intensified handweeding in broadcast and row-planted crops: teff. pp. 63-64. In: Results of Trials and Observations in 1968/69. Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 28, Addis Ababa, Ethiopia. *Evaluates the efficiency of intensified handweeding for broadcasted and drilled tef.*

Anon. 1969. Teff: Herbicide trial. pp. 51-52. In: Awasa Agro-Industrial Estate, Agricultural Research and Experiment. Report for 1968. Part II - Analysis Report. Ministry of National Community Development, IRAT. *Evaluates the effects of four herbicides (U-46-D Ester, U-46 fluid, agroxone 4, and weedone) in tef cultivation. Since the doses of the herbicides were high, leaves of tef were turned yellow or burnt ten days after application.*

Anon. 1969. The weed, pest and disease situation in 1969/70. I. weeds. pp. 62-66. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Reports survey results for 128 fields samples by Chilalo Agricultural Development Unit (CADU) regarding weeding practices adopted by farmers in fields of tef and other field crops. The amount of weeds were roughly one-third of the average total amount of green matter of wheat, barley and tef per ha.*

Anon. 1970. Holetta Guenet: teff. pp. 39-40. In: Report for the Period Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly reports the results of herbicide trial at Holetta.*

Anon. 1970. Teff herbicide trial. pp. 85-86. In: Holetta Guenet Research Station Progress Report for Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Tests the effects of 10 herbicides plus control on weeds, costs and yield of tef at Holetta.*

Anon. 1971. Handweeding of teff. pp. 74. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Evaluates effects of three treatments of weeding (no weeding, one handweeding, and two handweedings) on tef yield and cost:benefit. The tef plant in a check was severely infested with weeds. Highly significant effect on yield was obtained from one and two weedings where the yield difference due to one and two weedings was not significant.*

Anon. 1971. Handweeding-herbicides in teff. pp. 77-78. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Compares the effect of herbicides (rates and time of application) and handweeding on tef yield and benefit:cost ratio. The high dose of Linuron applied four weeks after planting had a pronounced effect on *Polygonum nepalense* although *Dichlorprop* is the best and significantly better both alone and together with MCPA.*

Anon. 1971. Herbicide trial on teff, red soils, Holetta, 1970. pp. 108-110. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of herbicides (pre- and post-emergent herbicides) on growth and yield of tef at Holetta.*

Anon. 1971. Herbicide trials: teff. pp. 37. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Screens nine herbicides (pre- or post-emergence) each at two rates for tef at Holetta. Three pre-emergence herbicides caused total loss of the crop. The post-emergence hormone type herbicides were superior but 2,4-D ester and MCPA were best treatments.*

Anon. 1971. The weed situation in 1970. pp. 64. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Determines the cost of handweeding for different crops including tef at eight extension sites of Chilalo Agricultural Development Unit (CADU). Cost of handweeding (in birr ha⁻¹) was 33 for Huruta, 47 for Etaya, 48 for Gonde, and 14 for Asella and Sagure.*

Anon. 1971. Time and rate of MCPA application study on teff, Holetta red soil, 1970. pp. 108-112. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates effects of dates of application and rates of MCPA herbicide on growth and yield of tef.*

Anon. 1971. Time of application and dosage of MCPA and 2,4-D amine on teff. pp. 74-76. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Investigates the effect of eight weed control treatments (no weeding, hand weeding, MCPA and 2,4-D amine at various levels and date of application) on tef yield and cost:benefit. The most favorable benefit:cost ratio and highest net benefit are obtained from the late application of 2,4-D at 0.5 and 1.0 kg a.i. per ha, respectively.*

Anon. 1971. Weed control in teff. pp. 60. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates different weed control methods including pre-emergence herbicides for tef at Bako.*

Anon. 1972. Herbicides trials: teff. pp. 80. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the effects of five herbicides or mixtures, each at two rates against handweeding and unweeded control at Holetta.*

Anon. 1972. Teff: rate of herbicide application trial. pp. 206-208. In: Holetta Guenet Research Station Progress Report for Apr. 1971 to Apr. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares four herbicide treatments (2,4-D + MCPA; CMPP; 2,4-D + CMPP; and Dichlorprop) each at three rates with single or double handweeding for their effect on costs and yield of tef.*

Anon. 1972. Tef: type of herbicide and date application trial. pp. 206-207. In: Holetta Guenet Research Station Progress Report for Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates 10 herbicides, handweeding and no weeding for their effect on yield of tef under two soil types and two application times.*

Anon. 1973. Chemical weed control in teff (Kulumsa). pp. 181-183. In: Report on Surveys and Experiments in 1972 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 87, Asella, Ethiopia. *Determines the effects of different herbicides and handweeding on tef yield and biomass of different weed species.*

Anon. 1973. Stale seedbed-conventional seedbed in teff with different weeding practices (Kulumsa). pp. 184-186. In: Report on Surveys and Experiments in 1972 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 87, Asella, Ethiopia. *Investigates the effects of two land preparation methods (stale seedbed and conventional) and weeding practices on tef yield and weed species.*

Anon. 1973. Tef herbicide screening trial. pp. 168. In: Report for Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the performance of seven herbicides and handweeding on the control of weeds and tef yield under Jimma condition.*

Anon. 1973. Tef herbicide time of application trial. pp. 88. In: Report for Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates effects of ten herbicides and three dates of application (16, 23 and 33 days after crop emergence) on weed growth and yield of tef at valley soils of Holetta.*

Anon. 1973. Time of application of herbicides in tef (Kulumsa). pp. 178-180. In: Report on Surveys and Experiments in 1972 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 87, Asella, Ethiopia. *Investigates the effects of some herbicides applied at different time on tef grain yield and biomass of various weed species.*

Anon. 1975. Stale seed bed vs conventional seedbed preparation in teff (Kulumsa). pp. 173-174. In: Reports on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 111, Asella, Ethiopia. *Evaluates the effect of seed bed preparation methods and weeding practices on grain yield of tef and weed infestation. The stale seedbed technique controlled 27% of broadleaved weeds and 76% of grasses. This effect was not seen in tef yield due to the dry spell after sowing tef which has disturbed the stand.*

Anon. 1975. Weed control in cereals: teff. pp. 62-65. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations 1974/75. EPID Publication No. 41, Addis Ababa, Ethiopia. *Indicates the results of weed control experiments for cereals including tef tested at farmers' fields in different regions. Regarding tef, at the national level, weeding twice increases yield by 36% followed by one time weeding (22%), MCPA (8%), and 2,4-D (3%).*

Anon. 1975. Weed control in teff (Kulumsa). pp. 170-172. In: Report on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 111, Asella, Ethiopia. *Studies the effects of no weeding, hand weeding and herbicides on the yield of tef. According to the findings, there was no significant yield differences due to treatments, however, the highest yield was obtained from handweeding.*

Anon. 1977. Results of weed control trials (Chilalo Agricultural Development Unit, CADU). pp. 250-257. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of herbicide trial for major crops and guide to herbicide use. According to the report, the average yield losses due to weeds in Ethiopia are around 30%. Based on the results, herbicide recommendation for tef are Dichlorprop 2 kg a.i. ha⁻¹, or MCPA 1.0 kg a.i. ha⁻¹.*

Anon. 1977. Weed control and seed treatment trials. pp. 23-34. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations. EPID Publication No. 39, Ministry of Agriculture (MoA), Addis Ababa, Ethiopia. *Demonstrates weed control trials for major crops including tef in different regions of Ethiopia.*

Anon. 1980. Studies on the efficiency of agro-technical and chemical means of weed control in wheat, tef and maize. pp. 33-35. In: Scientific Phytopathological Laboratory (SPL) Progress Report for the Period Jan. 1979 to Dec. 1979. SPL, Ambo, Ethiopia. *Investigates the effects of different methods of soil preparation, seed rate, means of weed control and their combinations on weed control and grain yield of wheat maize) and tef.*

Anon. 1981. Studies on the effectiveness of herbicides. pp. 164-165. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Determines the most optimal rates and days of application of herbicides for wheat, maize and tef.*

Anon. 1981. Studies on the efficiency of agro-technical and chemical means of weed control in wheat, tef and maize. pp. 165-177. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Determines the effect of different methods of soil preparation, seed rates, means of weed control and their combination on weeds and yields of tef, wheat and maize.*

Anon. 1982. Chemical control of the smudge pathogen of tef. pp. 188. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates that the trial conducted at Tibe to control smudge using chemicals had failed.*

Anon. 1982. Chemical control of weeds in tef. pp. 188. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports results of three year chemical weed control trials for tef at Ginchi. Crop yield and weed control performance benefited from the*

use of herbicides. The two problematic weeds controlled by Gesaten are Phalaris paradoxa and Setaria pallidifusca.

Anon. 1983. Chemical weed control in tef. pp. 87-89. In: Crop Protection Department Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates effects of different weed control treatments on tef yield, yield components and individual weeds at Ginchi. None of the herbicides caused crop damage except the highest rate of Gesaten (3.3 kg a.i. ha⁻¹). The best performance was obtained from Gesaten at 0.85 kg a.i. ha⁻¹ and CMPP.*

Anon. 1985. General weed population survey and collection for highland areas. pp. 165-170. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Lists weed species in the highland and lowland areas of Ethiopia which infest fields of wheat, barley, tef, maize, sorghum, faba bean, field pea, lentil, chick pea, haricot bean, and soy bean.*

Anon. 1986. Crop/weed competition trials at Institute of Agricultural Research (IAR)/Agricultural Development Department (ADD) trial sites. pp. 116-121. In: IAR/ADD Joint Research Extension Program for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1986. General weed population surveys and collections for the highland and lowland areas. pp. 105-108. In: Department of Crop Protection Progress Report for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of weed survey in the highland and lowland areas of Ethiopia in the fields of various crops including tef. Areas surveyed were, Holetta, Bichena, Motta, Debre Tabor, Dabat, and Bure.*

Anon. 1986. Weed surveys in some Institute of Agricultural Research (IAR)/Agricultural Development Department (ADD) trial. pp. 114-115. In: IAR/ADD Joint Research Extension Program for 1984/85. IAR, Addis Ababa, Ethiopia.

Anon. 1987. Chemical control of broadleaved weeds in tef. pp. 28. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Screens 10 herbicides at Debre Zeit Research Station and farmer's field for their effect on weeds, toxicity, and yield of tef.*

Anon. 1987. Report of the National Standing Committee for Parasitic Weed Control. pp. 547-550. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Nazret, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the efforts made by the National Standing Committee for Parasitic Weed Control since its formation in 1984. The report includes the results of the survey in 1985 in seven Administrative Regions. The parasitic weed Striga hermontica was reported in tef fields from Dejen area.*

Anon. 1987. The effect of seeding rates and frequency of hand weeding. pp. 29. In: Department of Field Crops, Tef Progress Report for 1985/86. IAR, Addis Ababa, Ethiopia. *Evaluates the effects of four seed rates of tef (20, 30, 40, and 50 kg ha⁻¹) and frequency of*

hand weeding (unweeded check, handweeding once, and handweeding twice) on weeds and tef yield at farmer's field.

Anon. 1987. The effect of sowing dates and frequency of hand weeding. pp. 29. In: Department of Field Crops, Tef Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates two sowing dates (July 7 and August 7), and frequency of hand weeding (no weeding, one hand weeding, and two hand weeding) on tef yield and weed infestation.*

Anon. 1987. Yield loss—a summary table. Ethiopian Weed Science Committee (EWSC) Newsletter Vol. 2, No. 4, pp. 1, Jan. 1987, Addis Ababa, Ethiopia. *Presents a table of yield losses, period of competition and critical time of weeding for various crops. According to the report, in tef, the yield loss due to weed reach up to 54% while the critical time of weeding is 20-30 days after emergence.*

Anon. 1990. General weed population survey. pp. 306-308. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates weed species at 18 sites surveyed in Menagesha Awraja (2 sites), Yerer Kereyu Awraja (6 sites), Selale Awraja (6 sites), Arsi (3 sites), and Gojam (1 sites).*

Anon. nd. Chemical control of *Avena spp.* in teff. pp. 53. In: Field Trials and Observations, 1968/69. Crop Production Department, Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Presents field lay-out for chemical control of Avena species from tef fields.*

Anon. nd. Chemical weed control in teff. pp. 52. In: Field Trials and Observations, 1968/69. Crop Production Department. Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Indicates field lay-out for chemical weed control experiments in tef.*

Anon. nd. Crop loss assessment due to weed competition in tef. pp. 81. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Presents the results of crop loss assessment trial (due to weeds) conducted for tef at four locations. According to the report, single handweeding at tillering stage was more profitable than two or three handweeding at different growth stages. Early tillering stage of tef was the critical stage in weed competition.*

Anon. nd. Effect of variety, seed rate and time of weeding on the yield of tef. pp. 64-69. In: Adet Research Center Progress Report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates two varieties of tef (DZ-01-354 and Adet local), at four seed rates (15, 25, 35, and 45 kg ha⁻¹), and four time of weeding (15, 30, 45, and 60 days after crop emergence). Variety Adet local gave the highest yield at the seed rate of 15 kg ha⁻¹ and weeding 45 days after emergence.*

Anon. nd. Frequency and time of handweeding in tef and wheat. pp. 82. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Highlights the effects of frequency and time of handweeding on tef and wheats. Handweeding once at early tillering stage of the crop was found to be more*

profitable than handweeding twice or three times. Crop losses of 45-55% could be obtained due to weed competition.

Anon. nd. Herbicides vs hand weeding in tef (1982/83). pp. 74-76. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Reports the results of herbicides vs hand weeding trial in tef in 1982/83 using glyphosate and terbutryne at three rates, hand weeding twice and unweeded check.*

Anon. nd. Herbicides vs handweeding in tef (1978/79). pp. 45-47. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Reports the effects of herbicides and handweeding on tef yield based on the trial at Debre Zeit black soil.*

Anon. nd. Herbicides vs handweeding in tef and wheat. pp. 82. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Presents the trial on type of herbicides, rate of application, source of herbicides on tef and wheat. Gesaten 500 FW performed better on heavy soil than on light soil. Herbicides were found to be more profitable than hand weeding.*

Anon. nd. Herbicides vs handweeding in tef. pp. 81-82. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Reports the results of a comparative study between hand weeding and chemical weed control. All treatments gave acceptable control of annual weeds by herbicides. performance of both herbicides was better on heavy than light soil. The lowest cost benefit ratio was obtained by Gesaten 500 FW.*

Anon. nd. Herbicides vs handweeding in wheat and tef (1982/83). pp. 64-69. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Presents the results of weed control trial in 1982/83 on wheat and tef using seven post emergence herbicides and one pre-emergence herbicides at three rates.*

Anon. nd. Herbicides vs handweeding in wheat and tef (1982/83). pp. 58-63. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Evaluates herbicides and handweedings for wheat and tef in 1982/83. For tef, no significant yield differences were obtained due to treatments.*

Anon. nd. Screening of herbicides in tef (1981/82). pp. 52-54. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Screens 11 post emergence herbicides (at recommended rates of manufacturer) for tef.*

Anon. nd. Screening of herbicides vs hand weeding in tef (1981/82). pp. 55-56. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agric. Res. Center, Debre Zeit, Ethiopia. *Compares seven post emergent herbicides and single handweeding for tef but no significant tef yield differences were obtained. Use of herbicides was cheaper than handweeding.*

Anon. nd. Teff: herbicide trial. pp. 58-60. In: Awasa Experiment Station Progress Report for 1970 Campaign. Part II. Analytical Report, IRAT. *Evaluates two herbicides (each at three rates), handweeding and no weeding on grain yield of tef.*

Anon. nd. Weeding in broadcast and row drilled teff. pp. 49. In: Field Trials and Observations, 1968/69. Crop Production Department. Chilalo Agricultural Development Unit (CADU), Asella, Ethiopia. *Shows field lay-out and treatments for the experiment on weeding practices and method of sowing for tef.*

Assefa A, Liben M, Yeshalem B. 2008. **The effect of tillage frequency and weed control on yield of tef in Yielmana-Densa Area, Northwestern Ethiopia.** East African Journal of Sciences 2:35-40. *Determines optimum tillage frequency, time and weeding frequency for tef production in the Yielmana Densa area. Grain yield increased linearly as tillage frequency increased. Twice weeding increased yield by 39% over un-weeded.*

Belz RG, Reinhardt C, Foxcroft LC, Hurle K. 2007. Residue allelopathy in *Parthenium hysterophorus*—Does parthenin play a leading role? Crop Protection 26:237-245. In: 4th International Weed Science Congress Conference, June 2004, Durban, South Africa. *Investigates the allelopathic and phytotoxic effects of Parthenium extracts on test plant species including tef and E. curvula.*

Cheverton M. 1985. Breeding tef: lodging, weed control and other aspects of *Eragrostis tef*. M.Sc. Thesis, University of London, Wye College (UK).

Chugonov V, Kassaye Z, Ergano S. nd. Influence of crop rotation and weeding methods on weed infestation and yield of following crop. pp. 460-468. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1986/87. SPL, Ambo, Ethiopia. *Investigates the influence of crop rotation and weeding methods on weed population for wheat, maize, tef and haricot bean. Hand weedings although reduced the number and mass of weeds in all crops, did not influence greatly the yield of all crops except tef as compared to the check.*

Davison J, Creech E, Laca M. 2009. Response of teff biomass yields to several broadleaf herbicides applied at three different growth stages during 2009. University of Nevada, Cooperative Extension, Fact Sheet-10-35. *Evaluates the toxicities of different types and rates of herbicides on tef plant. Tef forage yields were not increased as a result of any herbicide applications because the weed populations existing in the plots were relatively low and did not reduce tef production in the untreated plots.*

Debello A. 1992. Germination, yield and yield components of tef as affected by environment, tillage and weed control practices. Ph.D. Thesis, Oklahoma State University (USA). *Presents the results of four experiments (one field experiment in Ethiopia at three locations, and three greenhouse experiment in USA). The titles of the experiments are: i) tef yield and yield components as affected by tillage and weed control practices, ii) temperature, light, planting depth and soil texture effect on germination of tef, iii) germination response of tef cultivars to drought and salt stress induced by polyethylene glycol (peg 8000) sodium chloride, and iv) accelerated aging effect on germination of cultivars in salt and salt free solutions.*

Einhellig GF, Souza IF. 1992. Phytotoxicity of sorgoleone found in grain sorghum root exudates. *Journal of Chemical Ecology* 18(1):1-11. *Investigates the potential activity of sorgoleone as an inhibitor of weed growth. Bioassays showed 125 μ -M sorgoleone reduced radical elongation of Eragrostis tef. In liquid culture, 50- μ -M sorgoleone treatments stunted the growth of Lemna minor. Over a 10-day treatment period, 10 μ -M sorgoleone in the nutrient medium reduced the growth of all weed seedlings tested: Abutilon theophrasti, Datura stramonium, Amaranthus retroflexus, Setaria viridis, Digitaria sanguinalis, and Echinochloa crusgalli.*

Engstrom E. 1973. Some aspects of weed control in cereals in Chilalo Awraja. pp. 72-73. In: Proceedings of Annual Research Seminar, 25-27 Oct. 1972, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reviews weed control trials in Chilalo Awraja for wheat, barley, tef and maize from 1967 to 1971. For tef, the broadleaved weeds were satisfactorily controlled by MCPA, 2,4-D, and dichlorprop. Dichlorprop applied 4-5 weeks after planting was the most selective although hand weeding was the first alternative.*

Engstrom E. 1974. Crop protection trials 1967-1972. Crop and pasture section, Asella, April 1974. 57 pp. Ethiopia, Chilalo Agricultural Development Unit. *Presents the results of weed control trials over 5 years for wheat, barley, tef, maize and various legumes. In general, in the Chilalo area, weeds cause heavier losses than either insect pests or diseases. The most common method of weed control is hand-weeding and where labour is cheap the use of herbicides is uneconomic. For tef, dichlorprop at 2 kg ha⁻¹ applied 4-5 weeks after sowing gave the best control of broad-leaved weeds but for grass control hand-weeding is still the recommended treatment. Triallate at 1.6 kg ha⁻¹ incorporated prior to sowing gave the best control of wild oats (Avena sp.) but slightly injured both wheat and tef.*

Engstrom E. 1974. Weed control in teff. pp. 13-17. In: Crop protection Trials, 1967-1972. Chilalo Agricultural Development Unit (CADU) Publication No. 97, Asella, Ethiopia.

ENS (Ethiopian Nutrition Survey). 1959. A report by the Department Committee on nutrition for national defense. Washington, D.C.

Fessehaie R, Parker C. nd. Observation on herbicides for zero-tillage establishment of tef. pp. 130-131. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Evaluates non-selective herbicide (glyphosate) for the establishment of tef in zero-tillage.*

Fessehaie R, Tadele Z. 2001. Weed research in tef. In: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 201-213. *Reviews weed related research on tef including the control measures. According to the review, the yield loss in tef due to weed ranges from 23% in Debre Zeit to 58% in Welga.*

Fessehaie R. 1989. Research approach and monitoring weed management practices in Ethiopia. pp. 114-119. In: Proceedings of the Twentieth National Crop Improvement Conference, 28-30 Mar. 1988, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the effects of weeds on crop plants in Ethiopia and their control measures including alternative approaches. According to the author, tef is more sensitive to weeds 6-8 weeks after establishment. The tef yield losses due to uncontrolled weed growth were 23% at Debre Zeit.*

Franzel S, Mekuria M, Yirga C. 1989. Smallholder farmers weed problems and weed control practices in Ethiopia. pp. 25-48. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 14-15 May 1987, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Reports four case studies at Dendi, Wolmera, Adet and Bako with regard to weeds, control measures and labor requirement for different crops including tef. The total labor use for tef cultivation in the Central Zone was 82 mandays ha⁻¹ where as, labor for handweeding (in mandays ha⁻¹) was 40 for Holetta, 80 for Adet, 60 for Central Zone on black soil, and 138 in the highlands on red soil.*

Gebremariam E. 1985. Collection and preservation of weed specimens. Ethiopian Weed Science Committee (EWSC) Newsletter Vol. 1, No. 2, pp. 5-6, Dec. 1985, Addis Ababa, Ethiopia. *Indicates materials required and procedures to be followed in weed collection and pressing the samples.*

Gebremariam G, Chugonov V, Ergano S. nd. Survey on weed infestation. pp. 429-432. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1987/88. SPL, Ambo, Ethiopia. *Reports the results of weed surveys for major crops including tef at 14 locations in Shewa, Wellega, Arsi and Bale Regions. Major weeds of tef were *Commelina africana*, *Guizotia shemperi*, and *Phalaris paradoxa*.*

Gebremariam G. nd. Influence of crop rotation and weeding methods on weed infestation and yield of the following crop. pp. 461-467. In: Scientific Phytopathological Laboratory (SPL) Report for 1987/88. SPL, Ambo, Ethiopia. *Studies the effects of crop rotation and weeding practices on the yields of crops and weed infestation. Crops used for rotation are wheat, tef, maize and haricot bean.*

Goodall J, Witkowski ETF, Ammann S, Reinhardt C. 2006. Does allelopathy explain the invasiveness of *Campuloclinium macrocephalum* (pompom weed) in the South African grassland biome? Biological Invasions 12:3497-3512. *Investigates allelopathic and competition effects of *Campuloclinium macrocephalum* on tef, *E. curvula*, and lettuce. The greatest effect was radicle stunting produced by leaf extracts whereby *E. curvula* was less tolerant to the extracts than tef.*

Juraimi AS, Begum M, Sherif AM, Rahim AA. 2009. Competition effects of date of sowing and nutsedge removal time on yield and yield contributing characters of tef. American Journal of Applied Sciences 6:1820-1825. *Studies the effect of sowing date and nutsedge removal on tef performance.*

Juraimi AS, Begum M, Sherif AM, Rajan A. 2009. Effects of sowing date and nutsedge removal time on plant growth and yield of tef. *African Journal of Biotechnology* 8: 6162-6167. *Investigates the effect of three sowing dates and five weed removal periods on tef yield. According to the authors, nutsedge competition during the first six weeks after crop emergence reduced tef biomass by more than 30%.*

Kebede E. 1989. The nature of weed problems, control methods and future research strategies on the state farms. pp. 49-54. In: *Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 14-15 May 1987, Addis Ababa, Ethiopia.* Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Presents weed control practices adopted in state farms in Ethiopia.*

Kinfe B, Megenasa T. 1984. Frequency of handweeding on weed control and yield of tef. *Ethiopian Journal of Agricultural Sciences* 6:88-101. *Investigates the influence of handweeding at different phenological stages of tef development on tef grain yield and weed control at Debre Zeit Research Station and farmers' fields. Depending on the severity of weed infestation, handweeding once at early tillering or twice at early tillering and stem elongation stage of the crop were found more profitable.*

Kinfe B, Sherif AM. 1989. The importance of training for weed research and extension in Ethiopia. pp. 141-149. In: *Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 14-15 May 1987, Addis Ababa, Ethiopia.* Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Discusses the importance of weeds and weed science and provides recommendations for training Weed Science at college level. According to authors, yield losses in tef due to weeds was 48%.*

Kinfe B, Unger J. 1985. The effect of soil acting herbicides versus handweeding in tef under Ethiopian conditions. *Beitrage Zur Tropischen Landwirtschaft und Veterinarmedizin.* 23(3):295-299.

Kinfe B, Zeleke A. 1984. The effect of soil acting herbicides versus handweeding on weed control and yield of tef. *Ethiopian Journal of Agricultural Sciences* 6:35-50. *Studies the effects of rates and times of application of two soil acting herbicides (Gesaten 500 FW and Primagram 500 FW) versus frequency of handweeding on tef yield at Debre Zeit. According to the findings, both herbicides and times of application, and hand weeding satisfactorily controlled the annual broadleaf weeds while their effect on perennial weeds was poor.*

Kinfe B. 1981. Distribution and control of weeds in tef in the vicinity of Ada District. M.Sc. Thesis, Addis Ababa University, College of Agriculture, Alemaya, Ethiopia. *Investigates the distribution and importance of weed species, timing and frequency of hand-weeding and herbicide application on tef yield. Hand-weeding gave the best control of broadleaves than grasses. Tef plants and most annual weeds were more susceptible to herbicides than perennial weeds. Gesaten gave the highest benefit:cost ratio compared with Primagram and hand weeding.*

Kinfe B. 1986. A review of weed control research activities on tef in Ethiopia. Proceedings of the First Ethiopian Crop Protection Symposium, Addis Ababa (Ethiopia), 4-7 Feb 1985. IAR, Addis Ababa, Ethiopia.

Kinfe B. nd. A review of weed control research activities on tef in Ethiopia. pp. 149-159. In: Tsegede Abate (Ed.) Proceedings of the First Ethiopian crop Protection Symposium, a Review of Crop Protection Research in Ethiopia, 4-7 Feb. 1985, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Studies the major weed species in tef fields and reviews trials conducted to control weeds. Weed species reported are based on the survey made by Debre Zeit Agricultural Research Center (DZARC), Institute of Agricultural Research (IAR), and Chilalo Agricultural Development Unit (CADU).*

Lin LJ, Peise G, Ying BP, Mathias K, Karasina F, Wang Z, Itatani J, Green L, Hwang YS. 1995. Identification of plant growth inhibitory principles in *Ailanthus altissima* and *Castela tortuosa*. Journal of Agricultural and Food Chemistry 43:1708-1711. *Investigates the inhibitory activity of the extracts of Ailanthus altissima and Castela tortuosa on tef, brassica and other species.*

Lisanework N, Michelsen A. 1993. Allelopathy in agroforestry systems: The effects of leaf extracts of *Cupressus lusitanica* and three *Eucalyptus* spp. on four Ethiopian crops. Agroforestry Systems 21:63-74. *Investigates the potential allelopathic effect of the extracts of Cupressus lusitanica, Eucalyptus globulus, E. camaldulensis and E. saligna on tef, chickpea, maize and pea. Among the four crops, chickpea and tef were the most susceptible with respect to germination, and tef with respect to growth.*

Mersie W, Parker C. 1983. Response of teff to 2,4-D and MCPA at various growth stages. Weed Research 23:53-59. *Investigates the most tolerant growth stages of tef to two herbicides at different rates of application. Also determines the possible effects of day length and relationship between the development of shoot apex and the external morphology of tef.*

Mersie W, Parker C. 1983. Selective control of grass weeds in teff with and without a Safener. Tropical Pest Management 29:333-338. *Tests eleven herbicides in pot experiments for the control of Phalaris paradoxa and Setaria pallidifusca in tef.*

Mulatu T, Kefyalew A. 1993. Alternative weed control methods in tef in Nazret area. pp. 22-27. In: Rezene Fessehaie (Ed.) Proceedings of the Eighth Annual Conference of the Ethiopian Weed Science Committee (EWSC), 20-21 Mar. 1990, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Determines the economics of herbicide use compared to handweeding at five sites in Nazret area under small farm conditions growing tef. The trial consists of 2,4-D (1.0 l ha^{-1}), mecoprop (2 l ha^{-1}), once and twice handweeding. Although treatments did not show significant yield difference, the application of 2,4-D was the most economical method of controlling weeds in tef.*

Mulatu T, Kefyalew A. 1993. Alternative methods of weed control in tef in Nazret area. Annual Conference of the Ethiopian Weed Science Committee, Addis Ababa, Ethiopia, 20-21 Mar 1990. EWSC, Addis Ababa. *Investigates the most economical method of weed*

control in tef field. According to the authors, 2,4-D was the best although in its absence mecoprop can be also applied.

Mulatu T, Kefyalew A. (Unpublished). Alternative methods of weed control in *Eragrostis tef* in Nazret area. A completed research project from Nazret Research Center, Institute of Agricultural Research (IAR), Nazret, Ethiopia. *Compares the economics of weed control in tef for handweeding and herbicides under small farm conditions.*

Mulugeta D, Teferi T, Worku M. 1993. Determination of optimum time and frequency of handweeding in tef. pp. 52-56. In: Fessehaie R (Ed.) Proceedings of the Seventh Annual Conference of the Ethiopian Weed Science Committee, 13-14 Apr. 1989, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Identifies optimum time and frequency of weed removal and establishes the extent of yield loss incurred due to weed competition in tef at Assosa, western Ethiopia. Most parameters including tef grain yield were not affected by the treatments mainly due to the low level of weed infestation at the site.*

Oumer Z. 1970. Studies on chemical weed control in wheat and teff. pp. 40-43. In: Proceedings of Annual Research Seminar, 21-22 Oct. 1970, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Investigates eight herbicides each at two rates plus unweeded and hand weeded checks for tef and wheat plots.*

Parker C, Franzel S, Mulugeta D. 1989. Can herbicides be economic? pp. 91-105. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 14-15 May 1987, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Presents the benefits expected from the use of herbicides for different crops in Ethiopia.*

Parker C. 1970. Weeds in Ethiopia, Conclusions from a seven week survey (Sept. to Oct. 1969). Ministry of Overseas Development's Tropical Weed Section, ARC Weed Research Organization, Yarnton, Oxford, UK. 27pp. *Presents the conclusion from a visit made at the Ethiopian Institute of Agricultural Research to delineate weed problems and consider research work which should be justified towards their solution. According to author, weeding in tef fields is done late and the crop suffered severely from the weed competition. Although 2,4-D or MCPA would be of some use in tef, a soil acting herbicide selective against some weeds of annual grass weeds is required.*

Parker C. 1987. Mis-use of the "EWRC" 1-9 herbicide evaluation scoring system. Ethiopian Weed Science Committee (EWSC) Newsletter Vol. 2, No. 4, pp. 4-6, Jan. 1987, Addis Ababa, Ethiopia. *Indicates the weakness of EWRC (European Weed Research Council) herbicide evaluation system using 1-9 scoring.*

Parker C. 1990. Identification of some groups of Ethiopian Weeds. pp. 25-35. In: Proceedings of the Sixth Ethiopian Weed Science Committee (EWSC) Annual Meeting, 31 Mar. to 1 Apr. 1988, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Presents simple keys by which certain groups of important Ethiopian weeds can be distinguished.*

Parker C. 1990. Some comments on methodology in weed science: 1. weed competition/loss assessment trials. pp. 39-43. In: Proceedings of the Sixth Ethiopian Weed Science Committee (EWSC) Annual Meeting, 31 Mar. to 1 Apr. 1988, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Comments on different methods of loss assessment and weed competition and selects methods for optimum value.*

Parker C. 1990. Some comments on methodology in weed science: 3. Assessment methods on weed research trials. pp. 59-63. In: Proceedings of the Sixth Ethiopian Weed Science Committee (EWSC) Annual Meeting, 31 Mar. to 1 Apr. 1988, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Indicates merits and demerits of EWRC scale in assessing efficacy of weed control, and the choice of alternatives that might be employed.*

Parker C. 1990. Sources of weed science information. pp. 89-95. In: Proceedings of the Sixth Ethiopian Weed Science Committee (EWSC) Annual Meeting, 31 Mar. to 1 Apr. 1988, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Lists books, journals and newsletters relevant to weed science in Ethiopia, and institutions from whom information or reprints can be obtained.*

Pholan J. 1982. First results of weed control in tef. *Beitraege Zur Tropischen Landwirtschaft und Veterinarmedizin* 20:125-129. [in German].

Puelschen L. 1992. Impact of weediness on yield parameters of tef and wheat. var. durum at varying nitrogen fertilizer levels. In: Deutsche Arbeitsbesprechung ueber Fragen der Unkrautbiologie und -bekaempfung, Stuttgart-Hohenheim, 10-12 Mar 1992. *Zeitschrift fuer Pflanzenkrankheiten und Pflanzenschutz Spec.no.13.* p. 191-196. [in German]. *Studies the impact of varying level of weediness on the performance of tef and wheat. Increasing weediness caused a significant decline in crop yield. According to the author, the application of nitrogen fertilizer partly compensated for tef yield loss due to weeds.*

Reda F, Jones BMG, Parker C, Mengiste T, Bayou W, Cheverton M, Pullan M. 1989. *Striga hermonthica* on tef. Institute of Agricultural Research (IAR) Newsletter of Agric Research Vol. 4, No. 1, pp. 1-3, Apr. 1989, Addis Ababa, Ethiopia. *Reports the effects of Striga on tef in three different areas (Gojam, Northern Welo, and Abay Gorge), and its significance.*

Reda F. 1991. Studies on *Striga* host-range and sorghum genotype screening for resistance. pp. 545-550. In: J.K. Ransom, L.J. Musselman and A.D. Worsham (Eds.) Proceedings of the Fifth International Symposium of Parasitic Weeds, 24-30 June 1991, Nairobi, Kenya. CIMMYT (International Maize and Wheat Improvement Center), Nairobi. *Studies the host range of Striga species in pot experiment in which samples of S. hermonthica, S. forbesii and S. aspera were compared for parasitism on major crops including tef. According to the author, tef was not affected by any of the striga species.*

Reda F. 1995. *Striga* research in Ethiopia: achievements and future prospects. Nazret Research Center, Nazret, Ethiopia. *Indicates crop productivity problems due to Striga. According to the author, tef has also been reported to be infested by Striga hermonthica.*

Sahile G. 1982. Competition between *Cyperus rotundus* and cereal crops for nutrient and water. PhD Thesis, Justus-Liebig-Universität, Giessen, Germany. 159pp. *Investigates the competition between Cyperus rotundus and cereal crops (rice, tef, wheat and maize) for nutrient and water. According to the findings, the losses caused by C. rotundus were 54 for rice, 52% for tef, 30% for wheat, and 21% for maize.*

Sherif AM. 1989. The botanical nature of weed problems in Ethiopia. pp. 17-21. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia. 14-15 May 1987, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Lists problematic parasitic, annual and perennial weeds in different regions in Ethiopia.*

Sherif AM. 2004 *Competition effects of purple nutsedge (Cyperus rotundus L.) on growth and yield of tef in Ethiopia.* PhD thesis, University of Putra, Malaysia. *Investigates the competition of purple nutsedge on tef at three locations (Alem Tena, Debre Zeit and Tullu Bollo) in Ethiopia. With increased soil fertility, purple nutsedge becomes aggressive and has impact on the reduction of plant height and grain yield of tef.*

Slotvsov RI, Ratnikov A, Tegegn T. 1980. Comparative efficiency of some herbicides on tef. pp. 152-156. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Studies the efficiency and selectivity of different rates and methods of application for five herbicides plus check on tef.*

Slotvsov RI, Ratnikov A, Tegegn T. 1980. Practical trial of some herbicides on maize and tef on the field of farmers' association. pp. 171-178. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Demonstrates the efficacy of recommended herbicides for maize and tef in farmers' fields in Ambo area where broadleaved weeds predominate the tef field.*

Slotvsov RI, Ratnikov A, Tegegn T. 1980. Studies on the efficiency of cultural practices and chemical means of weed control in wheat, tef and maize. pp. 157-171. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Determines the influences of different methods of soil preparation, density of plant stand, methods of weed control and their interaction on weed infestations and yields of wheat, maize and tef.*

Slotvsov RI, Ratnikov A, Tegegn T. 1980. The inventory of weed infestation of major cereal growing areas and determination of the most dangerous and widely spread weed species. pp. 127-139. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Determines the level of weed infestation in crop fields. Regarding tef, up to the altitude of 2000 m both grass and broad leaf weeds had equal status, but from 2000 to 3000 m broad leaf weeds dominate. The calculated yield losses due to weeds are 23-33%.*

Slotvsov RI, Ratnikov A, Tegegn T. 1979. Yield losses of cereal crops due to weeds and perspectives of their control. pp. 87-96. In: Proceedings of Diseases, Pests and Weeds and Methods of their Control. Scientific Phytopathological Laboratory (SPL), Ambo, Ethiopia.

Indicates the yield losses in cereals due to weeds and control measures. For tef, one time handweeding decreased the weed infestation by 57%, while the application of Gesaten decreased the weeds by 53%.

Slovtsov RI, Ratnikov A, Tegegn T. 1980. Yield losses in wheat, teff and maize due to weed infestations in Ethiopia. African Journal of Agricultural Science (Addis Ababa, Ethiopia), Association for the Advancement of Agricultural Sciences in Africa (AAASA) 7 (1/2): 23-36.

Strekozov B, Slovtsov RI, Ratnikov A, Tegegn T. 1980. Working out weed control methods in agricultural crops. pp. 30-32. In: Scientific Phytopathological Laboratory (SPL) Progress Report for the Period Jan. 1979 to Dec. 1979. SPL, Ambo, Ethiopia. *Lists major weed species in tef and other cereals in Shewa and Welo Regions. The major weeds in tef were Guizotia scabra, Polygonum nepalense, Commelina spp, and Phalaris pallidifusca while the yield losses due to weeds reached up to 52%.*

Strekozov B, Yuhnin A, Tsiganok V, Ergano S. 1982. Study of herbicide effectiveness in teff. pp. 210-220. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1981. SPL, Ambo, Ethiopia. *Determines the effectiveness of chemical weed control in tef fields at Ambo. Although 18 weeds species were recorded, the dominant species were four, namely Phalaris paradoxa, Plantago lanceolata, Trifolium spp. and Guizotia scabra.*

Strekozov B. 1981. Investigation of the territory of cereal crops cultivation and determination of the most dangerous and widely spread weed species. pp. 163-164. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Studies weed infestations in major cereal crops including tef at different locations in Shewa, Arsi, Gojam, Harerghe, and Wellega Regions.*

Stroud A. 1989. Research activities needed by extension to promote appropriate weed management technology for small farmers and cooperatives. pp. 129-140. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 14-15 May 1987, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Indicates what the extension worker from research institute needs to know with regard to weed research.*

Stroud A. 1989. Weed management in Ethiopia, an extension and training manual. Food and Agriculture Organization (FAO), Technical Cooperation Programme, Rome. 237pp. *Provides concepts of weed management, general information on herbicides, methods of problem identification, and recommendations for weed control. According to the author, the critical weed free period for tef is 3-7 weeks after emergence and yield losses due to poor or no hand weeding ranges between 23-65%.*

Tadele Z, Stroud A, Haile M. Unpublished. Weed Population in tillage systems study for tef. Paper Presented at the Tenth Anniversary of the Ethiopian Weed Science Conference, 24-25 Nov. 1992, Addis Ababa, Ethiopia.

Tadele Z, Stroud A, Haile M. 1996. Evaluation of non-selective herbicide for no-tillage tef. In: Fessehaie R. (Ed.) AREM 1:48-56. Ethiopian Weed Science Society Conference, Addis Ababa, Ethiopia.

Tadele Z. 1993. Effect of minimized tillage and modified weed management on tef production. MSc Thesis, Alemaya University of Agriculture, Ethiopia. *Reports the results of three experiments conducted at and around Debre Zeit, Ethiopia. The experiments were, i) studying the major production problems related to tef production, ii) comparing the effects of different tillage systems on tef production, and iii) evaluating two non-selective herbicides at different rates for no-tillage tef production.*

Tadios T, Bogale T, Eshetu T. 1996. Effect of tillage and handweeding frequency on weed control and yield of tef at Melko, Jimma. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Tadios T, Eshetu T, Bogale T. 1997. Effect of tillage and hand weeding frequency on weed control and yield of tef. In: Reda F, Tanner DG (Eds.) Proceedings of the Ethiopian Weed Science Society, Addis Ababa (Ethiopia), 15-16 Dec 1994. EWSS, Addis Ababa. Ethiopian Weed Science Society, Addis Ababa, AREM 2&3, pp 110-115. *Investigates the effects of tillage and weeding on tef performance at Melko, Jimma. The highest tef yield was obtained from four times oxen plowing and three times hand weeding.*

Takele A, Gebeyehu H. 1986. Effect of seeding rates and frequency of weeding on the seed yield of tef. In: Kobbu Agricultural Research center, Progress Report, Kobbu, Ethiopia.

Takele A, Gebeyehu H. 1988. Effect of seeding rates and frequency of weeding on the seed of teff. pp. 18-19. In: Kobo Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa Ethiopia. *Investigates the effects of three seeding rates (20, 25 and 30 kg ha⁻¹), and four frequencies of weeding (no, one, two and three) on local tef variety. No significant yield difference was obtained due to treatments.*

Tanner DG. 1990. Some comments on methodology in weed science: 2. herbicides research trials. pp. 45-57. In: Proceedings of the Sixth Ethiopian Weed Science Committee (EWSC) Annual Meeting, 31 Mar. to 1 Apr. 1988, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Discusses various aspects of methodology pertaining to herbicide trials and evaluation.*

Tefera T. 2002. Allelopathic effects of Parthenium hysterophorus extracts on seed germination and seedling growth of Eragrostis tef. Journal of Agronomy and Crop Science 188:306-310. *Investigates the allelopathic effects of Parthenium hysterophorus on seed germination and seedling growth of tef. According to the author, increasing concentrations of aqueous extracts of Parthenium from leaf and flower inhibited tef germination; complete failure of germination was recorded when the extract concentration from the leaf was 10 %.*

Teferdegn T, Gebremariam G. nd. Determination of stage development of competition of weeds in cereal crops (teff). pp. 468-472. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1987/88. SPL, Ambo, Ethiopia. *Investigates the critical period of*

competition between tef and different weed species so that a right time of weed removal can be made.

Tesema T, Lema Y. 1998. Qualitative and quantitative determination of weeds in tef in West Shewa Zone. *Arem* 4:46-60. *Investigates the abundance and composition of weeds in major tef growing areas. The most frequent, abundant, and dominant weed species were Polygonum nepalense, medicago polymorpha, Guizotia scabra, Plantago lanceolata, Galinsoga parviflora, Anagalis arvensis, Spergula arvensis, Corrigiola capensis, Phalaris pardoxa, Setaria spp., Cyperus spp., and Andropogon abyssinicus.*

Unger J. 1984. Principles and practices of weed management. Addis Ababa university, College of Agriculture, Alemaya, Ethiopia.

Unger J. 1989. Problems and prospects of weed management in Ethiopian cereal production. *Beitrage zur Tropischen Landwirtschaft und Veterinarmedizin.* 27:227-233. *Reviews weed control practices such as crop rotation, seedbed preparation, and cultural and chemical weed control in Ethiopia with special emphasis on cereals including tef. Also suggests potential improvements for each weed control method.*

Wale M. 1989. Review of crop protection research at Kobo and recommendations for future research. Institute of Agricultural Research (IAR) Newsletter of Agric. Research. Vol. 4, No. 3/4, pp. 1-3, Oct. 1989. *Reviews the activities of crop protection research at Kobo for sorghum, tef and pulses plus recommendations. In tef fields about 60 weed species were recorded.*

Wale M. 1993. Weeds of sorghum and tef in Raya-Kobo Awraja, Welo Region. pp. 31-35. In: Rezene Fessehaie (Ed.) Proceedings of the Seventh Annual Conference of the Ethiopian Weed Science Committee, 13-14 Apr. 1989, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Presents list of common weed species in Raya-Kobbo Awraja of Welo Region. Also indicates densities of common weeds in sorghum and tef fields at Kobo Research Center. Major weeds in tef fields were Launea cornuta, Echinochloa colona, Cyperus rotundus, Gynandropsis gynadra, and Commelina latifolia.*

Wilson AK. 1989. The post emergence selectivity in warm-climate species of some recently developed herbicides; AC 263499, BAS 514 OOH, CGA 131036, DPX-L5300 and DPX-A7881. Technical Report, Institute of Arable Crops Research, Long Ashton Research Station, No. 100, UK. 50 pp. *Evaluates five herbicides as overhead post-emergence treatments in a greenhouse pot experiment on 38 crop and weed species of tropical or warm temperate regions including tef. Tef and rice were the only crops tolerant to 0.05 and 0.01 kg ha⁻¹ of CGA. According to the author, the control of annual grasses such as Bromus pectinatus, Phalaris minor and Snowdenia polystachya from tef fields is important in Ethiopia.*

Yirgou D. 1969. Control of weeds in teff plots. pp. 57. In: Melak-Hail Mengesha (Ed.) Progress Report on Agricultural Research Activities. College of Agriculture, Haile Selassie I University (HSIU), Alemaya, Ethiopia. *Compares the cost herbicides and handweeding for*

tef when the costs of 2,4-D herbicide was 5.75 birr ha⁻¹ and one time handweeding was 15 birr ha⁻¹.

Yuhnin A, Tsiganok V. 1982. Tef herbicide assessment trial on pellic Vertisols of Ambo region. In: Proceedings of the Fourteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1982, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the results of herbicide screening trial for tef from 1977 to 1981. The dominant weed species were Phalaris paradoxa (51%), Plantago lanceolata (15%), Trifolium spp. (11%) and Guizotia scabra (5%). Regarding the weed control, two recommendations were given: i) Gesaten (2.0 kg a.i. ha⁻¹) and Terbutrin (0.5 kg a.i. ha⁻¹) applied 2-3 weeks presowing, or ii) mixture of Primagram and MCPA (1.0 + 1.2 kg a.e. ha⁻¹) applied at tillering.*

18. Pests and Control Measures

Abdulahi A, Haile A. 1986. Survey of termite problems in Wellega Administrative Region. Committee of Ethiopian Entomologists (CEE) Newsletter Vol. 5, No. 2, pp. 4-9, Jan. 1986, Addis Ababa, Ethiopia. *Reports the results of the survey made to determine the problems of termites in five Woredas (Menesibu, Jarso, Ghimbi, Sassiga, and Gobo Sayo) of Wellega Administrative Region. The damage was high in field crops and uncultivated fields.*

Abdulahi A. 1983. Termite control campaign in Wellega. Committee of Ethiopian Entomologists (CEE) Newsletter Vol 3, No. 2, pp. 6-7, Oct. 1983, Addis Ababa, Ethiopia. *Reports the activities made in Wellega Region to control termites—a serious agricultural pest in the region—by farmers and staff of Ministry of Agriculture (MoA) using various means (flooding mounds, removal of queen, mound destruction, herbicide application, etc.).*

Abdulahi A. 1992. Termites of Agricultural Importance in Western Ethiopia. Ethiopian Journal of Agricultural Science 13:21-29. *Describes agriculturally important termites in western Ethiopia. Macrotermes subhyalinus was the most important pest species that caused crop damage by cutting the base of the stem at ground level on farmers' fields. The crops severely infested were maize, tef, finger millet, pepper, sugarcane and eucalyptus.*

Ali K. 1982. Chemical control of the Welo bush cricket. Committee of Ethiopian Entomologists (CEE) Newsletter. Vol. 1, No. 2, pp. 19, Feb, 1982, Addis Ababa, Ethiopia. *Investigates the effects of different chemicals on Welo bush cricket (or Degeza), a damaging pest of tef in Ethiopia. Recommendations for the control are 7-10 kg ha⁻¹ of 2.0%, or 15-20 kg ha⁻¹ of 1.0% home-formulated lindane dust.*

Anon. 1971. Field pest—survey. pp. 145-149. In: Holetta Guenet Research Station Progress Report for Apr. 1970 to Mar. 1971, Addis Ababa, Ethiopia. *Reports the results of pest survey in the high altitude crops. In tef, an anthomyid fly (unknown species) caused severe damage at Jiren farm of Jimma Institute of Agriculture where the crop loss was between 11 to 42%.*

Anon. 1973. Field pest survey. pp. 81-83. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of pest survey where nine new pests were discovered in various areas and crops. The pest recorded in tef fields was tef epilachna (Epilachna similis).*

Anon. 1974. Tef sowing date and shoot-fly control trial. pp. 64. In: Jimma Research Station Progress Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates four sowing dates and four seed dressing methods on the control of shoot fly. There was significant difference in tef seed yield due to sowing dates.*

Anon. 1975. Seed dressing of teff (Kulumsa). pp. 191. In: Report on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 111, Asella, Ethiopia. *Compares the effects of seed dressing insecticides and fungicides on the control of maggot, a pest that damages tef fields around*

Kulumsa in previous years. Since no serious maggot damage occurred during the experimental year, no significant yield differences were obtained.

Anon. 1975. Seed treatment trials. pp. 72-73. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations 1974/75. EPID Publication No. 41, Addis Ababa, Ethiopia. *Determines whether seed treatment in demonstration fields for cereals would increase grain yield. A yield increment due to seed treatment 11% for tef, 17% for wheat, 30% for barley and 34% for maize. The two treatments for tef were control Aldrin 40% WP (2 g kg⁻¹).*

Anon. 1976. Entomology. pp. 90-94. In: Annual Report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Lists major insect pests of crops in Ethiopia. According to the report the major tef pest was red tef worm.*

Anon. 1976. Tef sowing date and shoot-fly control trial (Jimma). pp. 32. In: Annual report for Apr. 1973 to Mar. 1974. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the effects of sowing dates and insecticides on the control of shoot fly at Melko, Jimma.*

Anon. 1977. Barley fly control in teff. pp. 216. In: Holetta Guenet Research Station Progress Report Apr. 1974 to Mar. 1975. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of six trials carried out at Debre Zeit area to control barley fly from tef fields. Due to low level of infestation, no significant yield differences were obtained among the treatments.*

Anon. 1977. General field pest survey. pp. 159-161. In: Holetta Guenet Research Station Progress Report for Apr. 1975 to Mar. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1977. Pest biology and control: Mendi termite. pp. 162. In: Holetta Guenet Research Station Progress Report Apr. 1975 to Mar. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1977. Pest biology and control: Welo bush cricket. pp. 162. In: Holetta Guenet Research Station Progress Report Apr. 1975 to Mar. 1976. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1977. Summaries on pest research activities (Institute of Agricultural Research (IAR)). pp. 247-249. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee, IAR, Addis Ababa, Ethiopia. *Presents summary of pest research at the Institute of Agricultural Research (IAR) and the status of major pests in the country. Regarding tef, the major pests were tef fly (*Hylemya arambourgi*), red tef worm (*Mentzxya ignocollis*), and tef black beetle (*Erlagherius niger*). Tef fly is a serious pest in some regions, but tef red worm is a pest becoming more important on Vertisols of Jimma, Bako, Dejen and Tefki.*

Anon. 1979. Tef fly control trial. pp. 280. In: Holetta Guenet Research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the effects of five insecticides on percent attack of tef fly and yield of tef at Illala site of Mekele Research Station.*

Anon. 1982. Demonstration of striped blister beetle control. pp. 186. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the major findings on the control of striped blister beetle, an important pest of young tef in Kobo area.*

Anon. 1982. Identification of *Helminthosporium species* on tef. pp. 187-188. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Briefly mentions the attempt made to study the distribution and economic importance of tef smudge (*Helminthosporium miyke*) in the laboratory at Holetta.*

Anon. 1982. Observation on the biology of black tef beetle. pp. 185. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates the major findings on the biology (major hosts, migration time, damage and life cycle of insect) of black tef beetle based on the study made at Debre Zeit.*

Anon. 1982. The biology and control of red tef worm in Becho area. pp. 186. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents a brief account on the biology and control of red tef worm. Also indicates a chemical control observation in farmer's field near Teji.*

Anon. 1983. Black tef beetle control at Berfeta, 1978. pp. 5. In: Crop Protection Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that due to the absence of sufficient infestation in the Berfeta area, near Holetta, the tef beetle control experiment was not executed in 1978 season.*

Anon. 1983. Black tef beetle control observation at Berfeta. pp. 72. In: Crop Protection Department Progress Report for 1977/78. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of chemical control of black tef beetle where all of the tested chemicals (Carbaryl 85% WP, Fenitrothion 50% ULV, Malathion 96% ULV, and Trichlorfon 50% ULV) were effective against the pest at Berfeta, near Holetta.*

Anon. 1983. Chemical control of black tef beetle, 1979/80. pp. 148-150. In: Crop Protection Department Progress Report for 1979/80. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates four insecticides (Carbaryl 85% WP, Fenitrothion 50% ULV, Malathion 96% technical, and Trichlorfon 50% ULV) against black tef beetle at Berfeta. For small scale farmers, Carbaryl 85% WP is recommended due to its cheapness than ULV chemicals.*

- Anon.** 1983. Control of tef epilachna on tef and finger millet at Gimbi or Nedjo, 1978. pp. 5. In: Crop Protection Department Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that due the absence of adequate infestation by this sporadic pest, the trial was not executed.*
- Anon.** 1983. Red tef worm control trial at Tulu Bolo. pp. 72. In: Crop Protection Department Progress Report for 1977/78. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that the trial was not conducted in 1977 since there was no infestation of the pest.*
- Anon.** 1983. Red tef worm control trial using ULV formulations at Tulu Bollo and Bako. pp. 5. In: Crop Protection Department Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that the experiment was not conducted at both locations due to absence of infestation at Bako.*
- Anon.** 1983. Tef fly control at Mekele, 1978. pp. 5. In: Crop Protection Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly indicates the results of three years trial to control tef fly at Mekele. Infestation by the fly was light in all seasons, hence no significant differences were obtained among the treatments. In normal seasons with adequate rainfall, heavier attacks by the fly maggots can be sustained by tef crop. But in dry periods with low rainfall and distribution, heavy damage can not be sustained by the crop.*
- Anon.** 1983. Tef fly control trial at Mekele. pp. 77-78. In: Crop Protection Department Progress Report for 1977/78. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of chemical control tef fly conducted for the second time at Illala, Mekele. However, no significant effect was observed on damage and seed yield of tef.*
- Anon.** 1985. Biology and survey of red tef worm. pp. 24. In: Department of Crop Protection Progress Report for 1983/84. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the biology of red tef worm especially the life cycle, fecundity and number of generations. Also presents results of the survey conducted in Becho, Jimma (Serbo) and Dejen areas regarding red tef worm.*
- Anon.** 1985. Host preference of *Diuraphis noxius*. pp. 24-25. In: Department of Crop Protection Progress Report for 1983/84. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies in the laboratory and field condition crop hosts for aphids. According to the finding, tef is one of the host for the aphid.*
- Anon.** 1985. Host preference studies of *Diuraphis noxius*. pp. 33-34. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates host preference for aphid (*Diuraphis noxius*) in the laboratory and in field at Holetta. The hosts of the pest were tef, barley, wheat, oats, and *Bromus pectinatus*.*
- Anon.** 1985. Method of alderin application on tef for termite control. pp. 435-46. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural

Research (IAR), Addis Ababa, Ethiopia. *Evaluates various doses of aldrin and methods of application on the control of termites and tef yield. Yield differences among different levels of aldrin for direct seed dressing were significant for both methods.*

Anon. 1986. Assessment of crop loss in tef due to the attack of black tef beetle, *Erlangerius niger*. pp. 33. In: Department of Crop Protection Progress Report for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Assesses yield loss in tef due to black beetle (a serious and sporadic pest in Berfeta area near Holetta) using four insecticides and check, where accepted level of control was obtained with all chemicals tested.*

Anon. 1986. Host preference of *Diuraphis noxius*. pp. 20. In: Department of Crop Protection Progress Report for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that hosts of aphid (Diuraphis noxius) are tef, barley, wheat, oats, and Bromus pectinatus.*

Anon. 1986. Method and rate of aldrin application on tef to control termite damage. pp. 44-45. In: Department of Crop Protection Progress Report for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares three methods of aldrin application (namely seed dressing, mixing with fertilizer, and soil application) and three rates of aldrin application for their effect on termites in tef fields at Kejo. However, no significant effect was observed on tef yield due to treatments.*

Anon. 1986. Red tef worm EC and ULV chemical control trials, 1984. pp. 46-47. In: Department of Crop Protection Progress Report for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates the effect of EC and ULV chemicals on controlling red tef worm, a serious pest of tef on black, deeply cracking, waterlogged clay soils.*

Anon. 1986. Survey and collection of crop pests based at Holetta. pp. 8-10. In: Department of Crop Protection Progress Report for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports about the survey and collection of insects from Shewa, Arsi, Gojam, Gondor and Welo Regions in cereals (including tef), oilseeds and pulses fields. Insect pests of tef are barley fly and army worm during seedling stage, and black tef beetle and red tef worm during grain filling period.*

Anon. 1987. Observation on the tef black beetle (*Erlangerius niger*). pp. 32. In: Department of Field Crops, Tef Progress report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the biology of tef black beetle (starting from its initial appearance), and host plants.*

Anon. 1987. Preliminary observation on the laboratory behaviour, survival and carry-over potential of field collected cereal grasshoppers through rearing on tef plants. pp. 30-31. In: Department of Field Crops, Tef Progress report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Studies the biology of grasshoppers through successful rearing and maintenance on tef plant.*

Anon. 1987. Preliminary survey, collection and identification of cereal grasshoppers in the Debre Zeit area. pp. 30. In: Department of Field Crops, Tef Progress report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the result of survey, collection and identification of grasshoppers damaging cereals (including tef) around Debre Zeit. The six species identified were Paracinema tricolor, Acrida sulphurpennis, Aiolopus thalassinus, Aiolopus longicornis, Aiolopus fieber, and Chrotognus seruille.*

Anon. 1987. Test on effectiveness of insecticides against grasshoppers on tef. pp. 31. In: Department of Field Crops, Tef Progress report for 1985/86. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates two insecticides each at three rates for their effect on grasshoppers in tef fields.*

Anon. 1990. Assessment of different types of application equipment on the control of red tef worm. pp. 259-260. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Assesses three types of ULV application equipment on controlling red tef worm at Becho farmers' fields.*

Anon. 1990. Assessment of yield loss in tef due to attack by black tef beetle, *Elongerius niger*. pp. 258. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Assesses the yield loss in tef due to black tef beetle at Berfeta. Since infestation was not adequate, chemical spray was not applied.*

Anon. 1990. Host preference studies of barley fly at Holetta. pp. 261. In: Holetta research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Assesses the damages caused by barley fly on host plants. According to the report, barley and tef are the most preferred hosts for the pest.*

Anon. 1990. Pheromone study on red tef worm. pp. 258-259. In: Holetta research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies and evaluates the type of pheromone in red tef worms. Since the larvae collected from Becho werenot adequate for the study, the experiment was not excuted.*

Anon. 1990. Prediction of army worm outbreak--Holetta. pp. 268-269. In: Holetta research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Predicts the outbreak of army worm using light trap and pheromone trap at Holetta. Only five moths of Spodeptera exempta were caught in the light trap in July 1986. Migration by this pest is limited and not important around Holetta.*

Anon. 1990. Survey and collection of insect pests. pp. 265-266. In: Holetta research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents survey results conducted in Arsi, Bale and Gojam to identify the types of pests and their economic significance. The major tef pests reported were grasshopper and epilachna.*

Anon. 1990. Survey of barley fly natural enemies and host plants. pp. 260. In: Holetta research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates plant species which are hosts for barley fly. The hosts*

indicated are oats, tef, barley, wheat, bermuda grass (*Cynodon dactylon*), *Digitaria* spp., *Setaria* spp., *Phalris paradoxa*, and *Cynodon ethiopicus*.

Anon. 1990. Survey, collection and identification of rodent pests in Ethiopia. pp. 317-319. In: Holetta research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates rodent pests, their pest status and crops attacked in five Awrajas of Shewa. From 28 species existed in the region, tef pests are, i) Arvicanthis dembeensis (in Shewa Robit), and ii) A. abyssinicus (in Addis Alem).*

Anon. nd. Seed dressing trial for tef in 1978/79. pp. 27-28. In: Tef Annual Reports, 1977-1982. Addis Ababa University (AAU), Debre Zeit Agricultural Research Center (DZARC), Debre Zeit, Ethiopia. *Presents the results of seed dressing trial in controlling shoot fly in tef but the treatment does not have effect on seed yield of tef.*

Anon. nd. Survey of insect pests of field crops in the vicinity of Debre Zeit, 1978/80. II—tef. pp. 4-7. In: Crop Protection Annual Reports, 1977-1982. Addis Ababa University, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Reports insect pests which are well recognized by local farmers, which include grasshoppers, tef shoot fly, tef epilachna, and tef black beetle. For each insect, its importance, life cycle, and control measures are indicated.*

Belay T, Woldu Z. 1998. Barley fly incidence on tef in Tigray. EARO, Addis Ababa, Ethiopia.

Berhe T. 1972. Insecticide trial on *Eragrostis tef*. Haile Selassie I University (HSIU), College of Agriculture, Debre Zeit Agric. Expt. Station, Debre Zeit, Ethiopia.

Boxall RA. 1974. Improvement of traditional grain storage pits in Harar Province, Ethiopia; a preliminary investigation. *International Pest Control* 16(5):4-7.

Boxall RA. 1974. Underground storage of grain in Harar Province in Ethiopia. *Tropical Stored Products Center (UK)* 28:39-48

Chichaybelu M, Damte T, Gebremedhin T. 2001. Entomological research in tef. In: *Narrowing the Rift: Tef Research and Development*. Tefera H, Belay G, Sorrells M (Eds), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 223-235. *Presents the major tef pests and control measures. The major tef pests are Wello Bush Cricket, Red Tef Worm, Tef Fly, Black Tef Beetle and grasshoppers.*

Crowe TJ, Gebremedhin S. 1977. Crop pest handbook. Third (revised) edition. Institute of Agricultural Research, Addis Ababa, Ethiopia. 55pp. *Presents the general guide to recognition and control of most important pests in Ethiopia. According to authors, general pests at seedling are crickets, grasshoppers, termites, cut worms, and Gojam red ant (*Dorylus* spp.), while tef pests are Welo bush cricket, red tef worm, army worm, barley fly, tef epilachna, and black tef beetle.*

- Crowe TJ, Gebremedhin T, Abate T.** 1977. An annotated list of insect pests of field crops in Ethiopia. Institute of Agricultural Research, Addis Ababa, Ethiopia. 71pp. *Lists major and minor pests in Ethiopian agriculture. Pests recoded in tef fields were red tef worm (Lepidoptera), maize leaf minor (Diptera), barley fly (Diptera), tef epilachna (Coleoptera), and black tef beetle (Coleoptera).*
- DLCO** (Desert Locust Control Organization). 1987. The African army worm. DLCO, Nairobi, Kenya. 18pp. *Reports the nature of damage, life cycle, natural enemies, migration, outbreaks, and control of army worm (Spodeptera exempta). Also indicates that the pest causes considerable damage to grasses including range grass, wheat, maize, tef, rice, sorghum, sugar cane and millet.*
- Gebremedhin T, Ali K.** 1984. Black teff beetle (*Erlangerius niger*) and its control. Committee of Ethiopian Entomologists (CEE) Newsletter Vol. 4, No. 2, pp. 18-22, Oct. 1984, Addis Ababa, Ethiopia. *Tests several insecticides against black tef beetle on small and large scale farms. Carbaryl 855 WP was recommended for small scale farms since it is easier to use and cheaper than ULV insecticides.*
- Gebremedhin T, Mathews GA.** 1986. The biology of red tefworm, *Mentaxya ignicollis* (Walker) (Lepidoptera: Noctuidae). Ethiopian Journal of Agricultural Sciences 8(2):103-114. *Studies the biology of red tef worm in the laboratory and field studies in Ethiopia. Four generations of red worm could be gerated in a year both in laboratory and field. The larvae feed on the leaves of tef and developing seeds which are in the milky stage. During the day, larvae were found in the shade or were hidden in cracks in the soil; feeding occurred during the night.*
- Gebremedhin T, Mulatu B.** 1991. Assessment of different types of application equipment on the control of red tef worm. pp. 150. In: Holetta Research Center Progress Report from Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Briefly indicates that lower number of live worms were counted from sprayed and control plots indicating that the drifting of the spray was minimal.*
- Gebremedhin T.** 1979. Chemical control of barley fly, *Delia arambourgi* (Seguy), (Diptera: Anthoyiidae). pp. 72-78. In: Proceedings of Diseases, Pests and Weeds and Methods of Their Control. Scientific Phytopathological Laboratory (SPL), Ambo, Ethiopia. *Investigates the effects of four insecticides plus the check on infestation of barley fly (a serious pest of tef) on red hill and Vertisols of Holetta Research Center.*
- Gebremedhin T.** 1986. The biology and control of red tef worm, *Mentaxya ignicollis* (Walker) (Lepidoptera: Noctuidae) in Ethiopia. Ph.D. Thesis, University of London, Imperial College of Science and Technology, UK.
- Gebremedhin T.** 1987. Red tef worm, *Mentaxya ignicollis* (Walker), a pest of tef. Committee of Ethiopian Entomologists (CEE) Newsletter Vol. 7, No. 1, pp. 3-8, July 1987, Addis Ababa, Ethiopia. *Reports the status, symptoms of attack, life history, natural enemies, alternative hosts and control measures for red tef worm. According to the author, red tef worm is a very important pest on black soil which is deeply cracking soils.*

Gebremedhin T. 1987. The control of red tef worm, *Mentaxya ignicollis* (Walker) (Lepidoptera: Noctuidae) in Ethiopia. *Tropical Pest Management* 33:170-172. *Evaluates the effect of insecticides on the control of red tef worm at Becho (Shewa Region) where main infestation occurs.*

Gebremedhin T. 1987. The control of red tef worm, *Mentaxya ignicollis* (Walker). Institute of Agricultural Research (IAR) Newsletter of Agric. Research Vol. 2, No. 1, pp. 13-16. Mar. 1987, Addis Ababa, Ethiopia. *Reviews the work on controlling red tef worm, a pest which infests tef in Shewa, Kefa, Gojam, Wellega and Tigray regions. Grain losses of up to 24% were recorded in Becho, Shewa Region. Economic losses begin at 20 larvae m⁻² particularly when the damage occurs in October during grain filling or milky stage of tef.*

Gebremedhin T. 1989. Research approach and monitoring pest management practices in Ethiopia. pp. 108-113. In: Proceedings of the Twentieth National Crop Improvement Conference, 28-30 Mar. 1988, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the importance of pests, usage of chemicals and evaluation of alternative control approaches in Ethiopia. The major insect pests for tef were red tef worm, Mendi termite, grasshopper, and Welo bush cricket. The estimated tef yield losses were 24% by red tef worm, 20-50% by Mendi termite, and 25-35% by grasshoppers.*

Gebremedhin T. nd. Assessment of different types of application equipment on the control of red tef worm. pp. 99. In: Holetta Research Center Progress Report for Apr. 1988 to Mar 1989, Ethiopia. *Assesses different ULV application equipment in controlling red tef worm.*

Habtewold T, Landin J, Wennergen U, Bergman KO. 1995. Life table for the tef grasshopper *Aiolopus longicornis* under laboratory conditions and demographic effect of the pathogen *Nosema locustae*. *Biological Control* 5:497-502. *Investigates the effects of biocontrol microorganism (Nosema locustae) on the grasshopper in the laboratory. The treatment with N. locustae reduced the intrinsic rate of population growth and net reproductive rate. Hence, N. locustae can be considered as a potential control agent for field testing.*

Habtewold T, Landin J. 1992. Composition and structure of Orthopteran faunas in cereal crops in Ethiopia. *Bulletin of Entomological Research* 82:29-39. *Examines the assemblages of adult grasshopper at four localities in tef and wheat fields. Aiolopus longicornis was the most dominant species.*

Habtewold T. 1993. Ecology and management of grasshoppers (Orthoptera) of cereals in central Ethiopia. PhD Thesis, Swedish University of Agricultural Sciences, Department of Plant and Forest Protection, Uppsala, Sweden. 129 pp. *Studies the ecology and management of grasshoppers of cereals in central Ethiopia and in the laboratory in Sweden. Of 30 grasshopper species present in the area, A. longicornis is the most important pest where the peak of its abundance and reproduction coincides with periods of short and long rains.*

Habtewold T. 1999. Seasonal abundance and breeding habits of *Aiolopus longicornis* (Orthoptera: Acrididae) in cereal crops in central Ethiopia. *Pest Management Journal of Ethiopia* 3:1-12.

Haile A, Ali K. 1986. A review of research on the control of insect pests of small cereals in Ethiopia. pp. 57-77. In: Tsedeke Abate (Ed.) *Proceedings of the First Ethiopian Crop Protection Symposium, a Review of Crop Protection Research in Ethiopia, 4-7 Feb. 1985, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Indicates major pests of barley, wheat and tef and their control measures. According to authors, the major pests of tef are Welo bush cricket, black tef beetle, ted tef worm, locusts and African army worm, and Mendi termite.*

Haile A, Gebrekal B, Yemane A. 1985. Comparison of termite mound control with aldrin 40% WP and chlordane 40% WP in Sassiga—Wellega Administrative Region. *Committee of Ethiopian Entomologists (CEE) Newsletter* 5(1):15-18. *Verifies whether Chlordane or Aldrin effectively controls termite. According to the findings, 40% WP Aldrin showed a 100% control of the treated termite mounds; hence recommended for use.*

Haile A, Gebremedhin T. 1991. The importance and control of insect pests in small cereal production. pp. 30-36. In: *Proceedings of the Eleventh Annual Meeting of the Committee of Ethiopian Entomologists (CEE), 21-22 Feb. 1991, Addis Ababa, Ethiopia.* CEE, Addis Ababa. *Presents important insect pests of small cereals and their control measures. According to the findings, the major pests of tef are red tef worm, Welo bush cricket, and black tef beetle. Other pests are, African army worm (Spodoptera exepmta), desert locust (Scnistocerca gregaria), striped blister beetle, tef epilachna, tef fly, African boll worm, termites, and grasshoppers.*

Haile A. 2006. On-farm storage studies on sorghum and chickpea in Eritrea. *African Journal of Biotechnology* 5:1537-1544. *Evaluates damages caused on sorghum and chickpea due to storage pests. Tef seeds were used as a treatment along with sand and chemicals.*

Hill BG. 1963. Some common agricultural insects of Ethiopia and their control. Imperial College of Agricultural and Mechanical Arts, Haile Selassie I University (HSIU), Experiment Station Bulletin No 23, Dire Dawa, Ethiopia. 48pp. *Indicates harmful and beneficial insects in Ethiopia, and control measures for the harmful ones. The beneficial insects are honey bee, lace wing fly, lady bird beetle, wasps, Tachina fly, and praying mantids; where as the harmful insects include, stored grain insects, cotton cushion scale, desert locust, aphids, maize stalk borers, ants, leaf hoppers, army worm, termites, thrips, darkening beetle, cut worms, grasshoppers, and flat headed borer.*

IAR (Institute of Agricultural Research). 1967. Army worm research. IAR, Addis Ababa, Ethiopia. 4pp. [in Amharic]. *Provides answers for some queries referring to army worm. The queries are, i) what is the army worm and their types, ii) what crops it attacks, iii) when does the outbreak occur, and iv) what should be done when the pest is seen on crops.*

IAR (Institute of Agricultural Research). 1971. Armyworm in Ethiopia. IAR, Addis Ababa, Ethiopia. 16pp. [in Amharic]. *Indicates economic significance of army worm, areas where*

the outbreak occur, periods of reproduction, crops affected, life cycle and control measures. According to the report, from 1960 to 1970 the area destroyed by the pest was 0.4 mio ha from crop fields, and 0.3 mio ha from pasture. Regarding tef, estimated loss in the area was 0.2 ha, production loss was 1.3 mio q, and in value terms 28.3 mio birr.

IAR (Institute of Agricultural Research). nd. Army worm: its recognition and control. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 24pp. [in Amharic and English]. *Presents host plants and damage, life history, outbreaks, natural control and chemical control of army worm. The hosts for this pests are grass family (graminae) from which tef is one.*

Kassa A, Tadesse A. unpublished. Yield losses in tef caused by barley fly at Bako. Paper Presented at the Fourth Annual Conference of Crop Protection Society of Ethiopia, 23-24 May 1996, Addis Ababa, Ethiopia.

McDaniel B, Boe A. 1990. A new host record for *Eurytomocharis eragrostidis* Howard (Chalcidoidea:Eurytomidae) infesting *Eragrostis tef* in South Dakota. Proceedings of the Entomological Society of Washington (USA) 92:465-470.

McFarlane JA, Dobie P. 1972. The susceptibility of tef to infestation by some insect pests of stored grain. J. Stored Prod. Res. 8:177-182. *Investigates the susceptibility of tef seeds to eight species of stored pests compared to wheat.*

McFarlane JA. 1969. Specialist study of stored products problems in Ethiopia: preliminary report and recommendations. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 55pp.

Mulatu B, Abate T. 1996. Survey Results on the Welo bush cricket. pp. 37-44. In: Eshetu Bekele, Abdurahman Abdulahi and Ayenekulu Yemane (Eds.) Proceedings of the Third Annual Conference of the Crop Protection Society of Ethiopia (CPSE), 18-19 May 1995, Addis Ababa, Ethiopia. CPSE, Addis Ababa. *Indicates the status, distribution and frequency of occurrence and level of damage caused by Welo bush cricket. Areas surveyed were in North Western Shewa (Debre Libanos, Girar Jarso, Wara Jarso Woredas), East Gojam (Dejen, Ense Sarmidir and Awbal Woredas), West Gojam (Tis Abay), Tigray (Indaba Guna), North Wollo (Sekota and Delanta), South Wollo (Debre Sina).*

Mulatu B, Gebremedhin T. 1990. An overview of survey results of agricultural insect pests in Ethiopia. Committee of Ethiopian Entomologists (CEE) Newsletter Vol. 11, No. 1, pp. 10-19, July 1990, Addis Ababa, Ethiopia. *Presents insect pests of crops in Ethiopia which include order, family, and scientific names of pests and host crop plants. Tef pests reported were *Oedaleus senegalensis*, *Decticoides brevipennis*, *Erlangerius nigra*, *Cimsiguata muls*, *Metaxia ignicollis*, and *Prospalata conducta*.*

Negasi A, Getu E. 1989. General crop pest survey in Sidamo and Gamu-Gofa. pp. 29-31. In: Awasa Progress Report for 1986, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of crop pest survey for major crops in Sidamo and Gamu-Gofa Regions. Among tef pests, elegant grasshopper (*Zonocerus spp.*) caused sporadic damage.*

- Negasi A.** 1988. The status of armyworm (*Spodoptera exempta*) in Southern Ethiopia. Committee of Ethiopian Entomologists (CEE) Newsletter Vol. 8, No. 1, pp. 2-9, Jun. 1988, Addis Ababa, Ethiopia. *Reports the activities made to control armyworm in the Southern Ethiopia and damages caused by armyworm on various crops including tef, wheat and others.*
- Negasi A.** nd. Armyworm (*Spodoptera exempta*) and its control in Southern Ethiopia. pp. 21-33. In: Proceedings of the Ninth Annual Meeting of the Committee of Ethiopian Entomologists (CEE), 26-27 Jan. 1989, Addis Ababa, Ethiopia. CEE, Addis Ababa. *Indicates the efforts made to control armyworm from Southern Ethiopia from 1980 to 1987. Also reports the outbreak and control in 1988 at different locations for different crops including tef.*
- Singh J, Dhawan NL, Joshi AB.** 1961. New host plants of the top-shoot borer of maize (*Chilo zonellus*). Current Science 30:109-110.
- Stretch C, Tekleab K, Edwards SB.** 1980. The biology and control of Welo bush cricket (*Decticoidea brevipennis* ragge) (Orthoptera: Tettigoniidae): a pest of cereals in Ethiopia. SINET (an Ethiopian Journal of Science) 3:21-30.
- Tadesse A, Basedow T.** 2004. A survey of insect pest problems and stored product protection in stored maize in Ethiopia in the year 2000. Journal of Plant Diseases and Protection 111:257-265. *Assesses the presence and prevalence of insect pests through interviewing 115 farmers in 44 districts and 63 villages. From the interviewed farmers, 18 mixed maize with tef in stores to prevent infestation by pests.*
- Tadesse A, Kassa A.** 1996. The influence of sowing date on the damage by tef fly (*Delia armbourgi*) on tef in the Bako area. pp. 87-91. In: Bekele E, Abdulahi A, Yemane A (Eds.) Proceedings of the Third Annual Conference of the Crop Protection Society of Ethiopia (CPSE), 18-19 May 1995, Addis Ababa, Ethiopia. CPSE, Addis Ababa. *Determines the optimum time of planting tef at Bako that results in minimum damage by tef fly and maximum grain tef grain yield. According to the authors, the second to third week of July is the best time for planting tef in Bako area. Tef tolerates the infestation of shoot fly in the presence of adequate rainfall and fertilizer.*
- Tadesse A.** 1986. Methods and rate of aldrin application on tef to control termite infestation at Bako area. Proceedings of the 18th National Crop Improvement Conference, 24-26 April 1986, Nazerth, Ethiopia. IAR, Addis Ababa, Ethiopia.
- Tadesse A.** nd. Termites: problems and possible methods of control in agriculture with reference to Ethiopian condition. pp. 50-74. In: Proceedings of the Tenth Annual Meeting of the Committee of Ethiopian Entomologists (CEE), 7-9 Feb. 1990, Addis Ababa, Ethiopia. CEE, Addis Ababa. *Reviews problems and solutions to control termites (using biological, chemical and cultural methods). According to author, the species of termites described are 2200 while those found in Ethiopia are 570.*

Teferi A. nd. Termites: their damage and control on maize, tef and hot pepper in Assosa area. pp. 43-49. In: Proceedings of the tenth Annual Meeting of the Committee of Ethiopian Entomologists (CEE), 7-9 Feb. 1990, Addis Ababa, Ethiopia. CEE, Addis Ababa. *Conducts experiments to control termites from maize, tef and hot pepper fields in Assosa.*

Walker DJ, Boxall RA. 1974. An annotated list of the insects associated with stored products in Ethiopia, including notes on mites found in Harar Province. East African Agricultural and Forestry Journal 39:330-335. *Lists insect pests of stored products and mites for crops grown in Ethiopia including tef.*

19. Diseases and Control Measures

Abate D, Gashe BA. 1985. Prevalence of *Aspegillus flavus* in Ethiopian cereal grains, a preliminary study. *Ethiopian Medical Journal* 23:143-148.

Amogne S, Kassaye Z, Bekele E. 2001. Tef pathology research in Ethiopia. In: *Narrowing the Rift: Tef Research and Development*. Tefera H, Belay G, Sorrells M (Eds), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 215-222. *Indicates major diseases affecting tef cultivation and control measures which include host resistance, cultural and chemical methods. The prominent tef diseases were Tef Rust, Head Smudge and Damping-off.*

Andnew Y, Hulluka M. 1995. Response of tef germplasm to tef rust. In: Daniel LD (Ed.) *Proceedings of Regional Wheat Workshop for Eastern, Central and Southern Africa*. Njoro, Kenya, CIMMYT. pp, 202-205.

Andnew Y, Hulluka M. Fungicides screening against tef rust. pp. 23. In: *Proceedings of the Proceedings of the Fourteenth Annual Meeting of the Ethiopian Phytopathological Committee*, 30-31 Mar. 1989, Scientific Phytopathological Laboratory (SPL), Ambo, Ethiopia. Ethiopian Phyto-Pathological Committee (EPC), Addis Ababa, Ethiopia. *Evaluates the effects of five fungicides on tef rust (Uromyces eragrostidis). According to the authors, Tilt (propiconazole) was promising in reducing disease incidence and increase tef yield, while Impact (flutriafol) increased tef yield irrespective of high disease incidence.*

Anisimov B. nd. Highlights on research and training of the Scientific Phytopathological Laboratory: a review, 1977-1986. pp. 6-11. In: *Scientific Phytopathological Laboratory (SPL) Progress Report for 1985/86*. SPL, Ambo, Ethiopia. *Presents the overall activities of Scientific Phytopathological Laboratory (SPL) from 1977 to 1986 in the area of plant disease survey and loss assessment, identification of fungal, virus and bacterial diseases, weed control, etc. According to the findings, the tef yield loss due to rust and damping-off was 20-30%. The recommended herbicides were Primagram + MCPA (1.0+1.2), or Gesaten 2.0 kg ha⁻¹ 2-3 weeks before sowing.*

Anon. 1968. Plant pathology. pp. 68-69. In: *Report for the Period from Feb. 1966 to Mar. 1968*. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies prominent diseases appeared during the preliminary survey made from November to December in various crop fields. The major tef pest recorded was head smudge (Helminthosporium miyakei).*

Anon. 1972. Seed dressing trials: teff. pp. 106-107. In: *Report for the Period Apr. 1971 to Mar 1972*, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates the results of seed dressing trials for tef where by the control gave the highest seed yield although differences due to treatments were not significant.*

- Anon.** 1975. Seed dressing of teff (Kulumsa). pp. 191. In: Report on Surveys and Experiments in 1974 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 111, Asella, Ethiopia. *Compares the effect of three seed dressing insecticides and fungicide on tef to control maggot which damage tef fields around Kulumsa. Since no serious maggot damage occurred, no significant yield differences were obtained.*
- Anon.** 1978. Bunt (*Tilletia* spp.) in teff seed samples from farmer fields. Ethiopian Phytopathological Committee (EPC) Newsletter No. 6, pp. 4, Nov. 1978, Addis Ababa, Ethiopia. *Briefly shows the importance of bunt in tef samples collected from local market around Holetta. The highest contaminated sample showed 10% of the sample weight to be bunt balls of Tilletia.*
- Anon.** 1980. Teff diseases. pp. 63-64. In: Mengistu Hulluka, Tadesse Gebremedhin and Biraraligne Zewide (Compilers) Plant Diseases and Pests of Major Economic Importance. Addis Ababa University (AAU), Awasa Junior College of Agriculture, Awasa, Ethiopia. *Provides information on the causal agent, geographical distribution, economic importance, symptoms, and environmental relations of the two major tef diseases, namely rust and smudge.*
- Anon.** 1981. Assessment of tef variety resistance to diseases. pp. 67-70. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Examines various entries of tef at different locations for their resistance against main tef diseases.*
- Anon.** 1981. Seedling lodging in tef and its control. pp. 61-67. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Examines the etiology and ecology of the disease causing seedling lodging and methods of control. According to the findings, early planted tef was highly attacked. Seed dressing with Benlate/Afos mixture reduced the incidence of disease.*
- Anon.** 1981. Study of biological features of rust on tef. pp. 59-60. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Studies the etiology and ecology of tef rust and the pathogenicity test for rust uredospores at tillering stage of the susceptible tef variety called DZ-01-354.*
- Anon.** 1982. Loss assessment study on rust of tef. pp. 187. In: Proceedings of the Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the results obtained from spraying fungicides to control tef rust.*
- Anon.** 1982. Methods of artificial inoculation and effect of high relative humidity on the occurrence of smudge pathogen and importance of *Phoma* on tef. pp. 187. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Briefly indicates that due to insufficient relative humidity at Holetta and some technical problems in the greenhouse, no satisfactory result was obtained.*

Anon. 1983. Diseases caused by *Phoma species* in cereals. pp. 40. In: Crop Protection Progress Report for 1977/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates cereals which are attacked by Phoma species. According to the report, Phoma sorghina attacked tef at Nedjo; wheat at Mekele, Debre Zeit, Nedjo, and Holetta; and sorghum at Awasa, Harbu, Melkassa, and Didessa; while Phoma spp. (syn. Phyllostitca helenae) was observed on tef at Cheffa.*

Anon. 1983. Observations on the effect of high relative humidity on the occurrence of smudge in tef. pp. 44. In: Crop Protection Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that the trial at Bako was abandoned since the sprinkler irrigation system which was to be used in raising the relative humidity around tef plots during the flowering stage was not functioning.*

Anon. 1983. Occurrence of smudge (Helminthosporium) in tef seed testing at Holetta (1977/78). pp. 8. In: Crop Protection Department Progress Report for 1977/78. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that the planned seed health testing in tef was not done for the indicated period due to the absence of technician.*

Anon. 1983. Seed treatment against smudge (Helminthosporium) in tef at Bako. pp. 31. In: Crop Protection Department Progress Report for 1977/78. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates different fungicides at Bako for tef seed treatment against artificially inoculated smudge spore. However, since no smudge was observed in plots, no evaluation was made.*

Anon. 1983. Smudge in tef. pp. 43. In: Crop Protection Department Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Investigates the biology and possibilities of controlling tef smudge using three experiments: i) study method of artificial inoculation using smudge, ii) investigate effect of sowing date on the occurrence of tef smudge, and iii) effect of seed treatment against smudge.*

Anon. 1983. Survey of seed-borne diseases of tef (Holetta and Bako). pp. 41-43. In: Crop Protection Department Progress Report for 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies seed-borne diseases of tef at Bako and Holetta based on 100 samples tested at Holetta. The origins of tef seeds were Holetta, Addis Alem, Gojam, Gondor, Wellega, and around Bako.*

Anon. 1985. Assessment of loss due to damping-off in tef. pp. 155. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents studies made on the damping-off of tef at the Scientific Phytopathological Laboratory (SPL).*

Anon. 1985. Assessment of loss due to rust and other leaf diseases of tef. pp. 155. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents studies made at the Scientific Phytopathological Laboratory (SPL) on tef rust.*

Anon. 1985. Assessment of losses due to damping-off in teff. pp. 111. In: Department of Crop Protection Progress Report for 1983/84. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents studies made on the damping-off of tef at the Scientific Phytopathological Laboratory (SPL).*

Anon. 1985. Assessment of losses due to rust and other leaf diseases on teff. pp. 111. In: Department of Crop Protection Progress Report for 1983/84. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents studies made at the Scientific Phytopathological Laboratory (SPL) on tef rust.*

Anon. 1985. Dosage determination of fungicides to be used in chemical control of tef smudge. pp. 127-128. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Determines the optimum rate of fungicides against tef smudge. Based on the results, four recommendations are given.*

Anon. 1985. Identification of *Drechslera* species on tef, wheat and barley. pp 121-122. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies Drechslera species on cereals at Addis Alem and Holetta. According to the findings, species observed in tef were D. frumentacei, D. miyakei, D. poae, D. bicolor, D. setariae and D. ellisii.*

Anon. 1985. Identification of *Drechslera* species on tef. pp. 65. In: Department of Crop Protection Progress report for 1983/84. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Identifies Drechslera species occurring frequently in tef fields. The species reported in tef were D. poae, D. bicolor, D. setarie, D. ellisii.*

Anon. 1985. Identification of pathogens causing damping-off of teff using serological methods. pp. 92. In: Department of Crop Protection Progress Report for 1983/84. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports pathogens causing damping-off in tef.*

Anon. 1985. Methods of artificial inoculation and effect of high relative humidity on the occurrence of the smudge pathogen. pp. 123-124. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Compares the efficacy of two artificial inoculation methods (spray to leaves and soil inoculation); where soil inoculation was found to be efficient.*

Anon. 1985. Pathogen of tef's damping-off identification by serological methods. pp. 120. In: Crop Protection Department Progress Report for 1980/81 to 1982/83. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents serological method of damping-off identification in tef.*

Anon. 1986. Assessment to losses due to rust on teff. pp. 100. In: Department of Crop Protection Progress Report for 1984/85. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates the yield loss assessment in tef due to rust.*

Asmus GL, Inomoto MM, Cargnin RA. 2008. Cover crops for reniform nematode suppression in cotton: greenhouse and field evaluations. *Tropical Plant Pathology* 33:85-89. *Evaluates the reaction of cover crops to reniform nematode (Rotylenchulus reniformis) and their effect on cotton yield. Poor hosts of the nematode were radish, sorghum, tef, foxtail millet, pearl millet and finger millet.*

Ayalew A, Fehrmann H, Lepschy J, Beck R, Abate D. 2006. Natural occurrence of mycotoxins in staple cereals from Ethiopia. *Mycopathologia*. 162:57-63. *Studies the occurrence of mycotoxins in barley, sorghum, tef and wheat. Aflatoxin B and ochratoxin A were detected in samples of all the four crops. The higher mycotoxin contamination in sorghum might be related to the underground storage nature of sorghum.*

Bekele E. 1986. A review of research on diseases of barley, tef and wheat in Ethiopia. Proceedings of the First Ethiopian Crop Protection Symposium, Addis Ababa, Ethiopia, 4-7 Feb 1985. IAR, Addis Ababa, Ethiopia.

Bekele E. nd. A review of research on diseases of barley, tef and wheat in Ethiopia. pp. 79-108. In: Abate T (Ed.) Proceedings of the First Ethiopian Crop Protection Symposium, a Review of Crop Protection Research in Ethiopia, 4-7 Feb. 1985, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reviews research work on diseases of tef, barley and wheat. According to the author, 22 fungi and three pathogenic nematodes were identified on tef.*

Bijlmakers H, Selvaraj JC. 1989. The importance of routine chemical seed treatment in Ethiopia. Committee of Ethiopian Entomologists (CEE) Newsletter Vol. 9, No. 1, pp. 4-10, June 1989. *Indicates the need for seed treatment in food crop in Ethiopia. Regarding tef, the pest damaging seeds and seedlings was barley fly, while seed- and soil-borne diseases were Drechslera spp., Phoma sorgha, and Tilletia spp.*

Castellani E. 1948. Anthracnose of tef. *Nuovo gior. Bot. Ital.* 55(1):142-148. [in Italian].

Dawit W, Andnew Y. 2005. The study of fungicides application and sowing date, resistance, and maturity of Eragrostis tef for the management of teff rust [Uromyces eragrostidis]. *Canadian Journal of Plant Pathology*. 27:521-527. *Evaluates 2000 accessions and 5000 mutant lines of tef against tef rust. According to the report, none of the accessions and mutant lines showed complete resistance, but 22 accessions had lower level of rust severity.*

Desta R. 1996. Tef disease survey in North and West Shewa. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Dmitriev AP, Deyassa T, Anga M. 1981. Agrobiological and immunological evaluation of wheat, barley and tef national yield trials, Ambo, 1980. pp. 36-38. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Evaluates wheat, barley, and tef NYT for at Ambo for agrobiological and immunological characters. According to the findings, all tested 11 entries of tef were susceptible to leaf rust.*

- Evmenenko A, Kidane A.** nd. Serological identification of damping-off pathogens of teff. pp. 12-15. In: Proceedings of the Ninth Annual Meeting of the Ethiopian Phytopathological Committee (EPC), 2-3 Feb. 1984, Nazret, Ethiopia. EPC, Addis Ababa, Ethiopia. *Investigates the inner antigen structure of strains and serological relationship between species of genus Drechslera. All stains gave different reactions.*
- Evmenenko A, Woldegiorgis A.** 1982. Fungicides trial against damping-off and other diseases. pp. 92-99. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1981. SPL, Ambo, Ethiopia. *Screens for the best fungicide to control damping-off and other diseases in tef.*
- Evmenenko A, Woldegiorgis A.** 1982. Immunological estimation of the germplasm materials for damping-off and rust. pp. 100-102. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1981. SPL, Ambo, Ethiopia. *Estimates immunological characteristics of 65 tef accessions for damping-off and rust.*
- Evmenenko A, Woldegiorgis A.** 1982. To determine the relations of spore release due to the change in meteorological conditions. pp. 89-91. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1981. SPL, Ambo, Ethiopia. *Studies the relationship of environmental factors to the development of disease epidemic for Drechslera miyakei at Ambo.*
- Evmenenko A.** 1982. Damping-off of tef: artificial inoculation methods for virulent estimation of damping-off pathogens. Ethiopian Phyto-Pathological Committee (EPC) Newsletter No. 17, pp. 15-16, Dec. 1982, Addis Ababa, Ethiopia. *Tests artificial inoculation methods for determining pathogenicity (in laboratory, green house and field) and estimates virulence of damping-off in tef.*
- Evmenenko A.** 1982. Damping-off of tef: release and dispersal of conidia. Ethiopian Phyto-Pathological Committee (EPC) Newsletter No. 17, pp. 4-5, Dec. 1982, Addis Ababa, Ethiopia. *Investigates the relationship of environmental factors to the development of damping-off in tef. According to the author, the favorable period of abundant sporulation is at the relative humidity above 80%. Under natural condition, the period from the beginning of conidia to its release was 20 days at the temperature of 17-20 °C.*
- Evmenenko A.** 1982. Tef's damping-off harmfulness study. pp. 82-88. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1981. SPL, Ambo, Ethiopia. *Studies the effect of damping-off on tef yield. There was reverse correlation between disease development and yield.*
- Evmenenko A.** 1983. Selective medium for isolation of fungi of the genus Drechslera from soil. Ethiopian Phyto-Pathological Committee (EPC) Newsletter No. 20, pp. 3-7, Addis Ababa, Ethiopia. *Selects the best medium for growing Drechslera, a soil borne fungus affecting tef cultivation.*
- Evmenenko A.** 1984. Greenhouse screening of tef cultivars for resistance to damping-off. pp. 8-11. In: Proceedings of the Ninth Annual Meeting of the Ethiopian Phyto-Pathological

Committee (EPC), 2-3 Feb. 1984, Nazret, Ethiopia. EPC, Addis Ababa, Ethiopia. *Describes the rapid greenhouse technique for evaluation of tef cultivars resistant to root- and stem-rot. According to the author, the seedling test was found to be an accurate index in determining resistance of tef cultivars to Drechslera root- and stem-rot.*

Evmenenko A. 1984. Screening of tef material for resistance to damping-off and rust in 1981/82. pp. 542-548. In: Proceedings of the Fifteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1983, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Screens 100 tef accessions against tolerance to damping-off and rust.*

Gorshkov A, Chekmenev S. 1981. Results of resistance in evaluating of some cereals to diseases and pests at Scientific Phytopathological Laboratory (SPL), Ambo. pp. 357-377. In: Proceedings of the Twelfth National Crop Improvement Conference, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the results of experiments done at the Scientific Phytopathological Laboratory (SPL) to screen tef and wheat against pathogens and maize stalk borer. Regarding tef, nine accessions were screened for tolerance to Helminthosporium, Fusarium, Alternaria, Cladosporium, Hormiscium, Phoma, Penicillium and Trichoderma.*

Gorshkov A, Madumarov TM. 1979. Results of evaluating wheat and tef varieties for resistance to rust in 1977. pp. 61-66. In: Proceedings of the Eleventh National Crop Improvement Committee Meeting. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Screens wheat and tef varieties for resistance to rust. Most tef varieties showed susceptibility to rust but only variety DZ-01-787 was moderately resistant.*

Gorshkov A, Mekonnen T. 1979. Diseases of teff and their control. pp. 19-27. In: Proceedings of Diseases, Pests and Weeds of Cereals and Horticultural Crops in Ethiopia and Methods of their Control. Scientific Phytopathological Laboratory (SPL), Ambo, Ethiopia. *Indicates major tef diseases, yield losses and resistance of tef genotypes to major diseases.*

Gorshkov A, Mekonnen T. 1980. Field and Greenhouse evaluation of tef varieties for resistance to rust diseases. pp. 52-54. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Screens 12 tef varieties for resistance to rust under greenhouse and field conditions.*

Gorshkov A, Mekonnen T. 1980. Studies on tef diseases and elaboration measures for their control. pp. 5-9. In: Scientific Phytopathological Laboratory (SPL) Progress Report for the Period Jan. 1979 to Dec. 1979. SPL, Ambo, Ethiopia. *Investigates major diseases of tef in Ethiopia, and studies control measures for damping-off, rust, Helminthosporium, and Septoria.*

Gorshkov A, Mekonnen T. 1980. Studying of agrobiological peculiarities of tef rust. pp. 45-52. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Investigates the etiology of tef rust, dynamics of the disease and alternate host.*

Gorshkov A, Mekonnen T. 1980. Studying of tef rust distribution and its harmfulness in 1978. pp. 42-45. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Indicates the distribution and harmfulness of tef rust in different regions of Ethiopia. The average yield losses in tef due to rust was 5-10% in 1978.*

Gorshkov A, Mekonnen T. 1980. Studying tef damping-off. pp. 55-62. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Studies the etiology and harmfulness of damping-off on tef, and control measures on 14 tef selections including local variety from Guder State Farm.*

Gorshkov A, Mekonnen T. 1980. Studying tef diseases and working out methods for their control. pp. 42-63. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1978. SPL, Ambo, Ethiopia. *Studies types and control measures of major tef diseases at the Scientific Phytopathological Laboratory (SPL). The yield losses in tef due to diseases were 10 and 25%.*

Gorshkov A, Mekonnen T. 1981. Tef diseases and their control. pp. 57-59. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1980. SPL, Ambo, Ethiopia. *Studies the occurrence of tef fields in farmers', state farms and Agricultural Development Department (ADD) fields in Shewa, Wellega, Arsi, Welo, Gojam and Gondor Regions at different crop development stages.*

Gorshkov A. 1980. Wild *Eragrostis* species source of infection: rust (*Uromyces eragrostidis*), smudge (*Helminthosporium*) for teff (*Eragrostis tef*). Ethiopian Phytopathological Committee (EPC) Newsletter No. 9, pp. 5-6, Jan. 1980, Addis Ababa, Ethiopia. *Proves that the wild Eragrostis species is the source of infection for tef rust and smudge.*

Hulluka M, Habtewold T, Andnew Y, Ahmed S, Tadesse N. 1988. Occurrence of diseases, insect pests and weeds in Ada Woreda in 1987 Alemaya University of Agriculture, Debre Zeit Agricultural Research Center, Debre Zeit, Ethiopia. *Reports on the major diseases, insect pests and weeds occurring on cereals, legumes and vegetable crops in Ada Woreda. Regarding tef, the major diseases were rust, damping-off, and leaf blight; insect pests were grasshopper, shoot fly, red tef worm, army worm and black tef beetle; while weeds were Amaranthus spp., Argemone mexicana, Convolvulus arvensis, Scorpiurus muricatus and Xanthium spp.*

Kassaye Z, Tafesse T. 1996. Assessment of yield losses caused by leaf rust on tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Kidane A, Desta R, Tadesse E. nd. A review of plant quarantine activities in the Institute of Agricultural Research. pp. 635-642. In: Abate T (Ed.) Proceedings of the First Ethiopian Crop Protection Symposium, a Review of Crop Protection Research in Ethiopia, 4-7 Feb. 1985, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates number of plant materials inspected for diseases, insects and weeds from 1979 to 1983. According to authors, the total number of inspection was 342024.*

Kidane A, Mathur SB. 1978. Seed transmission of *Drechslera miyakei* on *Eragrostis tef* from Ethiopia. *Plant Disease* 62:70-71.

Kidane A. 1979. Seed health tests with Ethiopian barley, wheat and teff seed samples. pp. 247-248. In: Holetta Guenet research Station Progress Report for Apr. 1976 to Mar. 1977. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of seed health tests (percent infection and pathogenicity) made in Denmark for seed samples of barley, wheat and tef varieties imported from Ethiopia.*

Kidane A. 1982. Additional index of plant diseases in Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 17pp. *Presents index of plant disease in Ethiopia in addition to those reported by R.B. Stewart and Dagnatchew Yirgou. Tef diseases reported were six leaf spots caused by different species of Drechslera collected from different areas of Arsi and Wellega regions.*

Kidane A. nd. A review of research on seed pathology in Ethiopia. pp. 617-633. In: Abate T (Ed.) Proceedings of the First Ethiopian Crop Protection Symposium, a Review of Crop Protection Research in Ethiopia, 4-7 Feb. 1985, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reviews the work on seed health testing for major crops in the country. Major tef diseases reported were bunt, smudge and Drechslera miyakei.*

Kidane A. nd. Effect of *Drechslera miyakei* on seed germination seedling mortality and the importance of seed transmission on *Eragrostis tef*. pp. 81-96. In: Proceedings of the Tenth Annual Meeting of the Ethiopian Phyto-Pathological Committee, 31 Jan. to 1 Feb. 1985, Addis Ababa, Ethiopia. Ethiopian Phyto-Pathological Committee (EPC), Addis Ababa. *Investigates the effects of Drechslera miyakei on seed germination, seedling mortality and its transmission from seed to seedlings. The methods used were, i) blotter, ii) deep-freezing blotter, and iii) agar plate. According to the findings, the pathogen was found on 56% of seeds using the blotter method and on 58% of seeds for deep-freezing method.*

Kidane A. nd. Identification of *Drechslera* species on *Eragrostis tef*. pp 23-25. In: Proceedings of the Ninth Annual Meeting of the Ethiopian Pathological Committee, 2-3 Feb. 1984, Nazret, Ethiopia. Ethiopian Phyto-Pathological Committee (EPC), Addis Ababa, Ethiopia. *Reports the results of the experiment on identification of Drechslera species on tef where six species were identified: D. frumentacei, D. miyakei, D. poae, D. bicolor, D. setariae, and D. ellisii.*

Madumarov TM, Gorshkov A. 1978. Alternate hosts of rust fungi, *Puccinia* species and *Uromyces eragrostidis*, which infect cereals in Ethiopia. *SINET (an Ethiopian Journal of Science)* 1:123-126.

Madumarov TM, Gorshkov A. 1979. Survey of wheat and tef rust distribution and evaluation of yield losses in 1977. In: Proceedings of the Eleventh National Crop Improvement Committee Meeting, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. pp. 67-71. *Reports the results of survey made on rust diseases in wheat and tef fields in Shewa, Wellega, Arsi, Gojam and Gondor for rust diseases. Regarding tef,*

the first occurrence of the rust was on Aug. 29 at SPL, Oct. 5 on farmers' fields around Ambo and Oct. 5 at Debre Zeit. The intensity of infection was 25% at SPL, 5-10% at farmers' field in Bako, 10-22% at Bako Research Center, and 40-80% at Debre Zeit. An approximate average yield loss of tef by rust was 10-20%.

Madumarov TM. 1977. Development of some fungal diseases in Ethiopia in 1976. Ethiopian Phyto-Pathological Committee (EPC) Newsletter No. 4, pp. 7-9, Aug. 1977, Addis Ababa, Ethiopia. *Indicates major fungal diseases of cereal crops in Shewa, Arsi, Harerghe, Sidamo, Bale, Welo, and Wellega Regions. Although tef rust was present everywhere, the intensity was high at Debre Zeit, Mojo and Shashemene areas.*

Mebrate SA. 2004. Host range of tef rust (*Uromyces eragrostidis*). Tropical Science 44: 177-179. *Studies hosts of tef rust. According to the author, 16 of 17 wild relatives of tef were all infected by the fungus. Crops such as barley, sorghum, maize and wheat were not infected by the tef rust.*

Naudè TW, Botha CJ, Vorster JH, Roux C, Van der Linde EJ, Van der Walt SI, Rottinghaus GE, Van Jaarsveld L, Lawrence AN. 2005. *Claviceps cyperi*, a new cause of severe ergotism in dairy cattle consuming maize silage and teff hay contaminated with ergotised *Cyperus esculentus* (nut sedge) on the Highveld of South Africa. Onderstepoort J Vet Res. 72:23-37. *Identifies effects of endophytic fungi and/or ergot infestation of tef and other grasses on cows fed the hay. In one Holstein herd, tef hay was contaminated with ergotised nut sedge. According to authors, this was the first report of bovine ergotism not associated with the Poaceae infected with Claviceps purpureum or endophytes but with the family Cyperaceae.*

Nieman E, Semeane Y, Abdella S, Yilma A. 1981. Preparing scoring aids for plant disease evaluation. Ethiopian Phyto-Pathological Committee (EPC) Newsletter No. 12, pp. 11-12, Apr. 1981, Addis Ababa, Ethiopia. *Presents disease scoring aids which are easily prepared and applied.*

Ralsgard K. 1987. Field data and disease manual. South Eastern Agric. Development, Crop and Pasture Research, Kulumsa, Ethiopia. 40pp. *Provides standardized recommendation on how to collect and record field data for the major agricultural crops in Ethiopia with regard to growth stages, agronomic characters and diseases.*

Saari EE, Prescott JM. 1985. World distribution in relation to economic losses. pp. 259-298. In: The Cereal Rusts, Vol. II. Academic Press. *Reports on distribution, epidemiological zone, long-distance dissemination and yield losses due to rusts. The authors indicated that tef rust (*Uromyces eragrostidis* Tracy) was one of the important diseases of tef.*

SPL (Scientific Phytopathological Laboratory). 1977. Agro-biological breeding and immunological evaluation of wheat, triticale, barley, sorghum, maize, and tef varieties' samples. pp. 70-75. In: SPL Progress Report for 1975. SPL, Ambo, Ethiopia. *Reports on varietal diversity of cereals in major farms of Ethiopia especially in Shewa, Sidamo, Gamu-Gofa, Arsi, Bale and Harerghe Regions.*

SPL (Scientific Phytopathological Laboratory). 1977. The development of practical measures to enhance resistance to important fungal diseases in cereals. pp. 3-48. In: SPL Progress Report for 1975. SPL, Ambo, Ethiopia. *Presents the history of plant disease research, experiments on phyto-sanitary status of crops in main agricultural areas, and common diseases of crop plants in Ethiopia. Regarding tef, the severity of rust reached up to 70%; areas of high incidence were Nazret, Awasa, and Soddo. The white tef was more susceptible to rust than the red or brown tef.*

SPL (Scientific Phytopathological Laboratory). 1982. SPL activity report. pp. 581-594. In: Proceedings of the Fourteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1982, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the activities of Scientific Phytopathological Laboratory (SPL) in research, training and dissemination of research results. According to the report, yield losses of tef due to rust and damping-off reached 20-30%. The immunological characteristics of more than 400 tef samples were also evaluated.*

SPL (Scientific Phytopathological Laboratory). 1984. SPL activity report, 1982. pp. 516-541. In: Proceedings of the Fifteenth National Crop Improvement Conference. 30 Mar. to 1 Apr. 1983, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the activities of Scientific Phytopathological Laboratory (SPL) in plant pathology and other areas for various crops including tef. Yield loss in tef due to damping-off was 57% on sick plots and 4% on treated plots. Loss assessment on rust was 85 S on sick plots and 5 S on treated plots. The total yield loss being 64.3%.*

Stewart RB, Yirgou D. 1967. Index of plant diseases in Ethiopia. Expt. Station Bulletin No. 30. Haile Selassie I University (HSIU), College of Agriculture. 95pp.

Stewart RB. 1956. Some plant diseases occurring in Kafa Provinces, Ethiopia. College of Agriculture, Dire Dawa, Ethiopia.

Veselovsky M, Kuzmichev A, Tafesse T. nd. Crop assessment study due to rust on teff. pp. 77. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1984/85. SPL, Ambo, Ethiopia. *Indicates that rust was not totally observed in 1984 due to drought; but in the previous years investigations, the average yield loss in tef due to rust was 28-36%.*

Veselovsky M, Kuzmichev A, Tafesse T. nd. Screening of germplasm material for resistance to damping-off and rust. pp. 72-75. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1984/85. SPL, Ambo, Ethiopia. *Screens 46 tef materials for their resistance to damping-off at Ambo, where only one variety was highly resistant to damping-off and rust.*

Veselovsky M, Kuzmichev A, Tafesse T. nd. Study on the development of damping-off in connection with the teff cultivation methods. pp. 73-77. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1984/85. SPL, Ambo, Ethiopia. *Studies the development of damping-off on tef under various cultivation methods, namely sowing dates, seed rates, and fertilizer levels. According to the findings, early sowing was less favorable for tef and dense sowing stimulated damping-off and leaf spot.*

Veselovsky M. nd. Crop loss assessment study to rust in teff. pp. 132-133. In: Scientific Phytopathological Laboratory (SPL) Progress Report for 1985/86. SPL, Ambo, Ethiopia. *Tests tef varieties at Ambo for their agrobiological immunological characteristics.*

Woldekidan T. 1989. General disease survey and identification in the Southern part of Ethiopia. pp. 42-43. In: Awasa Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of disease survey in Southern Region. Among tef diseases the intensity of rust was slight at Sawla.*

Yirgou D. 1967. Plant diseases of economic importance in Ethiopia. Expt. Station Bulletin 50, Haile Selassie I University (HSIU), College of Agriculture, Alemaya, Ethiopia.

20. Abiotic Stresses

Abebe M. nd. Salt tolerance of flax, noug, sesame and tef. pp. 119-126. In: Plant Science Annual Report, 1972, Vol. 2. College of Agric., Haile Selassie I University (HSIU), Ethiopia. *Investigates the effects of salinity on growth and yield of flax, noug, sesame and tef. According to the author, tef was the most salinity tolerant.*

Araya A, Keesstra SD, Stroosnijder L. 2010. Corrigendum to "Simulating yield response to water of Tef with FAO's AquaCrop model". Field Crops Research 117:265.

Araya A, Keesstra SD, Stroosnijder L. 2010. Simulating yield response to water of teff with FAO's AquaCrop model. Field Crops Research 116: 196-204. *Simulates yield response to water management strategies in tef using FAO's AquaCrop model. According to the model, the water-use efficiency of tef increased when supplementary irrigation after start of flowering was increased from 0 to 95 mm.*

Araya A, Stroosnijder L, Girmay G, Keesstra SD. 2011. Crop coefficient, yield response to water stress and water productivity of teff. Agricultural Water Management 98:775-783. *Quantifies the evapotranspiration and estimates yield response of tef to water stress using the single crop coefficient approach. According to the findings, the seasonal yield response of tef to water stress was 1.04 which indicates that tef exhibits a moderately sensitive and linear response to water stress.*

Araya A, Stroosnijder L. 2011. Assessing drought risk and irrigation need in northern Ethiopia. Agricultural and Forest Meteorology 151: 425-436. *Develops drought-assessing technique and explores site-specific needs for supplementary irrigation. Supplementary irrigation was recommended in the month of September for barely and tef Maychew, Mekelle and Adigudom stations.*

Asfaw KG, Itanna F. 2009. Screening some tef accessions/varieties for salt tolerance during germination and seedling stage. Mekelle University (MEJS) 1(2):17-29. *Evaluates 15 lowland tef genotypes for salinity tolerance. Germination rate and seedling root length were more affected by salts than final germination percentage and seedling shoot length. The main cause for reduced and delayed germination percentage was osmotic effect.*

Ayele M, Blum A, Nguyen HT. 2001. Diversity for osmotic adjustment and root depth in tef. Euphytica 121:237-249. *Evaluates osmotic adjustment and root depth for tef genotypes. Osmotic adjustment was significantly correlated across tef genotypes with delayed wilting and the maintenance of higher relative water content under conditions of soil moisture stress.*

Ayele M. 1989. Effect of moisture stress on tef. MSc Thesis, University of London, Wye College (UK).

Ayele M. 1992. Effects of NaCl induced salinity on the germination of tef genotypes. SEBIL Vol. 4, pp. 58. *Evaluates the effect of seven levels of NaCl on three varieties of tef.*

Ayele M. 1994. Comparison of optimum moisture environments against stress environments for developing drought-resistant tef (*Eragrostis tef*) varieties. Acta Agronomica Hungarica 43:223-228.

Ayele M. 1994. Use of excised-leaf water content in breeding tef (*Eragrostis tef*) for moisture stress areas. Acta Agronomica Hungarica 42:261-265.

Ayele M. 1999. Genetic diversity in tef for osmotic adjustment, root traits, and Amplified Fragment Length Polymorphism. PhD Thesis, Texas Tech University, USA. 152 pp. *Presents the results of the following three studies, i) screening tef germplasm for key drought resistance traits, ii) investigating the impact of osmotic adjustment and root depth on productivity of tef, and iii) assessing the diversity of tef germplasm using amplified fragment length polymorphism (AFLP) marker.*

Balsamo RA, Willigen CV, Bauer AM, Farrant J. 2006. Drought tolerance of selected *Eragrostis* species correlates with leaf tensile properties. Annals of Botany 97:985-991. *Investigates the effect of drought on mechanical properties of Eragrostis species including tef. Leaf tensile strength of fully hydrated leaves for the drought-intolerant E. capensis, the moderately drought-tolerant tef and the drought-tolerant E. curvula correlated well with drought tolerance.*

Degu HD, Ohta D, Fujimura M. 2008. Drought tolerance of *Eragrostis tef* and development of roots. International Journal of Plant Sciences 169:768-775. *Investigates the mechanism of drought tolerance in five representative cultivars of tef, namely Kaye Murri, Ada, Balami, Fesho, and Alba. Maximum root length were longer under drought conditions for Kaye Murri and Ada compared with irrigated conditions while the largest osmotic adjustment value was observed for Fesho.*

Delden SH, Brouwer G, Stomph TJ, Vos J. 2008. Towards an ideotype of teff for temperate climates. Italian Journal of Agronomy 3: 627-628. *Evaluates tef germplasm that adapts to temperate areas.*

Gebrelassie A. 1985. Control of growth and development in tef (*Eragrostis tef*) and niger seed (*Guizotia abyssinica*) by day length, temperature and plant growth regulators. Ph.D. Thesis, University of London, Wye College.

Geerts S, Raes D, Garcia M, Miranda R, Cusicanqui JA, Taboada C, Mendoza J, Huanca R, Mamani A, Condori O, Mamani J, Morales B, Osco V, Steduto P. 2010. Comment on Araya et al.: "Simulating yield response to water of Teff with FAO's AquaCrop model" [Field Crops Research (2010) 116, 196-204]. Field Crops Research 118: 102-103. *Presents a comment on the article published by Araya et al on simulating the yield response of tef.*

Giorgis K, Fessehaie R. 1990. Dryland research priorities to increase crop productivity. pp. 57-64. In: Proceedings of the Twenty First national Crop Improvement conference. 10-12

Apr. 1989. Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents a map of moisture index and research highlights for dry areas of Ethiopia. Also provides cultural practices, moisture conservation, weed control and cropping systems for different crops. According to authors, the tef variety suitable for dry area is DZ-01-354 with yield potential of 1700-2200 q ha⁻¹.*

Giorgis K, Alemu G. Unpublished. Assessing crop production constraints related to dryland farming in the northern region of Ethiopia. Paper Presented at the National Workshop on Dryland Farming Research, 26-28 Nov. 1991, Nazret, Ethiopia. *Assesses major constraints related to dryland farming in the northern region of Ethiopia where tef is an important crop.*

Gorham J, Hardy CA. 1990. Response of *Eragrostis tef* to salinity and acute water shortage. *Journal of Plant Physiology* 135:641-645.

Henricksen BL, Durkin JW. 1986. Growing period and drought early warning in Africa using satellite data. *International Journal of Remote Sensing* 7:1583-1608. *Determines vegetation growing periods in 1983/84 at 28 sites in Ethiopia using data from the Advanced Very High Resolution Radiometer (AVHRR) on the NOAA series of meteorological satellites.*

Henricksen BL. 1986. Reflections on drought: Ethiopia, 1983-1984. *International Journal of Remote Sensing* 7:1447-1451. *Reveals the dramatic contrast in vegetation growing conditions between 1983 and 1984 in Ethiopia, during the critical months of August and September. In 1984, northern region where tef is the major crop, was devastated by severe shortfalls in August rainfall.*

HRC (Holetta Research Center). 1996. Development of improved tef production package. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

HRC (Holetta Research Center). 1996. Evaluation of tef cultivars for physiological and morphological character associated with drought tolerance. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

HRC (Holetta Research Center). 1996. Screening of different tef genotypes for drought tolerance. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

HRC (Holetta Research Center). 1996. The response of tef to durations of moisture deficit at different growth stages. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

HRC (Holetta Research Center). 1996. Water use, water use efficiency, harvest index and yield of tef genotypes under water deficit. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

- Kebebew F, McNeilly T.** 1995. Variation in response of accessions of minor millets, *Pennisetum americanum* (pearl millet) and *Eleusine coracana* (finger millet), and *Eragrostis tef* (tef) to salinity in early seedling growth. *Plant and Soil* 175:311-321. *Evaluates the response of pearl millet, finger millet, and tef accessions to increasing NaCl concentration. Finger miller was more tolerant than tef, which was more tolerant than pearl millet.*
- Kubler E, Kaul HP, Aufhammer W.** 2002. Comparative study of crop stand establishment and dry matter production of the pseudocereals buckwheat (*Fagopyrum esculentum*), quinoa (*Chenopodium quinoa*), amaranth (*Amaranthus* sp.) and the cereals millet (*Panicum miliaceum*) and tef in a marginal environment. *Bodenkultur* 53:29-38. *Evaluates the effect of sowing dates and sowing rates on the performance of different crops. In parallel with the seed size, the field emergence percentages decreased in the sequence buckwheat > millet > quinoa > amaranth > tef.*
- Kuebler E, Aufhammer W.** 1996. Performance of millet species (*Panicum miliaceum*, *Eragrostis tef*) on a marginal site. In: Jahrestagung der Gesellschaft fuer Pflanzenbauwissenschaften, Hohenheim, Germany, 26-28 Sep 1996. *Mitteilungen der Gesellschaft fuer Pflanzenbauwissenschaften, Germany* 9:251-252. [in German].
- MacKenzie D.** 1985. Ethiopia: famine amid genetic plenty. *New Scientist*, August 1985. pp. 22-23. *Presents some advantages related to tef cultivation (as indicated by Dr. B.M.G. Jones) during great famine in Ethiopia. Also indicates bottlenecks hampering improvement.*
- Manna B.** Unpublished. Seed production strategies for drought prone areas. In: National Workshop on Dryland Farming research, 26-28 Nov. 1991, Nazret, Ethiopia. *Reports the activities of "Strategic Area Seed Reserve Project" in replacing seed stocks that are widely adapted and indigenous in origin. According to the author, 14 tef cultivars were chosen for wide adaptation.*
- Mengesha MH.** 1968. Problems affecting the high productivity of cereals in the highlands of Ethiopia with special reference to wheat, barley and tef. pp. 131-135. In: *Proceedings of the Conference on Agricultural Research Priorities for the Economic Development of Africa*, 5-12 Apr. 1968, Abidjan.
- Mengistu DK.** 2009. The influence of soil water deficit imposed during various developmental phases on physiological processes of tef. *Agriculture Ecosystems and Environment* 132:283-289. *Investigates the physiological responses of tef to water stress during various growth stages. The grain filling stage of tef was the most sensitive to water stress and severe water stress caused significant reduction in physiological performance of tef. According to the author, the low yielding nature of tef could be associated with its low light use efficiency which perhaps related to its leaf size and orientation.*
- Nugent G, Gaff DF.** 1989. Electrofusion of protoplasts from desiccation tolerant species and desiccation sensitive species of grasses. *Biochemie und Physiologie der Pflanzen*. 185:93-97. *Presents studies made to optimize the electrofusion of protoplasts. According to the finding, the fusion was successfully applied to drought sensitive and tolerant species (*S. pyramidalis**

and *S. pellucidus*, *E. tef* and either *E. hispidula* or *E. paradoxa*) and between two desiccation-tolerant species (*E. invalida* and *E. nindensis*).

Schneider R. 2011. Investigation of drought tolerance in tef. MSc Thesis, University of Bern, Switzerland. *Investigates the response of tef to drought stress induced by polyethylene glycol (PEG). Tef showed a reduction in stomatal conductance, transpiration rate and shoot dry biomass under osmotic stress, whereas the root dry biomass was not affected by the drought treatment. Also describes about the drought tolerant candidate tef lines obtained from EMS-mutagenized population.*

Shiferaw B, Baker DA. 1996. Agronomic and morphological responses of tef to drought. *Tropical Science* 36:41-50. *Evaluates the response of tef to drought under field conditions in Ethiopia. According to authors, the most obvious morphological change was a reduction in leaf area.*

Shiferaw B, Baker DA. 1996. An evaluation of drought screening techniques for *Eragrostis tef*. *Tropical Science* 36:74-85. *Evaluates in the greenhouse screening methodologies and potentials of tef cultivars differing in sensitivity to drought stress. Polyethylene glycol (PEG) was more suitable than mannitol and/or NaCl for tests involving germination under osmotic stress. With a 50% PEG solution, large differences were observed in cell membrane injuries among the cultivars.*

Shiferaw B. 1991. A study of drought tolerance in tef. PhD Thesis, University of London, Wye College. 202pp. *Evaluates screening methodologies and potentials for tef cultivars differing in sensitivity to drought stress and determine the adaptive responses of these cultivars.*

Smirnoff N, Colombe SV. 1988. Drought influences the activity of enzymes of the chloroplast hydrogen peroxide scavenging system. *Journal of Experimental Botany* 39:1097-1108. *Studies the effect of drought on the activity of ascorbate peroxidase (AP), glutathione reductase (GR) and monodehydroascorbate reductase (MDAR) in leaves of barley and tef. The enzymes are components of the chloroplast hydrogen peroxide scavenging system. Severe leaf water deficit resulted in increased activity of AP and MDAR in tef. The specific activity of all the scavenging enzymes was greater in plants under drought.*

Tadele Z. Unpublished. Effects of different periods of waterlogging on seedling establishment of tef, soil erosion, reaction and nitrogen content. Paper Presented at the Second Annual Conference of Agronomy and Crop Physiology Society of Ethiopia, 30-31 May 1996, Addis Ababa, Ethiopia.

Takele A, Alemu T. 1995. Review of teff research in the marginal rainfall areas of Ethiopia: past and future prospects. Nazret Research Center, Nazret, Ethiopia. *Reviews various research done on tef at drought-prone areas.*

Takele A, Mengiste T. unpublished. Observation on the response of tef genotype to short term waterlogging. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Takele A, Mengiste T. unpublished. Observation on the response of tef genotype to soil moisture deficit. Holetta Research Center Progress Report for the Period April 1993 to March 1994. Holetta, Ethiopia.

Takele A, Mengiste T. 1996. Observation on the response of tef genotype to soil moisture deficit. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

Takele A, Mengiste T. 1996. Observation on the response of tef genotype to short term waterlogging. Holetta Research Center Progress Report for the Period April 1994 to March 1995. Holetta Research Center, Institute of Agricultural Research, Ethiopia.

Takele A. unpublished. Response of tef genotypes to moisture deficit. Paper Presented at the Second Annual Conference of Agronomy and Crop Physiology Society of Ethiopia, 30-31 May 1996, Addis Ababa, Ethiopia.

Takele A. 1997. Genotypic variability in dry matter production, partitioning and grain yield of tef under moisture deficit. SINET: Ethiopian Journal of Science 20:177-188. *Investigates the response of 15 genotypes of tef to moisture stress. Moisture deficit generally resulted in a reduction in dry weight of individual plant parts, plant height and number of tillers. According to the author, the genotypes Fesho, Gea-lemi and Shewa-Gimira performed better than the rest while Gorradie, Goffarie and Key Murrie were poor performers.*

Takele A. 1998. The response of tef genotypes to simulated moisture deficit. ACPSE, Ethiopia. pp. 28-37. *Evaluates 15 tef genotypes under moisture stress condition. Moisture deficit resulted in reduction of dry weight of individual plant parts, plant height and number of tillers.*

Tefera T, Tefera H, Simane B, Tuinstra M. 2000. The effect of moisture stress on growth, leaf water loss rate and phenological development of tef. Tropical Science 40:100-107. *Investigates the response of six tef genotypes to drought. Under water stress, drought-tolerant genotypes such as DZ-01-1015 and DZ-Cr-37 had the lowest excised-leaf water loss (ELWL) and relative growth rate (RGR). ELWL was negatively and significantly correlated with grain yield at heading and grain filling under early stress.*

Tefera T, Tefera H, Simane B, Tuinstra M. 2000. The influence of drought stress on yield of tef. Tropical Science 40:40-45. *Studies the response of six tef genotypes to drought in the field. Grain and biomass yields were significantly reduced by early and terminal stress.*

Titshall LW, Hughes JC, Morris CD, Zacharias PJ. 2007. The disposal of a lime water treatment residue on soil and spoil material from a coalmine: a glasshouse investigation. J Environ Qual. 36:568-579. *Investigates the response of three grasses (tef, Cenchrus ciliaris, and Digitaria eriantha) on soil and spoil material from a coalmine with a lime water treatment residue (WTR). The yields of C. ciliaris, D. eriantha, and tef were decreased by 74, 79, and 60%, respectively, when compared with the control treatments. Grasses grown in the*

soil had higher Na concentrations, while those grown in the spoil typically had higher B, N, and Zn concentrations.

Vecchio V, Simoni G, Casini P. 1996. Optimum germination temperature and cold tolerance of teff. *Rivista di Agronomia (Italy)* 30:629-636. [in Italian]. *Determines optimum temperature for teff germination and investigates the effect of soaking time in presence of low temperature. The lethal germination temperature for teff was 10 °C. A significant increase in germination index was observed by soaking for 48 h at 5 °C.*

Yihun Y, Schultz B, Haile AM, Erkossa T. year Agricultural productivity optimization in water scarce semi-arid region of Ethiopia. Journal, volume *Investigates the effects of land preparation, seeding rate and irrigation using FAO AquaCrop model on teff production. According to the authors, reducing the seeding rate from 25 to 10 kg ha⁻¹ decreased lodging and raised potential yield to 5 tons ha⁻¹.*

21. Human Nutrition and Food Value

Abebe Y, Bogale A, Hambidge KM, Stoecker BJ, Bailey K, Gibson R. 2007. Phytate, zinc, iron and calcium content of selected raw and prepared foods consumed in rural Sidama, Southern Ethiopia, and implications for bioavailability. *Journal of Food Composition and Analysis* 20: 161-168. *Analyzes representative staple foods from Southern Ethiopia for phytate, Zn, Fe and Ca content. According to the findings, enset had the lowest phytic acid content, followed by fermented injera prepared from tef. Most of the fermented foods prepared from enset and tef had low Phy:Zn and Phy:Fe molar ratios.*

Adish AA, Esrey SA, Gyorkos TW, Johns T. 1999. Risk factors for iron deficiency anaemia in preschool children in northern Ethiopia. *Public Health Nutr.* 2:243-52. *Investigates the causes of anaemia in children where the disease is the major health problem in the region. From a sample of 230 anaemic children, 56% had a low red blood cell (RBC) count, and 43% had a serum ferritin of less than 12 microg l⁻¹ indicating that the anaemia was largely due to iron deficiency. Dietary related factors associated with anaemia include frequent consumption of iron absorption inhibitors such as fenugreek and coffee, and poor health in the child such as diarrhoea and stunting.*

Agren G, Anders E, Lieden S. 1975. Food composition table for use in Ethiopia—II. Amino acid content and biological data on proteins in Ethiopian foods. A research report supported by SIDA and Ethiopian Nutrition Institute (ENI). Almqvist and Wiksell, Uppsala, Sweden. 72pp. *Presents values for amino acid content, protein efficiency ratio and productive protein values for crops and foods in Ethiopia. Regarding tef, the amino acid content was analyzed for the whole grain, flour, dried injera, and porridge of different varieties.*

Agren G, Gibson R. 1968. Food composition table for use in Ethiopia—I. CNU Report No. 16. Almqvist and Wiksell, Uppsala, Sweden. 31pp. *Presents the food composition table for commonly used crops or foods in Ethiopia. The table includes values on food energy, moisture, nitrogen, protein, fat, carbohydrate, crude fiber, ash, calcium, phosphorus, iron, vitamin A, thiamine, riboflavin, niacin, vitamin B12, ascorbic acid, tryptophan, and folic acid. Studies for tef were from whole grain, flour, injera, dirqosh, porridge, etc of different varieties.*

Agren G. 1970. Chemical and biological evaluation of protein quality in Ethiopian Crops and diets. *Acta Soc. Med., Uppsala* 75:257-265. *Analyzes the chemical and biological protein for Ethiopian crops such as barely, tef, sorghum and millet. According to the author, barley, tef and wheat gave the highest values for growth, protein efficiency ratio (PER) and productive protein value (PPV).*

Alaunyte I, Stojceska V, Derbyshire E, Plunkett A, Ainsworth P. 2010. Iron-rich teff grain bread: an opportunity to improve individual's iron status. *Proceedings of the Nutrition Society* 69 (OCE1), E105. *Provides information on nutritional and baking qualities of tef bread. Iron level in tef breads was significantly higher when compared with wheat bread.*

Texture properties such as specific loaf volume, crumb firmness, shelf life and cellular structure showed no significant differences between control, 10 and 20% (w/w) tef breads.

Almagard G. 1963. High content of iron in teff and some other crop species from Ethiopia—a result of contamination. *Lantbrhogh. Ann.* 29:215-220. [in Africaans].

Anon. 1962. Tef: a source of protein. *Nutrition Review* 20:310-311. *Indicates the amino acid content of tef based on the study made on rats. According to the findings, tef contained high ratio of essential to non-essential amino-acids, i.e. high quality protein.*

Anon. 1992. How to make injera. *Food Chain No. 7*, pp. 19. *Describes a procedure of preparing injera, a fermented bread from tef. The flour is mixed with water and starter to form a dough. The dough is left to ferment for 3 days. The dough is thinned with water and left to rise before baking on a hot, clay griddle.*

Anon. 2008. Nutrition facts: Teff, cooked. *The Titi Tudoranacea bulletin. English Edition.* June 22, 2008.

. *Applied technology in the preparation of Ethiopian traditional food. Ethiopian Nutrition Institute, Addis Ababa, Ethiopia. 22pp. Presents the studies made on preparation of traditional Ethiopian food products including drying injera, and preparation of wot.*

Bekele A. 1991. Biochemical aspects of wheat in human nutrition. pp. 341-352. In: Gebremariam H, Tanner DG, Hulluka M. (Eds.) *Wheat Research in Ethiopia, a Historical Perspective.* Institute of Agricultural Research (IAR) and CIMMYT. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Compares energy, protein, vitamin, mineral content etc of wheat to that of other cereals. For tef, the iodine content was 0.04 ppm for white tef and 0.30 ppm for red tef.*

Bekele E, Fido RJ, Tatham AS, Shewry PR. 1995. Heterogeneity and polymorphism of seed proteins in tef. *Hereditas* 122:67-72. *Determines the fractions of albumin, globulin, and prolamin in seeds of 37 tef cultivars. Significant differences were obtained for prolamin fraction among the cultivars which can be classified into seven groups.*

Bekele E. 1989. Essential amino acid composition in the various fractions of major tef seed proteins. *SEBIL: Bulletin of Crop Science Committee of Ethiopia Vol. 2, No. 1/2*, pp. 6. (abstract). *Investigates amino acid compositions for 35 tef tef genotypes. The major amino acids were, glutamic acid (20.0%), alanine (14.5%), and lysine (1.6%).*

Bekele E. 1990. Lysine and other essential amino acids in the various fractions of teff seed proteins. pp. 230-232. In: *Proceedings of the Regional Seminar on Cereals of the Semi-arid Tropics, 12-16 Sept. 1989, Garoua, Cameroon.* International Foundation for Science, Stockholm, Sweden.

Bekele E. 1992. Regional variation in basic amino acids including lysine and total proteins in *Eragrostis tef*. *SEBIL: a Bulletin of Ethiopian Crops Science Society Vol. 4*, pp. 17, Addis Ababa, Ethiopia. *Identifies genotypes with high level of total protein and basic amino acids including lysine from 6000 tef lines.*

- Bekele E.** 1995. Essential and non-essential amino acids in a free state and in the major protein fractions of teff seeds. *SINET: An Ethiopian J. of Sci.* 18:79-99. *Determines free and protein-bound amino acid compositions in 35 tef genotypes and investigates nutritional status of different fractions of tef seed proteins. According to the author the major amino acids were glutamic acid, alanine, proline, valine, leucine and aspartic acid.*
- Bekele E.** 1995. Variations in basic amino acids including lysine and total protein in *Eragrostis tef*. *SINET: An Ethiopian Journal of Science* 18:175-194. *Investigates the variations in amino acids and protein content for about 3000 tef accessions. Genotypes that had high basic amino acids, including lysine and total protein, were mostly found within tef collections obtained from Gojam region.*
- Ben-Fayed E, Stojceska V.** 2010. Teff supplemented gluten-free breads as potential prevention of iron-deficiency Anaemia. Second International Symposium on gluten-free cereals and beverages. Manchester Food Research Center, UK. *Indicates the best proportion of tef flour to make quality bread. According to the finding, 20% tef breads showed significant increase in staling and also 45% iron increase compared to the control sample. Hence, upto 20% tef flour could be incorporated in bread formulation resulting in good texture and structure of baked breads.*
- Berry FB.** 1959. Ethiopian nutrition survey. A report by the Interdepartmental Committee on Nutrition for National Defense. Ministry of Defense, Washington D.C.
- Besrat A, Admasu A, Ogbai M.** 1980. Critical study of the iron content of tef. *Ethiopian Medical Journal* 18:45-52.
- Besrat A, Gebre P.** 1981. A preliminary study on the aflatoxin content of selected Ethiopian foods. *Ethiopian Medical Journal* 19:47-52.
- Beyene D, Error! Bookmark not defined.Misgina A, Terefe A.** 1988. The research of some common drinks and injera. Institute of Agricultural Research (IAR) Newsletter of Agric. Research Vol. 3, No. 3, pp. 5-6, Sept. 1988, Addis Ababa, Ethiopia. *Investigates at Holetta laboratory the pH content of common drinks and injera. According to the finding, the pH of tef dough was increased from 3.9 to 4.1 as the dough was stayed from 24 to 120 hours.*
- Borasio L.** 1937. Researches on tef in relation to its use as bread. *Rice Culture Journal* 2:19.
- Bradley C.** Teff—a nutritious and versatile grain blueberry lemon bread recipe. <http://whatscookingamerica.net/CharlotteBradley/Teff-Flour.htm> accessed July 4, 2011. *Presents a recipe for a blueberry lemon loaf that is made using a combination of wheat and tef flour. According to the author, the loaf which was made from the flour of dark tef was moist and delicious.*
- Bultosa G, Hall AN, Taylor JRN.** 2002. Physico-chemical characterization of grain tef starch. *Starch-Starke* 54:461-468. *Investigates the properties of starch isolated from the seeds of five tef varieties. Although the crude composition of tef starch is similar to that of*

maize, tef starch has higher water absorption index and lower water solubility index than maize starch.

Bultosa G, Hamaker BR, BeMiller JN. 2008. An SEC-MALLS study of molecular features of water-soluble amylopectin and amylose of Tef starches. *Starch-Starke* 60:8-22. *Evaluates the molecular features of five tef starches in comparison to the commercial maize starch. According to authors, the slow rate of retrogradation, the slightly lower percent crystallinity, the lower gelatinization temperatures and the lower gelatinization enthalpy observed for tef starches (as compared to maize starch) are probably related to the shorter outer chain lengths of their amylopectin molecules, and may be the foundation of the comparably good keeping quality of tef injera.*

Bultosa G, Taylor JRN. 2003. Chemical and physical characterisation of grain tef starch granule composition. *Starch-Starke* 55:304-312. *Characterizes the chemical and physical properties of starch granules isolated from five grain tef varieties. The lower swelling, apparently lower percentage of crystallinity and lower DSC gelatinisation endotherms than maize starch suggest that the proportion of long amylopectin A chains in tef starch is smaller than in maize starch.*

Bultosa G, Taylor JRN. 2004. Paste and gel properties and in vitro digestibility of tef starch. *Starch-Starke* 56:20-28. *Determines some properties of starch in five tef varieties. According to findings, the starch gel texture of tef was short and in most varieties was slightly firmer than that of maize.*

Bultosa G. 2007. Physicochemical characteristics of grain and flour in 13 tef grain varieties. *Journal of Applied Sciences Research* 3:2042-2051. *Analyzes some physical and chemical properties in 13 tef varieties. The tef flour starch showed less thickening ability, more shear tolerance and slow setback compared to maize starch. The pasting temperature in tef was high since it is a tropical C₄ cereal.*

Cercamondi CI. 2007. Preparation and consumption patterns of injera in Ethiopian families with preschool children. Msc Thesis, Swiss Federal Institute of Technology Zürich, Institute of Food Science and Nutrition, Switzerland. *Investigates the feeding patterns of preschool children in Ethiopian families, in order to estimate energy, iron and zinc intake. According to the finding, phytate content was relatively high, but it decreased during fermentation due to degradation by phytase, especially when tef flour was mixed with wheat flour. The author suggested to mix tef flour with wheat to improve the bioavailability of iron and zinc in injera.*

Cherinet H. 1988. Developing flour using traditional food crops for making injera. pp. 54-59. In: Annual Research Report, 1987/88. Addis Ababa University, Awasa College of Agriculture, Awasa, Ethiopia. *Identifies and develops a formula for preparation and production of acceptable injera using tef, wheat, sorghum, barley and maize. Also popularizes and organizes demonstrations. Observations made were eye count, smoothness of back, texture, elasticity, reconstitution property, moisture loss test, costs, processing loss, labor, and nutritive value. Tef, wheat and zengada make the best combination to imitate tef.*

Dendy DAV, Kasasian R, Bent A, Clarke PA, James AW. 1975. Composite flour technology bibliography. Report, Tropical Products Institute 989. 132pp. *Presents annotated literature under the following headings for cereals including tef, tubers and roots, and Protein supplementation.*

Earnest N. Finding stability through agricultural research and native crops in Ethiopia. Looking Ahead: Sustainable Paths toward Food and Nutrition Security. Mediapolis Community High School Mediapolis, IA.

<http://www.worldfoodprize.org/assets/YouthInstitute/06proceedings/MediapolisHS.pdf>
accessed 15 Sept. 2009.

Ebba T. 1979. Tef: the grass that provides injera. *Ethiopian Grain Review* 5:3-5. *Briefly describes the evolution, variation, ecology, scientific work, problems and prospects of tef production.*

Elsass P. 2010. Celiac diet foods.

<http://www.livestrong.com/article/197682-celiac-diet-foods/> accessed July 24, 2011. *Presents the benefits of gluten-free foods. According to the author, tef can be cooked and used as a base for vegetarian grain burgers, or sprouted for use in salads and sandwiches.*

Erde24.comError! Bookmark not defined.. The information portal for the gluten-free miracle grain from Africa–Teff. [in German] <http://www.erde24.com/> accessed July 5, 2011.

FAO (Food and Agriculture Organization). 1968. Food composition table use in Africa. FAO, Rome. *Presents a table for different seeds and foods of Africa. On pages 27-28, information was provided for white and red tef regarding food energy, protein, fat, carbohydrate, fiber, ash, etc.*

FAO (Food and Agriculture Organization). 1970. Amino acid content of foods and biological data on proteins. FAO, Rome. 285pp.

FAO (Food and Agriculture Organization). 1989. Ethiopian tef. pp. 76-81. In: *Utilization of Tropical Foods: Cereals. Traditional Food Plants.* Food and Nutrition Paper 47/1. FAO, Rome.

FAO. 1968. Food composition table for use in Africa.

<http://www.fao.org/DOCREP/003/X6877E/X6877E00.htm#TOC> accessed July 5, 2011.

Ferro-Luzzi G, Lanzo A, Muller R. 1956. Survey on the nutritional status of an Ethiopian community. *Arch. Ital. Sci. Med. Trop. Para.* 11.

Friedman M. 1993. Grain-based products promote 'well-bred' bodies. *Prepared-Foods* 162(1):49. *Describes the development of cereal-based products including those containing tef.*

Gamboa PA, Van Ekris L. Survey on the nutritional and health aspects of teff. 64pp.

http://educon.javeriana.edu.co/lagrotech/images/patricia_arguedas.pdf accessed July 4, 2011. *Describes nutritional and health benefits related to tef. The benefits related tef are the grain is gluten-free and has high iron and quality amino acid.*

Gashe BA, Girma M, Bisrat A. 1982. Tef fermentation. I. The role of micro-organisms in fermentation and their effect on the nitrogen content of tef. *SINET--Ethiopian Journal of Science* 5:21-25.

Gashe BA. 1985. Involvement of lactic acid bacteria in the fermentation of tef, an Ethiopian fermented food. *Journal of Food Science* 50:800-801. *Studies microorganisms involved in the fermentation of injera. Due to the activities of micro-organisms during the first 18 h of fermentation, the pH of the dough reduced to about 5.8. As the pH was further reduced to about 4.7, lactic acid bacteria were responsible for the acidic characteristics of the dough.*

Gebrekidan B. 1982. Sorghum injera preparations and quality parameters. pp. 55-66. In: International Symposium on Sorghum Grain Quality. International Crops Research Institute for the Semi Arid Tropics. *Compares injera made from tef and sorghum based on colour, 'eyes', texture, taste, overall appearance and storability. The poor keeping quality of sorghum injera compared to that of tef was a major problem which is traditionally solved by using composite flours (sorghum with 20-50% tef or barley).*

Gebremedhin M, Birbegard G. 1981. Serum ferritin in Ethiopian mothers and their new born infants in relation to iron content and socio-economic conditions. *Scan. J. Haematol.* 27:247-252. *Investigates ferritin content in serum from 38 Ethiopian and 10 Swedish pregnant women and in cord blood from their newborn infants. The mean ferritin level in Ethiopian mothers was significantly higher than in the Swedish mothers as well as in a non-pregnant population of apparently healthy Swedish women. The non-privileged group in Ethiopia consumed the iron-rich traditional diet unique for Ethiopia, whereas some of the privileged mothers had abandoned this menu in favour of more refined food items with a lower iron content.*

Gebremedhin M, Vahlquist B. 1974. Nutritional problems in relation to health: experience in Ethiopia. *Le Pédiate* 10:339-349. [in French].

Ghiglione C, Lemordant D. 1978. Two Ethiopian food products: tef flour and ensete paste. *Journal D'agriculture Tropical et de Botanique Applique* 25(3):185-193. [in French].

Gifawosen C, Bisrat A. 1982. Yeast flora of fermenting tef dough. *SINET: an Ethiopian Journal of Science* 5(1):21-25.

Girma M, Gashe BA, Lakew B. 1989. The effect of fermentation on the growth and survival of *Salmonella typhimurium*, *Staphylococcus aureus*, *Bacillus cereus* and *Pseudomonas aeruginosa* in fermenting tef. *World Journal of Applied Microbiology and Biotechnology* 5:61-66. *Evaluates the growth of pathogenic bacteria under different pH of fermenting tef. The test organisms grew in far more acidic conditions in broth than in fermenting tef due to antimicrobial substance(s) that was produced by some lactic acid bacteria.*

Golub C. 1996. Ancient and not-so-ancient grains find new-age cachet. *Environmental Nutrition* 19:2. *Focuses on alternative types of grains and their preparations. These grains are amaranth, kamut, quinoa, spelt, tef and triticale.*

Griffith LD, Castell-Perez ME, Griffith ME. 1998. Effects of blend and processing method on the nutritional quality of weaning foods made from select cereals and legumes. *Cereal Chemistry* 75:105-112. *Investigates the effects of blend and processing method on the nutritional quality of weaning foods made from 60:40 (w/w) cereal:legume mixtures (tef and/or pearl millet with either cowpea or peanut). Complementation of tef and millet flours with peanut produced weaning foods with significantly lower viscosity, higher nutrient density and increased in vitro protein digestibility than those found in blends using cowpea as the legume component.*

Griffith LD, Castell-Perez ME. 1998. Effects of roasting and malting on physicochemical properties of select cereals and legumes. *Cereal Chemistry* 75:780-784. *Evaluates the physicochemical properties for tef and other foods resulting from roasting and malting.*

Hopman E, Dekking L, Blokland ML, Wuisman M, Zuijderduin W, Koning F, Schweizer J. 2008. Tef in the diet of celiac patients in The Netherlands. *Scand J Gastroenterol.* 43:277-282. *Investigates whether naturally gluten-free cereal tef is associated with health problems when used by CD patients. According to the authors, tef products were frequently consumed by Dutch CD patients where the patients reported a significant reduction in the symptom. According to the authors, this might be due to a reduction in gluten intake or increase in fiber intake.*

Hozyasz KK, Slowik M. 2009. Teff—a valuable gluten-free cereal. *Przegląd Gastroenterologiczny* 4: 238-244 [in Polish]. *Indicates nutritional and health benefits of tef especially related to the potential of using tef as a gluten-free product in Poland.*

Hulse JH, Laing EM, Pearson OE. 1980. Sorghum and the millets: their composition and nutritive value. Academic Press, IDRC, London.

Inglett GE. 1977. Food proteins from unconventional cereals. *Food Technology* 31:180-181. *Presents the nutritional benefits of consuming non-traditional cereals such as tef.*

Jansen GR, Di-Maio LR, Hause NL. 1962. Amino acid composition and lysine supplementation of tef. *Agricultural Food Chemistry* 10:62-64. *Analyzes the amino acid composition of six tef lines. According to the findings, tef has a good balance among essential amino acids, except for being markedly limiting in lysine.*

Jansen GR. 1970. Amino-acid supplementation and the world food problem. *Wenner Gren Center International Symposium Series* 14:105-114. *Studies the growth of rat using various cereals. According to the author, the protein of tef, millet or sorghum can be made approximately equal to casein by addition of lysine alone.*

Jansen GR. 1974. The amino acid fortification of cereals. pp. 39-120. In: New Protein Foods. Vol 1a, Technology. Academic Press, New York.

Jardin C. 1967. List of foods in Africa. Food and Agriculture Organization (FAO) Publication, Rome.

Kebede Z. 2009. Levels of essential elements in three tef varieties. MSc thesis in Chemistry, Addis Ababa University. *Determines the composition of essential nutrients in tef. According to the result, red tef has higher content of essential metal followed by mixed tef. Furthermore, all three types of tef are considered rich in mineral content compared to maize, barely, sorghum, wheat, kocho and bulla.*

Kihlberg R, Ericson LE. 1964. Amino acid composition and supplementation of teff. Nutrition Dieta 6:151-155.

Klapheck S, Chrost B, Starke J, Zimmermann H. 1992. Gamma- Glutamyl-cysteinyl-serine: A new homologue of glutathione in plants of the family Poaceae. Botanica Acta 105:174-179. *Reports the presence of tripeptide which has the amino acid sequence gamma GluCysSerin family of Poaceae including tef.*

Labruto G. 1963. Chemical composition of the oil made from tef, a cereal in East Africa. Atti della Societa Pelortana di Scienze Fisiche Matematiche e Naturali 9:177-188. [in Italian].

Lacey T. 2005. Eragrostis tef as a specialized niche crop. State of Western Australia, No. 42/2005, ISSN 0726-934X. *Indicates the potential of tef marketing in Australia especially due to its nutritional benefits. According to the author, in the year 2000 the demand for tef in the US was estimated at 1000 to 1400 ton year⁻¹.*

Lealem F, Gashe BA. 1994. Amylase production by a gram-positive bacterium isolated from fermenting tef. Journal of Applied Bacteriology 77:348-352. *Investigates the optimum condition and properties of Bacillus sp. that was isolated from fermenting tef. The organism grew at the optimum pH of 7-7.5 and temperature of 35-40°C at which it entered the stationary phase after about 72 h and amylase production was at its highest.*

Lester RN, Bekele E. 1981. Amino acid composition of the cereal tef and related species of Eragrostis (Gramineae). Cereal Chemistry 58:113-115. *Determines the amino acid composition of seed proteins for 11 tef and 10 wild accessions. According to the finding, the tef accessions were similar to each other but distinctly different from the wild spp. The amount of lysine in protein was positively correlated with the amount of glycine, arginine, aspartic acid, and threonine but negatively correlated with glutamic acid, isoleucine, leucine, and proline.*

Lovis LJ. 2003. Alternatives to wheat flour in baked goods. Cereal Foods World. 48: 61-69.

Mamo T, Parsons JW. 1987. Iron nutrition of teff. Tropical Agriculture 64:313-317. *Evaluates the iron content of the seeds of two tef varieties, namely DZ-01-354 and DZ-01-99.*

According to authors, tef does not have an exceptionally higher iron content than other cereals but it is an iron efficient plant.

Marechal C. 2009. Teff - Ein Glutenfreies Nahrungsmittel: eine afrikanische alternative zu glutenfreien Produkten. July 27, 2009.

<http://www.suite101.de/content/teff-ein-glutenfreies-nahrungsmittel-a59347> accessed August 25, 2011. *Describes about the nutritional and health benefits of consuming tef, a gluten-free cereal.*

McDonough CM, Rooney LW. 1985. Structure and phenol content of six species millets using fluorescence microscopy and high performance liquid chromatography. *Cereals Foods World* 30(8):550.

Mengesha B, Ergete W. 2005. Staple Ethiopian diet and cancer of the oesophagus. *East Afr Med J.* 82:353-356. *Investigates the association of diet (e.g. kocho, wheat and tef) and incidence of carcinoma of oesophagus in Ethiopia. According to the finding, kocho eating appears to be associated with developing cancer of the oesophagus.*

Mengesha MH. 1966. Chemical composition of tef compared with that of wheat, barley and grain sorghum. *Economic Botany* 20:268-273.

Miller DF. 1958. Composition of cereal grains and forages. National Academy of Sciences, National Research Council Pub. 585, Washington, D.C.

Mohammed MIO, Mustafa AI, Osman GAM. 2009. Evaluation of wheat breads supplemented with teff grain flour. *Australian Journal of Crop Science* 3:207-212. *Investigates the effect of supplementations of tef grain flour to wheat flour on organoleptic and nutritional values. Falling Number increased significantly as the percentage of tef flour was increased. Bread supplemented with up to 5% tef flour is organoleptically and nutritionally acceptable.*

Molineaux L, Mengesha B. 1965. Tef consumption, hookworm infestation and haemoglobin levels: a preliminary report. *Journal of Health* 5(1):1-5. Public Health and Training Center, Gondor, Haile Selassie I University (HSIU), Ethiopia.

Montouri R. 1934. The purinic bases in the seeds of Eleusine coracana, Sorghum aethiopicum, Eragrostis tef and Pennisetum spicatum. *Pamesan Athenum* 6:85-87.

Moroni AV, Arendt EK, Dal Bello F. 2010. Biodiversity of lactic acid bacteria and yeasts in spontaneously-fermented buckwheat and teff sourdoughs. *Food Microbiol.* 28:497-502. *Studies the diversity of bacteria and yeast from fermented buckwheat and tef sourdoughs. Tef sourdoughs were dominated mainly by obligate or facultative heterofermentative lactic acid bacteria, which are commonly associated with traditional wheat or rye sourdoughs. Among yeasts, Saccharomyces cerevisiae and Candida glabrata dominated tef sourdoughs.*

Moroni AV, Arendt EK, Morrissey JP, Bello FD. 2010. Development of buckwheat and teff sourdoughs with the use of commercial starters. *International Journal of Food*

Microbiology 142: 142-148. *Investigates the suitability of commercial starters for the production of gluten free sourdoughs from buckwheat and tef. The isolation of autochthonous lactic acid bacteria and yeasts from the stable tef and buckwheat sourdoughs indicates that both flours represent important reservoir for the isolation of novel and competitive starters for the production of gluten free sourdough bread.*

Myburgh SJ. 1935. The carotene content of some South African seeds. *Vet.* 2:475-484.

Nigatu A, Ahrne S, Gashe BA, Molin G. 1998. Randomly Amplified Polymorphic DNA (RAPD) for discrimination of *Pediococcus pentosaceus* and *Ped-acidilactici* and rapid grouping of *Pediococcus* isolates. *Letters in Applied Microbiology* 26:412-416. *Investigates the taxonomic relationships between *Pediococcus* species from fermenting tef dough and fermented kocho using a PCR-based RAPD procedure.*

Nigatu A, Gashe BA. 1994. Inhibition of spoilage and food-borne pathogens by lactic acid bacteria isolated from fermenting tef dough. *Ethiop Med J.* 32:223-229. *Analyzes the inhibitory potential of fermenting tef and the lactic acid bacteria isolated from fermenting tef dough on lactic acid bacteria. The results showed that the spent media from all of the four lactic acid bacterial isolates inhibited the test bacteria.*

Nigatu A, Gashe BA. 1998. Effect of heat treatment on the antimicrobial properties of tef dough, injera, kocho and aradisame and the fate of selected pathogens. *World Journal of Microbiology & Biotechnology* 14:63-69. *Determines populations of the major indigenous bacteria, yeasts and moulds in fermented tef dough, kocho, and injera. Better efficacy of extracts from injera and suggested improved antimicrobial properties of the baked products than in doughs. Heat of baking inactivated all vegetative cells although spores of yeasts and moulds survived the 100 °C heat applied for 5 min.*

Nigatu A. 1992. Lactic acid bacteria of fermenting tef and fermented kocho and their inhibitory effect on certain food-borne pathogens and spoilage organisms. Addis Ababa University.

Nigatu A. 1998. Systematics of *Lactobacillus* and *Pediococcus* isolates from fermented tef and kocho (*Ensete ventricosum*) and microbiological status of baked products. Thesis, Addis Ababa University. 160pp. *Characterizes lactic acid bacteria from tef dough and kocho fermentation using molecular markers such as RAPD, DNA:DNA hybridization, and 16S rRNA. The use of RAPD was valuable for grouping the lactobacilli and pediococci isolates from kocho and tef.*

Nigatu A. 2000. Evaluation of numerical analyses of RAPD and API 50 CH patterns to differentiate *Lactobacillus plantarum*, *Lact. fermentum*, *Lact. rhamnosus*, *Lact. sake*, *Lact. parabuchneri*, *Lact. gallinarum*, *Lact casei*, *Weissella minor* and related taxa isolated from kocho and tef. *Journal of Applied Microbiology* 89:969-978. *Investigates the relationship of isolates from fermentation.*

Oke OL. 1978. Food protein from unconventional cereals and cereal-like grains. *International Congress of Food Science & Technology Abstracts* pp. 3. *Indicates that many*

unconventional cereals produce nutritious grain and are easily cultivated. Tef contains 9.1% protein but only 273 mg lysine 100 g⁻¹ protein.

Orru A. 1931. Chemical and biological analysis of African cereals and nutritional value of *Eragrostis tef*. Bolletino della Societa Italiana Biologia Sperimentale Vol. 6. [in Italian].

Parker ML, Umeta M, Faulks RM. 1989. The contribution of flour components to the structure of injera, an Ethiopian fermented bread made from tef. Journal of Cereal Science 10:93-104. *Examines the role of major components of the bran and endosperm in injera made up of tef during the two-stage fermentation and baking. According to authors, angular starch granules released from compound grains during milling showed a range of erosion effects typical of enzymatic degradation during fermentation.*

Piccinin D. 2010. More about Ethiopian food: teff. December 14, 2010 <http://ethnomed.org/clinical/nutrition/more-about-ethiopian-food-teff> accessed July 5, 2011. *Indicates that the tef flour imported from Ethiopia does not make good injera in Seattle, USA as compared to the one produced in Idaho, USA. According to the author this might be due to the environmental/atmospheric differences or varying water acidities/microflora.*

Postmus S. 1958. Report on a survey of the nutritional needs of children in Ethiopia. Food and Agriculture Organization (FAO), Rome.

Railey K. Whole grains: teff. <http://chetday.com/teff.html> accessed July 4, 2011 *Describes how to make recipes from tef especially soup.*

Ramachandran K, Bolodia G. 1984. The effect of fermentation on iron, phosphorus and zinc content of tef. Ethiopian Medical Journal 22:45-48.

Reh G. 1972. Toward whiter teff. pp. 25-26. In: Proceedings of Annual Research Seminar, 22-24 Sept. 1971, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the results of preliminary tests made with bleaching method. According to the author, bleached flour from grey tef appeared whiter than flour from even the whitest unbleached tef. Some loss in nutritional value was observed due to bleaching, for example, vitamin A components were destroyed by bleaching.*

Roosjen J. 2005. Processing of teff flour (WO/2005/025319), Patent application. Health & Performance Food International B.V., Assen, The Netherlands. publication date: 24.03.2005. <http://www.wipo.int/patentscope/search/en/WO2005025319> accessed 14 June 2011. *Describes the patent filed to process tef flour.*

Roshevitz R. 1928. A bread plant of Abyssinia: *Eragrostis tef*. Bulletin of Applied Botany and Plant Breeding 18:389-403.

Rouk HF, Mengesha MH. nd. An introduction to tef: a nutritious cereal grain of Ethiopia. Haile Selassie I University, Imperial Ethiopian College of Agricultural and Mechanical Arts, Experiment Station Bulletin No. 26, Dire Dawa, Ethiopia. 21pp. *Introduces tef to foreigner*

who visits Ethiopia. It gives general information, chemical composition, and cultural practices of tef.

S&C. Eragrain teff: a natural, high-performance whole grain food. Soil & Crop Improvement BV, Assen, The Netherlands. *Describes about Eragrain®*, a trade name for tef sold in Europe.

Saleeby JP. Teff: Obscure grain with exceptional nutritional content <http://www.wellsphere.com/general-medicine-article/teff-an-obscure-grain-of-exceptional-nutritional-content/1109080> accessed July 4, 2011.

Scaefter AE. 1961. Food patters in North Africa-Ethiopia. pp. 28-39. In: Proceedings of the Third International Congress of Diet, London.

Scarpa J. 1993. Grains: amaranth, t'ef, splot, kamut, quinoa, and triticale are moving onto New-Wave menus. Restaurant Business Magazine, Sept 20, 1993. v. 92 (14):162. New York, N.Y.

Slimak KM. 1993. Processes for products from potatoes and other roots, seeds and fruit. United States Patent. *Describes how to manufacture a variety of food products using edible roots, seeds or starchy fruits as substitute for cereals, milk, eggs or as a partial substitute for nuts. Among the substitutes tef is also indicated.*

Spaenij-Dekking L, Kooy-Winkelaar Y, Koning F. 2005. The Ethiopian cereal tef in celiac disease. Engl J Med. 353:1748-1749. *Investigates the safety of tef consumption by patients of celiac disease. According to the study, no gluten or gluten homologues were detected in 14 tef varieties tested.*

Stewart BR, Getachew A. 1962. Investigation of the nature of injera. Economic Botany 16:127-130. *Studies the fermentation process in making injera. The primary agent responsible for fermentation of tef flour was Candida guilliermondii.*

Stojceska V, Ainsworth P, Plunkett A, İbanoğlu S. 2010. The advantage of using extrusion processing for increasing dietary fibre level in gluten-free products. Food Chemistry 121:156-164. *Studies how to increase the level of total dietary fibre in gluten-free products using extrusion technology and incorporating a number of fruits, vegetables, cereals including tef.*

Sufian S, Pitwell LR. 1968. Iron content of teff. Journal of Science, Food and Agriculture 19:439. *Evaluates the iron content of seeds of white and red tef. The iron content of locally purchased tef has been determined before treatment and after repeated sequential washing with hydrochloric acid and water.*

Tatham AS, Fido RJ, Moore CM, Kasarda DD, Kuzmicky DD, Keen JN, Shewry PR. 1996. Characterisation of the major prolamins of tef and finger millet. Journal of Cereal Science 24:65-71. *Indicates that the major prolamins of tef and finger millet were similar to*

the alpha-prolamins of the Panicoideae (e.g. maize and sorghum) although the former are classified in a separate sub-family of Chloridoideae.

Teka T, Tuku B, Yetneberk S. Broadening the food base with traditional food plants in Ethiopia. Paper Presented at Food and Agriculture Organization (FAO) expert consultation on Broadening the food base with traditional food plants, 16-23 Nov. 1985, Harare, Zimbabwe.

Thomson P. 1996. *Gluten-free Grains and Flours for baking and bread.* Trafalgar Square Publishing. 209pp. *Presents the composition of tef seeds. According to the author, tef contains 14% protein, 2% fat and good source of calcium, iron and thiamine which are better than other cereal grains.*

Tilley M, Evert S, Staggenborg S, Olson B. 2007. Separation of teff seed proteins by capillary electrophoresis [abstract]. *Cereal Foods World.* 52:A66. *Optimizes conditions for separation of proteins from tef seeds. A free zone capillary electrophoresis (FZCE) method was developed to separate tef prolamins.*

Umeta M, Faulks RM. 1988. The effect of fermentation on the carbohydrates in tef. *Food Chemistry* 27:181-189. *Evaluates the carbohydrate composition of flour milled from red and white-seeded tef varieties and changes in carbohydrate composition. The content of free sugar initially increased during fermentation and then decreased. Yeasts were the major microorganism in flour where by levels increasing during fermentation.*

Umeta M, Faulks RM. 1989. Lactic acid and volatile (C2-C6) fatty acid production in the fermentation and baking of tef. *Journal of Cereal Science* 9:91-95. *Studies microbial counts, moisture content and other properties of tef injera. Lactic acid levels increased throughout fermentation. Baking reduced the acetic acid content but the other acids were largely unaffected by baking. Lactic and acetic acids are responsible for the characteristic sour taste of the baked product, while the other acids contribute to its flavour.*

Umeta M, Haidar J, Demissie T, Akalu G, Ayana G. 2008. Iron deficiency anaemia among women of reproductive age in nine administrative regions of Ethiopia. *Ethiopian Journal of Health Development* 22:252-258. *Assesses the prevalence of iron deficiency anaemia among women of reproductive age in nine administrative regions in Ethiopia. According to authors, significantly higher proportion of clinical anaemia was observed in Afar Region signifying distinct regional variation. The most affected age groups were those between 36-49 years.*

Umeta M, West CE, Fufa H. 2005. Content of zinc, iron, calcium and their absorption inhibitors in foods commonly consumed in Ethiopia. *Journal of Food Composition and Analysis* 18:803-817. *Analyzes nutrient composition and moisture content of 36 foods consumed in Ethiopia. Tef injera was the best source of bioavailable iron of all foods analyzed due to high iron content and relatively favorable phytate:iron molar ratio. According to authors, since fermentation decreases the phytate content by a factor of 3-4, traditional household practices need to be encouraged to address the problem of zinc deficiency, which is particularly prevalent in Ethiopia.*

Urga K, Fite A, Biratu E. 1997. Effect of natural fermentation on nutritional and anti-nutritional factors of tef. *Ethiop. J. Health Dev.* 11:61-66.

Urga K, Keshava N, Narasimha HV. 1997. Effects of natural and mixed culture of lactobacilli fermentation on in vitro iron and zinc bioavailability in tef atmit. *Bulletin of the Chemical Society of Ethiopia* 11:101-109. *Investigates the in vitro availability of iron and zinc in atmit made from fermented white and brown tef. Naturally fermented atmit from white and brown tef had phytic acid levels reduced by 47 and 45%, respectively. Ionizable iron in both naturally and mixed cultures of lactobacilli fermented tef atmit was significantly higher in brown tef compared to white tef.*

Urga K, Narasimha HV, Sasikala BV, Vishwanatha S. 1998. Bioavailability of iron and zinc from tef in rats. *Bulletin of the Chemical Society of Ethiopia* 12:95-103. *Evaluates the bioavailability of iron and zinc from tef products such as kita (non-fermented) and injera (fermented). According to authors, the relative biological value of iron and zinc in kitta was the lowest compared to that of injera suggesting that natural lactic acid fermentation increased the relative biological value of iron and zinc.*

Urga K, Narasimha HV. 1997. Effect of natural fermentation on the HCl-extractability of minerals from tef. *Bulletin of the Chemical Society of Ethiopia* 11:3-10. *Examines effect of fermentation on HCl-extractability of minerals from tef. Fermentation decreased phytic acid but increased the level of inorganic phosphorus, iron, calcium, and zinc. Hence, fermentation improves extractability of minerals tef.*

Van Damme P. 2008. Food and nutrition: the role of under-utilised crops in traditional crop improvement and new crop development. In: Smartt J, Haq N. (Eds.) *New crops and uses: their role in a rapidly changing world.* University of Southampton, UK. pp23-35. *Indicates that the African continent gave birth to a number of cereals such as finger millet (Eleusine coracana), fonio (Digitaria exilis), and tef.*

Watson L, Creaser EH. 1975. Non-random variation of protein amino-acid profiles in grass seeds and dicot leaves. *Phytochemistry* 14:1211-1217. *Evaluates amino-acid composition of cereal grains and dicotyledonous leaves. In cereal grains, leucine and alanine levels were lower in festucoids (Hordeum, Avena, Secale and Triticum) than in other grasses, while those of lysine and glycine were higher. In Chloridoid (Eleusine and Eragrostis) leucine and alanine had intermediate values.*

Wickens GE, Haq N, Day P. (Eds.). 1989. *New crops for food and industry.* International symposium on new crops for food and industry held at Southampton University, London, UK; Chapman and Hall Ltd. 444pp. *Describes the cultivation, marketing, and socio-economic and environmental factors influencing utilization of various crops including tef.*

Wilson RT, Lewis JG. 1977. Observations on the speckled pigeon Columbia Guinea in Tigray, Ethiopia. *IBIS* 119:195-198. *Indicates that wheat and tef are preferred foods at harvest time.*

Woldearegay M. 1989. The urban demand for food in Ethiopia. pp. 483-502. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 Dec. 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Estimates minimum calorie requirement and food supply prospect and suggests alternative prices to alleviate unsatisfactory nutritional status of urban population. According to the author, the annual per capita consumption of tef in Ethiopia is 40 kg, daily consumption is 110 g, and per capita daily intake is 11 g protein. Also indicates demand of population and food production from 1984 to 1994.*

Wondimu A, Tekabe F. 2001. Utilization of tef in the Ethiopian diet. In: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 239-244. *Indicates nutritional benefits of tef, microbial composition and various food products made from tef flour. The procedure of making injera is also presented.*

Wood RT. nd. Cooking with tef. Maskal Forages Inc. 1318 Willow, USA.

Yetneberk S, Rooney LW, Taylor JRN. 2005. Improving the quality of sorghum injera by decortication and compositing with tef. Journal of the Science of Food and Agriculture 85:1252-1258. *Evaluates the quality of tef due to decortication and compositing sorghum with tef. Good quality injera was produced at a 50:50 (w/w) composite of whole tannin-containing sorghum and tef.*

Yetneberk S. 1996. Survey on utilization of tef. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Yigzaw Y, Gorton L, Akalu G, Solomon S. 2001. Fermentation of teff, grass-pea (*Lathyrus sativus*), and their mixtures: Aspects of nutrition and food safety. Lathyrus Lathyrism Newsletter 2, pp. 8-10. *Studies the effect of fermentation of pure tef or tef:grasspea mixtures at 9:1 or 8:2 ratios.*

Yigzaw Y, Gorton L, Solomon T, Akalu G. 2004. Fermentation of seeds of teff, grass-pea (*Lathyrus sativus*), and their mixtures: aspects of nutrition and food safety. Journal of Agricultural and Food Chemistry 52: 1163-1169. *Investigates the effects of fermentation of pure tef or mixture with grass pea.*

Zegeye A. 1997. Acceptability of injera with stewed chicken. Food Quality and Preference. 8:293-295. *Studies the acceptability of injera made from tef, maize, sorghum and barley by panelists. According to the finding, fresh sorghum injera and maize injera were not significantly different in flavour or preference from tef injera. However, tef injera was clearly preferred over other injera types.*

Zelege K. 2009. Levels of essential elements in three tef varieties. MSc thesis in Chemistry, Addis Ababa University. *Determines the level of nine essential elements (namely Na, K, Mg,*

Ca, Mn, Co, Cu, Zn and Fe) in red, mixed and white tef. Although red tef had higher content of essential metal, all three tef types are rich in mineral content compared to maize, barely, sorghum, wheat, kocho and bulla.

Zinsmeister HD, Erb N, Lehmann G. 1980. Hydrocyanic acid content of tropical and subtropical grain varieties. *Zeitschrift fuer Lebensmittel Untersuchung und Forschung* 171:170-173. [in German]. *Studies hydrocyanic acid contents (HCN) of different cereal grains including tef. The HCN content ($\mu\text{g } 100\text{g}^{-1} \text{ DM}$) were 0.8-10.7 for finger millet, 0.7 for tef, 0.0-3.0 for *Oryza glaberrima*, 0.4-2.3 for *O. sativa*; 2.1 for *Panicum miliaceum*, 1.9 for *Paspalum scrobiculatum*, and 0.7-1.5 for *Pennisetum glaucum*.*

22. Animal Nutrition and Feed Value

Abebe W, Mekonnen HM, Moges WM, Getachew T. 2001 Effect of concentrate supplementation and deworming on beef performance of indigenous Ethiopian zebu cattle fed on teff straw. *Revue de Medecine Veterinaire* 152:307-310. *Investigates the effect of concentrate supplementation and deworming on indigenous zebu cattle fed ad libitum on tef straw. According to authors, animals fed on concentrate supplement had a higher dressing percentage than animals fed on tef straw only.*

Allied Seed. 2011. Dessie teff (summer lovegrass) http://www.farmsciencegenetics.com/products/dessie_teff/ accessed July 8, 2011. *Describes benefits of a new tef variety called Dessie which has wide adaptation in USA. Some advantages of Dessie are high yielding forage, excellent palatability and forage quality, great for use as an emergency forage crop and for double cropping, excellent rotational crop when replacing alfalfa or perennial grass stands, can be used as a green manure crop and for erosion control.*

Anon. 1894. Tropical fodder grasses. *Kew Bulletin* 95:378-380.

Bediye S, Fekadu D. 2001. Potential of tef straw as livestock feed. *In: Narrowing the Rift: Tef Research and Development.* Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 245-254. *Presents nutritional benefits of tef straw with regard to chemical composition, digestibility and voluntary intake. Also compares the performance of livestock when fed tef straw alone or with nitrogen supplementation. According to authors, in vitro digestibility and energy value of tef straw are higher than that of wheat and barely.*

Bediye S, Sileshi Z, Mengiste T. 1996. Tef straw quality as influenced by variety differences and locations. *In: 4th National Conference of the Ethiopian Society of Animal Production, Addis Ababa (Ethiopia), 18-19 Apr 1996.* ESAP, Addis Ababa, Ethiopia. ESAP, Addis Ababa. pp 145-152. *Studies nutritional quality of tef straw using ten varieties grown in two seasons and two locations. Substantial differences existed in in vitro digestibility between the varieties where by improved varieties had higher digestibility than unimproved varieties.*

Bediye S, Sileshi Z. 1989. The comparison of Ethiopian feeds. Institute of Agricultural Research, IAR Research Report No. 6. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 33pp.

Bediye S, Sileshi Z. Utilization of tef straw as livestock feed: research review. ESAP, EIAR, Ethiopia. *Evaluates the availability and utilization of tef straw in different regions in Ethiopia. Availability of tef straw varies from region to region. The major tef growing regions account for 80 percent of the total straw production and 50 percent of ruminant population.*

Boe A, Robbins K. 1989. Warm-season annual grass production. Plant Science Pamphlet - Plant Science Department, Agricultural Experiment Station, South Dakota State University (USA) no. 16, p. 8-9.

Boe A, Sommerfeldt J, Wynia R, Thiex N. 1986. A preliminary evaluation of the forage potential of teff. *Pro. South Dakota Acad. Sci.* 65:75-82.

Boe A, Twidwell EK, Casper DP. 1991. Forage potential of teff. In: *Proc. Forage Grassl. Conf. Columbia, Mo. American Forage and Grassland Council.* pp. 236-239.

Bonsi MLK, Osuji PO, Nsahlai IV, Tuah AK. 1994. Graded levels of *Sesbania sesban* and *Leucaena leucocephala* as supplements to teff straw given to Ethiopian Menz sheep. *Animal Production* 59: 235-244. *Investigates the effect of supplementation with fodder tree leaves on the utilization of teff straw. Supplementation increased intakes of total DM, organic matter and N retention but had no effect on the intake of teff straw.*

Bonsi MLK, Osuji PO, Tuah AK, Umunna NN. 1995. *Vernonia-amygdalina* as a supplement to teff straw fed to Ethiopian Menz sheep. *Agroforestry Systems* 31:229-241. *Investigates the chemical compositions and other properties of vernonia used as supplement to teff in feeding Ethiopian Menz type sheep. According to the finding, supplementation did not affect the degradation constants of teff straw, but dry matter disappearance was increased.*

Bonsi MLK, Osuji PO, Tuah AK, Umunna NN. 1995. Intake, digestibility, nitrogen balance and certain rumen characteristics of Ethiopian Menz sheep fed teff straw supplemented with cotton seed cake, dry *sesbania*, dry *leucaena* or fresh *leucaena*. *Agroforestry Systems* 31:243-256. *Determines roughage utilization when different types of supplements (sesbania, leucaena, cotton seed cake) and forms (fresh or dry leucaena) were fed. Supplementation enhanced the dry matter degradation of teff straw at 6 and 12 hours of incubation.*

Bonsi MLK, Osuji PO, Tuah AK. 1995. Effect of supplementing teff straw with different levels of *leucaena* or *sesbania* leaves on the degradabilities of teff straw, *sesbania*, *leucaena*, *tagasaste* and *vernonia* and on certain rumen and blood metabolites in Ethiopian Menz sheep. *Animal Feed Science and Technology* 52:101-129. *Evaluates in vitro gas production, dry matter and nitrogen degradability of foliage of fodder trees and teff straw. The rate of teff straw degradation in sheep fed supplemented diets was increased.*

Bonsi MLK, Osuji PO. 1997. The effect of feeding cotton seed cake, *Sesbania* or *Leucaena* with crushed maize as supplement to teff straw. *Livestock Production Science* 51:173-181. *Investigates the effects of feeding an energy source on intake and digestibility of teff straw fed by Ethiopian Menz rams. The supplemented diets improved the dry and organic matter intakes of teff straw. The intakes of teff straw and total feed were higher for sheep fed the foliage than cottonseed cake diets.*

Bonsi MLK, Tuah AK, Osuji PO, Nsahlai IV, Umunna NN. 1996. The effect of protein supplement source or supply pattern on intake, digestibility, rumen kinetics, nitrogen utilization and growth of Ethiopian Menz sheep fed tef straw. *Animal Feed Science and Technology* 64: 11-25.

Bruce A. 2009. Selecting summer annual forage grasses. *Crop watch*. May 8, no. 11. *Describes about the benefits of using tef as forage crop. According to the author, tef is the best grass that provides soft and high quality horse hay.*

Bruce A. 2009. Teff grass offers benefits and challenges. *Crop watch*. Apr. 24, no. 9. *Shows the advantages and disadvantages of growing tef as a livestock feed. The benefits are tef makes a very palatable hay and is well accepted by horses. Some of the challenges related to tef are, i) it is difficult to establish, and ii) it has a very tiny seed hence must be planted very shallow, extra firm seedbeds may be needed when a drill is used.*

Burt-Davy J. 1916. Teff Grass: A valuable hay and pasture grass for arid and semi-arid tropical and warm-temperate regions. Johannesburg, South Africa. *Describes about the discovery of tef in Ethiopia by James Bruce between 1768 to 1773 Also indicates that the Royal Botanic Gardens at Kew obtained from Ethiopia the first tef seeds in 1886 and distributes to Agricultural Experiment Stations in India and the British Colonies.*

Butterworth MH, Mosi AK. 1984. Practical evaluation of crop residues and agro-industrial by-products for ruminants in developing countries with emphasis in East Africa. *ARNAB Newsletter of Africa Research Network for Agric. Byproducts*. Vol. 4, No.1, pp. 6, Mar. 1984, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Briefly presents the history of evaluation of crop residues as animal feeds in developing countries especially in East Africa.*

Cal-West Seeds. Teff Grass.com <http://teffgrass.com/> accessed June 13, 2011. *The largest forage seed company describes about the benefits of summer forage grasses including tef.*

Chichaibelu B, Coppock CE, McDowell RE. 1977. Laboratory evaluation and estimation of nutritive values of some Ethiopian feedstuffs and formula feeds. *African Journal of Agricultural Science*, Addis Ababa, Ethiopia, Association for the Advancement of Agricultural Sciences in Africa (AAASA) 4:9-24. *Evaluates and estimates nutritive values of nine forages and roughages, 18 energy feeds, eight protein and three mineral supplements from different regions of Ethiopia. Tef straw was also included in the study.*

Chichaibelu B. 1965. Studies on the biological evaluation of the protein quality of tef and abish (*Trigonella foenum graecum*) and the supplementary value of abish when added to tef. M.Sc. Thesis, Cornell University, Ithaca, New York.

Cowling DW. 1954. Plant introduction at the Grassland Research Institute, *Eragrostis abyssinica*. *Journal of British Grassland Society* 9:242.

Cristóbal FL. 2008. Experience of teff cultivation in the province of Valladolid [Spain] during 2008 season. *Tierras de Castilla y León. Agricultura* 149:102-105. In Spanish.

Crosse S, Umunna NN, Osuji PO, Khalili H, Tegegne A, Tedla A. 1998. Comparative yield and nutritive value of forages from two cereal-legume based cropping systems. 1. Crop yield and the nutritive value of forages. *Tropical Agriculture* 75:409-414. *Investigates the effect of two cropping systems on grain and fodder yields and nutritive quality of the fodder. According to the report, neither grain yields nor yields of straws or hays were affected by intercropping.*

Crosse S, Umunna NN, Osuji PO, Tegegne A, Khalili H, Tedla A. 1998. Comparative yield and nutritive value of forages from two cereal-legume based cropping systems. 2. Milk production and reproductive performance of crossbred dairy cows. *Tropical agriculture.* 75:415-421. *Evaluates effects of forages from two cropping systems and feeding levels on milk yield and other parameters. Milk composition was not influenced by treatments.*

David B. 2009. Teff shows promise as new summer forage alternative. *Ag opportunities. Missouri Ag Connection*, June, v. 20, no. 6. *Describes the benefit of tef as a summer forage grass in USA. According to the author, research done in Oregon, South Dakota and Kentucky had shown that tef can be a viable option for American farmers as a forage crop.*

Davison J, Laca M. 2009. Biomass production of 15 teff varieties grown in Churchill County, Nevada during 2009. University of Nevada, Cooperative Extension, Fact Sheet-10-34. *Indicates expected forage yields in USA by growing different varieties of tef. The authors suggested that a producer wishing to grow tef as a forage need to conduct small scale trials to investigate the adaptability and productivity of cultivars.*

Degu A, Melaku S, Berhane G. 2009. Supplementation of isonitrogenous oil seed cakes in cactus (*Opuntia ficus-indica*)-teff straw based feeding of Tigray Highland sheep. *Animal Feed Science and Technology* 148:214-226. *Investigates the effect of different protein sources on feed intake, nutrient digestibility and carcass parameters. Dramatter intake of tef straw was reduced as the result of noug seed cake supplementation.*

Duthie JR. 1894. Tropical fodder grasses. *Kew Bulletin* pp. 378-380.

Ebong C. 1995. *Acacia nilotica*, *Acacia seyal* and *Sesbania sesban* as supplements to tef straw fed to sheep and goats. *Small Ruminant Research* 18:233-238. *Evaluates the effect of supplements to tef straw on 15 sheep and 15 goats. Sheep consumed more straw and total drymatter than goats fed on the same browses. Digestibility of DM and NDF were higher in goats than in sheep.*

Ebro A, Nsahlai IV, Yami A, Umunna NN. 2004. Effect of supplementing graded levels of forage legumes on performance of crossbred calves fed tef straw. *Journal of Applied Animal Research* 26:107-112. *Studies the effect of supplementing forage legumes on 56 calves fed tef straw. Supplementation increased total dry matter, organic matter, nitrogen, gross energy and digestible energy intakes.*

Ebro A, Umunna NN, Nsahlai IV, Osuji PO, Yami A. 1995. The effect of supplementing teff straw with graded levels of cowpea and lablab hays on degradation, rumen particulate passage and intake by crossbred (Friesian x Boran) calves. *Livestock Production Science*

44:221-228. *Investigates the effect of legumes on the intake and degradability of tef straw. According to authors, herbaceous legumes are efficient in alleviating nutrient deficiencies incurred when tef straw is fed to calves.*

Ebro A, Umunna NN, Yami A, Nsahlai IV. 1995. Effect of cowpea (*Vigna unguiculata*) and Lablab (*Lablab purpureus*) hay supplementation on nitrogen and energy utilization in calves fed tef straw. National Conference of the Ethiopian Society of Animal Production, Addis Ababa, Ethiopia, 27-29 Apr 1995. ESAP, Addis Ababa, Ethiopia. pp 99-104. *Evaluates the effect of supplementation on calves fed tef straw. When fed alone, tef straw cannot maintain nitrogen equilibrium; hence requires supplementation.*

Ebro A. 1994. Performance of crossbred calves fed tef supplemented with graded levels of cowpea and Dolichos lablab hay. MSc Thesis, Alemaya University of Agriculture, Ethiopia.

El Hassan SM, Lahlou-Kassi A, Newbold CJ, Wallace RJ. 2000. Chemical composition and degradation characteristics of foliage of some African multipurpose trees. *Animal Feed Science and Technology* 86:27-37. *Examines chemical composition and degradation of foliage from multipurpose leguminous trees (MPT) which had been selected as potential feed supplements for ruminants. Some MPT were useful dietary supplements for ruminants receiving poor quality forages like tef straw.*

Englebrecht C, deWet DF. 1963. Annual hay crops for dry areas. *Boerdery South Africa* 39(4):46-48.

Erasmus LJ, Prinsloo J, Botha PM, Meissner HH. 1990. Establishment of a ruminal protein degradation data base for dairy cattle using the in situ polyester bag technique. 3. Roughages. *South African Journal of Animal Science* 20:130-135. *Estimates protein degradation for 13 roughages including tef in the rumen of cannulated lactating dairy cows, at 3 fractional outflow rates using the in situ polyester bag technique. According to authors, ruminal degradation was higher for silage, lucerne hay, ammoniated roughages and high-quality pastures than for low-quality roughages such as Smuts finger grass hay, tef hay and *Eragrostis curvula* hay.*

Gebremariam T, Melaku S, Yami A. 2006. Effect of different levels of cactus (*Opuntia ficus-indica*) inclusion on feed intake, digestibility and body weight gain in tef straw-based feeding of sheep. *Animal Feed Science and Technology* 131:42-51. *Investigates the effect of different levels of cactus inclusion in tef straw-based feeding sheep. Cactus was readily consumed and animals preferred cactus to tef straw. Inclusion of cactus in the diet up to 50% on DM basis for sheep fed tef straw promotes weight gain without causing digestive disturbances common in diets with high cactus inclusion.*

Gebrewold A. 1976. Results of feeding trials on local Boran beef cattle with crop residues of tef, wheat, oat, native hay, haricot bean, maize, sisal in Ethiopia. pp. 98-106. In: Proceedings of the Sixth Annual Research Seminar, 12-14 Nov. 1975, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the results of feeding trials where different crop residues including tef straw were evaluated. From a four month experiment at Holetta, the highest gain was achieved from tef straw.*

George D. 1990. Cattle like love grass. *The Dakota Farmer* 109:11. Intetec Pub. Minneapolis, Mn.

Getachew G, Makkar HPS, Becker K. 2000. Tannins in tropical browses: effects on in vitro microbial fermentation and microbial protein synthesis in media containing different amounts of nitrogen. *Journal of Agricultural and Food Chemistry* 48:3581-3588. *Studies the effect of tannins on microbial fermentation and other parameters. Incubation of browses with straw significantly decreased ammonia nitrogen concentration but increased microbial protein synthesis compared to straw alone.*

Gilchrist FMC, Potgeither E, Voss JBN. 1968. The biuretolytic activity of the ruminal flora of seep fed practical rations containing biuret. *Journal of Agricultural Science* 70:157-163. *Determines the biuretolytic activity of the ruminal flora in the ingesta of Merino sheep. In the ruminal ingesta from sheep fed tef hay, the biuretolytic activity was low, but when maize meal was given in addition the activity was about three times as high.*

Gizachew L, Abegaz S, Hasen A. 1998. Relationships of grain yield with residue to maize genotypes and tef sub humid western Ethiopia. ACPSE, Addis Ababa, Ethiopia. *Investigates the relationship of straw to grain yield in tef for 95 samples collected from farmers' fields.*

Gizachew L, Smit GN. 2005. Crude protein and mineral composition of major crop residues and supplemental feeds produced on Vertisols of the Ethiopian highland. *Animal Feed Science and Technology* 119:143-153. *Assesses the concentrations of crude protein and minerals in tef, grass pea and noug.*

Gizachew L, Tadesse A. 1992. Effects of feeding hydrated tef straw and protein sources on tef straw voluntary intake and growth of young Horro sheep grazing native pasture during the dry season. pp. 147. In: *Proceedings of the Joint Feed Resources Networks: the Complementary of Feed Resources for Animal Production in Africa*, 4-8 Mar. 1991, Gaborone, Botswana. African Feeds Research Network, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Investigates the effect of supplementary feeding on dry matter intake and growth of young Horro sheep grazing native pasture during dry season. According to authors, neither dry matter nor wetted tef straw supplements significantly increased lamb growth rates in comparison with unsupplemented controls.*

Gizachew L. 1993. Comparison of legumes hay, urea and noug cake as protein supplements to Horro sheep fed on tef straw. pp. 211-215. In: *Proceedings of the Fourth National Livestock Improvement Conference*, 13-15 Nov. 1991, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Investigates the effect of supplementation of different legumes on voluntary tef straw intake and growth rate of Horro sheep.*

Gizachew L. 2002. Crude protein and mineral status of forages grown on pellic vertisol of Ginchi, central highlands of Ethiopia. PhD thesis, University of the Free State, Bloemfontein, South Africa. 147 pp. *Assesses the crude protein (CP) and mineral status of feeds produced in the Vertisol area of Ginchi. Significant differences in mineral concentration were observed between residues of tef and grass pea.*

Gohl BO. 1981. Tropical feeds: feed information and nutritive values. Food and Agriculture Organization (FAO), Rome.

Gylswyk NOV, Hoffman JPL. 1970. Characteristics of cellulolytic cillobacteria from the rumens of sheep fed teff hay diets. *J. Gen. Microbiol.* 60:381-386. *Characterizes nine isolates of bacteria from the rumen contents of sheep fed on tef.*

Gylswyk NOV, Roche CE. 1970. Characteristics of ruminococcus and cellulolytic butyriivihiro species from the rumens of sheep fed differentially supplemented teff hay diets. *J. Gen. Microbiol.* 60:11-17. *Characterizes 24 isolates from the rumens of sheep fed differently supplemented tef hay.*

Gylswyk NOV. 1970. The effect of supplementing a low protein hay on the cellulolytic bacteria in the rumen of sheep and on the digestibility of cellulose and hemi-cellulose. *Journal of Agricultural Sciences* 74:169-180.

Hagos T, Melaku S. 2009. Feed intake, digestibility, body weight and carcass parameters of Afar rams fed tef straw supplemented with graded levels of concentrate mix. *Tropical Animal Health Production* 41:599-606. *Evaluates the effect of supplementation on Afar rams fed tef straw. Intake of tef straw reduced as the level of supplementation increased, whereas the contrary was true for crude protein intake.*

Holin F. 2009. Tracking teff: growers like this annual grass, but it needs a firm seedbed. http://hayandforage.com/hay/farming_tracking_teff_0101/index1.html accessed 11 June 2011. *Presents information on seedbed preparation and sowing tef for forage at the University of Kentucky in USA.*

Hunter M, Barney P, Kilcer T, Cherney J, Lawrence J, Ketterings Q. 2007. Teff as emergency forage. Cornell University, Extension service. Agronomy Fact Sheet 24. 2pp. *Indicates potential uses of tef as a forage crop in New York. Some of the benefits related to tef are, i) serve as emergency hay that can be planted in mid-summer, ii) used as summer annual cover crop for erosion control, iii) provides green manure crop, iv) rotation break crop when renovating a perennial grass or alfalfa stand or pasture. According to authors, proper seed depth is critical for tef; sowing between 1/8 and 1/4 inch deep into a very firm seedbed is recommended.*

Hunter M. 2008. Evaluation of teff as a forage crop in New York. MSc Thesis Iowa State University, Ames, Iowa, USA. 16pp. *Evaluates for two years the potential of tef as a forage crop in New York. According to the author, tef established easily and performed well at all locations tested.*

Hurder KA. 2011. Nitrogen rate and source effects on biomass yield of teff grown for livestock feed in the Mid-Atlantic Region. MSc thesis, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, USA. 94pp. http://scholar.lib.vt.edu/theses/available/etd-05032011-120702/unrestricted/Hurder_KA_T_2011.pdf accessed August 25, 2011. *Investigates at*

three Virginia locations for two years the effect of rate and source of nitrogen fertilization on forage yield, nutritive value and nitrate content of tef at three locations in Virginia for two years. According to the author, tef responds to moderate rates of N and could provide summer forage for grazing livestock in mid-Atlantic region.

Hurvitz S. 1940. New field crops for Palestine, Summer Crops. 3. teff. Agric. Res. Station Bull. Rehovoth 26:27-39.

Hurvitz S. 1940. New forage crops for Palestine. Empire Journal of Experimental Agriculture 8:1-5. *Indicates that tef was introduced into Palestine from South Africa in 1935. According to the author, tef has high nutrient value and contains over 30% dry-matter. Since its growth is rapid and vigorous, weed competition is easily overcome. It is adapted to various soil types and can be grown on light as well as heavy soils.*

Jansen TH, Hofmeyr HS, Staden JHV. 1977. The value of ruminant digesta as animal feed. S. Afr. Tydskrif Weekd 7(3):201-202.

Jessee D. 2009. Putting teff to the test.

http://www.southernstates.com/articles/eq/pasture/spring2009_puttingtefftothetest.aspx

accessed July 4, 2011. *Shows the economic advantages of growing tef for hay production in USA. Additional benefits of tef are palatability of the hay and tolerance of the plant to drought and heat.*

Kaitho RJ, Tegegne A, Umunna NN, Nsahlai IV, Tamminga S, Van Bruchem J, Arts JM. 1998. Effect of Leucaena and Sesbania supplementation on body growth and scrotal circumference of Ethiopian highland sheep and goats fed teff straw basal diet. Livestock Production Science 54:173-181. *Investigates the long term effect of supplementation on growth and reproduction performance of 30 male sheep and 25 goats. Sheep had significantly higher tef straw intake than goats.*

Kaitho RJ, Umunna NN, Nsahlai IV, Tamminga S, Van Bruchem J. 1997. Utilization of browse supplements with varying tannin levels by Ethiopian Menz sheep—2. Nitrogen metabolism. Agroforestry Systems 39:161-173. *Determines the effect of tannin concentrations on protein metabolism from browse supplements on 66 Menz sheep. The supplemented animals had significantly higher total dry matter and nitrogen intake than the ones fed tef straw alone.*

Kaitho RJ, Umunna NN, Nsahlai IV, Tamminga S, Van Bruchem J. 1997. Utilization of browse supplements with varying tannin levels by Ethiopian Menz sheep—1. Intake, digestibility and live weight changes. Agroforestry Systems 39:145-159. *Investigates the effect of tannins on intake, digestibility and live weight changes of 66 Menz sheep. Animals supplemented with forage legumes with low condensed tannin levels had a lower tef straw intake than those on the control diet.*

Kaitho RJ, Umunna NN, Nsahlai IV, Tamminga S, Van Bruchem J. 1998. Effect of feeding graded levels of Leucaena leucocephala, Leucaena pallida, Sesbania sesban and Chamaecytisus palmensis supplements to teff straw given to Ethiopian highland sheep.

Animal Feed Science and Technology 72:355-366. *Investigates the effect of feeding graded supplements on intake and digestibility of 102 male sheep. As the level of supplement increased, significant decrease in tef straw intake was observed.*

Khalili M, Lindgren E, Varvikko T. 1991. A survey of mineral status of soils, feeds and cattle in the Selale Ethiopian highlands: 1. Macro elements. Rapport—Institutionen for Husdjurens Utfodring och Vard. No. 207, 15 pp. *Presents the result of macro mineral status of cattle in Selale highlands of Ethiopia in 25 farms. Available feeds were pasture, hay, oats, and straws of tef and barley.*

Khalili M. 1991. Mineral status of cattle in the Ethiopian Highlands with special reference to sodium. Rapport—Institutionen for Husdjurens Utfodring och Vard. No. 207, 1-47. *Evaluates the mineral status of cattle in Selale highlands of Ethiopia. Available feeds in the area consisted of pasture, hay, barley, oat and tef straws, and barley and oat grains.*

Kock SG, Kistner A. 1969. Extent of solubilization of alpha-cellulose and hemicellulose of low protein teff hay by pure cultures of cellulolytic rumen bacteria. J. Gen. Microbiol. 55:459-462. *Characterizes ten isolates from high dilutions of menfluid from sheep conditioned to low-protein tef hay.*

Krasnokutski VP, Konetang GG. 1939. Teff and its feeding value. Exp. Station Anim. Breed. Saratov. Soc. Zer. Hoz. 5:91-98.

Lambourne LJ, Mosi AK, Butterworth MH. 1986. Relationships between chemical composition and voluntary intake of feeds by sheep and cattle. pp. 162-178. In: Proceedings of International Livestock Center for Africa (ILCA)/ARO/CABO Workshop on Modelling of Extensive Livestock Production Systems, 5-9 Feb. 1985, ARO, Bet Dagan, Israel. ILCA, Addis Ababa, Ethiopia. *Investigates the chemical composition and voluntary intake of local forages and crop residues (such as wheat, tef, maize, oats) by Ethiopian highland sheep, zebu and Friesian/zebu crosses.*

Lategen PJ, Mellett P, Nel JW. 1971. Influence of different protein sources up on the growth and wool properties of early weaned lambs. Agroanimalia 3:17-22. [in Afrikaans].

Lupwayi NZ, Girma M, Haque I. 2000. Plant nutrient contents of cattle manures from small-scale farms and experimental stations in the Ethiopian highlands. Agriculture, Ecosystems and Environment 78:57-63. *Investigates the mineral content of manure from livestock. Manures collected from farms in Deneba area had significantly greater contents of P, K, Mg, and Cu than manures collected in Ginchi area.*

Melaku S, Peters KJ, Tegegne A. 2003. In vitro and in situ evaluation of selected multipurpose trees, wheat bran and Lablab purpureus as potential feed supplements to tef straw. Animal Feed Science and Technology 108:159-179. *Determines nutritive value of feed samples at Debre Zeit.*

Melaku S, Peters KJ, Tegegne A. 2004. Effects of supplementation with foliages of selected multipurpose trees, their mixtures or wheat bran on feed intake, plasma enzyme

activities, live weight and scrotal circumference gains in Menz sheep. *Livestock Production Science* 89:253-264. *Determines effect of supplementation on Menz sheep. Supplementation with mixtures of multi-purpose trees promoted better utilization of nutrients and animal performance compared to sole MPTs or wheat bran in sheep fed on a basal diet of tef straw.*

Melaku S, Peters KJ, Tegegne A. 2004. Feed intake, live weight gain and reproductive performance of Menz ewes supplemented with Lablab purpureus, graded levels of *Leucaena pallida* 14203 and *Sesbania sesban* 1198. *Livestock Production Science* 87:131-142. *Evaluates feed intake and other parameters for Menz ewe fed diverse types of supplements.*

Melaku S, Peters KJ, Tegegne A. 2004. Microbial nitrogen supply, nitrogen retention and rumen function in Menz sheep supplemented with dried leaves of multipurpose trees, their mixtures or wheat bran. *Small Ruminant Research* 52:25-36. *Investigates nitrogen retention and related parameters for 9 supplements.*

Melaku S, Peters KJ, Tegegne A. 2004. Supplementation of Menz ewes with dried leaves of Lablab purpureus or graded levels of *Leucaena pallida* 14203 and *Sesbania sesban* 1198: effects on feed intake, live weight gain and estrous cycle. *Animal Feed Science and Technology* 113:39-51. *Evaluates effect of supplementation on 70 Menz ewes where tef straw is part of the basic feed.*

Melaku S, Peters KJ, Tegegne A. 2005. Intake, digestibility and passage rate in Menz sheep fed tef straw supplemented with dried leaves of selected multipurpose trees, their mixtures or wheat bran. *Small Ruminant Research* 56:139-149. *Studies the effect of supplementing single or mixtures of multipurpose trees in Menz sheep offered a basal feed of tef straw. Tef straw contained high NDF and low crude protein. Soluble phenolics and condensed tannins were higher in the multipurpose trees than in tef straw.*

Melaku S. 2004. Feed intake, digestion kinetics and rumen volatile fatty acids in Menz rams supplemented with Lablab purpureus or graded levels of *Leucaena pallida* 14203 and *Sesbania sesban* 1198. *Animal Feed Science and Technology* 117:61-73. *Studies feed intake and digestibility in Menz rams fed tef straw.*

Melaku S. 2004. Nitrogen utilisation and rumen function in Menz rams supplemented with foliage of Lablab purpureus or graded levels of *Leucaena pallida* 14203 and *Sesbania sesban* 1198. *Australian Journal of Agricultural Research* 55:1117-1124. *Studies the effect of supplementation on 35 male Menz rams fed on a basal diet of tef straw.*

Mengistu A, Ebro A, Assefa T, Hirpa A, Shenkute B. 2007. Effect of supplementation of tef straw with different levels of noug (*Guizotia abyssinica*) meal on worked Arsi oxen (*Bos indicus*). *Tropical Science* 47:49-51. *Investigates the effect of supplementation to tef straw on Arsi oxen. According to authors, supplementation with one kilograms of noug meal was the most profitable, giving a net return per animal of US\$17.10, whereas a sole diet of tef straw gave a loss of US\$18.66 per animal.*

Mengistu A. 1987. Feed resources in Ethiopia. pp. 35-43. In: *Proceedings of the Second PANESA Workshop, Animal Feed Resources for Small Scale Livestock Producers*, 11-15

Nov. 1985, Nairobi, Kenya. IDRC, Ottawa, Canada. *Presents information on feed resources, their status and development in Ethiopia. According to the author, straws from tef, barley and wheat are the largest component of livestock diet in the intermediate and highland areas. Tef is grown at intermediate altitudes and barley replaces wheat at the higher altitudes where pulses are also grown to a great extent.*

Mesfin R, Ledin I. 2004. Comparison of feeding urea-treated teff and barley straw based diets with hay based diet to crossbred dairy cows on feed intake, milk yield, milk composition and economic benefits. *Livestock Research for Rural Development* 16 (12). Art. # 104. *Investigates whether urea-treated tef straw or urea-treated barley straw can replace hay in the diet of dairy cows. The diet with urea treated tef straw gave the highest daily net return. Urea treatment increased the nutritive value of tef and barley straw and these roughages can replace hay in the diet of dairy cows with no loss of milk yield or change in composition.*

Miller D. 2009. Teff grass: a new alternative. In: *Proceedings, 2009 California Alfalfa & Forage Symposium and Western Seed Conference, Reno, NV, 2-4 December, 2009.* UC Cooperative Extension, Plant Sciences Department, University of California, Davis, USA. *Indicates some benefits of using tef as a forage grass.*

Miller D. Teff grass: crop overview and forage production guide. A guide for producers, extension, educators and seed marketers. Cal/West Seeds. Second Edition. 12pp. *Indicates agronomic and soil conditions suitable for growing tef as a forage grass. According to the author, firm seed bed at planting is absolutely critical and seeding depth should not exceed 1/4 inch.*

Morris EJ, Gylswyk NOV. 1980. Comparison of the action of rumen bacteria on cell walls from *Eragrostis tef*. *Journal of Agricultural Science* 95:313-323. *Investigates cellulolytic organisms incubated in vitro with tef cell walls. Examination of thin sections in the electron microscope showed no relationship between attachment of bacteria to the cell walls and ability to degrade them.*

Morris EJ. 1980. The cell walls of *Eragrostis tef*: variations in chemical composition and digestibility. *Journal of Agricultural Sciences* 95:304-311. *Determines the chemical composition of cell walls isolated from the leaf and stem fractions of tef. Throughout the growing season, the leaf cell walls differed in composition from those of the stem. At the start of growth, the leaves had lower xylose and acetyl groups.*

Mosi AK, Butterworth MH. 1985. The voluntary intake and digestibility of combinations of cereal crop residues and legume hay for sheep. *Anim. Feed Sci. Technol.* 12:241-252. *Investigates the digestibility of cereal crop residues. According to authors, using legumes to supplement cereal crop residues-based diets is more appropriate in small mixed farms in Africa.*

Mosi AK, Butterworth MH. 1985. The voluntary intake and digestibility of diets containing different proportions of tef straw and *Trifolium tembense* hay when fed to sheep. *Tropical Animal Production* 10:19-22. *Evaluates intake and digestibility of tef straw and legumes.*

Mosi AK, Butterworth MH. 1985. The voluntary intake and digestibility of diets containing different proportions of teff straw and trifolium (*Trifolium tembense*) hay when fed to sheep. ARNAB Newsletter of African Research Network for Agric. By products Vol. 5, No. 2, pp. 9-12, June 1985. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Examines the value of increasing levels of trifolium hay as a supplement to tef straw fed to sheep.*

Mosi AK. 1981. The role of tef straw as a livestock feed in the Ethiopian highlands. pp. 119-124. In: Proceedings of the Workshop on Utilization of Low Quality Roughages in Africa, 18-22 January 1981, Arusha, Tanzania. Agric. Dev. Rep. Agric. Univ. Norw. Aas, Norway.

Norberg S, Roseberg R, Charlton B, Shock C. 2009. Teff: a warm-season annual grass for Oregon. Oregon State University Extension Service. Revised June 2009. 2pp. <http://extension.oregonstate.edu/catalog/pdf/em/em8970-e.pdf> accessed July 8, 2011.

Norberg S. 2005. Overseeding teff into alfalfa. Malheur Agricultural Experiment Station. Oregon State University, Ontario, OR. <http://www.cropinfo.net/AnnualReports/2005/OverseedTeff.html> accessed August 4, 2011. *Investigates the usefulness of tef as a warm season annual forage crop to fill in declining alfalfa stands in Malheur County, Oregon. According to the author, although tef appears promising as an annual forage grass in monoculture, using tef for overseeding into declining alfalfa stands did not show much promise.*

Nsahlai IV, Osuji PO, Umunna NN. 1995. The degradability by sheep of fruits of acacias and leaves of Sesbania sesban and the effects of supplementation with mixtures of browses and oilseed cake on the utilization of teff straw. Animal Science 61:539-544. *Investigates the degradability of tef and other feeds by sheep. Supplementation with mixtures of oilseed cake and browses did not significantly reduce rumen degradation rates of oilseed cake or tef straw dry matter.*

Nsahlai IV, Osuji PO, Umunna NN. 2000. Effect of form and of quality of feed on the concentrations of purine derivatives in urinary spot samples, daily microbial N supply and predictability of intake. Animal Feed Science and Technology 85:223-238. *Investigates the influence of dietary variation as predictors of intake by cattle.*

Nuwanayakpa M, Butterworth MH, Preston TR, Sayers R, Askabe A. 1985. Effects of levels of noug (*Guizotia abyssinica*) cake and different watering frequencies on body weight change in highland sheep and on the intake of teff straw, molasses/urea and water. ARNAB Newsletter of African Research Network for Agric. By-products. Vol. 5, No. 2, pp. 13-15, June 1985, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Evaluates the intake and utilization of tef straw fed with and without noug cake on growth of highland sheep.*

Nuwanyakpa M, Butterworth MH. 1986. Effects of urea, molasses, molasses-urea, N uptake and legume hay on the intake and digestibility of teff straw by highland sheep. ARNAB Newsletter Vol. 6, No. 4, pp.5, International Livestock Center for Africa (ILCA),

Addis Ababa, Ethiopia. *Evaluates the feed intake utilization by male Ethiopian highland sheep feeding on tef, noug, and trifolium with some additions of urea, molasses and urea molasses. According to the result, supplementation of tef straw with molasses alone depressed the intake of tef straw.*

Nuwanyakpa M, Butterworth MH. 1987. Effects of urea, molasses, molasses-urea, noug cake and legume hay on the intake and digestibility of teff straw by highland sheep. pp. 87-98. In: Proceedings of a Workshop on Utilization of Agricultural By-products as Livestock Feeds in Africa, Sept. 1986, Blantyre, Malawi. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Investigates the effect of two levels of noug cake and trifolium hay on feed intake and utilization by sheep given a basal diet of tef straw. According to authors, response to N (urea) supplementation was greater than to energy (molasses) supplementation, indicating that N deficiency in cereal crop is the main cause of poor animal performance than energy deficiency.*

O'Donovan PB. 1979. Fattening crossbred and zebu cattle on local feeds and by-products in Ethiopia. World Animal Review (Food and Agriculture Organization, FAO) 30:23-29. *Investigates the effect of different feeds including tef straw on crossbred and zebu cattle.*

Ohlde G, Akin H, Becker K. 1991. An histological method for determining the feed quality of straw of different plants. Journal of Animal Physiology and Animal Nutrition 66:189. [in German].

Osuji PO, Capper B. 1992. Effect of age on fattening and body condition of draught oxen fed teff straw based diets. Trop Anim Health Prod. 24:103-108. *Evaluates 24 Ethiopian Boran steers fed on tef straw plus concentrates for a period of 18 weeks.*

Peck SI. 2010. Evaluation of teff as an annual forage crop in Michigan. MSc thesis. Michigan State University. 73 pp. *Compares tef forage to other four warm season grasses in terms of nutritive values to animals. The millets and the sudan grass resulted in greater dry matter yield than tef, however, tef exhibited greater forage quality (crude protein and fiber). According to the author, tef is a desirable alternative forage crop as emergency forage crop.*

Reed JD, Soller H, Woodward A. 1990. Fodder tree and straw diets for sheep: intake, growth, digestibility and the effects of phenolics on nitrogen utilisation. Animal Feed Science and Technology 30:39-50. *Studies the intake, growth, digestibility and nitrogen utilization by sheep fed on tef straw and other feeds. According to authors, diets containing acacias had the highest levels of feed refusals and the lowest intake of tef straw but sheep fed *S. sesban* had the highest intake of tef straw.*

Reed JD. 1984. Inexpensive detergent fibre analysis using a micro system. ARNAB Newsletter of African Research Network for Agric. By-products Vol. 4, No. 4, pp. 7-11, Dec. 1984, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Briefly presents the newly developed micro-fibre apparatus used for fibre analysis tested on feeds such as maize stover, tef straw, and wheat straw.*

Roseberg R, Norberg S, Smith J, Charlton B, Rykbost K, Shock C. 2006. Yield and quality of teff forage as a function of varying rates of applied irrigation and nitrogen. In: Research in the Klamath Basin 2005 Annual Report. Oregon State University Agricultural Experiment Station Special Report 1069: 119-136.

Ross JC, Bosman AM. 1927. Digestibility of tef hay for sheep. Union of South Africa, Dept. of Agric. Sci. Bull. 57:3-24.

Said AN, Tolera A. 1991. Utilization of wheat straw in Ethiopia. pp. 353- . In: Gebremariam H, Tanner DG, Hulluka M (Eds.) Wheat Research in Ethiopia: a Historical Perspective. Institute of Agricultural Research (IAR) and CIMMYT, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Shows production, utilization and prospects of wheat straw in Ethiopia. Also presents comparison to tef straw.*

Sandberg T. 2002. Temperate forages [Teff and Italian ryegrass]: getting the most from your cultivars. Farmer's Weekly (South Africa), no. 92009, p. 40-41

Saunders AR. 1935. Hay and fodder grasses and legumes in the Union of South Africa. Herbage Revs. pp. 128-135.

Sileshi Z, Bediye S, Jones BMG, Mengiste T. 1991. Digestibility, morphological and anatomical characteristics of straw of unimproved tef types. pp. 243-245. In: Holetta Research Center Progress Report for Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Studies digestibility and morphological and anatomical characteristics of straw from ten varieties of tef including the local check.*

Sileshi Z, Bediye S. 1991. Utilization of feed resources and feeding systems in the central zone of Ethiopia. pp. 129-132. In: Proceedings of the Third National Livestock Improvement Conference, 24-26 May 1989, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the results of the survey of 1176 farm households in 11 Awrajas in the Central Zone focusing on livestock ownership, feed resources and feeding practices.*

Sisay Z, Shenkoru T, Tegegne A, Woldeamanuel Y. 2006. Feed intake water balance and water economy in highland sheep fed tef straw and supplemented with graded levels of *Leucaena leucocephala*. Ethiopian Journal of Animal Production 6:67-82. *Investigates the effect of fodder supplementation on feed intake and water balance in highland sheep fed tef straw as basal diet. The results showed the potential of L. leucocephala as supplement to poor quality roughages.*

Skerman PJ, Rivers F. 1990. Tropical grasses. Food and Agriculture Organization (FAO), Rome.

Stanjar WB, Bussard JR, Repard NM, Hall MH, Burk AO. 2010. Voluntary intake and digestibility of teff hay fed to horses. Journal of Animal Science 88:3296-3303. *Evaluates nutrient composition and digestibility of tef hay for horses. Digestibility of tef hay decreased from boot to late-heading stage of tef plant.*

Staniar WB, Bussard JR, Repard NM, Hall MH, Burk AO. Voluntary intake and digestibility of teff hay fed to horses.

<http://teffgrass.com/wp-content/themes/tg/downloads/psu-teffhorse.pdf> accessed July 4, 2011. *Investigates nutrient composition and voluntary intake of tef hay for horses. Digestibility increased from boot to early-heading to late-heading hay for nonfiber carbohydrates and water-soluble carbohydrates.*

Therion JT, Mackie RI, Gilchrist FMC. 1983. Rumen bacteria in sheep fed supplemented teff hay. *South African Journal of Animal Science* 13:215-217.

Tiruneh R. 2004. Minerals and Oxalate content of feed and water in relation with ruminant urolithiasis in Adea district, central Ethiopia. *Revue de Medecine Veterinaire* 155:272-277. *Evaluates the mineral and oxalate level of feed and chemical composition of drinking water in ruminant animals. The oxalate content of tef straw was greater than its respective mean calcium content.*

Tucho TA, Ebro A. 1993. Economics of feeding old oxen for beef production. pp. 246-250. In: *Proceedings of the Fourth National Livestock Improvement Conference, 13-15 Nov. 1991, Addis Ababa, Ethiopia.* Institute of Agricultural Research (IAR), Addis Ababa. *Compares the body weight gains of old oxen for high energy versus high roughage feeds and the cost effectiveness of these feeds. According to authors, old oxen gained better body weight on high feeds rather than on high roughage feeds.*

Twidwell EK, Boe A, Casper DP. 1991. Teff: a new annual forage grass for South Dakota? Extension extra ExEx - South Dakota Cooperative Extension Service, USA No. 8071.

Twidwell EK, Boe A, Fluharty K. 1992. Forage and seed production of two accessions of teff. *Proceedings of the Forage and Grassland Conference, USA vol. 1 p. 180-184.*

Twidwell EK. 2002. Teff: A New Annual Forage Grass for South Dakota? College of Agriculture & Biological Sciences, South Dakota State University ExEx 8071, F&F 1.4-7. *Presents research on tef at South Dakota. According to the author, tef offers some flexibility, since it can be seeded from May through July.*

Umunna NN, Osuji PO, Khalili H, Nsahlai IV, Crosse S. 1995. Comparative feeding value of forages from two cereal-legume based cropping systems for beef production from crossbred (*Bos taurus* x *Bos indicus*) steers and subsequent performance of underfed and realimented steers. *Animal Science* 61:35-42. *Investigates nutritive values from cereals and legume based feeds. According to authors, the growing food crops in association with legumes has the potential of increasing cattle performance.*

Umunna NN, Osuji PO, Nsahlai IV. 1997. Strategic supplementation of crossbred steers fed forages from cereal-legume cropping systems with cowpea hay. *Journal of Applied Animal Research* 11:169-182. *Assesses the feeding value of forages from two cereal-legume cropping systems. According to authors, the basal tef straw did not meet the calcium and phosphorous requirement of the steers.*

Van der Merwe HJ, Von la Chevallerie M, Vermaak LM, Van Rensburg LJJ. 1980. Beef production at different slaughter weights. II. Changes in proportions of various body and carcass components. *Agroanimalia* 12(2):19-26. [in Afrikaans]. *Studies various tissues, organs and carcass parts of 30 animals fed on diet of 60% tef hay, 20% lucerne meal, 15% maize meal, and 5% groundnut oilcake diet.*

Van Gylswyk NO, Hoffman JPL. 1970. Characteristics of cellulolytic cillobacteria from the rumens of sheep fed teff hay diets. *J. Gen. Microbiol.* 60:381-386. *Investigates nine isolates obtained from the rumen contents of sheep fed on tef hay.*

Van Gylswyk NO, Roche CE. 1970. Characteristics of ruminococcus and cellulolytic butyrvibrio species from the rumens of sheep fed differently supplemented teff hay diets. *J Gen Microbiol.* 64:11-17.

Van Niekerk FE, Van Niekerk CH. 1997. The effect of dietary protein on reproduction in the mare. I. The composition and evaluation of the digestibility of dietary protein from different sources. *J S Afr Vet Assoc.* 68:78-80. *Determines digestibility of crude protein and contents of essential amino acids. The concentrations of the amino acids threonine, isoleucine, leucine and arginine were increased in the total ration when lucerne hay replaced the tef hay.*

Vancampenhout K, Nyssen J, Gebremichael D, Deckers J, Poesen J, Haile M, Weibye C. 1990. Fast food for livestock. *Hay and Forage Grower* 6:12. Intertec Pub., Minneapolis, USA.

Vangylsw NO, Hoffman JPL. 1970. Characteristics of cellulolytic cillobacteria from rumens of sheep fed teff (*Eragrostis tef*) hay diets. *Journal of General Microbiology* 60:381-386. *Indicates that nine isolates of cellulolytic, Gram-positive motile rods obtained from the rumen contents of sheep fed on tef hay belong to the genus Cillobacterium.*

Vangylsw NO, Roche CE. 1970. Characteristics of ruminococcus and cellulolytic butyrvibrio species from rumens of sheep fed differently supplemented teff hay diets. *Journal of General Microbiology* 64:11-17. *Characterizes 24 representative isolates of cellulolytic cocci and ten cellulolytic rods from the rumens of sheep fed differently supplemented tef hay.*

Vough LR, Taylor R. Producing teff as an annual hay crop. <http://slate.wvu.edu/r/download/12945> accessed July 5, 2011. *Indicates recommended cultural practices of tef cultivation in USA for forage purpose.*

Watts K. Is teff grass hay always low in NSC? http://www.safergrass.org/pdf/Teff_grass.pdf accessed July 5, 2011. *Provides information about the nutritive value of tef grass grown under diverse environmental conditions in USA.*

Watts K. Teff hay for foundered horses: a good fit? <http://www.thehorse.com/ViewArticle.aspx?ID=13307> accessed July 4, 2011. *Indicates that tef is the perfect grass for foundered horses in California.*

Wiegand RO, Reed JD, Combs DK, Said AN. 1996. Leaves from tropical trees as protein supplements in diets for sheep. *Tropical Agriculture* 73: 62-68. *Determines digestibility and other properties for rams fed tef straw.*

Woldemeskel M, Tegegne A, Umunna NN, Kaitho RJ, Tamminga S. 2001. Effects of *Leucaena pallida* and *Sesbania sesban* supplementation on testicular histology of tropical sheep and goats. *Anim Reprod Sci.* 67:253-265. *Determines the effect of supplementation to tef straw on sheep and goats.*

Woldemichael T, Osuji PO, Yimegnuhal A, Yami A. 2001. Effect of wheat bran supplementation on feed intake, body weight change and retained energy in the carcass of Ethiopian highland zebu (*bos indicus*) oxen fed teff straw as basal diet. In: *Livestock in food security-roles and contributions. Proceedings of the 9th annual conference of the Ethiopian Society of Animal Production (ESAP), 30-31 August 2001, Addis Ababa, Ethiopia.* ESAP, Addis Ababa. pp. 111-124. *Investigates the effect of wheat bran on oxen fed tef straw as a basal diet.*

23. Farming Systems Studies

Abagodu A. 1988. Sidama mixed farming zone diagnostic survey report, Sidamo Region. Institute of Agricultural Research (IAR) Research Report No. 3/88, Addis Ababa, Ethiopia. 40pp.

Alkamper J. 1973. The cereal production of Ethiopia situation, performance and possibilities of improved supply of population. Abstract in: Referate Von Habilitation Sarbeiten und Dissertatioen 1964-1981. Justus-Liebig Universitat Giessen, Germany. *Reports the result of survey on economic situation and production of cereals in Ethiopia.*

Anon. 1975. Crop sampling survey for 1974/75. Extension and Project Implementation Department (EPID) Publication No. 29, EPID, Ministry of Agriculture. Addis Ababa, Ethiopia. 67pp. *Presents yield data for major crops in different regions, and interpretation and analysis of the results of fertilizer studies. Regarding tef, the yield increment due to fertilizer application was 2.4 q ha⁻¹.*

Anon. 1988. Tef-wheat-sorghum-chickpea-cattle-donkey-goat farming system of the Woina-Dega. pp. 144-169. In: Assistance to land-use planning, Ethiopia. Socio-economic Evaluation of the Current Land-use and Farming Systems in the Menagesha (Shewa) Awraja. Ministry of Agriculture (MoA)/Food and Agriculture Organization (FAO), Addis Ababa, Ethiopia. *Presents results of farming system survey in Woina-Dega Region of Menagesha Awraja where the major crops are tef, wheat, sorghum and chick pea. For tef, koticha lands are preferred; sown in puddle to prevent weed growth; plowing five times on chilo and four times on koticha soils.*

Anon. 1988. Wheat-barley-tef-flax-cattle-horse-sheep farming system of the lower Dega. pp. 98-120. In: Assistance to land-use planning, Ethiopia. Socio-economic Evaluation of the Current Land-use and Farming Systems in the Menagesha (Shewa) Awraja. Ministry of Agriculture (MoA)/Food and Agriculture Organization (FAO), Addis Ababa, Ethiopia. *Reports the farming system survey in Menagesha Awraja dominated by barley, wheat, tef and flax with regard to crop production, livestock production, etc. Regarding tef, practices applied in the survey area are: four times plowing, seed rate of 30 kg ha⁻¹, fertilizer rate of 50 kg ha⁻¹ DAP and 50 kg ha⁻¹ urea.*

Anon. 1988. Wheat-tef-horse bean-lentil-cattle-horse-sheep farming system of the lower Dega. pp. 121-143. In: Assistance to land-use planning, Ethiopia. Socio-economic Evaluation of the Current Land-use and Farming Systems in the Menagesha (Shewa) Awraja. Ministry of Agriculture (MoA)/Food and Agriculture Organization (FAO), Addis Ababa, Ethiopia. *Reports farming system survey from Menagesha Awraja where wheat, tef, horse bean and lentil are mainly grown. Farmer grow tef on koticha soil and make three plowings before sowing.*

Anon. 1990. Farming systems diagnostic survey. pp. 409-410. In: Holetta Research Center Progress Report, 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Reports the results of diagnostic survey at three Awrajas (Menagesha, Selale and Ada) of the Central Zone where percent of farmers growing tef were 86% in Menagesha, 80% in Selale and 100% in Ada.

Anon. nd. Diagnostic surveys. pp. 157-158. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Briefly reports the results of two surveys in the Northern Shewa (Enewari, Aleltu and Sendafa), and Addis Alem Woreda where tef is the major crop. According to the report, major constraints in Northern Shewa were waterlogging, poor soil fertility and feed shortage.*

Asamenew G, Beyene H, Negatu W, Ayele G. 1993. A survey of the farming systems of Vertisol areas of the Ethiopian Highlands. pp. 29-49. In: Mamo T, Srivastava KL, Dibabe A (Eds.) Improved Management of Vertisols for Sustainable Crop-livestock Production in Ethiopian Highlands: Synthesis Report 1986-1992. Technical Committee of the Joint Vertisol Project, Addis Ababa, Ethiopia. *Presents results of informal and formal surveys carried out at four Vertisol regions (Wereilu, Ginchi, Inewari and Debre Zeit). In these areas, farmers growing tef were 86% at Wereilu, 97% at Ginchi and 84% at Inewari.*

Bekele M. 1987. Farmers' constraints for increasing crop production in Ethiopia. pp 134-137. In: Improving Food Crop Production in Small Farms in Africa. Food and Agriculture Organization (FAO), Rome. *Briefly shows ecological conditions, farmers' constraints and plans in solving the constraints. The major constraints were, i) problems in adopting technology, ii) organizational and basic development problems, and iii) policy related problems. According to the author, the total area allocated for tef was 1.4 mio ha (or 22% of the total area) and the average yield was 0.9 ton ha⁻¹.*

Belayneh H, Beyene H, Debela S. Experiences in farming systems research in Ethiopia. pp. 47-53. In: Proceedings of Eastern and Southern Africa Research Extension Administrators' Workshop, 14-17 Nov. 1988, Nairobi, Kenya. CIMMYT, Regional Office, Nairobi. *Presents the institutionalization, sustainability and mechanism of linkage an on-farm research (OFR) in Ethiopia. According to authors, grain yields of tef (in q ha⁻¹) were 7.2 using farmers' method for local variety and 6.9 for improved variety. By researchers' method, the yield was 13.1 for local variety and 14.7 for improved variety.*

Belette S. 1988. Rural development approaches: a challenge to agricultural sciences. Ethiopian Journal of Agricultural Sciences 10:11-23. *Reviews major components of rural development programs and projects in Ethiopia which include Community and Comprehensive Development Projects, Chilalo Agricultural Development Unit (CADU), Wolaita Agricultural Development Unit (WADU), minimum, and Fourth Livestock Projects.*

Bengston ML. 1983. Agricultural research, technical changes in plant husbandry activities and development among farmers in the Chilalo Awraja, Arsi Region, Ethiopia, 1967-1980. pp. 99-188. In: Reklam and Kalalogtryck (Eds.) Rural Development Research and Agricultural Innovations. SIDA Report 115, Uppsala, Sweden.

Bengtoson B. 1968. Cultivation practices and the weed, pest and disease situation in some parts of the Chilalo Awraja. Chilalo Agricultural Development Unit (CADU) Report No. 10,

Asella, Ethiopia. *Reports the results of the survey made in 1967 focusing on existing cultivation practices in some parts of Chilalo Awraja.*

Beyene H, Yirga C. 1989. Initial results of informal survey Inewari and Sendafa-Aleltu areas of Northern Shewa. Institute of Agricultural Research (IAR) Working Paper No. 9, Addis Ababa, Ethiopia. 29pp.

Beyene H, Yirga C. 1991. Diagnostic survey of Kembata: Hadya Awraja. pp. 250. In: Holetta Research Center Progress Report Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Briefly reports the results of diagnostic survey conducted in 1989/90 in Kembata, Hadya Awraja, where tef is one of the major crop.*

Beyene H, Yirga C. 1992. Vertisol farming systems of North Shewa. pp. 79-96. In: S. Franzel and H. Van Houten (Eds.) *Research with Farmers: Lessons from Ethiopia.* CABI, UK. *Presents natural and socio-economic factors, enterprise pattern and food consumption and problems in Vertisol areas of North Shewa. At Inewari and Sendafa-Aleltu areas 100% of farmers grew tef mainly on bottom land which is prone to waterlogging.*

Bogale A, Hagedorn K, Abalu G. 2002. Implications of agricultural land degradation to the profitability and competitiveness of subsistence farmers: A comparative study from rural Ethiopia. *Journal of Agriculture in the Tropics and Subtropics* 103:61-71. *Investigates the competitiveness of smallholder farmers and economic profitability for six major crop-district categories, i.e., sorghum and maize in Alemaya; wheat and barley in Hitosa; and tef and sorghum in Merhabete.*

CADU (Chilalo Agricultural Development Unit). 1968. Crop sampling in the Chilalo Awraja, Arussi Province in the 1967. CADU, Asella, Ethiopia. 15pp. *Reports the results of the survey made in Chilalo Awraja at Huruta, Etaya, Gonde, Asella, Sagure and Digellu regarding the estimation of yield for different crops including tef.*

CADU (Chilalo Agricultural Development Unit). 1973. General agricultural survey, 1972. Planning and Evaluation Section. CADU Publication No. 82, Asella, Ethiopia. 63pp. *Presents results of the survey carried out in 1972 in Chilalo Agricultural Development Unit (CADU)'s project area to assess farming and consumption habits. According to the report, the area allocated for tef was 14% at Zwai and Dugda, 11% at Dera, and 12% at Sire.*

Dadi L, Gedeno G, Kumsa T, Degu G. 1987. Bako Mixed Farming Zone diagnostic survey report, Welega and Shewa Regions. Institute of Agricultural Research (IAR) Research Report No. 1, Addis Ababa, Ethiopia.

Dadi L, Gedeno G, Kumsa T, Degu G. 1992. The farming system of the Bako area. pp. 43-59. In: Franzel S, Van Houten H (Eds.) *Research with Framers: Lessons from Ethiopia.* CABI, UK. *Presents detailed description of tef-maize farming system in Bako area with regard to farmers' circumstances, enterprise pattern and resources and constraints. In the study area, the average farm size for tef was 0.5 ha per farmer in 1985 while farmers growing tef were 87 in 1977 and 52 in 1985.*

Degu G, Mwangi W, Workayehu T, Grisley B. 1991. Areka area mixed farming zone, Northern Omo Region: Diagnostic survey. Institute of Agricultural Research (IAR) Research Report No. 15, Addis Ababa, Ethiopia. 25pp.

Degu G, Workayehu T. 1990. Initial results of informal survey: Areka area mixed farming zone, Wolaita Awraja, Sidamo Region. Institute of Agricultural Research (IAR) Working Paper No. 11, Addis Ababa, Ethiopia. 43pp.

Ebba F. 1970. A case study of six peasant farms in Ada District, Shewa Province. Ministry of Agriculture (MoA), Addis Ababa, Ethiopia.

Ensermu R, Yalew A. 1995. Factors influencing crop enterprise choice by smallholders: a case study of Bahr Dar and Yilema Densa areas. Working Paper No. 14, Institute of Agricultural Research, Addis Ababa, Ethiopia.

Erkossa T, Ayele G. 2003. Indigenous knowledge and practices for soil and water management in East Wollega, Ethiopia. Deutscher Tropentag 2003 Göttingen, October 8-10, 2003 Conference on International Agricultural Research for Development. *Examines local soil and water management related knowledge and practices of farmers in western Ethiopia. According to authors, small cereals like tef which require highly intensive tillage and smooth seedbed are considered detrimental while legumes and oil crops contribute positively to the land quality.*

Eshete S. 1989. Crop's survey report in Gamo and Mendayo Awrajas Mixed Farming Zones, Gamu-Gofa and Bale Regions. Agri-Service Ethiopia (ASE) Working Paper Ag. 1/1989, Addis Ababa, Ethiopia. 16pp. *Studies production systems for target farmers of Agri-Service Ethiopia in Bale and Gamu-Gofa Regions, mainly to identify priority crop production problems, and determine the type of technology for solving these problems. The author indicates that tef is one of the major crops in both Bale (dega area, 2000-2600 m asl), and Gamu-Gofa (kola area, 1200-1700 m asl).*

Ferede S, Ayele G, Teklewold H. 2003. Impact of technology on household food security in tef and wheat farming systems of Moretna-Jiru wereda. EARO, Research Report no. 48, Addis Ababa, Ethiopia.

Franzel S, Van Houten H. (Eds.). 1992. Research with farmers: Lessons from Ethiopia. CABI, UK. 303pp. *Presents the activities of agricultural researchers in Ethiopia in applying farming systems research. The book provides detailed descriptions of five selected farming systems in Ethiopia: the maize-tef system, the wheat-tef system, the semi-arid areas, the barley-wheat system, and coffee-maize system.*

Franzel S. 1992. Impact, institutionalization and methodology: research with farmers in Ethiopia pp. 243-264. In: Franzel S, Van Houten H (Eds.) Research with Farmers: Lessons from Ethiopia. CABI, UK. *Presents summary of the contribution of farming systems approach to agricultural research in Ethiopia. Regarding tef, estimates of parameters for Adet area are shown. During the informal survey in 1986, farmers growing tef were 100%,*

and average area per grower was 0.65 ha; while during the formal survey in 1987, farmers growing tef were 98%, and average area per grower was 0.68 ha.

Friedrich KH, Slangen AVE, Belette S. 1973. Initial farm management survey, 1972/73. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Game GK, Thaipakdee S, Intaratat K, Aungsuratana A. 2004. Tef production and fertilizer use in the mid- and low- agro-ecological zones of Southern Ethiopia. *Kamphaengsaen Acad.* 2:48-60. *Determines factors affecting the production of tef and fertilizer use for 81 farmers in mid-altitude and 76 farmers from low-altitude areas. In the year 2000, about 90% of the mid- and 70% of the low-altitude zone farmers adopted improved tef varieties. The study reveals that the majority of the farmers applied fertilizer less than the recommended rate. The adoption of chemical fertilizer is consistently higher for tef farmers in the mid-altitude than those in the low-altitude.*

Gebre-Egziabher TB, Gebrekiros F, Kidane A, Yimane G. 1982. Participation of a rural community in the identification of technological problems in Ethiopia: a case study from Wolmera Woreda. The United Nations University, Japan. 61pp. *Indicates research and development systems in rural settings, methodology of the study, and problems as identified by peasants and their traditional solutions based on Wolmera Woreda. The major crops grown in the area were tef, durum wheat, chick pea, grass pea and fenugreek in lower areas of Vertisols while tef, bread wheat, barley, linseed, lentils, peas, and horse bean in red oxisols.*

Gebrekiros F. 1980. Search for alternatives of agricultural development strategy under varied conditions of peasant production in Ethiopia—a case study in Ada Woreda. *Ethiopian Journal of Agricultural Sciences* 2:115-127. *Demonstrates the need for the re-orientation of agricultural development in Ethiopia based on the study made in Ada Woreda where tef is the major crop.*

Getnet K, Verbeke W, Viaene J. 2005. Feasibility of on-farm commercial grain storage in the smallholder agriculture of Ethiopia. *Outlook on agriculture* 34:41-47. *Investigates the feasibility of on-farm grain storage for two major food crops in Ethiopia as a strategy to raise and stabilize the income of smallholder farmers.*

Gorshkov A, Bekele E. 1979. To the questions regarding ecological peculiarities of *Eragrostis tef* and its diseases. pp. 56-61. In: *Proceedings of Diseases, Pests and Weeds and Methods of Their Control.* Scientific Phytopathological Laboratory (SPL), Ambo, Ethiopia. *Presents some observations undertaken in natural conditions during surveys in Fitcha, Chacha and Sheno all in the highland of Shewa Administrative Region where tef is also among the major crops.*

Gryseels G, Andereson FM. 1983. Research on the farm and livestock productivity in the Central Ethiopian highlands: Initial results, 1977-1980. International Livestock Center for Africa (ILCA) Research Report No. 4, ILCA, Addis Ababa, Ethiopia. 52pp. *Reports ILCA's research activities at Debre Zeit and Debre Berhan sites in Ethiopia. Regarding tef, the*

average crop yield, average annual labor inputs, average gross margins and other information were provided.

Holovlasky J. 1974. Major crops grown in the warm zone (woyna daga) of Ethiopia. *Sbornik Vysoka Skola Zemedelska*. 7:107-116. *Indicates that Woyna Daga, the warm region in Ethiopia, is the most important farming area in the country. Commonly cultivated crops in the region are sorghum, tef and maize, which together contributes for 62% of the whole acreage under crops in the region.*

Jutzi S, Asamenew G, Haque I, Tedla A, Astatke A. 1987. Intermediate technology for increased food and feed production from deep black clay soils in the Ethiopian highlands. pp. 373-383. In: *Improving Food Crop Production on Small Farms in Africa*. Food and Agriculture Organization (FAO), Rome. *Presents problems, potentialities, and nutrient utilization for Vertisols in the highlands of Ethiopia. Based on farmers' interview, the tef yield at Wereilu was 651 kg ha⁻¹ in good year and 297 kg ha⁻¹ in bad year.*

Kefyalew A, Ensermu R. 1989. Initial results of informal survey Bahir Dar mixed farming zone: Bahir Dar Zuria, Mecha and Achenefer Woredas, Gojjam Region. Institute of Agricultural Research (IAR) Working Paper No. 5, Addis Ababa, Ethiopia.

Kefyalew A, Ensermu R. 1992. Bahir Dar Mixed Farming Zone: Diagnostic Survey. Institute of Agricultural Research (IAR) Research Report No. 18, Addis Ababa, Ethiopia.

Kefyalew A, Franzel S. 1987. Initial results of informal survey: Adet mixed farming system zone. Institute of Agricultural Research (IAR), Dept. of Agric. Economics and Farming Systems Research. Working Paper No. 2/87, Addis Ababa, Ethiopia. 36pp.

Kefyalew A, Geleto T, Ensermu R. 1992. Initial results of informal survey of the Debre Tabor mixed farming zone. Institute of Agricultural Research (IAR) Working Paper 12, Addis Ababa, Ethiopia. 27pp.

Kefyalew A, Kebede T. nd. Results of farming systems research. pp. 119-124. In: *Adet Research Center Progress report for 1985/86*. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports results of farming systems survey from middle altitude area of Yilama Densa Woreda around Adet Research Center where tef and maize are intercropped with irish potato and rape seed. Tef has the largest share of land (31%) followed by barley (15%), maize (13%), and rough pea (10%). Common rotations followed are tef-barley, tef-chickpea, etc. Prices of tef (in birr q⁻¹) were at Adet local market 55.00 at harvest, 75.00 at planting, and 45.00 by Agricultural Marketing Corporation price.*

Kefyalew A, Regassa S, Mulatu T. 1994. Adami Tullu Mixed Farming Zone: Diagnostic Survey. Research Report, Institute of Agricultural Research, Addis Ababa, Ethiopia.

Kefyalew A. unpublished. Review of on-farm research in the semi-arid areas of Central Ethiopia. In: *The National Workshop on Dryland Farming Research*, 26-28 Nov. 1991, Nazret, Ethiopia. *Reviews on-farm activities conducted in the central semi-arid regions of Ethiopia with regard to package testing, variety verification, weed control, moisture*

conservation, soil fertility, and evaluation of improved moldboard plow. Regarding tef, variety verification and weed control are reported.

Kefyalew A. unpublished. System constraints in the semi-arid areas of central Ethiopia. In: The National Workshop on Dryland Farming Research, 26-28 Nov. 1991, Nazret, Ethiopia. *Indicates enterprise pattern, major production and marketing constraints in three semi-arid areas of Central Ethiopia, namely Adama Bosset, Adami-Tulu and Mieso-Asebot.*

Kefyalew A. 1988. Adet mixed farming zone diagnostic survey report, Gojam Region. Institute of Agricultural Research (IAR) Research Report No. 4/88, Addis Ababa, Ethiopia. 42pp.

Mamo A, Franzel S. 1987. Initial results of informal survey: Sinana mixed farming system zone. Institute of Agricultural Research (IAR) Working Paper No. 1/87, Addis Ababa, Ethiopia. 43pp.

Mekuria M, Franzel S, Beyene H. 1989. Farming system research in the Institute of Agricultural Research: Progress and Challenges. Institute of Agricultural Research (IAR) Working Paper No. 8, Addis Ababa, Ethiopia. 20pp.

Mekuria M, Franzel S, Beyene H. 1992. Farming systems research in Ethiopia: evolution, development and organization. pp. 28-39. In: Franzel S, Van Houten H (Eds.) *Research with Farmers: Lessons from Ethiopia*. CABI, UK. *Indicates the status of FSR in Institute of Agricultural Research (IAR) and current on-farm research activities. The on-farm trials executed in 1989 were 3 at 23 sites.*

Mekuria M, Franzel S. 1987. Farming system research in the Institute of Agricultural Research, Ethiopia: Evolution, impact, issues. Department of Agricultural Economics and Farming Systems Research, Institute of Agricultural Research (IAR), Working Paper No. 3/87, Addis Ababa, Ethiopia. 12pp.

Mekuria M, Franzel S. 1989. Farming systems research in Ethiopia. pp. 321-339. In: *Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia*, 8-12 Dec. 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Indicates the evolution of farming systems research at the Institute of Agricultural Research in Ethiopia, and presents initial results and implications based on three case studies at Nazret, Bako and Sinana farming system studies. The major crops in study areas were maize, tef, sorghum and haricot bean at Nazret; and maize, tef, noug and pepper at Bako.*

Mela A. 1973. Farm management survey of the Bako area. pp. 140-142. In: *Proceedings of the Fourth Annual Research Seminar*, 24-26 Oct. 1973. Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports on the land use, labor, capital goods, livestock production, farm expenses and cost of production for major crops including tef in Bako area.*

Miller LF, Mekonnen T. 1965. Organization and operation of three Ethiopian case farms. Haile Selassie I University (HSIU), Imperial Ethiopian College of Agricultural and Mechanical Arts, Experiment Station Bulletin No 35, Dire Dawa, Ethiopia. 43pp. *Reports organization and operation of three farms in the Lake Alemaya region at College of Agriculture. The study was made on diets, health, community activities, use of family labor, and income and expenses. Mixed cropping of tef with sorghum and beans were reported.*

MoA (Ministry of Agriculture). 1953. Agriculture in Ethiopia. MoA, Addis Ababa, Ethiopia. 73pp. *Reports the general situation of agriculture in Ethiopia with special reference to policies, crops, animals, forestry, improvements and statistics. According to the report, tef is the most important grain crop as far as food consumption is concerned.*

MoA (Ministry of Agriculture). 1970. An application to the United States agency for International development for Ethiopia: the Ada Agricultural Development Project. Imperial Government of Ethiopia, MoA, Addis Ababa, Ethiopia. *Presents technical, economic and financial analysis of Ada Agricultural Development Project where tef covers 37% of the cultivated land. With regard to tef, the yield was 10 q ha⁻¹; but raised to 17 q ha⁻¹ using improved practices and to 20 q ha⁻¹ using improved practices plus mechanization.*

MoA (Ministry of Agriculture). 1973. Final report of crop condition survey for the 1972-73 harvest. Imperial Ethiopian Government, Ministry of Agriculture, Planning and Programming Department, Addis Ababa, Ethiopia. 177pp. *Provides results of crop harvest survey for 1972/73 from different Regions and Woredas in Ethiopia. Regarding tef, information about commodity review and outlook, supply implications, and price behaviour were presented on pages 145 to 148.*

MoA (Ministry of Agriculture). 1975. Belg crop condition in 1975. Planning Department, MoA, Addis Ababa, Ethiopia. 81pp. [in Amharic]. *Provides lists of regions with belg crop; also identifies regions which face shortage of belg rain. According to the report, tef is grown as a belg crop in the following Regions (Woredas in each region are indicated in parenthesis): Bale (Goro, Ginir, Lehida); Gamu Gofa (Dara Malo, Gardula, Gomaide, Gofa); Kefa (Kersa, Gera, Bonga, Ufa); Shewa (Silti, Kondaliti, Ankober, Angacha); Sidamo (Damot Gale, Damot Woyde, Sodo Zuria, Ofa, Fsha Genet, Wonago, Bonsa, Hagre Mariam, Burgi); Wollega (Nekemte, Arjo); and Wello (Urgesa, Kewori Dhar).*

MoA (Ministry of Agriculture). 1977. Land utilization and crop production. Report on the small-scale agricultural sample census 1976/77 (1969 E.C.) Vol. 1. Ministry of Agriculture and Settlement, Addis Ababa, Ethiopia. 195pp. *Presents information on size and type of agricultural holding, land utilization and area, yield and production of major crops in Ethiopia. Main crops on private peasant holdings are tef, barley, sorghum and maize.*

MoA (Ministry of Agriculture). 1984. General agricultural survey, preliminary report 1983/84. Vol. I. Planning and Programming Department, Ministry of Agriculture (MoA), Addis Ababa, Ethiopia. 128pp. *Provides data for rural population, crop and animal diseases, use of farm inputs, marketing and credit in Ethiopia. Regarding tef, the total area of cultivation was 1.3 mio ha while the total production was 0.85 mio ton. Proportion of farmers growing tef were 53%. The relative importance of crop damage was 22% by excess*

rain, 37% by shortage of rain, 12% by frost, 6% by insects, 3% by diseases, 2% by wild animals, and 1% by rodents.

Muhr. 1976. Ada District Development Project, Agriculture Department. pp. 225-247. In: Results of the National Crop Trials and Others (1974). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents 24 tables dealing with variety trials of different crops (with or without fertilizer) at different locations. For tef, the trials were conducted on light and black soils of Dukem, Denkaka, Dire, Godino and Bekojo using Ada recommendation and farmers' practice. At all locations and both soil types, Ada recommendation gave superior yield.*

Mulatu T, Kefyalew A. 1991. Labor use in major crop enterprises in the Nazret area. Institute of Agricultural Research (IAR) Research Report No. 13, Addis Ababa, Ethiopia. 9pp.

Mulatu T, Regassa T, Franzel S. 1990. On-farm research in Nazret area: Experiences in developing technologies for small holders. Institute of Agricultural Research (IAR) Research Report No. 8, Addis Ababa, Ethiopia.

Mulatu T, Regassa T, Kefyalew A. 1992. Farming systems of the Nazret area. pp. 111-125. In: S. Franzel and H. Van Houten (Eds.) Research with Farmers: Lessons from Ethiopia. CABI, UK. *Presents enterprise pattern, farmers' resources, crop husbandry, livestock enterprise and problems in Nazret area. Proportion of farmers growing tef were 89% in wet zone and 81% in dry zone. The area for tef was 0.8 ha in wet zone and 0.7 ha in dry zone. In the study area, red tef is planted late since "it tolerates moisture stress". Handweeding tef 3-4 weeks after planting requires 37 workdays ha⁻¹. With regard to fertilizer use, 94% of the farmers apply fertilizer for tef.*

Mulatu T, Regassa T. 1987. Nazret Mixed Farming Zone diagnostic survey report, Shewa region. Institute of Agricultural Research (IAR) Research Report No. 2, Addis Ababa, Ethiopia. 47pp.

Mulatu T. 1990. Farming systems survey. pp. 192-193. In: Nazret Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly reports on research priorities in mixed farming zone of Nazret area. Crops in the area (according to their importance) were maize, tef, haricot bean, sorghum and barley. Main food crops are maize, sorghum and barley, while cash crops are tef, haricot bean and potato.*

Nagassa A, Gameda A, Kumsa T, Gedeno G. 1997. Agroecological and socioeconomical circumstances of farmers in east Wellega Zone of Oroomia Region. Research Report No 32, Institute of Agricultural Research, Addis Ababa, Ethiopia.

Negash M. 1989. Inventory of vegetation and current land use in the Menagesha (Shewa) study area. FAO Project Field Document No. 30, Addis Ababa, Ethiopia.

Negatu W. 1996. Cereal-based farming systems in the central highlands of Ethiopia: technological innovation for surplus production and alleviation of poverty. PhD thesis, University of East Anglia, UK.

Puelschen L. 1990. Natural site factors and agronomic aspects in the grain-plough complex of the Shewa Province, Ethiopia. Institute für Pflanzen Produktion in den Tropen und Subtropen. Universität Hohenheim, Germany. PLITS Vol. 8, No. 3. 84pp. *Reviews major findings for Shewa Region in Ethiopia with regard to soil fertility status and agronomic practices. Soil analysis and survey of the traditional farming practice was also reported. For tef, use of inputs by farmers was 21% for improved seed, 47% for artificial fertilizer, and 42% for herbicides.*

Regassa T, Mulatu T, Kirkby R. 1992. Developing technologies for small farmers: on-farm research in the Nazret area. pp. 126-142. In: Franzel S, Van Houten H (Eds.) *Research with Farmers: Lessons from Ethiopia*. CABI, UK. *Reports about the study carried out in response to eight constraints in Nazret area where is the major crop. According to authors, the eight problems in the area were moisture stress, shortage of animal feed, weeds, bird damage, poor soil fertility, shortage of pulses in diet, cash shortage and poor seedling emergence in sorghum. Regarding tef, 20% of the farmers apply 2,4-D (the use of this herbicide was more economical than hand weeding).*

Ruthenburg H. 1980. *Farming systems in the tropics*. Oxford, Clarendon Press. Third ed. 424pp.

Seyoum K, Franzel S, Kumsa T. 1988. Initial results of informal survey coffee producing areas of Manna and Gomma Woredas, Keffa region. Institute of Agricultural Research (IAR) Working Paper No. 4/88, Addis Ababa, Ethiopia. 46pp.

Seyoum K, Tafesse H, Bogale T, Tadios T, Franzel S. 1989. Initial results of informal survey Asendabo-Sokoru cereal producing areas, Kefa Region. Institute of Agricultural Research (IAR) Working Paper No 7, Addis Ababa, Ethiopia. 34pp.

Seyoum K, Tafesse H, Franzel S. 1992. Prospects for improving coffee-based farming systems. pp. 173-190. In: Franzel S, Van Houten H (Eds.) *Research with Farmers: Lessons from Ethiopia*. CABI, UK. *Discusses about government policies concerning coffee, and also presents about the farming system, profitability and proposals for increasing coffee production in Yebu and Agaro areas of Illubabor Region where tef is one of the food crops.*

Seyoum M. 1998. Technology generation, transfer and gap analysis: the case of North Gonder zone. EARO, Addis Ababa, Ethiopia.

Slangen AVE. 1973. Initial farm management survey, 1972-1973. pp. 134-139. In: *Proceedings of the Fourth Annual Research Seminar, 24-26 Oct. 1973, Addis Ababa, Ethiopia*. Institute of Agricultural Research (IAR), Addis Ababa. *Discusses farming systems, utilization of resources, problems, and impact of new technologies for major crops at Bako, Holetta, Modjo and Jimma.*

Tadele Z. 1994. Tef in the Farming Systems of the Ada Area. IAR Research Report (Ethiopia) No. 24. Institute of Agricultural Research, Addis Ababa, Ethiopia. 26pp. *Studies the farming systems in Ada district of Central Ethiopia where tef is the dominant crop. To overcome labor shortage during busy periods, farmers use family and hired labor and debo, a traditional system in which farmers work collectively by exchanging labor. Eighty percent of the farmers grow tef on their best land. The primary constraints for tef production are poor rainfall distribution, inadequate and untimely land preparation, poor weed control, and untimely availability of fertilizer.*

Tesfaye A, Agegnehu G, Gebeyehu A, Haile M. 2004. Analysis of tef production systems and constraints in Ejera and Ada Berga weredas, west Shewa zone. Ethiopian Agricultural Research Organization, Addis Ababa, Ethiopia. pp. 83-96.

Tiruneh A. 1989. Women in the food system: a case study from Bale Region. pp. 107-132. In: Proceedings of the Workshop on Problems and Prospects of Rural Development in Ethiopia, 1-2 Dec. 1989, Nazret, Ethiopia. Institute of Development Research, Addis Ababa University, Addis Ababa, Ethiopia.

UNDP/FAO (United Nations Development Program/Food and Agriculture Organization). 1982. Ethiopia: report of survey on plant protection, 7 Apr. to 2 May 1981. Action Programme for Improved Plant Protection. United Nations Development Program (UNDP)/Food and Agriculture Organization (FAO), Rome. *Presents the results of the survey made by Food and Agriculture Organization (FAO) committee to Ethiopia in the various disciplines of plant protection. Regarding tef, major diseases were head smudge, rust, bunt, and leaf spot while pests were Welo bush cricket, African army worm, barley fly, red tef worm, tef epilachna, black tef beetle, and lesser army worm.*

Westphal E. 1975. Agricultural systems in Ethiopia. Centre of Agri. Pub. & Doc., Wageningen, The Netherlands. 277pp. *Reports about agricultural systems in Ethiopia which include seed farming, enset planting, pastoral complex and shifting cultivation. According to the author, tef is unsuitable for raised bread since it does not contain gluten.*

Woldesemait B. 1983. Some spatial characteristics of peasant farming in Ethiopia. Ethiopian Journal of Development Research 5-7 (2):17-48. *Determines the spatial distribution of crop land and types and patterns of crops cultivated, crop combinations and associations. Also determines the degree of concentration of crops using common statistical methods such as coefficient of crop specialization and localization.*

Yadeta K, Ayele G, Negatu W. 2001. Farming systems research on tef: smallholders' production practices. In: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 9-23. *Presents the results of the farming system research conducted in the major tef growing regions of Ethiopia. The report shows farming practices including plowing, sowing, weeding, etc. Information on marketing and profitability of tef production is also presented.*

Yadeta K. 1997. Resource use under uncertainty in small-scale farmers in Ada District, Eastern Shoa: with special emphasis to crop production. MSc thesis, Alemaya University of Agriculture, Ethiopia.

Yalew A, Ensermu R. 1995. Factors influencing small holder crop enterprise choice, around Bahir Dar, West Gojam. pp. 120-126. In: SEBIL—Proceedings of the Sixth Annual Conference of Crop Science Society of Ethiopia (CSSE), 3-4 May 1994, Addis Ababa, Ethiopia. CSSE, Addis Ababa. *Presents crop enterprise choice for small holders in two mixed farming zones in West Gojam, namely Adet and Bahir Dar. Tef was the number one crop in terms of area and farmers growing the crop.*

Yao S. 1993. The determinants of cereal crop productivity of the peasant farm sector in Ethiopia, 1981-1987. Portsmouth Univ., United Kingdom. 30 p.

Yirga C, Beyene H, Zewide L, Tanner DG. 1989. Initial results of informal survey: Kulumsa Mixed Farming System Zone, Chilalo Awraja, Arsi Region. Institute of Agricultural Research (IAR) Working Paper No. 10, Addis Ababa, Ethiopia. 31pp.

Yirga C, Beyene H, Zewide L, Tanner DG. 1992. Farming systems of the Kulumsa area. pp. 145-157. In: Franzel S, Van Houten H (Eds.) Research With Farmers: lessons from Ethiopia. CABI, UK. *Presents farmer circumstances, crop husbandry, livestock and problems in Kulumsa area. Tef was the minor crop Tiyo Woreda since only 10% farmers grow the crop.*

Yirga C, Tesfaye A, Tadele Z. 1996. Baseline study of tef-based farming systems in Abote and Ware Jarso Weredas of Northwestern Shewa. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

24. Socio-economic Studies

Anon. 1971. Cost of production of teff. pp. 178-179. In: Holetta Guenet Research Station Progress Report for the Period Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates costs of production for teff in 1970 based on 8.7 ha area of crop on black soil.*

Anon. 1971. Cost of production of wheat, barley, teff and hay at Holetta Research Station. pp. 53-54. In: Report for the Period Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents costs of production for wheat, barley, teff and hay from bulk areas at Holetta Research Station in 1970. For teff, operational cost was 465 birr ha⁻¹, and cost per quintal was 84 birr.*

Anon. 1972. Cost of production: teff (Holetta). pp. 232-233. In: Report for the Period Apr. 1971 to Mar. 1972. Addis Ababa, Ethiopia. *Presents cost of production for one variety of teff (DZ-01-354) on black soil at Holetta using two methods: i) cutting by sickle, gathering by hand, threshing by self-propelled combine, and ii) cutting by sickle, gathering by hand, transporting by tractor, threshing by oxen, winnowing by hand. The total costs (birr ha⁻¹) were, 223.67 for method i, and 176.48 for method ii.*

Anon. 1972. Economic analysis of fertilizer use. pp. 116-119. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Conducts economic analysis of fertilizer use for maize, red pepper and teff using local and improved varieties around Bako. For teff, the application of fertilizers was uneconomic. Because additional yield from fertilization (1.5 q ha⁻¹) was 37.50 birr ha⁻¹, and cost of fertilizer was 53.00 birr ha⁻¹; the net loss being 15.00 birr ha⁻¹.*

Anon. 1973. Farm management and agricultural economics. pp. 91-92. In: Report for the Period Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the activities of farm management and agricultural economics in the area of farm performance, survey and planned surveys. For teff, the grain yield was 9.83 q ha⁻¹ and cost of production was 85.00 birr ha⁻¹.*

Anon. 1975. Farm records of Holetta Research Station: teff. pp. 328-330. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents direct costs of teff production on black and red soils at Holetta. Costs (in birr ha⁻¹) were 304.68 on black soil and 31.02 on red soil; while costs (in birr q⁻¹) were 149.23 on black soil and 13.46 on red soil.*

Anon. 1975. Farm records of small farmers: teff. pp. 341-342. In: Holetta Guenet Research Station Progress Report for Apr. 1972 to Mar. 1973. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents input and output relationships and costs of production for teff under fertilized (i) and unfertilized (ii) condition for small farmers. Costs for seed (kg ha⁻¹) were 32 for (i), and 25 for (ii); labor (hours ha⁻¹) were 549 for (i), and 1055 for (ii);*

Variable costs (birr ha⁻¹) were 29 for (i), and 81 for (ii); labor costs (birr ha⁻¹) were 69 for (i), and 132 for (ii); and yield (q ha⁻¹) were 4.73 for (i) and 15.00 for (ii).

Anon. 1977. Results of crop sampling survey from 1971/72 to 1974/75 by Wolaita Agricultural Development Unit (WADU). pp. 333-345. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of crop sampling survey from 1971/72 to 1974/75 and cost:benefit analysis of settlement areas. Crops used for study were maize, tef, cotton and chilies. For tef, the combined effect of improved seed and fertilizer in increasing yield was estimated at 3.40 q. Costs of input for tef (birr ha⁻¹) were 7.00 for seed, 44.00 for fertilizer, 8.40 for hired labor, 5.00 for other; and total was 65.20. The market price of tef in 1974/75 was 33.00 birr q⁻¹.*

Anon. 1979. Benefit cost analysis. pp. 30-40. In: Wolaita Agricultural Development Unit (WADU) Annual Crop Sampling Survey, 1977/78. WADU Publication No. 63, Wolaita Soddo, Ethiopia. *Indicates costs of production, estimated net-return and benefit:cost for various crops including tef at various developmental centers in Wolaita Awraja.*

Anon. 1980. Awasa Research Station--input/output data and cost of production, 1978/79. pp. 50-54. In: Bellete S, Beyene H, Zegeye T (Comp.) Progress Report of the Department of Socio-economic Studies, 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1980. Nazreth Research Station--Input/output data and cost of production of major crops, 1978/79. pp. 43-49. In: Bellete S, Beyene H, Zegeye T (Comp.) Progress Report of the Department of Socio-economic Studies, 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1980. Package development and testing program, 1978/79: Holetta red soil zone. pp. 60-64. In: Bellete S, Beyene H, Zegeye T (Comp.) Progress Report of the Department of Socio-economic Studies, 1978/79. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1982. Nazreth Research Station, input/output data and costs of production, 1979/80. pp. 49/56. In: Socio-economics Department Progress Report for 1979/80. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents data on costs of production for wheat, tef, haricot bean, maize and onion at Nazreth Station. For tef using variety DZ-01-787 on the area of 10.28 ha the yield was 7.1 q ha⁻¹. Machine hour required was 9.63 ha⁻¹, and labor hour required was 424.23 ha⁻¹. Direct cost of production was 252.85 birr ha⁻¹ or 35.61 birr q⁻¹.*

Asamenew G, Beyene H, Haile A, Negatu W. 1993. Technology validation and transfer. pp. 139-146. In: Mamo T, Srivastava KL, Dibabe A (Eds.) Improved Management of Vertisols for Sustainable Crop-livestock Production in Ethiopian Highlands: Synthesis Report 1986-1992. Technical Committee of the Joint Vertisol Project, Addis Ababa, Ethiopia. *Presents about the approach in technology transfer, Vertisol technology package, and factors affecting technology adoption. Regarding the economic analysis for tef, the gross*

margin (in birr ha⁻¹) was 565 at Inewari and 986 at Ginchi; the net gain (in birr ha⁻¹) was 241 at Inewari and 725 at Ginchi; where as the MRR for traditional management was 162% at Inewari and 127% at Ginchi.

Asamenew G, Jutzi S, Tedla A, McIntire J. 1988. Economic evaluation of improved Vertisol drainage for food crop production in the Ethiopian highlands. pp. 263-283. In: Proceedings of Management of Vertisols in Sub-Saharan Africa, 31 Aug. to 4 Sept. 1987, International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. ILCA, Addis Ababa. *Provides economic analysis for improved surface-drainage technology using broad-bed maker (BBM) for different crops including tef on farmers' fields at four Ethiopian highland Vertisol areas namely Inewari, Wereilu, Debre Zeit, and Fogera plain. Regarding the study made at Debre Zeit on tef, the average seed yield (in kg ha⁻¹) was 1654 for broad-bed and farrow (BBF) and 1558 for traditional method; straw yield (in kg ha⁻¹) was 4918 for BBF and 4538 for traditional; gross revenue (in birr ha⁻¹) was 1913 for BBF and 1791 for traditional; total cost (in birr ha⁻¹) was 537 for BBF and 400 for traditional; and net return (in birr ha⁻¹) was 1376 for BBF and 1391 for traditional.*

Ayalew S. 1989. Labor supply in agriculture: problem or springboard for development. pp. 360-382. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 Dec. 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Indicates the analysis for time budget and link in social reproduction for labor mobilization. Information was presented based on the study at Yetnora Producers' Cooperative and Giraram Community.*

Balcha B. 1981. The role of peasant associations in implementing the targets of economic development campaign in Ada Woreda (1979-80). MSc Thesis, Addis Ababa University, College of Agriculture, Alemaya, Ethiopia. *Evaluates peasant associations with regard to implementing targets of economic development in Ada Woreda where tef is the dominant crop.*

Becker G, Desta AA. 1989. The contribution of forestry to the employment situation in developing countries in comparison with agricultural forms of use: results of a field study in Ethiopia. Forstarchiv. 60:108-15. [in German]. *Studies employment and economic results for 20 land-use projects of various sizes and types in Ethiopia including natural forest, forest plantations, rain-fed crops and perennial crops. Tef is included in the study under rain-fed crops.*

Belette A. 1990. The demand for fertilizer in Ethiopian peasant agriculture (1971/72 to 1984/85). Occasional Papers in Economic Development, Faculty of Economic Studies, University of New England. No. 23, 12pp. *Evaluates the implications of a rise in fertilizer prices for five major food crops namely tef, wheat, barley, maize and sorghum. According to the author, the low level of fertilizer consumption by the peasant sector is mainly a response to a rise in the relative price of fertilizer, as the price of fertilizer has increased in relation to farm product prices.*

Belette S. 1973. An economic analysis of fertilizer use data in selected minimum package areas. pp. 143-151. In: Proceedings of the Fourth Annual Research Seminar, 24-26 Oct. 1973, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the results of farmers' demonstrations carried out in various regions in Ethiopia for four major crops (tef, wheat, barley and maize) with regard to economics of nitrogen and phosphorus fertilizers.*

Belette S. 1979. An economic analysis of small-holders agriculture in the Central Highlands of Ethiopia: a system simulation approach. PhD Thesis, Oregon State University. 154pp. *Studies the production and consumption behaviour of smallholders' peasant agriculture the Central Highlands of Ethiopia over five years. According to the author, the area allocated to crops such as tef and wheat increased by 50% and resulted in modest output and income increases.*

Ebba F, Phillips R. 1972. Supply and demand projections for food grains in Ethiopia 1970-1980. Report, Food Grain Drying, Storage, Handling and Transportation Project, Food and Feed Grain Institute, Kansas State University. No.33. 288pp. *Indicates projections of supply and demand for tef and other major crops in Ethiopia for 1970 to 1980, based on data from 1961 to 1970. The results indicate need for improving the movement of products from rural to urban areas within a province as well as among provinces. The authors concluded that increases in domestic supply will not keep pace with increases in demand originated from high rates of population and income growth, particularly in urban areas.*

Erkossa T, Teklewold H. 2009. Agronomic and economic efficiency of manure and urea fertilizers use on Vertisols in Ethiopian Highlands. *Agricultural Sciences in China* 8: 352-360. *Studies the economic optimum amount of farm yard manure and nitrogen on Vertisols under cereal-pulse-cereal rotation system. According to findings, the economic optimum rate for tef production was 4.53 t ha⁻¹ manure and 37 kg ha⁻¹ N.*

Friedrich KH, Slangen AVE, Belette S. 1973. The effect of increasing fertilizer input on return from farming under various types of land tenancy systems in Ethiopia. Institute of Agricultural Research, Addis Ababa, Ethiopia. 26pp. *Studies the response of crops to fertilizer and their profitability in different provinces and tenancy arrangements. Crops used for the study were barley, maize, sorghum, tef and wheat. Regarding tef (pp. 16-19), yield responses for various regions were indicated. The profitability of fertilizer use for different regions under various tenancy systems, namely owner farmer, irbo arash, siso arash and ekul arash are also presented.*

Gebrehiwot A. 1974. Farm management research in Ethiopian agricultural extension: an application of production economics to planning in traditional agriculture. MSc Thesis, University of Wales, Aberystwyth, UK. 128pp. *Studies farm management in Ethiopia, and coordination between farm management research and extension services. Regarding tef, labor for farm operation (in hour ha⁻¹) were 256 for plowing, 68 for planting, 500 for weeding, and 550 for harvesting.*

Gebreselassie S, Sharp K. 2008. Commercialisation of smallholder agriculture in selected tef-growing areas of Ethiopia. Future Agricultures, Discussion Paper 006. University of

Sussex, Brighton, UK. 20pp. *Studies the scale of commercialisation in four tef growing areas: Ada- Lome and Bacho in Oromia Region, and Dejen and Enemay in Amhara Region. According to authors, the level of commercialisation in study areas was higher than the national average. The average farmer sold almost half of the production in value terms compared to the national average in 2004 of about 33%.*

Getahun A. 1977. Socio-cultural and economic factors affecting the evolution of traditional cropping systems in Ethiopia. pp. 87-91. In: Proceedings of the Workshop on Cropping Systems in Africa. 1-6 Dec. 1975, Morogoro, Tanzania. African Journal of Agricultural Science (Addis Ababa, Ethiopia), Association for the Advancement of Agricultural Sciences in Africa (AAASA), Addis Ababa.

Kebede A. 1989. The scope for introduction of improved implements and cultivation methods in Ethiopia. pp.75-81. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 14-15 May 1987, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Indicates about labor requirements to perform different cultural practices for various crops including tef.*

Kindness H, Sanford S. 1996. The economics of fertilizer use on cereal crops in Welaita in mid-1994. FRP Technical Pamphlet No 11. Farm Africa Farmers' Research Project, Addis Ababa, Ethiopia. 25pp. *Determines the economics of fertilizer use on cereal crops including tef in Welaita area, in North Omo. Two models were used, namely the ADD/NFIU plant nutrient model and the chemical fertilizer simulation model.*

Kynda R, Curtis KR, Bishop C, Davison J. 2008. Northwestern Nevada teff production costs and returns. Special University of Nevada, Reno, Publication-08-13. 8pp. *Presents the guide how to make production decisions, determine potential returns, and prepare business and marketing plans for growing tef in Nevada.*

Nair KNNS, Libsework A. 1989. Manual on socioeconomic evaluation for land use planning. FAO Field Document No., Addis Ababa, Ethiopia.

Sandford J, Kasa H. 1994. The effect of gender on resource contribution, decision making and influence; a comparison between ensete, teff and maize. Farm Africa, Addis Ababa, Ethiopia. FRP Technical Pamphlet, No. 6, pp. 43-50. *Assesses the role of gender in decision making for three significant crops, namely ensete, tef and maize in Wolaita region of Ethiopia.*

Teclmedhin G, Mekonnen T. 1974. Socio-economic characteristics of peasant families in the Central Highlands of Ethiopia. Haile Selassie I University, Debre Zeit Agric. Research Center, Debre Zeit, Ethiopia. 62pp. *Investigates cultural and economic practices of peasant farmers in Ada area, a major tef producing area in Ethiopia. According to findings, land use for tef in 1969/70 was 2.55 ha, and in 1970/71 was 3.29 ha, while area under tef was 55.46%.*

Yirga C, Hassan RM. 2010. Social costs and incentives for optimal control of soil nutrient depletion in the central highlands of Ethiopia. *Agricultural Systems* 103: 153-160. *Analyzes trade-offs between short- and long-term objectives of soil use by smallholder tef farmers in Ethiopia. Authors concluded that there was evidence of high social gains from better utilization of soil resources through appropriate policy such as tenure security, to improve incentives for smallholder farmers to adjust input use towards socially desirable dynamic optimization levels.*

25. Production and Marketing

Adissu A. 1991. Wheat marketing in Ethiopia. pp. 323-338. In: Gebremariam H, Tanner DG, Hulluka M (Eds.) *Wheat Research in Ethiopia, a Historical Perspective*. Institute of Agricultural Research (IAR) and CIMMYT. International Livestock Center for Africa (ILCA), Addis Ababa, Ethiopia. *Presents activities of Agricultural Marketing Corporation (AMC) in marketing and distribution of wheat in Ethiopia. Also shows the share of tef in marketing from 1982 to 1988.*

Alkamper J. 1987. Development of cereal production in Ethiopia. pp. 95-103. In: *Proceedings of 20 Jahre Agrarforschung des Tropeninstituts in Athiopien*. Wissenschaftliches Zentrum Tropeninstitut, Justus-Liebig-Universitat [in German]. *Presents about the production of cereals in Ethiopia over 40 years. According to the author, cereal imports increased from 8.3 mio. Birr to almost 85 million Birr which was 10% of the total imports.*

Amha W. 1995. The performance of maize and tef marketing in Southern Ethiopia. *Ethiopian Journal of Economics* 5:101-131.

Anon. 1972. An implementation plan for a seed improvement program in Ethiopia. Report No. III. Prepared for Planning and Programming department of the Ministry of Agriculture (Ethiopia) by Experience, Incorporated, Dain Tower, Minnesota, USA. 70pp. *Provides the report made by consultants of seed marketing, distribution and economic analysis for Ethiopia. Regarding tef, the total area under cultivation and production were presented.*

Anon. 1980. Land use and crop production. pp. 2-6. In: Solomon Belette, Hailu Beyene and Tesfaye Zegeye (Comp.) *Progress Report of the Department of Socioeconomic Studies, 1978/79*. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia.

Anon. 1981. Ethiopian Grain Agency. pp. 258-266. In: *Proceedings of the Twelfth National Crop Improvement Conference, Addis Ababa, Ethiopia*. Institute of Agricultural Research (IAR), Addis Ababa. *Shows the performance and future prospects of Ethiopian grain exports. According to the report, Ethiopia exported five tons of tef worthing 3000 birr in 1971.*

Anon. 1981. The Ethiopian Seed Enterprise. pp. 251-257. In: *Proceedings of the Twelfth National Crop Improvement Conference, Addis Ababa, Ethiopia*. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the activity of Ethiopian Seed Corporation (ESC) in seed production, processing and quality control. With regard to tef, seed production (in q) in 1979/80 was 562 by Addis Ababa University (AAU), 1200 by Arsi Rural Development Unit (ARDU), and 3733 by state farms. Also shows the amount of seed requests by different organizations.*

Anon. 1982. Ethiopian Seed Corporation (ESC). pp. 8-15. In: *Proceedings of the Fourteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1982, Addis Ababa, Ethiopia*. IAR, Addis Ababa. *Reports the activities of Ethiopian Seed Corporation (ESC) in seed*

distribution, and also seed requests and major problems. Regarding tef, the seed distribution in 1980/81 was 1724 q while the production in 1981/82 was only 1870 q although the request was 7383 q.

Anon. 1982. Ministry of state farms. pp. 33-41. In: Proceedings of the Fourteenth National Crop Improvement Conference. 30 Mar. to 1 Apr. 1982. Addis Ababa, Ethiopia, Institute of Agricultural Research (IAR), Addis Ababa. *Presents the objectives, organizational set up, current production plans and major bottlenecks in the Ministry of State Farm Development (MSFD). According to the report, tef was planned to be grown on 1090 ha in State farms at Nura Era, Chefa, Birr, Wellega and Keffa.*

Anon. 1988. National seed industry consulting study. Final report prepared for Ethiopian Seed Corporation by Landell Mills Associates Ltd., UK. 103pp. *Indicates about the organizational setup and strategy of the Ethiopia Seed Corporation. Regarding tef, the national seed requirement until 1993 was is 395400 q. The selling price (in birr q⁻¹) of improved seed was 73.25 by government bodies, 92.40 by NGOs, 94.30 by AISCO, 62-104 by free market, and 38.00 by Agricultural Marketing Corporation (AMC) farm-gate price.*

Anon. 2008. Ethiopians receive their improved teff seeds back [in German] <http://www.3sat.de/nano/cstuecke/98113/index.html> accessed July 5, 2011.

Anon. nd. Experimental seed distribution. pp. T4-T6. In: Debre Zeit Agricultural Research Center Progress Report for 1975/76, Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Indicates names of national and international organizations where the tef seeds were distributed by Debre Zeit Agricultural Research Center.*

Anon. The rise of teff on the world market. Why Ethiopia's next gift to the world is a likely boom for business.

http://www.ethiopiainvestor.com/index.php?option=com_content&view=article&id=2100:the-rise-of-teff-on-the-world-market-why-ethiopias-next-gift-to-the-world-is-a-likely-boom-for-business&catid=95:precise-insights accessed July 5, 2011. *Indicates the potential of tef as an export item especially to United States where the price of 100 kg of tef is \$1400 that is more than 20 times the local retail price in Ethiopia. According to the author, Ethiopia possesses the ideal agro-climatic conditions for the production of tef.*

Aredo D. 1989. Famine causation, food aid and foreign financial assistance to agriculture in Ethiopia. pp. 58-73. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 December 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP **Error! Bookmark not defined.**), Addis Ababa, Ethiopia. *Reports on food situation, food aid and aid to agriculture in Ethiopia. Also presents details on estimated production of major crops including tef from 1979 to 1985.*

Ashagari D. 1989. The structure of farming in Ethiopia: the state farm sub-sector. pp. 11-16. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 4-15 May 1987, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Shows the organizational structure of state farms and*

area allocated for crop cultivation. In state farms tef was grown on 549 ha in 1986/87 and total production was only 2700 q.

Atsbeha DM. 2006. Household demand for cereals in rural Ethiopia: a censored regression approach. MSc Thesis, Universitetet for miljø- og biovitenskap, Ås, Norway.

Berhane G, Paulos Z, Tafere K, Tamiru S. 2011. Food grain Consumption and Calorie Intake Patterns in Ethiopia. Development Strategy and Governance Division, International Food Policy Research Institute, Ethiopia Strategy Support Program II (ESSP II). ESSP II Working Paper No. 23, May 2011. 22pp.

http://essp.ifpri.info/files/2011/02/ESSP2_WP23_FoodgrainConsumption_CalorieIntakePatterns.pdf accessed September 4, 2011. *Indicates consumption patterns and intake of selected food grains (namely tef, wheat, maize, sorghum, barley, and enset) across rural and urban locations, agro-ecological zones, and income groups. Regarding tef, in 2004 per capita calorie consumption were 603 in urban and 197 in rural areas while the national average was 254. According to authors, tef is consumed predominantly in urban areas, so continued increases in urbanization will also contribute to increased demand for tef.*

Canon S. 2009. Kansas farmers grow an Ethiopian staple. Ag News State News. 28 September 2009.

http://www.ksagland.com/index.php?option=com_content&view=article&id=1823:kansas-farmers-grow-an-ethiopian-staple-&catid=35:state-ag-news&Itemid=56 accessed July 5, 2011. *Presents the benefits and market potential of growing tef in Kansas, USA.*

CSA (Central Statistical Authority). 1990. Agricultural sample survey 1989/90, results of area and production for private holdings. CSA, Addis Ababa, Ethiopia.

CSA (Central Statistical Authority). 1990. Average retail prices of goods and services in rural areas by region (Sept. 1987 to Aug. 1988). CSA Statistical Bulletin 83, Addis Ababa, Ethiopia.

CSA (Central Statistical Agency). 1996. Agricultural Sample Surveys for 1994 and 1995. Report on Area and Production for Major Crops Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 152.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_1995/survey0/data/docs%5Cpdf%5Creport%5CArea%20and%20major%20production1995.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for tef cultivation in 1994 was 1.8 mio ha while in 1995 was 2.1 mio ha. The respective figures for total production were 1.2 and 1.7 mio ton.*

CSA (Central Statistical Authority). 1997. Agricultural sample survey for 1996. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 171.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_1996/survey0/data/docs%5Cpdf%5Creport%5CArea%20and%20production1996.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops*

and cost of agricultural inputs and other relevant information. The total area for tef cultivation in 1996 was 2.2 mio ha and the total production was 2.0 mio ton.

CSA (Central Statistical Authority). 1998. Agricultural sample survey for 1997. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 189.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_1997/survey0/data/docs%5Cpdf%5CReport%5Carea%20and%20production1997.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 1997 was 1.7 mio ha and the total production was 1.3 mio ton.*

CSA (Central Statistical Authority). 1999. Agricultural sample survey for 1998. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 200.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_1998/survey0/data/docs%5Cpdf%5CAREA%20AND%20MAJOR%20PRODUCTION%20FOR%20MAJOR%20CROPS.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 1998 was 2.1 mio ha and the total production was 1.6 mio ton.*

CSA (Central Statistical Authority). 2000. Agricultural sample survey for 1999. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 227.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_1999/survey0/data/docs%5Carea_prod_1999.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 1999 was 2.1 mio ha and the total production was 1.7 mio ton.*

CSA (Central Statistical Authority). 2001. Agricultural sample survey for 2000. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 245.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2000/survey0/data/docs%5Carea_prod_2000.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2000 was 2.1 mio ha and the total production was 1.7 mio ton.*

CSA (Central Statistical Authority). 2004. Agricultural sample survey for 2003. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 302.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2003/survey0/data/docs%5Carea_prod_2003.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2003 was 2.0 mio ha and the total production was 1.7 mio ton.*

CSA (Central Statistical Authority). 2005. Agricultural sample survey for 2004. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 331.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2004/survey0/data/docs%5CReport%5CAreaproduction%20report-2004.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2004 was 2.1 mio ha and the total production was 2.0 mio ton.*

CSA (Central Statistical Authority). 2006. Agricultural sample survey for 2005. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 361.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2005/survey0/data/docs%5CReoprt%5Cproductionreport98.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2005 was 2.2 mio ha and the total production was 2.2 mio ton.*

CSA (Central Statistical Agency). 2007. Agricultural sample survey for 2006. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 388.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2006/survey0/data/docs%5CPdf%5Cproductionreport99.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2006 was 2.4 mio ha and the total production was 2.4 mio ton.*

CSA (Central Statistical Agency). 2008. Agricultural sample survey for 2007. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 417.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2007/survey0/data/Docs%5Cpdf%5Creport%5Carea_production_report_final.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2007 was 2.5 mio ha and the total production was 3.0 mio ton.*

CSA (Central Statistical Agency). 2009. Agricultural sample survey for 2008. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 446.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2008/survey0/data/Docs%5Carea%20and%20production%20report%202008-2009.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2008 was 2.5 mio ha and the total production was 3.0 mio ton.*

CSA (Central Statistical Agency). 2010. Agricultural sample survey for 2009. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 468.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_sample_survey_2009/survey0/data/Docs/Area%20and%20Crop%20Prod%20Report%20Fina-2002EC.pdf accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2009 was 2.6 mio ha and the total production was 3.2 mio ton.*

CSA (Central Statistical Agency). 2011. Agricultural sample survey for 2010. Volume I, CSA, Addis Ababa, Ethiopia. Statistical Bulletin 505.

http://www.csa.gov.et/surveys/Agricultural_sample_survey/Agricultural_%20sample_survey_2009/survey0/data/Docs/Area%20and%20Crop%20Prod%20Report%20Fina-2002EC.pdf

accessed August 28, 2011. *Estimates the total cultivated land and total production for major crops and cost of agricultural inputs and other relevant information. The total area for cultivation tef in 2010 was 2.8 mio ha and the total production was 3.5 mio ton.*

CTA. 2010 Tef blooms in USA: Spore No 145 - February 2010. Investigates the potential growing tef in Kansas, USA. *Indicates the prospects of marketing tef in USA. According to the report, the premium paid for tef by Ethiopian restaurants and grocery stores catering to African immigrants is expected to make the crop a worthwhile venture.*

Curtis KR, Entsminger JS, Cowee MW, Harris TR. 2008. Market Potential for Nevada Teff Products. University of Nevada, Reno, Technical Report UCED 2008/09-02. 42pp.

<http://www.cabnr.unr.edu/uced/Reports/Technical/08-09-02%20Teff%20Study%20Final%20Report.pdf>

accessed July 4, 2011 *Investigates the market potential of tef in Nevada, USA. Also provides summary of competitive market analysis of tef flour.*

Dadi L, Negassa A, Franzel S. 1991. Marketing maize and tef in the Bako area: implications for policies of post-market liberalization. Institute of Agricultural Research (IAR) Research report No. 17, Addis Ababa, Ethiopia. 12pp.

Dadi L, Negassa A, Franzel S. 1992. Marketing maize and tef in the Bako area: implications for post-market liberalization policies. pp. 227-240. In: Franzel S, Van Houten H. (Eds.) *Research with Farmers: Lessons from Ethiopia*. CABI, UK. *Reports on state involvement in cereal marketing, farmers' decision, government regulation, price variations, and problems for maize and tef around Bako. Tef is the major cash crop grown by 52% of the farmers in Bako area.*

Dadi L, Negassa A, Franzel S. 1992. Marketing maize and tef in western Ethiopia: implications for policies following market liberalization. *Food Policy* 17:201-213. *Provides results of economic analysis for prices of maize and tef after market liberalization in Ethiopia. According to authors, returns from storing grain for later sale can be high but predicting price movements was difficult. Suggestions to improve marketing performance were also indicated.*

Dadi L, Negassa A. 1989. The marketing of agricultural products in Bako area, Western Shewa and Wellega regions. Institute of Agricultural Research (IAR) Research Report No. 7, Addis Ababa, Ethiopia. 44pp.

Debela S. 1988. Agricultural research and food production in Ethiopia. *Ethiopian Journal of Agricultural Science* 10:25-37. *Indicates food needs and production potentials, agricultural research, and impacts international cooperation in agricultural research in Ethiopia. According to the author, the mean yield of pilot-cum-production for tef at Holetta was 7.8 q ha⁻¹ by farmers' method and 14.6 q ha⁻¹ using improved package.*

Dessaiegn G. 1987. Recent grain production trends, constraints and solutions. pp. 72-80. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents about recent trends of grain production and identifies some areas of concern that require immediate action by agriculturists and researchers. According to the author, the tef grain yield (in $q\ ha^{-1}$) was 11.6 from fertilizer use only and 13.0 from fertilizer and improved seed while the national average yielded was $8.0\ q\ ha^{-1}$.*

Disasa B. 1977. Should or shouldn't state farms produce tef? Ethiopian Grain Review 3(1): 13-15. *Indicates merits and demerits of producing tef by state farms. According to the author, state farms shouldn't produce tef until high yielding varieties are developed.*

Endale D. 1993. Rural markets, food-grain prices and famines: a study on selected regions in Ethiopia. WIDER Working Papers No. 104. 28pp. World Institute for Development Economics Research of the United Nations University, Helsinki, Finland. *Analyzes the behaviour of food-grain market prices under conditions of impending famine. Based on 46 local markets, and the price of five different types of grains (namely tef, wheat, maize, sorghum and barley), the study highlighted the behaviour of grain prices in rural local markets. According to the author, unreliability of food prices has significant implications for famine early warning systems.*

Endeshaw G. 1982. Ethiopian Seed Corporation (ESC), activities. pp. 20-28. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Shows the activities of Ethiopian Seed Corporation (ESC) in seed production, distribution, and processing. In 1980, the total tef seed produced was 1193 q, and distributed was 1188 q; while in 1981, 4000 q was produced.*

Endeshaw G. 1987. Ethiopian Seed Corporation. pp. 35-42. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Nazret, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Provides the activities of Ethiopian Seed Corporation (ESC). Regarding tef, amount of seed distributed from 1979 to 1985, planned seed production for 1986/87, etc. were also indicated.*

Endeshaw G. 1988. The Ethiopian seed industry. pp. 156-168. In: Van Gastel AJG, Kerley J (Eds.) Quality seed production. ICARDA Publication No. 124. Aleppo, Syria; International Center for Agricultural Research in the Dry Areas. *Indicates the need for the establishment of the Ethiopian Seed Corporation (ESC) and presents plans for two basic seed farms to produce seeds of wheat, barley, maize, tef, and others.*

EPID (Extension and Project Implementation Department). 1975. Report on the short-term recovery program for drought stricken areas in Ethiopia, 1974. EPID Publication No. 30, Addis Ababa, Ethiopia. *Reports the activities of Extension and Project Implementation Department (EPID) in short-term recovery program, relief and rehabilitation measures, and financing and implementing measures. With regard to tef, amount of seed distributed was 38161.39 q worthing 1343844.08 Birr.*

ESC (Ethiopian Seed Corporation). 1981. Some technical information on seeds produced by the Ethiopian Seed Corporation. Ethiopian Seed Corporation (ESC), Addis Ababa, Ethiopia. *Indicates main crop varieties produced by the Ethiopian Seed Corporation (ESC) and gives related information on the varieties. Regarding tef, the yield (in q ha⁻¹) was 7.3 for local variety, 11.5 for local with fertilizer, and 16.5 for improved variety with fertilizer.*

ESC (Ethiopian Seed Corporation). 1984. Production of improved seed in 1982/83 by ESC. pp. 29-39. In: Proceedings of the Fifteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1983, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates crops and varieties produced by the Ethiopian Seed Corporation (ESC) in 1982/83 and plan for 1983/84. The amount seed produced from three tef varieties was provided.*

ESC (Ethiopian Seed Corporation). 1985. ESC, activities. pp. 32-40. In: Proceedings of the Sixteenth National Crop Improvement Conference, 16-18 Apr. 1984, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. [in Amharic]. *Reports the activities of Ethiopian Seed Corporation (ESC) in seed production, and exchange. Regarding tef, seed production in 1983/84 was 1584 q for variety DZ-01-354, and 880 q for variety DZ-01-196.*

ESC (Ethiopian Seed Corporation). 1986. Ethiopian Seed Corporation (ESC). pp. 29-46. In: Proceedings of the Seventeenth National Crop Improvement Conference, 16-18 Apr. 1985, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Shows the activities of Ethiopian Seed Corporation (ESC) in 1984/85 with regard to organization set up, facilities, seed multiplication and distribution. The report indicated that the request for tef seed by Ministry of Agriculture (MoA) was high, but the Ethiopian Seed Corporation (ESC) could not to meet the demand of the ministry.*

ESC (Ethiopian Seed Corporation). 1989. Improved crop varieties in Ethiopia. Ethiopian Seed Corporation (ESC), Addis Ababa, Ethiopia. [in Amharic]. *Presents lists of improved varieties of cereals, pulses and oilseeds and brief recommendations with regard to management practices. Varieties of tef indicated were DZ-01-354, DZ-01-787, DZ-01-196, and DZ-Cr-37.*

FAO (Food and Agriculture Organization). 1978. Agricultural research in drought-affected areas, Ethiopia. Irrigation Agronomy and Settlement, Wabi Shebele Valley, FAO, Rome. *Reports about the research activity of Gode Station from 1971 to 1977 and development of settlement irrigation in the valley. According to the report, tef gave seed yields of 13 q ha⁻¹ which might be economical depending on price.*

Franzel S, Dadi L, Colburn F, Degu G. 1989. Grain marketing and peasant production in Ethiopia. Institute of Agricultural Research (IAR) Research Report No. 5, Addis Ababa, Ethiopia. 27pp.

Franzel S, Dadi L, Colburn F, Degu G. 1992. Grain-marketing policies and peasant production. pp. 212-226. In: Franzel S, Van Houten H (Eds.) Research with Farmers: Lessons from Ethiopia. CABI, UK. *Reports on marketing policies, implementation of quotas,*

farm income, fertilizer use, crop selection, crop quality, and markets in Ethiopia. According to authors, sites at which fertilizer was not profitable to farmers were 100% at Agricultural Marketing Corporation (AMC) prices, and 0% at local market prices.

Friedrich F. 1973. Crop production. pp. 24-28. In: Proceedings of the Fourth Annual Research Seminar, 24-26 Oct. 1973, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Briefly indicates crop production status from 1966 to 1971 and rate of growth for each crop in Ethiopia. According to the author, crop is expected to increase by an average annual growth rate of 4.4.%.*

Getachew T. 1993. Belg: a dependable crop season in Bale Region. Institute of Agricultural Research (IAR) Newsl. Agric. Res. 8(3):8-10, Addis Ababa, Ethiopia. *Indicates how a "belg" season crops are important in different Awrajas of Bale Administrative Region. According to the author, although major crops grown during the belg season were barley, wheat, and emmer wheat crops such as tef, lentil and chickpea were also cultivated as minor crops.*

Getahun A. 1977. Raising the productivity of peasant agriculture in Ethiopia. AAASA Journal 4:27-40. *Provides general profile of the Ethiopian peasant, lists and discusses major obstacles and presents historical account of national efforts to raise the productivity of peasant agriculture.*

Getnet K, Verbeke W, Viaene J. 2005. Modeling spatial price transmission in the grain markets of Ethiopia with an application of ARDL approach to white teff. Agricultural Economics 33:491-502. *Presents the model for the spatial equilibrium relationship between the producer and the wholesale prices of white tef. According to authors, the wholesale price of white tef in the central market was the major short- and long-run obstacle of the producer price in the local supply markets.*

Haile M, Tesfaye A, Aregu L, Mulat E. Market access versus productivity: The case of Teff Conference presentation at Ethiopian Economic Association, Conference on Ethiopian Economy, 3-5 June 2044, Addis Ababa, Ethiopia. 26 pp <http://www.ethiopian-gateway.com/eaportal/sites/default/files/Market%20access%20versus%20productivity.pdf> accessed July 5, 2011. *Conducts studies regarding farmers and market in Dendi and Adaberga areas of west Shewa in Ethiopia where tef is the major crop and produced as a surplus. In both weredas there were a total of 22 markets, nine in Dendi and the rest in Adaberga. According to authors, considering the calculated 35% market surplus, the estimated production for Dendi is 47309 q and for Adaberga is 33748 q.*

Jonsonius J. 1989. Food security systems. pp. 97-127. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia. 8-12 Dec. 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Discusses about approaches and aspects of food security, and also indicates about the disaster preparedness interventions in Ethiopia. Information about production of major crops at various regions were also provided.*

Kaluski DN, Ophir E, Amede T. 2002. Food security and nutrition: the Ethiopian case for action. *Public Health Nutr.* 5:373-81. *Assess food security situation and the food relief programs in Ethiopia, and indicates the need for the national food and nutrition policy. According to authors, food availability was severely restricted due to recurrent disasters such as drought, flood, war and a lack of diversity of food items.*

Kebede Y, Gunjal K. 1991. Production structure and technical change: the case of a post-drought recovery project in the Central Highlands of Ethiopia. *Oxford Agrarian Studies.* 19:41-51. *Analyzes the impact of projects of Oxfam and some other international organizations on the productivity of important inputs and also on the disembodied technological change on drought affected areas of Central highlands of Ethiopia. The estimated production functions for selected crops including tef, reveal that the total factor productivity was higher in five of the seven crops for the beneficiaries.*

Kefyalew A. 1994. Grain marketing in the Central Rift Valley. Research Report No. 26, Institute of Agricultural Research, Addis Ababa, Ethiopia.

Kidane A. 1973. The demand and price structure for selected food products in Ethiopia. Thesis, Pennsylvania State University. 121pp. *Studies the demand for five selected food products (namely tef, wheat, barley, maize and oil) using time series data for 1955-1970. Price coefficients were not significant throughout but income coefficients were significant for tef, wheat and barley. According to the author, barley and wheat were income elastic while tef was income inelastic. Cross spectral analysis revealed little substitution between tef and wheat in response to price changes.*

Lirenso A. 1987. Grain marketing and pricing in Ethiopia. Institute of Development Research, Addis Ababa University, Addis Ababa, Ethiopia.

Mefita. Health from out-door cultivation: Crop of the future. <http://www.mefita.com/English/Home/> accessed July 5, 2011. *Presents about the work of Mefita, the Dutch company which produces and sells tef and tef products. According to the report, tef possesses a number of useful properties that ensure for the supply of long-term energy.*

Miller CJ, Ream HW, Beak FV, Wodajeneh A. 1969. Production of grains and pulses in Ethiopia. SRI Report No. 10. The Technical Agency Imperial Ethiopia Government.

NRDC/CSO (National Revolutionary Development Campaign/ Central Statistical Office). 1982. Agricultural sample survey, 1981/82, Area, production and yield of major crops for Ethiopia. NRDC/CSO, Addis Ababa, Ethiopia. 33pp. *Indicates estimates of area, production and yield for major crops cultivated by private farmers and cooperatives. According to the report, in 1981/82, tef was cultivated on 1.3 mio ha (25% of all crops) and produced 10.7 mio q (18% of all crops).*

NRDC/CSO (National Revolutionary Development Campaign/ Central Statistical Office). 1983. Agricultural sample survey, 1982/83, Area, production and yield of major crops for Ethiopia. NRDC/CSO, Addis Ababa, Ethiopia. 31pp. *Indicates estimates of area, production*

and yield for major crops cultivated by private farmers and cooperatives. According to the report, in 1982/83, tef was cultivated on 1.4 mio ha (24% of all crops) and produced 13.5 mio q (17% of all crops).

ONCCP (Office of National Committee for Central Planning). 1987. The plan of 1988 improved seed production. ONCCP, Addis Ababa, Ethiopia. 24pp. [in Amharic]. *Indicates about seed distribution and cleaning in 1987 and plan for seed production in 1988.*

Rashid S, Negassa A. 2011. Policies and Performance of Ethiopian Cereal Markets. Development Strategy and Governance Division, International Food Policy Research Institute – Ethiopia Strategy Support Program II (SSP II). ESSP II Working Paper No. 21, May 2011.

http://essp.ifpri.info/files/2011/02/ESSP2_WP21_PoliciesPerformanceCerealMarketsEthiopia.pdf accessed September 4, 2011. *Indicates policies that affect cereal production and marketing in Ethiopia, and analyzes the market structure and performances. According to authors, prices of agricultural crops (including tef) fall immediately after farmers harvest their crops and rise gradually thereafter until the next harvest. Also presents price variability in cereals from 1983 to 2008.*

RRC (Relief and Rehabilitation Commission). 1982. Crop production profile in settlement schemes. pp. 42-. In: Proceedings of the Fourteenth National Crop Improvement Conference, 30 Mar. to 1 Apr. 1982, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the activities of Relief and Rehabilitation Commission (RRC) regarding crop production. The major crops grown at RRC settlement sites were maize (36.8%), sorghum (9.5%), tef (8.6%), wheat (8.7%), pulses (6.9%), oil crops (4.0%), fiber crops 20.0%), others (5.5%).*

RRC (Relief and Rehabilitation Commission). 1982. Highlights of progress and problems of crop production practices on settlement sites. pp. 54-60. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Briefly reports about crop production and problems in Trials Demonstration and Seed Increase (TDSI) program of the Relief and Rehabilitation Commission (RRC). Tef was one of the major crops grown at RRC settlement sites.*

RRC (Relief and Rehabilitation Commission). 1985. Food situation in Ethiopia, 1981-1985: Trend analysis report. Early Warning and Planning Services, RRC, Special Report, Addis Ababa, Ethiopia. 37pp. *Indicates about food balance and trends of food supply situation. Areas affected by serious food shortages from 1981 to 1985 and prices of major crops are also shown. Regarding tef, the price of one quintal at Dessie Zuria was 83 birr in 1981 and 255 in 1985; the respective figures for Raya and Kobbo were 50 and 252; and for Ambasel 72 and 276.*

RRC (Relief and Rehabilitation Commission). 1985. Food Supply Project of 1986 (supplement). Early warning system report. Early Warning and Planning Services, RRC, Addis Ababa, Ethiopia. 19pp. *Reports about the food supply in 1986 through identifying Woredas where food shortages were likely to occur, and the number of people affected.*

Regarding tef, prices for five months (May to September, 1985) in different regions were indicated.

RRC (Relief and Rehabilitation Commission). 1985. RRC. pp. 65-75. In: Proceedings of the Sixteenth National Crop Improvement Conference, 16-18 Apr. 1984, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. Part I. *Reports the activities of Relief and Rehabilitation Commission (RRC) in 1983/84 in the area of crop production and protection. According to the report, the area allocated for tef in 1983/84 was 1913 ha.*

Shapouri S, Dommen AJ, Rosen S. 1987. Constraints facing African countries to provide needed food. pp. 64-67. In: Bellamy MA, Greenshields BA. (Eds.) Agriculture and economic instability. IAAE Occasional Paper, International Association of Agricultural Economists. No. 4, OQEH, Aldershot, Gower, UK. *Analyzes the economies of staple grains (millet, sorghum, wheat, maize, tef and barley) in 10 sub-Saharan African countries (Mali, Niger, and Senegal in western Africa; Ethiopia, Kenya, Sudan, and Somalia in eastern Africa; and Lesotho, Mozambique, and Zambia in southern Africa). According to the study, weather variation particularly drought, had significant impact on reducing annual crop production upto 50%.*

Tadesse M, Alemu B, Bekele G, Tebikew T, Chamberlin J, Benson T. 2006. Atlas of the Ethiopian rural economy. International Food Policy Research Institute (IFPRI). Ethiopian Development Research Institute, Addis Ababa, Ethiopia.

<http://www.ifpri.org/node/3764> accessed September 4, 2011. *Presents information about production, infrastructure, markets, agroclimate, social indicators, institutions in Ethiopia.*

Taffesse AS, Dorosh P, Asrat S. 2001. Crop Production in Ethiopia: Regional Patterns and Trends. Development Strategy and Governance Division, International Food Policy Research Institute, Ethiopia Strategy Support Program II (ESSP II). ESSP II Working Paper No. 16. March 2011. 32pp. <http://www.ifpri.org/sites/default/files/publications/esspwp16.pdf> accessed September 4, 2011. *Presents information about production, land holdings and other relevant figures regarding crop cultivation in Ethiopia. According to authors, in 2004 number of small holders growing tef were 5.4 mio. While the total area of tef cultivation were 2.3 mio ha. Tef production was increased by about 9% during the first decade of the 2000s.*

Tef Company. <http://www.teffco.com/index.html> accessed July 4, 2011. A company sells tef flour in USA. *Indicates the importance of consuming tef. According to the report, whether your goal is to run a marathon, to avoid common allergens like gluten, or simply to eat good tasting food, tef provides all you need for accomplishing these goals.*

Tekle G. 1989. The role of transport and marketing in rural development: a micro level study of farmers in Ada Woreda. pp. 1-17. In: Proceedings of the Workshop on Problems and Prospects of rural Development in Ethiopia, 1-2 Dec. 1989, Nazret, Ethiopia. Institute of Development Research, Addis Ababa University, Addis Ababa, Ethiopia.

Tirfe K, Abraham M. 1995. Grain marketing in Ethiopia in the context of the recent policy reform. In: Aredo D, Demeke M (Eds.) *Ethiopian Agriculture: Problems and Transformation*. Proceedings of the Annual Conference on the Ethiopian Economy. Addis Ababa, Ethiopia.

Watt I. 1988. Regional and sub-regional cereal consumption patterns: Estimates based on a food-balance approach. IREUS Schriftenreihe, Institut für Raumordnung und Entwicklungsgestaltung, Universität Stuttgart. No. 13, pp. 227-242. *Studies the pattern of cereal consumption at various regions of Ethiopia. According to the author, the average per capita level of rural cereal consumption was low (less than 100 kg per annum) in the 78 awrajas. Awrajas where tef was the dominant cereal in 1982/83 tended to be characterized by higher cereal consumption. Tef was dominant crop in 23 awrajas, sorghum in 12, wheat and barley in 5 and millet in 1 awraja.*

Williams GH. 1975. A survey of impurities in Ethiopian crop seed samples. *East African Agricultural and Forestry Journal* 40:453-456.

Woldemariam M. 1971. Wolencomi: a socio-economic and nutritional survey of a rural community in the Central Highlands of Ethiopia. The World Land Use Survey Occasional Paper No. 11. Geographical Pub. Ltd. Berkhamsted, England. 67pp. *Indicates the physical and socio-economic environment, agriculture, food and nutrition, and farm and family economics of Wolencomi area. According to the author, tef was grown on 29% of the area. The price (in birr q⁻¹) for white tef was 37 at Addis Ababa, and 35 at Wolencomi; for red tef 30 at Addis Ababa and 28 at Wolencomi; while for sergegna tef 34 at Addis Ababa and 32 at Wolencomi.*

Woldemariam W. 1990. Seed production policy for increasing crop production in drought-prone areas. pp. 51-56. In: Proceedings of the Twenty First National Crop Improvement Conference, 10-12 Apr. 1989, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates institutional framework, project activities and selection of crops for drought prone areas of Ethiopia. Regarding tef, information about area of cultivation and production were presented.*

Woldeyesus K. 1975. Wolaita Agricultural Development Unit (WADU) results of 1973 crop sampling survey. pp. 146-153. In: Results of the National Yield Trials (1973). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents results of sampling survey for maize, tef and cotton. Regarding tef, the survey was made at 20 development centers in the lowland and highland areas.*

Woldeyesus K. 1976. Wolaita Agricultural Development Unit (WADU) results of 1974/75 crop sampling survey. pp. 198-204. In: Results of the National Crop Trials and Others (1974). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents yield estimates for maize, tef, and cotton based on the study conducted from 1971 to 1974 by the Wolaita Agricultural Development Unit (WADU). For tef, the survey was made at 22 highland and lowland development sites.*

Yehualawork Y. 1989. Agricultural credit and rural financial markets. pp 383-430. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and

Nutrition Strategy for Ethiopia, 8-12 December 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Provides information about credit and finance of improved input packages, savings, and grain damage and weight losses in stores. Regarding tef, the amount of improved seed distributed by the Agricultural Marketing Corporation (AMC) from 1978 to 1984 was 14593 q; while the physical grain damage in store (gotera) after 13 months was nil and weight losses in store was 1.9%.*

26. Extension and On-farm Research

Abebe H. 1990. Tef verification trial and farm survey in Shoa Region, 1986. pp. 171-180. In: Proceedings of Ethiopian Weed Science Committee (EWSC) Sixth Annual Meeting, 31 Mar. to 1 Apr. 1988, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Reports the results of farming systems survey and verification trial for tef at Debre Zeit and other sites.*

Anon. 1969. Recommendations for extension. pp. 12-14. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46, Asella, Ethiopia. *Indicates recommendations for different crops and disciplines which are helpful for extension purposes. Regarding tef, recommendations were variety (DZ-01-354), fertilizer (100 kg ha⁻¹ DAP), and weed control (1-2 handweeding or MCPA at 1.0 kg ha⁻¹ applied when plants are 8-10 cm high).*

Anon. 1969. Recommendations for the Extension Department. pp. 8-9. In: Results of Trials and Observations in 1968/69. Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 28, Addis Ababa, Ethiopia. *Presents recommendations to be applied by the Extension Department in Chilalo Awraja with regard to improved varieties of different crops including tef, fertilizers, and crop protection.*

Anon. 1969. Summary and conclusions. pp. 5-8. In: Results of Trials and Observations in 1968/69. Crop Production Department, Chilalo Agricultural Development Unit (CADU) Publication No. 28. Addis Ababa, Ethiopia. *Presents summary and conclusions of research activities by Chilalo Agricultural Development Unit (CADU) in 1968/69 for different disciplines.*

Anon. 1969. Summary and conclusions. pp. 6-11. In: Report on Surveys and Experiments in 1969 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 46. Asella, Ethiopia. *Provides summary and conclusions for research activities by Chilalo Agricultural Development Unit (CADU) in 1969 under different disciplines.*

Anon. 1970. Bako: teff. pp. 74. In: Report for the Period Apr. 1969 to Mar. 1970. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly indicates the results of tef yield trials and cultural practice trials at Bako. Recommendations for the area were, sowing date (early July); seed rate (20-25 kg ha⁻¹); and weed control (handweeding and post emergence applications of 4 L ha⁻¹ MCPA). According to the report, application of cycocel shortened the tef straw when applied late at heading stage, but did not prevent from lodging.*

Anon. 1971. Demonstration plots on farmers fields, Holetta area, 1970. pp. 114-116. In: Holetta Guenet Research Station Progress Report for the Period Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of demonstration trials using improved varieties of wheat, barley and tef with their package at 15 farmers' fields near Holetta. The average yield of tef using variety DZ-01-354 was 860 kg ha⁻¹ whereas the maximum and minimum yields were 1429 and 454 kg ha⁻¹, respectively.*

Anon. 1971. Extension work and results of demonstrations on farmers' fields: teff. pp. 76. In: Report for Apr. 1970 to Mar. 1971. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly mentions the results of fertilizer demonstrations for tef around Bako.*

Anon. 1971. Recommendations for extension. pp. 10-11. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63, Asella, Ethiopia. *Presents recommendations given by Chilalo Agricultural Development Unit (CADU) regarding improved varieties, fertilizer rate, weed control, etc. for wheat, barley, tef, maize, flax and forage crops. Recommendations for tef were, variety (DZ-01-354), fertilizer (100 kg ha⁻¹ DAP), and weed control (1-2 hand weeding, or MCPA at 1.05 kg ha⁻¹ after tillering has started).*

Anon. 1971. Summary and conclusions. pp. 5-9. In: Report on Surveys and Experiments in 1970 by Crop Production Department. Chilalo Agricultural Development Unit (CADU) Publication No. 63. Asella, Ethiopia. *Indicates summary and conclusions for research activities made by Chilalo Agricultural Development Unit (CADU) different disciplines. The tef variety DZ-01-354 was the best yielder.*

Anon. 1972. Results of demonstrations farmers' fields. pp. 116-117. In: Report for the Period Apr. 1971 to Mar. 1972. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Reports the results of demonstrations on farmers' fields around Bako for Maize, pepper and tef. According to the report, although fertilizer application increased the yield of tef, was not profitable to apply fertilizer.*

Anon. 1973. Recommendations. pp. 15-17. In: Report on Surveys and Experiments in 1972 by Crop and Pasture Section. Chilalo Agricultural Development Unit (CADU) Publication No. 87, Asella, Ethiopia. *Provides research recommendations for Chilalo Agricultural Development Unit (CADU) regarding different crops including tef.*

Anon. 1975. Extension and Project Implementation Department (EPID) agents handbook for agronomy crops. EPID Publication No. 27, Ministry of Agriculture, Addis Ababa, Ethiopia. 57pp. *Presents fertilizer recommendations (based on field trials and fertilizer price) for major crops including tef. On page 41-42, recommendation for tef with regard to ecology, varieties, and cultural practices were indicated.*

Anon. 1975. Variety trials: teff. pp. 51-53. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations 174/75. EPID Publication No. 31, Addis Ababa, Ethiopia. *Reports the results of variety trials for different crops tested at farmers' fields in different regions. Regarding tef, four varieties were tested, namely local check, DZ-01-196, DZ-01-99, and DZ-01-354.*

Anon. 1976. Teff. pp. 16-17. In: Institute of Agricultural Research (IAR)/Extension and Project Implementation Department (EPID) Cooperative Research Program, Preliminary Summary of Integrated research on Field Crops at Kobo, 1973 to 1975. IAR, Addis Ababa, Ethiopia. *Indicates farmers' practices and research results for tef, and provides suggestions*

for further research. The tef yields for best varieties were 17-19 q ha⁻¹ although the yield was raised to 26 q ha⁻¹ using fertilizers.

Anon. 1977. Agronomic trials and demonstrations, Ada District Development Project. pp. 347-363. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents results of demonstrations using varieties and fertilizers. Demonstrations made for tef were fertilizer trials at six locations, yield comparisons using farmers' practice vs Ada Project Package recommendation at seven locations, and demonstration of cumber bedding regular plowing for fertilized and unfertilized plots.*

Anon. 1977. Cultural practice demonstrations. pp. 48-52. In: Results of Extension and Project Implementation Department (EPID) Trials and Demonstrations. EPID Publication No. 39, Ministry of Agriculture (MoA), Addis Ababa, Ethiopia. *Evaluates four cultural practices on farmers' fields for tef, maize, wheat, and barley on different soil types.*

Anon. 1977. Extension and Project Implementation Department (EPID) Agronomy Section. pp. 285-293. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents the results of several cultural practice demonstrations and variety trials on farmers' fields by the Extension and Project Implementation Department (EPID) throughout Ethiopia. Regarding tef, four trials consisting of improved practices and fertilizer were tested on red and black soils.*

Anon. 1977. Extension and Training Division (Wolaita Agricultural Development Unit, WADU). pp. 346. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Briefly reports the strategy of WADU's Extension Service for six years in distributing improved varieties of maize, tef, cotton, and chilies to farmers.*

Anon. 1977. Summary of findings from the meeting: extension and development. pp. 2-4. In: Results of the National Crop Trials and Others (1975). National Crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents summary of the activities of Extension and Project Implementation Department (EPID), State Farm Development Authority, Arsi Rural Development Unit (ARDU), Wolaita Agricultural Development Unit (WADU), Agricultural Development Department (ADD), and GOFADep regarding their activities in technology demonstration to farmers.*

Anon. 1982. Tef demonstration trial. pp. 193-194. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. IAR, Addis Ababa. *Reports the results of demonstration trial conducted at five locations around Debre Zeit using four tef varieties. The varieties were DZ-01-354 (as standard check), DZ-01-787 (better resistance to rust), code 03 (cross), and code 04 (cross which out-yielded standard check). The two crosses out-yielded standard check at three locations.*

Anon. 1984. Tef extension trial (Agricultural Development Department, ADD/Institute of Agricultural Research, IAR, in 1982/83. pp. 174-181. In: Proceedings of the Fifteenth

National Crop Improvement Conference, 30 Mar. to 1 Apr. 1983, Addis Ababa, Ethiopia. IAR, Addis Ababa. *Provides the results of two tef variety trials (early and late set) conducted at 12 sites of IAR/ADD (Institute of Agricultural Research/Agricultural Development Department).*

Anon. 1985. General information on Trials Demonstration and Seed Increase (TDSI) stations. pp. 7-25. In: Review of Crop Research and Seed Multiplication Activities at Various Settlement Schemes of Ethiopia, 1980-1984. TDSI Program, Relief and Rehabilitation Commission (RRC), Addis Ababa, Ethiopia. *Presents general information on climate, soil and average yields for major crops at 10 Trials Demonstration and Seed Increase (TDSI) sites namely, Asossa, Anger Gutin, Dimtu, Tedelle, Harole, Harawa, Gode, Dana, Gambella, and Humera. Tef is considered as the major crop at Asossa, Tedelle, Harole, and Dana.*

Anon. 1989. The recommendations of the discussion groups. pp. 545-574. In: Proceedings of the National Workshop on Food Strategies for Ethiopia: Towards a Food and Nutrition Strategy for Ethiopia, 8-12 Dec. 1986, Alemaya University of Agriculture, Ethiopia. Office of the National Committee for Central Planning (ONCCP), Addis Ababa, Ethiopia. *Presents recommendations for the conference of the national workshop on food strategies for Ethiopia under three topics, i) food production systems, ii) food distribution, marketing, processing and consumption, and iii) planning and information requirements. With regard to tef, resolutions passed were, i) to use the advantage of relay and double cropping; ii) to encourage the use as household and village food reserve since tef is characterized by low storage losses; iii) to use short-maturing varieties; and iv) to grow tef on marginal areas.*

Anon. nd. Ada region observation trials. pp. T2-T3. In: Debre Zeit Agric. Research Center Progress Report for 1975/76. Addis Ababa University (AAU), Debre Zeit, Ethiopia. *Reports the results of observation trials conducted at six locations on farmers' fields in Ada region. The highest yield of 3000 kg ha⁻¹ was obtained from Godino.*

Anon. nd. On-farm verification of production packages. pp. 158-161. In: Holetta Research Center Progress Report for 1988 to Mar. 1989, Ethiopia. *Evaluates the performance of improved varieties of tef, wheat, barley and faba bean on farmers' fields. The tef varieties tested at Butajira and Hosana were Cr-44, DZ-01-354 and local checks.*

Anon. nd. Summary of some recommendations on tef production for Debre Zeit and its vicinity. pp. 123. In: Tef Annual Reports, 1977-1982. Addis Ababa University (AAU), Debre Zeit Agricultural Research Center (DZARC), Debre Zeit, Ethiopia. *Presents some recommendations for tef cultivation on two soil types. Recommendation for light soil were planting time (early July to mid July); seed rate (25-30 kg ha⁻¹); fertilizer (40:60 kg ha⁻¹ N:P₂O₅); and weeding (minimum of two weeks during third and eighth week) and for black soil were planting time (mid July to late July); seed rate (30-40 kg ha⁻¹); fertilizer (60:60 kg ha⁻¹ N:P₂O₅); weeding (same to light soil).*

Anon. Tef. pp. 14-15. In: Awasa Experiment Station Progress Report for 1970. Part I. Summary and General Agronomy Report. Ministry of National Community and development. IRAT. *Reports briefly the results of tef experiments conducted at Awasa. The trials include variety, fertilizer, sowing date and herbicide evaluation. Recommendations for*

tef were, varieties [DZ-238 (white), and A-44 (red)]; fertilizer [low response to N and P]; sowing date [late July]; and herbicide [2,4-D].

ARDU (Arsi Rural Development Unit). 1982. A brief account of research and seed multiplication activities. pp. 74-80. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Presents the activities of Arsi Rural Development Unit (ARDU) regarding the survey, trials, seed multiplication and distribution. With regard to tef, the seed produced from 95 ha was 1568 q in 1980/81.*

Assefa K, Tefera H. 2003. Spatial recommendation domains of improved tef technologies (varieties) in Ethiopia. EARO, Addis Ababa, Ethiopia.

Aynalem A. 1988. The new agricultural development strategy implications for food self-sufficiency. pp. 24-36. In: Proceedings of the Nineteenth National Crop Improvement Conference, 22-26 Apr. 1987, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates constraints and efforts made to promote technology and strategies in extension and research. Also presents the list of 148 surplus-producing Woredas in 14 Administrative Regions in Ethiopia. According to the author, in 12 out of 13 regions, local varieties of tef out yielded improved ones.*

Beshah T. 1990. Relevance and availability of agricultural technology in Ethiopian agriculture: the case of sorghum, maize and tef production in selected regions. MSc Thesis, Wageningen Agricultural University, The Netherlands.

Beyene H, Hussien M. 1991. Verification of improved surface drainage on tef at Ginchi trial site. pp. 260. In: Holetta Research Center Progress Report for the Period Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Indicates that this trial was discontinued due to an overlapping activities during planting period.*

Beyene H, Yirga C. 1991. On-farm verification of improved varieties of wheat, barley, tef and faba bean. pp. 251. In: Holetta Research Center Progress Report Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Reports the results of an on-farm verification for wheat, barley, tef and faba bean using improved and farmers management at Hosana and Butajira. Regarding tef tef, three varieties (DZ-01-354, Cr-44, and local) were tested at both locations under improved and farmers' condition.*

Bull TA. 1987. Review of half-hectare trials. pp. 16-28. In: Proceedings of the Eighteenth National Crop Improvement Conference, 24-26 Apr. 1986, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Reports the activities, successes and drawbacks of the half-hectare fertilizer, variety, and cultural practice trials conducted by Agricultural Development Department (ADD) in the Ministry of Agriculture for various crops throughout the country. The trials indicated for tef were fertilizer, variety, planting time, weed control, and seeding rate.*

Davison J, McKnight C. 2004. Tef demonstration planting for 2003. University of Nevada, Reno Cooperative Extension. Reno, NV. Fact Sheet-04-51. 4pp.

<http://www.unce.unr.edu/publications/files/ag/2004/fs0451.pdf> accessed July 14, 2011. *Presents the tef demonstration made in the Lahontan Valley in Nevada, USA on 2.5 acres.*

Davison J, Peraldo M. 2005. Tef demonstration planting for 2004. University of Nevada, Reno Cooperative Extension. Fact Sheet-05-28. 4pp.

<http://www.unce.unr.edu/publications/files/ag/2005/fs0528.pdf> accessed July 14, 2011. *Indicates the benefits of growing tef as an alternative crop in western Nevada.*

Davison J. 2005. Tef demonstration planting results for 2005. The University of Nevada, Reno. Cooperative Extension. Fact Sheet FS-06-58. 4pp.

<http://www.unce.unr.edu/publications/files/ag/2006/fs0658.pdf> accessed July 14, 2011. *Presents recommendations for growing tef in Nevada, USA. Some of the recommendations were, i) planting time mid-May, ii) firm seedbed at planting, iii) irrigation every 7-10 days until tillering.*

Deressa A, Nagassa W, Dinsa B. 2006. Response of tef to nitrogen and phosphorus fertilizers under farmers' conditions. In: Zeleke A (ed.) The Conference of the Crop Science Society of Ethiopia, 11, Addis Ababa, Ethiopia, 26-28 Apr 2004. Crop Science Society of Ethiopia, Addis Ababa, Ethiopia. pp. 169-175. *Conducts a three year fertilizer experiment on farmers' fields in Arjo and Shambu areas of West Ethiopia. According to authors, the lack of response to the application of nitrogen and phosphorus fertilizers for tef in most sites were due to high soil fertility status which was also confirmed by soil analytical tests.*

Deressa B. 1982. Report by Ethiopian Farmers' Association. pp. 40-44. In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. (in Amharic). *Presents the report of the representative of farmers at the Thirteenth National Crop Improvement Conference (NCIC). The author indicated the problems due to diseases of small cereals including tef as the major threat since farmers do not have chemicals for control.*

EPID (Extension and Project Implementation Department). 1972. Fertilizer and variety trials and demonstrations in Ethiopia, 1971-1972. EPID Publication No. 5, Addis Ababa, Ethiopia. 45pp. *Presents summary and analysis of harvest data based on 393 fertilizer and 17 variety demonstrations. For tef, number of demonstrations were 182 on fertilizer, and 7 on variety. The price of tef (in birr q⁻¹) for producer was as low as 16 in Bale, and 33 in Tigre; the average being 25.*

EPID (Extension and Project Implementation Department). 1972. Fertilizer and variety trials and demonstrations in Ethiopia, 1971/72. EPID Publication No. 5, Ministry of Agriculture (MoA), Addis Ababa, Ethiopia. *Presents summary and analysis of harvest data obtained from 1971/72 fertilizer and variety demonstration program. The number of trials made were 182 for fertilizer and 7 for variety.*

EPID (Extension and Project Implementation Department). 1978. Extension/demonstration trials. pp. 190-194. In: Results of the National Crop Trials and Others (1976). National Crop Improvement Committee, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR),

Addis Ababa. *Demonstrates cultural practices for tef, maize, wheat and barley on different soil types.*

FAO (Food and Agriculture Organization). 1979. Fertilizer demonstration and pilot credit scheme, 1967-1978, Ethiopia: Project findings and recommendations. Food and Agriculture Organization (FAO), Rome. 43pp. *Presents the results, conclusions and recommendations for terminal report of fertilizer demonstration and pilot credit scheme funded by DANIDA through Food and Agriculture Organization (FAO)/government Cooperative Program. Yield increments (in $q\ ha^{-1}$) due to application of fertilizer were 3.0-4.5 for tef, 4.0-5.0 for wheat, 3.5-6.6 for barley, and 10.0-14.0 for maize. According to the report, tef responded well to fertilizer but lodges easily even with low application rates; its low yield potential is due to small seeds and weak stems.*

Franzel S, Dadi L, Mulatu T. 1993. On-farm verification of herbicides: a case study on maize in the Bako area and tef in the Nazret area. pp. 15-26. In: Fessehaie R. (Ed.) Proceedings of the Seventh Annual Conference of the Ethiopian Weed Science Committee (EWSC), 13-14 Apr. 1989, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Presents the result of on-farm herbicide verification trials in 1988 for maize at Bako and tef at Nazret. Regarding tef, most broad leaf weeds were controlled using 2,4-D herbicide. The recommended rate of 2,4-D in Nazret area based on the cost and time of the farmer was $1.0\ L\ ha^{-1}$.*

Gebeyehu G, Daba C. Research recommendation for tef and sorghum production in Western Ethiopia. EIAR, Ethiopia.

Gedeno G. 1990. Communication and linkages between farming systems and on-center researchers. pp. 162-169. In: Proceedings of Ethiopian Weed Science Committee (EWSC) Sixth Annual Meeting, 31 Mar. to 1 Apr. 1988, Addis Ababa, Ethiopia. EWSC, Addis Ababa. *Indicates the procedures to be followed in planning on-farm experiments and discusses linkages between Farming System Research (FSR) and On-Center Research (OCR).*

Geleta M, Asfaw Z, Bekele E, Teshome A. 2002. Edible oil crops and their integration with the major cereals in North Shewa and South Welo, Central Highlands of Ethiopia: an ethnobotanical perspective. *Hereditas*. 137:29-40. *Examines the status of integration of edible oil crops into the cereal-based farming system (sorghum and tef fields) in six sites in north Shewa and south Welo. According to the study, noug was more frequently intercropped with sorghum than with tef, while it was more frequently border cropped with tef than with sorghum.*

Haile A, Zerfu E. 1989. Recommendation and adaptation of improved technology. pp. 154-170. In: Proceedings of the Twentieth National Crop Improvement Conference, 28-30 Mar. 1988, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates the out-reach trails and demonstrations which were used to popularize improved cultivars and their packages to promote adoption by farmers for better production. For tef, two varieties (improved and local), and two management practices (improved and farmers' method) were tested at seven locations.*

Haile A, Zerfu E. 1990. Pre-extension demonstration. pp. 432-436. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Indicates that package testing to demonstrate improved varieties of barley, bread wheat, tef and faba bean and their packages were better than local ones. For tef, the package include varieties (DZ-01-354, Cr-76, Cr-44); fertilizer (60/60 N P₂O₅ kg ha⁻¹); seed rate (30 kg ha⁻¹); and sowing date (10-21 July).*

Haile A, Zerfu E. 1990. Production demonstration on barley, wheat, tef, and faba bean in Central Zone. pp. 437-442. In: Holetta Research Center Progress Report for 1986. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents results of demonstrations for barley, bread wheat, tef and faba bean in some areas of Central Zone, however, none of the improved varieties out-yielded the local check.*

Haile A, Zerfu E. 1991. Pilot production-cum-demonstration of improved tef variety with its package in the Central Zone, 1989. pp. 261-262. In: Holetta Research Center Progress Report for the Period Apr. 1989 to Mar. 1990. Institute of Agricultural Research (IAR), Holetta, Ethiopia. *Reports the results of demonstration trial for local and improved (DZ-01-354) tef varieties at 10 locations in the Central Zone of Ethiopia. Improved variety with its package gave higher yield than the farmers' practice.*

Haile A, Zerfu E. nd. Pilot production-cum-demonstration of small cereals (bread wheat, barley and tef) in the highlands of Central Zone. pp. 164-15. In: Holetta Research Center Progress Report for Apr. 1988 to Mar. 1989, Ethiopia. *Demonstrates the performance and economic advantages of wheat, barley and tef in farmers' fields.*

Haile A. 1984. Linkages between research and extension in Ethiopia. pp. 109-112. In: Proceedings of Crop Improvement in Eastern and Southern Africa: Research objectives and On-farm Testing, 20-22 July 1983, Nairobi, Kenya. IDRC, Ottawa, Canada. *Indicates organizational setup, coordination of programs at 11 trial sites and sites of the joint extension programs of IAR/ADD (Institute of Agricultural Research/Agricultural Development Department) in Ethiopia. According to the author, tef was tested at all sites except at Inewari.*

Haile A. 1987. Institute of Agricultural Research (IAR) and Agricultural Development Department (ADD) Agricultural Development Joint and Extension Program. Institute of Agricultural Research (IAR) Newsletter vol. 2, No. 2, pp. 16-18, Aug. 1987, Addis Ababa, Ethiopia. *Presents activities of the IAR/ADD (Institute of Agricultural Research/Agricultural Development Department) Joint Research and Extension Program in adaptive tests in potential areas of crop production at 16 sites in 9 Administrative Regions.*

Haile B. 1983. Activities of the Plant Husbandry Department. Arsi Rural Development Unit (ARDU) Pub. No. 24. ARDU, Asella, Ethiopia.

IAR (Institute of Agricultural Research). 1979. Handbook on crop production in Ethiopia. IAR, Addis Ababa, Ethiopia. 41 pp. *Presents brief description of IAR stations and IAR/ADD trial sites, and recommendations for major crops. Information or recommendations provided*

for tef (on page 18-19) include varieties, altitude, types of soils, rainfall, time of sowing, rate and types fertilizers, diseases and pests, growth period and yield per hectare.

IAR (Institute of Agricultural Research). 1983. Handbook on crop production. IAR, Addis Ababa, Ethiopia. 38 pp. [in Amharic]. *Presents brief description about IAR stations and packageful recommendations for major crops under cereals, oil crops, fiber crops, pulses and horticulture. Recommendations for tef were, best altitude (1700-2400 m asl); best soil (drained red or clay); rainfall (annual 1000 mm); improved varieties (DZ-01-354, DZ-01-99 and DZ-01-196); sowing date (mid July to early August); seed rate and seeding method (25-30 kg ha⁻¹ by broadcasting); fertilizer (30 kg urea + 130 kg DAP ha⁻¹ for light soil, and 79 kg urea + 130 kg DAP ha⁻¹ for black soil); major diseases (rust and smudge); and major insect pest (shoot fly).*

IAR (Institute of Agricultural Research). 1989. Agricultural research recommendations by Institute of Agricultural Research. IAR, Addis Ababa, Ethiopia. [in Amharic]. 102pp. *Presents brief notes on recommendations for mandate crops including tef of the Institute of Agricultural Research (IAR).*

IAR (Institute of Agricultural Research). 1992. Guidelines for on-farm experimentation: what kinds of experiments can be conducted and who should conduct them. pp. 267-274. In: Franzel S, Van Houten H. (Eds.) *Research with Farmers: Lessons from Ethiopia*. CABI, UK. *Indicates guidelines for the kinds of on-farm experiments that need to be conducted.*

IAR/EPID (Institute of Agricultural Research/Extension and Project Implementation Department). 1974. Tef. pp. 30-31. In: *Extension Agents Handbook*. EPID, Ministry of Agriculture (MoA), Addis Ababa, Ethiopia.

Kasaye G. 1995. Demonstration and Dissemination of Improved Technology for Maize, Sorghum, Teff, Beans, and Sweet Potato in the Southern Region of Ethiopia. Farmers' Research Project, Farm Africa, Addis Ababa, Ethiopia.

Kassaye L. 1979. Trial, demonstration and seed increase (TDSI) progress report for 1978. Ministry of Agriculture and Settlement Authority, Addis Ababa, Ethiopia. *Indicates about Trials Demonstration and Seed Increase (TDSI) stations and activities for 1979 season. TDSI stations indicated in the report were Dana Valley, Deramalo, Tedele and Hoha.*

Kebede H. 1985. Tef extension trial. Agricultural Development Department (ADD)/Institute of Agricultural Research (IAR). pp. 23-30. In: Adugna Haile and Kifle Wolde-Yesus (Compilers) *IAR/ADD Joint Research and Extension Program Progress Report for the Period 1982/83*. IAR, Addis Ababa, Ethiopia. *Evaluates the performance of two varieties of tef (early and late) and fertilizer (with and without) at 11 IAR/ADD sites. Tef trials were performed at Bure, Goha Tsion, Mota, Shambu, Robe, Bichena, Inewari, Tefki, Harbu, and Woldia.*

Kebede H. nd. Tef variety adaptation trial at the Agricultural Development Department (ADD)/Institute of Agricultural Research (IAR) sites, 1981/82. pp. 17-19. In: Haile A, Tefera M (Compilers) *IAR/ADD Joint Research and Extension Program Progress Report for the*

Period 1981/82. IAR, Addis Ababa, Ethiopia. *Reports the results of tef adaptation trial conducted at five IAR/ADD sites, namely Goha Tsion, Shambu, Debre Tabor, Bichena, and Inewari.*

Ketema S. 1988. Research recommendations for production and brief outline of strategy for the improvement of tef. pp. 140-151. In: Proceedings of the Nineteenth National Crop Improvement Conference, 22-26 Apr. 1987, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Provides advantages obtained by growing tef and recommendations with regard to varieties, agronomy, crop protection and soil sciences. Also provides research strategies for the crop.*

Kidanemariam E. 1975. Extension and Project Implementation Department (EPID), Results of variety trial in 1972 and 1973. pp. 167-181. In: Results of the National Yield Trials (1973). National crop Improvement Committee, Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Presents results of variety trials for major crops including tef. Regarding tef trials, local varieties were superior in low altitudes and on soils with low pH.*

Kidanemariam E. 1976. Results of Extension and Project Implementation Department (EPID) trials in 1973/74. pp. 170-179. In: Results of the National Yield Trials and Others (1974). National crop Improvement Committee. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. *Evaluates different varieties of major crops under various groups of soils and altitude range. Regarding tef, local varieties gave superior yields in low altitudes and on soils with low pH. In higher altitudes and soils with high pH, improved varieties were as good as the local ones.*

Kidanemariam E. 1979. Prospects of improved seed production, processing, marketing and distribution in Ethiopia. pp. 111-124. In: Proceedings of the Eleventh National Crop Improvement Committee Meeting, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Shows the activities of Ethiopian Seed Corporation in seed production and implementation. The author indicated that the mandate is given for Debre Zeit Agricultural Research Center (DZARC) to develop breeder seed. The tef yield (in q ha⁻¹) were 7.3 without inputs, 11.5 with fertilizer, and 16.5 with fertilizer and improved variety.*

MoA (Ministry of Agriculture). 1998. Field trial site results (Agronomy trials). Part III North, North Eastern and Eastern Zones. MOA, Addis Ababa, Ethiopia. 79pp.

Negatu W. 1989. Recommendation and adoption of improved technology, with particular reference to Debre Zeit Agricultural Research Center. pp. 171-176. In: Proceedings of the Twentieth National Crop Improvement Conference, 28-30 Mar. 1988, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. *Indicates improved technologies, transfer and adoption of technologies, outreach program and constraints for crops that were coordinated by the Debre Zeit Agricultural Research Center (DZARC) where is tef is one them. According to the author, the tef yield from demonstration trials (in q ha⁻¹) were 12 for variety DZ-01-196 and DZ-01-354, 13 for DZ-01-99 and 7 for local variety.*

Negeri A. 1987. Role and effectiveness of extension and advisory services in assisting small farm communities. pp. 115-119. In: Improving Food Crop Production on Small Farms in

Africa. Food and Agriculture Organization (FAO), Rome. *Presents about agricultural extension system in Ethiopia.*

NFIU (National Fertilizer and Inputs Unit). 1989. Tef: results of the FTS, ITS and DSFT fertilizer trials conducted by ADD/NFIU in 1988. Joint Working Paper No 27. NFIU, Ministry of Agriculture, Addis Ababa, Ethiopia. 69pp. *Presents results of 86 factorial fertilizer trials and partial factorial fertilizer trials on tef conducted in FTS (Field Trials Site), ITS (Intermediate Trials Site) and DSFT (Dispersed Simple Fertilizer Trial).*

NFIU (National Fertilizer and Inputs Unit). 1993. Agronomic feasibility of the proposed recommendations and comparison with the previous recommendations. NFIU General Paper No 17, Addis Ababa, Ethiopia. *Presents fertilizer recommendations for different soil types (Vertisols, Nitosols, Cambisols, Luvisols, Andosols, black soils, grey soils, red soils and brown soils), regions, and crops (tef, wheat, barely, maize and sorghum).*

Seboka B, Deressa A. 1996. A Crash Program of Community-Based decentralized improved tef seed multiplication by pilot farmers. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Seboka B, Deressa A. 1996. Pre-extension demonstration of improved tef production package on farmers field. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

Seyoum Y, Cajuste J. 1980. Tef production guideline. Institute of Agricultural Research (IAR), Addis Ababa, Ethiopia. 9pp. [in Amharic and English]. *Presents recommended practices for tef production that include land preparation, sowing dates, seed rates, fertilizer and weed control.*

Stroud A. 1989. Research activities needed by extension to promote appropriate weed management technology for small farmers and cooperatives. pp. 129-140. In: Proceedings of the First Ethiopian Weed Science Workshop, Problems and Priorities for Weed Science in Ethiopia, 14-15 May 1987, Addis Ababa, Ethiopia. Ethiopian Weed Science Committee (EWSC), Addis Ababa. *Indicates requirements by extension workers at research institutes with regard to weed research.*

Stroud A. 1989. Weed management in Ethiopia, an extension and training manual. Food and Agriculture Organization (FAO), Technical Cooperation Programme, Rome. 237pp. *Provides concepts of weed management, general information on herbicides, methods of problem identification, and recommendations for weed control. According to the author, the critical weed free period for tef was 3-7 weeks after emergence and yield losses due to poor or no hand weeding ranged between 23 and 65%.*

Surur OO. 2007. Effectiveness of agricultural development training program: the cases of tef and livestock farmers of Alaba Woreda, southern Ethiopia. Thesis, Haramaya University, Ethiopia. *Investigates the effectiveness of tef and poultry farmers' training process and outcomes in Alaba Woreda. According to the author, the gaps between the contents of the*

trainings and the identified needs of farmers were very wide because of lack of participatory need assessment.

Tadele Z. 1996. The agro-ecology and production technology of tef. *In: Technology Generation, Transfer and Gap Analysis Workshop, Nazret, Ethiopia, 25-27 Dec 1995. Institute of Agricultural Research, Addis Ababa, Ethiopia. Presents the agro-ecological regions where tef is extensively cultivated in Ethiopia and recommendations given for growing the crop. The recommendations include optimum sowing date, seed rates, fertilizer type and rate, frequency of weeding or type of herbicide.*

Tesfaye T, Kelemework F, Deressa A, Zerfu E, Bedane K, Dadi L. 2001. Tef technology transfer and adoption. *In: Narrowing the Rift: Tef Research and Development. Tefera H, Belay G, Sorrells M (Eds.), Proceedings of the International Workshop on Tef Genetics and Improvement, 16-19 October 2000, Addis Ababa, Ethiopia. Ethiopian Agricultural Research Organization, Ethiopia. pp. 255-264. Presents recommended production technologies for different agro-ecologies and results of on-farm research involving tef. According to authors, widely adapted tef cultivars in Ethiopia were DZ-01-354, DZ-Cr-37 and DZ-01-196.*

Toborn J. 1977. Crop sampling survey for 1975/76. Extension and Project Implementation Department (EPID) Publication No 45. Ministry of Agriculture and Settlement. Addis Ababa, Ethiopia. 59pp. *Reports on crop sampling starting from design, data collection and analysis, and to results and discussion. Yield estimates for major crops at selected sites for fertilized and unfertilized plots are also indicated.*

Tolessa B, Musa A, Seboka B, Amade G. 1989. Recommendations for increasing crop production and experience of technology transfer in the Western Region. pp. 142-153. *In: Proceedings of the Twentieth National Crop Improvement Conference, 28-30 Mar. 1988, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. Indicates major factors responsible for low yield in three crops (maize, sorghum, and tef), recommendations available and experiences in technology transfer. Regarding tef, the average yield in 1979/80 was 8 q ha⁻¹. According to authors, the low usage of improved tef varieties was due to, i) inadequate supply of the seed, ii) high price of improved seed, and iii) poor research-extension linkage. Also presents recommended technologies for six varieties of tef.*

WADU (Wolaita Agricultural Development Unit). 1982. WADU research results from 1970 to 1980. pp. 34-39. *In: Proceedings of the Thirteenth National Crop Improvement Conference, 23-25 Mar. 1981, Addis Ababa, Ethiopia. Institute of Agricultural Research (IAR), Addis Ababa. [in Amharic]. Reports the activities of Wolaita Agricultural Development Unit (WADU) from 1970 to 1980 in the area of crop research at three zones (dega, woyna-dega and kolla). Recommendations for tef were variety (DZ-01-196), planting date (Aug. 1-20), fertilizer (100 kg ha⁻¹), seed rate (30 kg ha⁻¹), and yield (8-10 q ha⁻¹).*

Waktola A. 1979. Adoption and diffusion indices developed for analysis of data for Chilalo Agricultural Development Unit (CADU). *Ethiopian Journal of Agricultural Sciences* 1:59-67. *Studies the extent of package innovations designed to promote rural development and types of impact occurred due to Chilalo Agricultural Development Unit (CADU).*

Waktola A. 1980. Assessment of the diffusion and adoption of agricultural technologies in Chilalo. *Ethiopian Journal of Agricultural Sciences* 2:51-68. *Presents the analysis of data primarily on the question of what variables are closely associated with the adoption of improved agricultural inputs. According to the author, farmers benefited more from intensive field demonstrations and their visits to extension centers than from the model farmer approach.*

Zerfu E. 1996. Demonstration-cum-production of improved tef production in the central zone. Tef Commodity Research Progress report for the Period April 1995 to March 1996. Institute of Agricultural Research, Tef Commodity, Holetta, Ethiopia.

27. Biofuel or Bioenergy

Nigatu AS, Mandere N, Abaya S. 2011. The potential of teff as energy crop: a comparative and evaluative assessment of biogas production. VDM Verlag, Germany. 56pp. *Investigates the potential of teff for biogas production in order to meet the energy need of Ethiopia. In addition to assessing the impact of the biogas production, the authors analyzed methane production of teff at various growth stages and compare to that of maize and wheat.*

28. Genus *Eragrostis*, Excluding *E. tef*

Alvarez E, Scheiber SM, Beeson RC, Sandrock DR. 2007. Drought tolerance responses of purple Lovegrass and 'Adagio' maiden grass. *Hortscience* 42:1695-1699. *Investigates Miscanthus sinensis and native Eragrostis spectabilis for drought tolerance. Greater growth in conjunction with higher cumulative water stress indicates the native E. spectabilis is anisohydric and more drought-tolerant than the isohydric nonnative M. sinensis.*

Balsamo RA, Willigen CV, Boyko W, Farrant J. 2005. Retention of mobile water during dehydration in the desiccation-tolerant grass *Eragrostis nindensis*. *Physiologia Plantarum* 124:336-342. *Evaluates the leaf tensile strength for the drought-tolerant Eragrostis curvula and the desiccation-tolerant E. nindensis when fully hydrated, partially dehydrated, naturally air-dried, and flash-dried. According to authors, there was fundamental difference in strategy for surviving water loss in vegetative tissues between desiccation-tolerant species and drought-tolerant species.*

Burson BL, Voigt PW. 1996. Cytogenetic relationships between the *Eragrostis curvula* and *E. lehmanniana* complexes. *International Journal of Plant Sciences* 157:632-637. *Analyzes the meiotic chromosome pairing behavior of hybrids between diploid ($2n=2x=20$) and tetraploid ($2n=4x=40$) species of Eragrostis curvula and Eragrostis lehmanniana.*

Cardone S, Polci P, Selva JP, Mecchia M, Pessino S, Hermann P, Cambi V, Voigt PW, Spangenberg G, Echenique V. 2006. Novel genotypes of the subtropical grass *Eragrostis curvula* for the study of apomixis (diplospory). *Euphytica* 151:263-272. *Investigates a series of genetically related lines of Eragrostis curvula with different ploidy levels and reproductive modes, which can be used for the discovery of genes associated to diplospory. According to authors, the availability of sexual tetraploid genotypes of E. curvula allows the production of hybrids with interesting combinations of agronomic traits and the developing of mapping populations segregating for diplospory.*

Cervigni GD, Paniego N, Diaz M, Selva JP, Zappacosta D, Zanazzi D, Landerreche I, Martelotto L, Felitti S, Pessino S, Spangenberg G, Echenique V. 2008. Expressed sequence tag analysis and development of gene associated markers in a near-isogenic plant system of *Eragrostis curvula*. *Plant Mol Biol.* 67:1-10. *Develops ESTs from four cDNA libraries of Eragrostis curvula. From a total of 12 000 ESTs, 8000 unigenes were obtained which cover 22% of the genome.*

Cervigni GD, Paniego N, Pessino S, Selva JP, Diaz M, Spangenberg G, Echenique V. 2008. Gene expression in diplosporous and sexual *Eragrostis curvula* genotypes with differing ploidy levels. *Plant Mol Biol.* 67:11-23. *Performs a comparative expression analysis based on expressed sequence tags (ESTs) sequencing and differential display in Eragrostis curvula diplosporous tetraploid genotype and an artificial sexual tetraploid. According to authors, a group of genes were differentially expressed or silenced only in the 4x sex plant, presenting similar levels of expression in the 4x apo and the 2x sex genotypes.*

Colom MR, Vazzana C. 2001. Drought stress effects on three cultivars of *Eragrostis curvula*: photosynthesis and water relations. *Plant Growth Regulation* 34:195-202. *Studies the effect of water stress on three cultivars of Eragrostis curvula. Photosynthesis decreased as a function of the degree of water stress severity in all cultivars. Cultivar Consol showed a better conservation of water and higher resistance to water stress than the other two cultivars.*

Di Renzo MA, Ibanez MA, Bonamico NC, Poverene MM. 2000. Estimation of repeatability and phenotypic correlations in *Eragrostis curvula*. *Journal of Agricultural Science* 134:207-212. *Estimates repeatability and phenotypic correlations in Eragrostis curvula in the semi-arid regions of central Argentina. According to authors, reliable estimates of parameters such as repeatability and phenotypic correlation are needed for prediction of production values and for the design of efficient improvement programmes.*

Diaz M, Garbus I, Echenique V. 2010. Allele-specific expression of a weeping lovegrass gene from the lignin biosynthetic pathway, caffeoyl-coenzyme A 3-O-methyltransferase. *Molecular Breeding* 26:627-637. *Isolates the enzyme caffeoyl-CoA 3-O-methyltransferase (CCoAOMT), a key step in the lignin biosynthetic pathway from Eragrostis curvula, and studies its expression. According to results, the expression was not organ-independent.*

Echenique V, Diaz M, Polci P, Mroginski L. 2001. Embryogenic cell suspensions from different explants and cultivars of *Eragrostis curvula* (Schrad.) Nees. *Biocell* 25:131-138. *Establishes embryogenic calli and cell suspensions from different explants and cultivars of Eragrostis curvula to be used as target for biolistic transformation. Immature inflorescences were the best source of explant and Kromdraai was the cultivar that showed the best morphogenic response with inflorescences, embryos and leaf bases.*

Echenique V, Polci P, Mroginski L. 1996. Plant regeneration in weeping lovegrass, (*Eragrostis curvula*) through inflorescence culture. *Plant Cell Tissue and Organ Culture* 46:123-130. *Presents regeneration methods from Eragrostis curvula via three developmental pathways: embryogenesis, organogenesis and direct regeneration. Organogenic and embryogenic callus cultures were initiated from young inflorescence segments on Murashige and Skoog's medium supplemented with 2,4-D and BA at different concentrations.*

Emmerich WE, Hardegree SP. 1996. Partial and full dehydration impact on germination of 4 warm-season grasses. *Journal of Range Management* 49:355-360. *Evaluates the ability of germinating seeds of diverse grasses to withstand temporary periods of dehydration. The length of dehydration period produced significant differences in total germination for Eragrostis lehmanniana and Panicum coloratum.*

Escobar I, Ruiz E, Finot VL, Negritto MA, Baeza CM. 2011. Taxonomic revision of *Eragrostis* Wolf from Chile, based on statistical multivariate analysis. *Gayana Botanica* 68:49-85. *Establishes the limit and the diagnostic characters in Chilean taxa of Eragrostis species.*

Fernandez RJ, Wang MB, Reynolds JF. 2002. Do morphological changes mediate plant responses to water stress? A steady-state experiment with two C-4 grasses. *New Phytologist*

155:79-88. *Investigates the effect of water stresses on morphological change of slow-growing Bouteloua eriopoda and fast-growing Eragrostis lehmanniana. According to authors, reduced growth under drought can be considered as a byproduct of the same plastic, developmental responses that result in a reduced water loss.*

Foy CD, Fleming AL, Schwartz JW. 1981. Differential resistance of weeping lovegrass genotypes to iron-related chlorosis. *Journal of plant nutrition* 3: 537-550.

Foy CD, Voigt PW, Schwartz JW. 1977. Differential susceptibilities of weeping love grass strains to an iron-related chlorosis on calcareous soils. *Agronomy Journal* 69:491-496.

Foy CD, Voigt PW, Schwartz JW. 1980. Differential tolerance of weeping love grass genotypes to acid coal mine spoils. *Agronomy Journal* 72:859-862.

Fravolini A, Williams DG, Thompson TL. 2002. Carbon isotope discrimination and bundle sheath leakiness in three C₄ subtypes grown under variable nitrogen, water and atmospheric CO₂ supply. *J Exp Bot.* 53:2261-2269. *Investigates the effect of environmental factors on physiological parameters of three dominant grasses of semi-desert grassland in Arizona. Eragrostis lehmanniana had the highest photosynthetic rate.*

Fujii T. 1969. Photocontrol of development of excised Eragrostis embryos. *Dev Growth Differ.* 11:153-163.

Fynn RWS, Naiken J. 2009. Different responses of Eragrostis curvula and Themeda triandra to rapid- and slow-release fertilisers: insights into their ecology and implications for fertiliser selection in pot experiments. *African Journal of Range & Forage Science* 26:43-46. *Investigates the response of Eragrostis curvula and Themeda triandra to rapid- and slow-release fertilisers. Both E. curvula and T. triandra increased linearly in biomass with increasing levels of the slow-release fertiliser, achieving similar maximum biomass at the highest level of the slow-release fertiliser.*

Hamerlynck EP, Scott RL, Moran MS, Keefer TO, Huxman TE. 2010. Growing season ecosystem and leaf-level gas exchange of an exotic and native semiarid bunchgrass. *Oecologia* 163:561-570. *Investigates the relationship between plant parameters to high productivity associated with Eragrostis lehmanniana invasive success. According to authors, canopy structure facilitates higher theta under E. lehmanniana, reducing phenological constraints and stomatal limitations to whole-plant carbon uptake through the short summer monsoon growing season.*

Ignace DD, Huxman TE, Weltzin JF, Williams DG. 2007. Leaf gas exchange and water status responses of a native and non-native grass to precipitation across contrasting soil surfaces in the Sonoran Desert. *Oecologia.* 152:401-413. *Investigates whether soil surface and seasonal timing of rainfall events mediate the dynamics of leaf-level photosynthesis and plant water status of a native and non-native grass species in response to precipitation pulse events.*

Illing N, Denby KJ, Collett H, Shen A, Farrant J. 2005. The signature of seeds in resurrection plants: a molecular and physiological comparison of desiccation tolerance in seeds and vegetative tissues. *Integr Comp Biol.* 45:771-787. *Evaluates some molecular and physiological parameters related to desiccation-sensitive plants to abiotic stress, and the response of desiccation-tolerant plants to extreme water loss. A comparison of antioxidant enzyme activity in two desiccation-sensitive species of Eragrostis with the desiccation-tolerant E. nindensis showed equivalent responses upon initial dehydration, but activity was retained at low water content in E. nindensis only.*

Ingram AL, Christin PA, Osborne CP. 2011. Molecular phylogenies disprove a hypothesized C-4 reversion in *Eragrostis walteri* (Poaceae). *Annals of Botany* 107:321-325. *Studies Eragrostis walteri, whose leaf anatomy has been described as typical of C-3 plants, was an exceptional example of evolutionary reversion from C-4 to C-3 photosynthesis. Carbon isotope analyses confirmed that E. walteri is a C-3 plant. Hence, authors rejected the long-standing hypothesis of C-4 to C-3 reversion in E. walteri.*

Johnston WH, Koen TB, Shoemark VF. 2002. Water use, competition, and a temperate-zone C-4 grass (*Eragrostis curvula* (Schrad.) Nees. complex) cv. Consol. *Australian Journal of Agricultural Research* 53:715-72. *Investigates the effects of moisture and competition on Eragrostis curvula. According to authors, E. curvula rarely wilted; it exhibited water-saving strategies, including leaf waxing and leaf rolling in the heat of the day in response to increasing water demand without necessarily exhausting its water supply.*

Li X, Li X, Jiang D, Liu Z. 2006. Germination strategy and ecological adaptability of *Eragrostis pilosa* [in Chinese]. *Ying Yong Sheng Tai Xue Bao.* 17:607-610. *Studies the germination strategy of Eragrostis pilosa under different storage and environmental conditions. The critical amount of rain for seed germination was about 10 mm, and the germination percentage and duration were increased with increasing rainfall. E. pilosa had two germination strategies, i. e., quick germination and dormancy for more than one year.*

Lowry JB, Kennedy PM, Conlan LL. 2002. Lignin in the 'cell contents' fraction of tropical forages. *Journal of the Science of Food and Agriculture* 82:370-374. *Investigates the lignin content of eight species of tropical grasses including Eragrostis sp.*

Lugo MA, Cabello MN. 2002. Native arbuscular mycorrhizal fungi (AMF) from mountain grassland (Cordoba, Argentina) I. Seasonal variation of fungal spore diversity. *Mycologia.* 94:579-586. *Studies Arbuscular mycorrhizal fungi (AMF) in the rhizosphere of three Poaceae with metabolic pathway C₃ and two Poaceae with C₄ metabolic type including Eragrostis lugens.*

Mecchia M, Ochogavia AC, Pablo Selva J, Laspina N, Felitti S, Martelotto L, Spangenberg G, Echenique V, Pessino S. 2007. Genome polymorphisms and gene differential expression in a 'back-and-forth' ploidy-altered series of weeping lovegrass (*Eragrostis curvula*). *J Plant Physiol.* 164:1051-1061. *Applies molecular markers to analyze the genomic structure of an euploid series of Eragrostis curvula, obtained after a tetraploid dihaploidization procedure followed by chromosome re-doubling with colchicine.*

Considerable levels of genome polymorphisms were detected between lines. Several of the polymorphic sequences corresponded to known genes.

Meier M, Zappacosta D, Selva JP, Pessino S, Echenique V. 2011. Evaluation of different methods for assessing the reproductive mode of weeping lovegrass plants, *Eragrostis curvula* (Schrad.) Nees. *Australian Journal of Botany* 59:253-261. *Compares different techniques to determine the reproductive mode of Eragrostis curvula. Flow cytometry seed screening using individual seeds did not differentiate between sexual and apomictic plants as the embryo:endosperm DNA content ratio was similar in sexual and apomictic plants.*

Mitchell ML, Koen TB, Johnston WH, Waterhouse DB. 2001. LIGULE: An evaluation of indigenous perennial grasses for dryland salinity management in south-eastern Australia - 2. Field performance and the selection of promising ecotypes. *Australian Journal of Agricultural Research* 52:351-365. *Identifies accessions that may be useful for pastoral purposes and for controlling land degradation on hill-lands in the high rainfall zone of south-eastern Australia. 807 accessions representing 37 target species were established including Eragrostis curvula.*

Nakamura AT, Longhi-Wagner HM, Scatena VL. 2010. Anther and pollen development in some species of Poaceae (Poales). *Brazilian Journal of Biology* 70:351-360. *Studies anther and pollen development in Eragrostis solida and Chloris elata.*

Nakamura AT, Scatena VL. 2009. Post-seminal development of Poaceae species (Poales). *Acta Botanica Brasiliica* 23:212-222. *Investigates the existence of a pattern of the post-seminal development in Poaceae: Olyra humilis, Axonopus aureus, Paspalum polyphyllum, Chloris elata, and Eragrostis solida.*

Ncanana S, Brandt W, Lindsey G, Farrant J. 2005. Development of plant regeneration and transformation protocols for the desiccation-sensitive weeping lovegrass *Eragrostis curvula*. *Plant Cell Reports* 24:335-340. *Presents a tissue culture protocol suitable for transformation of Eragrostis curvula. Callus was generated in the dark from leaf and seed tissues on a medium comprising MS salts supplemented with 2 mg l⁻¹ 2,4-D, 0.01 mg l⁻¹ BAP and 2% sucrose. Plant regeneration occurred via organogenesis on the same medium with 6% and 3% sucrose for shoot and root formation, respectively.*

Ochogavia AC, Cervigni GD, Selva JP, Echenique V, Pessino S. 2009. Variation in cytosine methylation patterns during ploidy level conversions in *Eragrostis curvula*. *Plant Molecular Biology* 70:17-29. *Analyzes the cytosine methylation status in a 'tetraploid-diploid-tetraploid' series of Eragrostis curvula with a common genetic background using the MSAP (Methylation-sensitive Amplified Polymorphism) technique. Considerable levels of polymorphisms were detected during ploidy conversions. The total level of methylation observed was lower in the diploid genotype compared to the tetraploid ones.*

Potts DL, Huxman TE, Cable JM, English NB, Ignace DD, Eilts JA, Mason MJ, Weltzin JF, Williams DG. 2006. Antecedent moisture and seasonal precipitation influence the response of canopy-scale carbon and water exchange to rainfall pulses in a semi-arid grassland. *New Phytol.* 170:849-60. *Studies net ecosystem exchange of CO₂ (NEE) and*

evapotranspiration (ET) for native (*Heteropogon contortus*) or non-native invasive (*Eragrostis lehmanniana*).

Poverene MM, Voigt PW. 1997. Isozyme variation and germplasm relationships in the *Eragrostis curvula* complex. *Biochemical Systematics and Ecology* 25:21-32. *Investigates isozyme variation and different morphological descriptors in Eragrostis curvula. Distinct bands were found for each of those types and were used as isozyme markers.*

Prendergast HDV, Hattesley PW, Stne NE, Lazrides M. 1986. C₄ acid decarboxylation type in *Eragrostis* (Poaceae): patterns of verification in chloroplast position, ultra structure and geographical distribution. *Plant, Cell and Environment* 9:333-344. *Investigates the activity of C₄ acid decarboxylating enzymes, the PCR ('photosynthetic carbon reduction', or 'Kranz') bundle sheath anatomy and ultrastructure, and the geographical distribution of Australian species of the C₄ grass genus Eragrostis.*

Puecher DI, Ibanez MA, DiRenzo MA. 1996. Classification and diversity values of seventeen cultivars of *Eragrostis curvula*. *Seed Science and Technology* 24:139-149. *Classifies 17 populations of Eragrostis curvula, through a mathematical analysis of their morphological and isoenzymatic seed characteristics. The morphological characters used were colour, form, length, width and dorsal sulcus of seed, and length of embryo.*

Puliga S, Vazzana C, Davies WJ. 1996. Control of crops leaf growth by chemical and hydraulic influences. *Journal of Experimental Botany* 47:529-537. *Investigates the effect of soil drying on three species of forage grasses: Festuca arundinacea, Eragrostis curvula, Sporobolus stapfianus. The production of ABA was stimulated by soil drying and there was a clear relation between increasing ABA accumulation and reduction in leaf growth of E. curvula.*

Read TR, Bellairs SM. 1999. Smoke affects the germination of native grasses of New South Wales. *Australian Journal of Botany* 47:563-576. *Determines the effect of smoke on germination of seeds of 20 native grass species (including Eragrostis) from New South Wales, Australia. According to authors, smoke was shown to be an important environmental stimulus for breaking the dormancy of native grasses. Sowing smoke-treated husked seeds is likely to be preferable as it would still promote greater germination, whereas dehusking seeds can result in the seeds being more susceptible to desiccation and fungal attack in the field.*

Saito M, Oba H, Kojima T. 2011. Effect of nitrogen on the sporulation of arbuscular mycorrhizal fungi colonizing several gramineous plant species. *Soil Science and Plant Nutrition* 57:29-34. *Investigates the effect of nitrogen on sporulation of arbuscular mycorrhizal (AM) fungi colonizing gramineous plant species (including Eragrostis curvula) growing on a volcanic deposit with a nitrogen deficit.*

Scott RL, Hamerlynck EP, Jenerette GD, Moran MS, Barron-Gafford GA. 2010. Carbon dioxide exchange in a semi-desert grassland through drought-induced vegetation change. *Journal of Geophysical Research-Biogeosciences* 115:G03026. *Investigates the net ecosystem exchange of carbon dioxide (NEE) of a semidesert grassland through a severe*

drought which drove succession from native bunchgrasses to forbs and to eventual dominance by an exotic bunchgrass. Respiration normalized by evapotranspiration showed no interannual variation, while water use efficiency was low during drought years and then increased as the rains returned and the E. lehmanniana invasion progressed.

Siebke K, Ghannoum O, Conroy JP, Badger MR, Von Caemmerer S. 2003. Photosynthetic oxygen exchange in C-4 grasses: the role of oxygen as electron acceptor. *Plant Cell and Environment* 26:1963-1972. *Investigates photosynthetic oxygen in grasses species such as Eleusine coracana, Sorghum bicolor and Eragrostis superba. In all C-4 grasses gross O-2 uptake increased with increasing irradiance at very high CO2 partial pressures (pCO(2)) and was on average 18% of gross O-2 evolution.*

Snyman HA, Venter WD, VanRensburg WLJ. 1997. Transpiration and water-use efficiency in response to water stress in Themeda triandra and Eragrostis lehmanniana. *South African Journal of Botany* 63:55-59. *Investigates the effects of water stress on the rate of transpiration and water-use efficiency (WUE) of the C4 grasses such as Themeda triandra and Eragrostis lehmanniana. The decrease in transpiration rate and WUE was significantly correlated with leaf water potential for both species.*

Sun D, Liddle MJ. 1993. Plant morphological characteristics and resistance to simulated trampling. *Environmental Management* 17:511-521. *Studies the relationship between responses of 13 species (including Eragrostis tenuifolia) to trampling and their morphological characteristics.*

Tischler CR, Voigt PW, Young BA. 1991. Tray system for measuring drought tolerance of forage grasses. *Crop Science* 31:1696-1699. *Evaluates a soil-tray system in conjunction with a growth chamber to determine drought tolerance of hybrids of Eragrostis curvula. Results with the tray system agreed with field performance of genotypes with known drought tolerance. According to authors, the system successfully identified drought-tolerant germplasm in lovegrass.*

Vander Willigen C, Pammenter NW, Mundree SG, Farrant J. 2004. Mechanical stabilization of desiccated vegetative tissues of the resurrection grass Eragrostis nindensis: does a TIP 3;1 and/or compartmentalization of subcellular components and metabolites play a role? *J Exp Bot.* 55:651-661. *Investigates the effect of dehydration on metabolite accumulation in vegetative tissues of desiccation-tolerant Eragrostis nindensis. During dehydration of the desiccant-tolerant leaves, abundant small vacuoles were formed in the bundle sheath cells, while cell wall folding occurred in the thin-walled mesophyll and epidermal cells, leading to a considerable reduction in the cross-sectional area of these cells.*

Venter WD, Snyman HA, VanRensburg WL. 1997. Photosynthetic response to water stress in Themeda triandra and Eragrostis lehmanniana. *South African Journal of Botany* 63:37-41. *Determines the influence of water stress on the photosynthetic rate of the C4 grasses Themeda triandra and Eragrostis lehmanniana. The decline in rate of photosynthesis was significantly correlated with leaf water potential, and linear relationships with correlation coefficients of 0.936 and 0.938 were obtained for T. triandra and E. lehmanniana respectively.*

Wan CG, Sosebee RE. 1998. Tillering responses to red:far-red light ratio during different phenological stages in *Eragrostis curvula*. *Environmental and Experimental Botany* 40:247-254. *Investigates the effect of light quality in different phenological stages of Eragrostis curvula. Tillering rates were higher in the low R/FR treatment when the plants in the high R/FR regime reached the reproductive stage, while the plants in the low R/FR regime remained vegetative. Both tillering and inflorescence development appeared to be controlled by R/FR ratio.*

Wan CG, Sosebee RE. 2002. Tiller recruitment and mortality in the dryland bunchgrass *Eragrostis curvula* as affected by defoliation intensity. *Journal of Arid Environments* 51:577-585. *Investigates the effects of moderate vs. severe defoliation on tiller recruitment and mortality within the interior and on the perimeter of Eragrostis curvula. Tiller natality increased significantly four weeks after defoliation except for tillers cut to 7-cm stubble height within the interior of tussocks where tiller natality reached a peak at 4.5 weeks after defoliation.*

White LM. 1991. Mefluidide effect on weeping lovegrass heading, forage yield and quality. *Journal of Range Management* 44:501-507. *Determines the rate and time of application of mefluidide, a growth regulator, on forage quality of Eragrostis curvula. Application of 0.56 kg ha⁻¹ of mefluidide one week after floral primordium initiation decreased number of floral stems 58 to 93%, decreased forage yield 14 to 23%, but increased percent leaves 4 to 32 percentage units, and had little effect on leaf yield.*

Willigen CV, Farrant J, Pammenter NW. 2001. Anomalous pressure volume curves of resurrection plants do not suggest negative turgor. *Annals of Botany* 88:537-543. *Compares pressure-volume (PV) curves for the desiccation-tolerant angiosperms (such as Eragrostis nindensis, Craterostigma wilmsii and Xerophyta humilis), and the desiccation-sensitive species (E. curvula). The shape of curves for E. nindensis and C. wilmsii differed from the usual curvilinear form.*

Willigen CV, Pammenter NW, Mundree SG, Farrant J. 2001. Some physiological comparisons between the resurrection grass, *Eragrostis nindensis*, and the related desiccation-sensitive species, *E. curvula*. *Plant Growth Regulation* 35:121-129. *Compares some physiological parameters between resurrection grass Eragrostis nindensis, and the desiccation sensitive species. The older outer leaf in most tillers of E. nindensis does not rehydrate. These leaves show signs of membrane damage and curl in an irregular manner similar to those of E. curvula during dehydration.*

Yepez EA, Huxman TE, Ignace DD, English NB, Weltzin JF, Castellanos AE, Williams DG. 2005. Dynamics of transpiration and evaporation following a moisture pulse in semiarid grassland: A chamber-based isotope method for partitioning flux components. *Agricultural and Forest Meteorology* 132:359-376. *Describes a novel method for partitioning evapotranspiration (ET) from isotopic measurements of water vapor within large plot-scale gas exchange chambers for invasive grass Eragrostis lehmanniana and the native Heteropogon contortus. According to authors, the method is useful for partitioning ET over a*

dynamic wetting event in semi-arid grassland at a scale relevant for experimental ecosystem studies.

Author Index

- Abagodu A.....233
 Abalu G.....235
 Abate D.....179, 183
 Abate T.....172, 175
 Abaya S.....279
 Abdella S.....188
 Abdulahi A.....165
 Abebe A.....23, 119
 Abebe H.....265
 Abebe M113, 119, 133, 135,
 138, 191
 Abebe W.....215
 Abebe Y.....199
 Abraham A.....93
 Abraham M.....263
 Acland JD.....1
 ADD.....45
 ADD/NFIU.....119
 Addisu M.....107
 Adela A.....84, 111, 117
 Adish AA.....199
 Adissu A.....251
 Adjei-Twum DC.....23
 Admas S.....41
 Admassu L.....107
 Admasu A.....145, 201
 Adnew H.....23
 Adnew T.....45, 77
 Afza R.....42, 95, 97
 Agafonov N.....33, 45, 62
 Agegnehu G.....98, 243
 Agmas S.....45
 Agren G.....199
 Ahmed S.....186
 Ahrne S.....208
 Ainsworth P.....199, 210
 Akalu G.....211, 213
 Akin H.....227
 Alaunyte I,.....199
 Albertazzi F.....88
 Alem G.....113, 119
 Alemu B.....262
 Alemu D.....118
 Alemu G.....193
 Alemu T.....66, 67, 195
 Ali K.....165, 172, 174
 Ali MS.....5
 Aliye S.....60
 Alkamper J..23, 45, 95, 119,
 145, 233, 251
 Allied Seed.....215
 Almagard G.....200
 Alvarez E.....281
 Amade G.....276
 Amare G.....81
 Amare T.....134
 Amede T.....260
 American Embassy.....1
 Amha W.....251
 Ammann S.....155
 Amogne S.....179
 Andereson FM.....237
 Anders E.....199
 Anderson FM.....142
 Andnew Y.....179, 183, 186
 Anga M.....62, 66, 183
 Anisimov B.....179
 Anon .1, 2, 3, 17, 18, 19, 27,
 33, 34, 39, 41, 45, 46, 47,
 48, 49, 50, 51, 52, 53, 54,
 55, 56, 57, 58, 59, 60, 81,
 93, 95, 98, 99, 100, 101,
 102, 103, 104, 105, 106,
 107, 113, 114, 115, 116,
 120, 121, 122, 123, 124,
 125, 126, 127, 128, 129,
 141, 145, 146, 147, 148,
 149, 150, 151, 152, 153,
 165, 166, 167, 168, 169,
 170, 171, 179, 180, 181,
 182, 200, 215, 233, 234,
 245, 246, 251, 252, 265,
 266, 267, 268
 Araya A.....23, 191
 Araya W.....60
 ARDU.....269
 Aredo D.....252
 Aregu L.....259
 Arendt EK.....207
 Arts JM.....222
 Arumuganathan K.....42
 Asamenew G.142, 234, 238,
 246, 247
 Asefa A.....19
 Asfaw KG.....191
 Asfaw Z.....271
 Ashagari D.....252
 Askabe A.....226
 Asmamaw B.....139
 Asmus GL.....183
 Asrat S.....262
 Assefa A.....116, 136, 153
 Assefa F.....97
 Assefa K..60, 61, 62, 68, 70,
 76, 77, 87, 89, 93, 95,
 107, 110, 269
 Assefa M.....41, 61, 81
 Assefa T.....224
 Assen Y.....135
 Astatke A.....117, 138, 141,
 142, 238
 Atanasiu N.....129
 Atero B.....79
 Atlabachew W.....138
 Atnafseged G.....3
 Atsbeha DM.....253
 Aufhammer W.....194
 Aune J.....118, 138, 139
 Aungsuratana A.....237
 Avezdjanov R.....66
 Avezdzhanov A.....62
 Avezdzhanov G.....62
 Avezdzhanov R.....62
 Ayalew A.....183
 Ayalew S.....247
 Ayana G.....211
 Ayele G..129, 234, 236, 243
 Ayele M..14, 41, 60, 62, 70,
 77, 81, 87, 88, 91, 95,
 107, 191, 192
 Aynalem A.....129, 269
 Badger MR.....287
 Baenziger PS.....39, 42
 Baeza CM.....282
 Bai GH.....60, 87
 Bailey K.....199
 Baker DA.....195
 Balcha A.....62, 130
 Balcha B.....247
 Baldrati I.....3, 4
 Balsamo RA.....192, 281
 Barney P.....221
 Barron J.....117
 Barron-Gafford GA.....286

- Bartolozzi E4
 Basedow T176
 Bateman GA82
 Bauer AM192
 Bawza Staff.....3
 Bayou W159
 Bayu W107
 Beak FV260
 Bechere E.....39, 68
 Bechtold GK23, 24, 135
 Beck R.....183
 Becker G247
 Becker K220, 227
 Bedada W.....107
 Bedane K.....276
 Bediye S.....215, 228
 Beeson RC281
 Begum M110, 155, 156
 Behailu M137
 Bekele A200
 Bekele E..27, 28, 39, 95, 96,
 179, 183, 200, 201, 206,
 237, 271
 Bekele G262
 Bekele M.....130, 234
 Bekele T.....130, 137
 Belaineh G130
 Belay G ...14, 41, 60, 61, 62,
 76, 77, 90, 91, 107
 Belay T.....171
 Belayneh H62, 68, 116, 130,
 132, 234
 Belette A247
 Belette S234, 237, 248
 Bellairs SM286
 Bello FD.....207
 Belton PS3
 Belz RG.....153
 BeMiller JN.....202
 Ben-Fayed E201
 Bengston ML234
 Bengtson B.....234
 Bennett MD.....42, 88
 Bennetzen JL.....88
 Benscher D.....90, 91
 Benson T262
 Bergman KO173
 Berhane G218, 253
 Berhe T63, 64, 171
 Berry FB201
 Beshah T269
 Besrat A201
 Beyene D108, 130, 131,
 133, 139, 201
 Beyene H142, 234, 235,
 239, 244, 246, 269
 Beyene T19
 Bid J3
 Biellmann F3
 Bijlmakers H.....183
 Biratu E.....212
 Birbegard G204
 Birch HF131
 Birke L19
 Bishop C249
 Bisrat A.....204
 Bjoern LO84
 Blokland ML.....205
 Blum A.....60, 81, 191
 Boe A175, 216, 229
 Bogale A199, 235
 Bogale T108, 110, 111, 118,
 162, 242
 Bolodia G.....209
 Bonamico NC282
 Bonsi MLK216, 217
 Books Group.....3
 Borasio L201
 Boru G64
 Bosman AM.....228
 Bossolini E.....89
 Botha CJ.....188
 Botha PM219
 Boxall RA171, 177
 Boyko W281
 Bradley C201
 Bradley V.....89
 Brandt W.....285
 Braun A.....3, 4
 Breland TA138
 Breseghello F.....90, 91
 Brouwe G.....85
 Brouwer G40, 192
 Brown LH23
 Bruce A.....217
 Brunner H41
 Brzostowski HW117
 Buchanan-Wollaston V...93,
 96
 Bull TA269
 Bultosa G201, 202
 Burayu W116
 Burk AO228, 229
 Burson BL.....281
 Burt-Davy J4, 217
 Busey P65
 Bussard JR228, 229
 Butterworth MH ...217, 223,
 225, 226, 227
 Cabello MN284
 Cable JM.....285
 CADU142, 235
 Cajuste J.....275
 Cal-West Seeds.....217
 Cambi V.....281
 Camis M4
 Canon S.....253
 Capper B227
 Cardone S281
 Cargnin RA.....183
 Casini P.....197
 Casper DP216, 229
 Castellani E.....4, 183
 Castellanos AE288
 Castell-Perez ME.....205
 Cercamondi CI.....202
 Cervigni GD281, 285
 Chamberlin J.....23, 262
 Chanyalew S65
 Chapman G39
 Chapman GP...4, 39, 77, 97
 Charlton B.....75, 111, 138,
 226, 228
 Chekmenev S185
 Chennaveeraiah MS.....41
 Cherney J221
 Cheverton M.4, 39, 65, 153,
 159
 Chichaibelu B217
 Chichaybelu M171
 Chinawong S.....116
 Chioventa E4, 34
 Christin PA284
 Chrost B206
 Chugonov V...108, 153, 155
 Ciccrone A.....4
 Ciferri R.....4
 Clark JD.....4, 27
 Clayton WD5, 27
 Cocheme J.....23
 Codym A.....97
 Colburn F.....258
 Collett H284

- Colom MR282
Colombe SV.....84, 195
Combs DK231
Condori O192
Conlan LL.....284
Conroy JP.....287
Coppock CE.....217
Cornelis W137
Costanza SH.....27
Costich DE.....91
Coulbeaux E.....5
Cowee MW256
Cowling DW217
Creaser EH.....212
Creech E.....153
Cristóbal FL217
Crosse S218, 229
Crowe TJ.....171, 172
CSA.....253, 254, 255, 256
CTA256
Cufodontis G.....5
Curtis KR249, 256
Cusicanqui JA192
Daba C66, 271
Dadi L ...142, 235, 256, 258,
271, 276
Dagne K41
Dal Bello F.....207
Damesa D.....36
Damte T171
D'Andrea AC.....27, 30
David B218
Davies WJ286
Davis RL.....72
Davison J.....153, 218, 249,
269, 270
Dawit W183
Day P.....212
De Pauw E23
De Winter B5
Debela S234, 256
Debele B131, 137
Debele T.....108
Debello A.....116, 153
Debelo A.....110
Debusho LK.....23
Deckers J.....24, 137, 230
Degu A218
Degu G.....235, 236, 258
Degu HD88, 192
Deiesa T72
Dekking L205
Delden SH.....192
Demissie A.....34, 36
Demissie T211
Denby KJ284
Dendy DAV5
Denton ME.....91
Derbyshire E199
Deressa A.....270, 275, 276
Deressa B270
Desalegn T5, 45, 66, 67
Dessalegn G257
Dessalegn Y79
Desta AA247
Desta K5, 137
Desta R.....183, 186
deWet DF.....219
deWet JMJ27, 28
Deyassa T.....183
Dhawan NL.....176
Di Renzo MA.....282
Diaz M281, 282
Dibabe A108, 130, 131,
133, 134, 138
Didehvar F39, 65
Diedhiou ML112
Diksissa G.....72
Di-Maio LR205
Dimitriev A.....66
Dinsa B270
DiRenzo MA.....286
Disasa B257
Ditterline RL.....66
Dixon PA29
DLCO172
Dmitriev AP.....183
Dobie P175
Doggett H.....5
Dolezel J41
Dommen AJ262
Dorosh P262
Doyle JJ29
Drescher A88
Drolsom PN41
Duffera M112
Dunn RL66
Durkin JW142, 193
Duthie JR218
DZARC.....5, 6
Earnest N203
Ebba F236, 248
Ebba T.....6, 28, 34, 203
Ebong C218
Ebro A....218, 219, 224, 229
Echenique V .281, 282, 284,
285
Eckoff GL13
Eckoff JLA66
Edwards H90
Edwards SB28, 176
Eilts JA285
Einhellig GF154
El Hassan SM219
Elias E.....112
Ellis G142
Ellis RH81, 82, 85, 86
Elsass P203
Elshire R91
Emmerich WE282
Endale D257
Endeshaw G.....257
Endo O.....108
Engels JMM.....35, 37
Englebrecht C219
English NB285, 288
Engstrom E154
Ennos AR.....40
ENS.....154
Ensermu R236, 238, 244
Entsminger JS256
EPID257, 270
Erasmus LJ219
Erb N.....214
Erde24.com.....203
Ergano S 108, 153, 155, 161
Ergete W207
Ericson LE206
Erkossa T116, 131, 135,
136, 197, 236, 248
ESC258
Escobar I.....282
Esfeld K6, 13, 66, 76, 89
Eshete S236
Eshetu T.....118, 162
Espelund M.....28
Esrey SA199
Estifanos T.....24
Eticha F.....66
Evans CE134
Evert S108, 211
Evmenenko A184, 185
Falcon WP94

- FAO ...6, 203, 206, 258, 271
 Farrant J 192, 281, 284, 285,
 287, 288
 Faulks RM.....209, 211
 Fehrman H183
 Fekadu D.....215
 Feleke A.....6
 Felitti S.....281, 284
 Felleke A.....66, 109, 132
 Feltus FA.....88
 Ferede S236
 Fernandez RJ.....282
 Ferris DM.....83
 Ferro-Luzzi G203
 Fessehaie R6, 117, 154,
 155, 192
 Feyissa R.....35
 Fido RJ.....200, 210
 Finot VL.....282
 Fita T.....139
 Fite A212
 Fleming AL.....283
 Fluharty K.....229
 Forster BP42
 Foxcroft LC.....153
 Foy CD.....283
 Francis D.....42
 Franzel S155, 158, 235,
 236, 238, 239, 241, 242,
 256, 258, 271
 Fravolini A.....283
 Friedman M.....203
 Friedrich F.....259
 Friedrich KH.....237, 248
 Friis I.....136
 Frohlich G.....6
 Fufa F.....45
 Fufa H211
 Fujii T82, 283
 Fujimura M192
 Fujimura T88
 Fujiwara T.....108
 Fukui K.....37
 Fulton TM.....90
 Fynn RWS.....283
 Gaff DF.....84, 194
 Gaiser T.....116
 Gaj MD95
 Galperin G.....6
 Gamboa PA.....203
 Game GK237
 Garbus I282
 Garcia M192
 Gashe BA.....179, 204, 206,
 208
 Gebeyehu A243
 Gebeyehu G66, 67, 271
 Gebeyehu H111, 162
 Gebre E39
 Gebre H.....7, 109, 129
 Gebre P201
 Gebre-Egziabher TB237
 Gebrehiwot A.....248
 Gebrekal B174
 Gebrekidan B204
 Gebrekiros F237
 Gebremariam E.....39, 155
 Gebremariam G155, 162
 Gebremariam H19
 Gebremariam T.....219
 Gebremedhin M204
 Gebremedhin S171
 Gebremedhin T171, 172,
 173, 174, 175
 Gebremichael D230
 Gebreselassie A192
 Gebreselassie S248
 Gebretsadik H.....117, 132
 Gebrewold A.....219
 Gedano G108
 Gedeno G109, 235, 241,
 271
 Gedil M.....76
 Geerts S.....192
 Geissler C.....15
 Gelaw B7
 Geleta M271
 Geleta N66
 Geleto T238
 Gemeda A241
 George D.....220
 Getachew A62, 210
 Getachew G220
 Getachew T.....215, 259
 Getahun A.....19, 249, 259
 Getahun T96
 Getnet K.....237, 259
 Getu E175
 Ghannoum O.....287
 Ghebrehiwot HM82
 Ghiglione C.....204
 Ghizaw A98
 Gibson R.....199
 Gifawosen C204
 Gilbertson KM.....13
 Gilchrist FMC.....220, 229
 Giorgies H.....36
 Giorgis K...7, 109, 192, 193
 Girma M204, 223
 Girma T.....68
 Girmay G191
 Gizachew L.....220
 Goettsch E.....35
 Gohl BO.....221
 Gola EM83
 Goldhamer D109
 Goldowitz I.....91
 Golub C.....205
 Goodall J.....155
 Goodman RM94
 Gorham J.....193
 Gorshkov A...185, 186, 187,
 237
 Gorton L213
 Gough MC82
 Govaerts B137
 Graznak EV89, 90
 Green L157
 Greig A39, 65
 Gressel J.....93
 Gretzmacher R.....62, 130
 Griffith LD.....205
 Griffith ME205
 Grisley B.....236
 Groth D88
 Gryseels G142, 237
 Guard AT.....72
 Guarino L.....35
 Gugsu L...41, 42, 66, 67, 73,
 75, 77, 93, 95, 96
 Gunjal K260
 Guthrie A40
 Guzman M42
 Gylswyk NOV221, 225
 Gyorkos TW199
 Habtegebrial K.....117, 132
 Habtewold T ..173, 174, 186
 Hagedorn K.....235
 Hagos T.....221
 Haidar J.....211
 Haile A...68, 132, 165, 174,
 246, 271, 272
 Haile AM197

- Haile B130, 272
Haile M...24, 117, 132, 137,
161, 162, 230, 243, 259
Hailemariam G.....36
Hailemariam S19
Haileselassie B132
Haileslassie A133
Hall AN.....201
Hall MH228, 229
Hamaker BR202
Hambidge KM199
Hamerlynck EP283, 286
Hamito D.....131, 133
Hansen R.....7
Haq N.....212
Haque I...133, 134, 223, 238
Hardegree SP282
Hardy CA193
Harlan JR27, 28, 29, 35
Harris TR256
Harrouni MC.....82
Hassan RM.....139, 250
Hassen Y130
Hattlesley PW286
Hause NL205
Hawando T.....134
Hawkes JG35, 36
Haylett DG.....134
Hederg O.....7
Heiligttag B85
Heiniger U.....7
Henricksen BL193
Hermann P281
Herrmann RG.....88
Hesselbach D7, 95, 134
Hewett R24
Hill BG.....174
Hiremash SC41
Hirpa A224
Hoffland E.....132
Hoffman JPL.....221, 230
Hofmeyr HS222
Hohmann U.....88
Holin F221
Holmer B.....24
Holovlasky J238
Holst-Jensen A28
Hong TD81, 82
Hoogmoed WB118, 142
Hopman E205
Hoppenstedt A136
Hosegood PH117
Hozyasz KK.....205
HRC110, 193
Huanca R192
Hudricourt AG29
Huffnagel HP7
Hughes JC.....196
Hulluka M.....179, 186
Hulse JH.....205
Huluka G.....134
Hundera F39, 42, 60, 61, 68,
69, 77, 93, 95, 110
Hunduma T36
Hunter M.....221
Hupfer H88
Hurder KA221
Hurle K153
Hurni H24
Hurvitz S222
Hussien M.....269
Huxman TE...283, 285, 288
Hwang YS.....157
IAR .19, 20, 21, 68, 69, 174,
175, 272, 273
IAR/EPID273
Ibanez MA282, 286
İbanoğlu S210
IDRC.....7
Ignace DD.....283, 285, 288
Illing N.....284
Imhasly P7
Inglett GE.....205
Ingram AL29, 284
Inomoto MM.....183
Inoue K108
Intaratat K237
Isak S134
ISNAR21
Itanna F116, 132, 191
Itatani J.....157
Jackman ND.....29
Jahn MM.....89, 94
Jain SM42
Jakobsen KS.....28
Jansen GR205, 206
Jansen TH222
Jardin C.....206
Jarra D.....62
Jayasuriya CT91
Jenerette GD286
Jessee D8, 222
Jiang D.....284
Jiru D110
Johns T.....199
Johnsen FH118
Johnson RC.....83
Johnston WH284, 285
Jonckheere M.....8
Jones BMG8, 29, 42, 65, 69,
70, 73, 159, 228
Jones CA.....83
Jonsonius J.....259
Joshi AB176
Jöst M40, 83, 89
Juraimi AS110, 155, 156
Jutzi S ...119, 133, 142, 238,
247
Kahehay G.....85
Kaitho RJ222, 231
Kaluski DN.....260
Kantety RV89, 90
Karasina F.....157
Kasa H249
Kasarda DD210
Kasaye G.....273
Kassa A.....175, 176
Kassa LD69
Kassaye L273
Kassaye Z ...66, 67, 69, 108,
110, 153, 179, 186
Katayama TC83
Kaul HP194
Kaurnbutho P.....117
Kebebew F.....36, 194
Kebede A249
Kebede E.....156
Kebede H.....83, 85, 273
Kebede T.....134, 238
Kebede Y40, 260
Kebede Z.....206
Kedir K69, 70
Keefer TO283
Keen JN210
Keesstra SD23, 191
Kefyalew A...157, 158, 238,
239, 241, 260
Kefyalew T ...60, 61, 68, 70,
77, 93, 95, 110
Kejela K.....135
Kelemework F276
Kelemu F141
Kena K.....135

- Kennedy PM284
 Keshava N.....212
 Ketema S.....8, 9, 14, 21, 41,
 45, 60, 70, 71, 72, 73, 77,
 81, 107, 110, 274
 Ketterings Q.....221
 Khalili H218, 229
 Khalili M.....223
 Kidane A.....184, 186, 187,
 237, 260
 Kidanemariam A.....135
 Kidanemariam E274
 Kidanu S83, 117, 135
 Kidd AD.....42
 Kihlberg R.....206
 Kilcer T.....221
 Killham K136
 Kindness H.....249
 Kinfе B.....156, 157
 Kirkby R242
 Kirkman KP82
 Kisha T.....89
 Kistner A.....223
 Klaij MC112
 Klapheck S.....206
 Klatt AR.....5
 Kleeberg A.....40, 83
 Klock G.....95
 Kock SG.....223
 Koen TB.....284, 285
 Kojima T286
 Kokeb Y9
 Konetang GG223
 Koning F205, 210
 Konstapel CD.....135
 Kooy-Winkelaar Y.....210
 Korobko AP9
 Krasnokutski VP223
 Krecek RC.....40
 Kreitschitz A83
 Kresovich S.....90
 Kubler E.....194
 Kuebler E194
 Kugler J.....75
 Kulkarni MG.....82
 Kumlehn J.....42
 Kumsa T.....235, 241, 242
 Kunert KJ.....39
 Kuzmichev A72, 79, 189
 Kuzmicky DD210
 Kynda R249
 Labruto G.....206
 Laca M.....153, 218
 Lacey T206
 Ladewig K9
 Lahlou-Kassi A.....219
 Laing EM.....205
 Lakew B.....204
 Laktionov HI.....134
 Lambourne LJ.....223
 Landerreche I281
 Landin J173
 Lanzo A203
 Laspina N.....284
 Lategen PJ.....223
 Lawrence AN.....188
 Lawrence J.....221
 Lazrides M286
 Lealem F206
 Ledin I.....225
 Lehmann G214
 Lema Y163
 Lemmens RHMJ13
 Lemordant D.....204
 Lepschy J183
 Lesschen JP.....133
 Lester RN.....27, 206
 Leul M108
 Lewis JG212
 Li X.....284
 Liben M116, 136, 153
 Libsework A249
 Liddle MJ.....287
 Lieden S199
 Lin LJ.....157
 Lindgren E223
 Lindsey G.....285
 Lirenso A260
 Lisanework N.....136, 157
 Liu Z284
 Loban V72
 Lohithaswa HC88
 Longhi-Wagner HM285
 Longly B42, 72
 Loret V9
 Lörz H.....42
 Louant BP42, 72
 Lovis LJ206
 Lowry JB284
 Lugo MA284
 Lule D66
 Lupwayi NZ.....134, 223
 Lyons D30
 MacKenzie D.....194
 Mackie RI229
 Madumarov TM....185, 187,
 188
 Maier RM88
 Majerus M.....66
 Makari F9
 Makkar HPS220
 Maluszynski M95
 Mamani A192
 Mamani J192
 Mamo A.....239
 Mamo G.....24
 Mamo K.....136
 Mamo T ..83, 112, 117, 129,
 132, 133, 135, 136, 138,
 206
 Mandere N279
 Manig W145
 Manna B194
 Mantell SH.....93, 96
 Marathee JP10
 Marechal C207
 Marshall C82
 Martelotto L.....281, 284
 Marye A.....136
 Masefield GB.....10
 Mason MJ285
 Mathews GA.....172
 Mathias K157
 Mathur SB.....187
 Mawenya L117
 Mazengia W.....112
 Mba C42, 76
 McDaniel B.....175
 McDonough CM.....207
 McDowell RE217
 McFarlane JA175
 McIntire J.....247
 McKnight C269
 McNeilly T194
 Mebrate SA.....188
 Mecchia M.....281, 284
 Mefita.....260
 Megenasa T.....156
 Meier M285
 Meissner HH.....219
 Mekbib F.....93, 96
 Mekbib H.....36
 Mekonnen D69

- Mekonnen HM.....215
Mekonnen T ..185, 186, 240,
249
Mekuria M13, 155, 239
Mekuria T30
Mela A239
Melaku S218, 219, 221,
223, 224
Mellett P.....223
Mendoza J.....192
Mengesha B207
Mengesha MH.....10, 72, 73,
194, 207, 209
Mengiste T10, 42, 43, 67,
69, 70, 73, 74, 75, 84, 94,
159, 195, 196, 215, 228
Mengistu A96, 224
Mengistu DK.....194
Mengistu G66
Meredith DBD10
Merker A.....61, 87
Mersie W.....157
Mesfin R225
Metaferia G.....60, 62, 107
Michelsen A136, 157
Miller CJ260
Miller D.....225
Miller DG.....63
Miller LF.....240
Miranda R192
Misgina A201
Mitchell ML.....285
Mitchell SE90
Mitiku D.....117
MoA137, 236, 240, 274
MoA/ADD75
Moeyersons J24, 137
Moges WM215
Mohammed D36
Mohammed MIO207
Mohammed YA5, 137
Mohammed-Saleem MA112
Molin G.....208
Molineaux L.....207
Molla A110, 111
Montouri R.....207
Moore CM.....210
Morales B.....192
Moran MS283, 286
Moroni AV.....207
Morris CD.....196
Morris EJ225
Morris JW137
Morris MR63
Morrissey JP207
Moruzzi G.....10
Mosali J.....5
Mosi AK 217, 223, 225, 226
Mroginski L282
Muhie K.....110
Muhr241
Mulat E259
Mulat G.....36
Mulatu B172, 175
Mulatu T142, 157, 158, 238,
241, 242, 271
Mulkey S.....90
Muller R.....203
Mulugeta D158
Mulugeta W19, 66, 67
Mulugeta Y10
Mundree SG.....287, 288
Munkvold J91
Murdock GP.....10
Musa A.....276
Mustafa AI.....207
Mutua J117
Mwalley J.....117
Mwangi W236
Myburgh SJ.....208
Nagassa A241
Nagassa W270
Naiken J283
Nair KNNS249
Nakagama A83
Nakamura AT285
Nakayama M.....108
Narasimha HV212
Naudè TW.....188
Naylor RL89, 94
Ncanana S285
Negash L.....81, 84
Negash M.....241
Negasi A175, 176
Negassa A142, 256, 261
Negatu W234, 242, 243,
246, 274
Negeri A.....274
Negewo A21
Negritto MA.....282
Nel JW223
Nelson LA.....39, 63
Nelson RJ.....89, 94
Newbold CJ219
NFIU275
Nguyen HT ...60, 81, 87, 91,
191
Nickel C.....88
Nieman E188
Nigatu A208
Nigatu AS279
Nnadi LA133
Norberg S75, 111, 138, 226,
228
Nordal I.....28
NRDC/CSO260
Nsahlai IV216, 217, 218,
219, 222, 226, 229
Nugent G.....84, 194
Nuwanayakpa M.....226
Nuwanyakpa M.....226, 227
Nyberg G10
Nyssen J.....24, 137, 230
Nzabi AW117
Oba H.....286
Obilana AB10
Ochogavia AC284, 285
Ochtman LHJ.....137
O'Donovan PB227
Oenema O132
Ogbai M.....201
Ohlde G.....227
Ohta D.....192
Oicha T137
Oke OL208
Okwelogy TN84
Olson B211
Olson BLS108
Olsvig-Whittaker L.....137
ONCCP261
Ophir E260
Orru A.....209
Osborne CP.....284
Osco V192
Osman GAM.....207
Osuji PO216, 217, 218, 226,
227, 229, 231
Ouattara M.....10
Oubrecht J.....11
Oumer Z.....158
Pablo Selva J.....284
Pammenter NW287, 288
Paniego N281

- Parche H.....85
 Parker C 117, 154, 157, 158,
 159
 Parker ML.....209
 Parsons JW.....136, 206
 Paterson AH.....88
 Pathak BS.....142
 Pathak P134
 Paulos Z253
 Payne W.....11
 Pearson OE205
 Peat WE77, 78
 Peck SI.....227
 Peise G157
 Peraldo M.....270
 Pereira HC.....117
 Pessino S.....281, 284, 285
 Peters KJ223, 224
 PGRC/E37
 Phanacharoensawad R11
 Phillips R.....248
 Pholan J.....159
 Piccinin D209
 Pickett RC.....72
 Piepho HP85
 Pillay M.....30
 Pinstrup-Anderson P11
 Pinto FF.....11
 Pitwell LR.....210
 Plaza S.....13, 66, 76, 89
 Plunkett A199, 210
 Poesen J.....24, 230
 Poland J.....90
 Polci P.....281, 282
 Ponti JA.....29, 30
 Porteres R.....11
 Porters R30
 Postmus S.....209
 Potgeither E.....220
 Potts DL285
 Poverene MM282, 286
 Prendergast HDV286
 Prescott JM188
 Preston TR226
 Priess JA133
 Prinsloo J.....219
 Puecher DI286
 Puelschen L....111, 159, 242
 Puliga S286
 Pullan M.....39, 40, 65, 159
 Purselove JW11, 30
 Quenemoen ME11
 Rabau T.....42, 72
 Rachie KO12
 Radcliffe DJ24
 Raes D.....192
 Rahim AA.....110, 155
 Railey K.....209
 Rajan A110, 156
 Ralsgard K188
 Ramachandran K209
 Rashid S261
 Rasetti GE12
 Ratnikov A.....160, 161
 Read TR.....286
 Ream HW260
 Reda F.....159
 Reed JD.....227, 231
 Refera A.....111
 Regassa H117, 138
 Regassa S117, 238
 Regassa T.....241, 242
 Reh G209
 Reilly PM.....12
 Reinhardt C.....153, 155
 Renvoize SA27
 Repard NM228, 229
 Reynolds JF282
 Richardson WL.....75
 Richter C.....40, 83, 85, 136
 Rivers F.....228
 Robbertse PJ40
 Robbins K216
 Roberts EH.....81, 82
 Roberts S.....5
 Robison RG12
 Roche CE221, 230
 Rockstrom J ...117, 118, 142
 Rooney LW.....207, 213
 Roosjen J.....209
 Roseberg R.....75, 226, 228
 Rosell S24, 25
 Rosen S262
 Rosenberg R.....111, 138
 Roshevitz R.....209
 Ross JC228
 Rota ML.....90
 Rottinghaus GE.....188
 Rouk HF.....12, 209
 Roux C188
 RRC261, 262
 Ruiz E282
 Ruthenburg H242
 Ryan R130
 Ryffel M12
 Rykbost K111, 138, 228
 S&C210
 Saari EE188
 Saha M.....91
 Sahile G160
 Sahlu M.....133
 Said AN228, 231
 Said M.....43
 Saito M286
 Sakamoto S37
 Saleeby JP.....210
 Sandberg T.....228
 Sandford J.....249
 Sandrock DR.....281
 Sands DC66
 Sanford S249
 Sap D130
 Sarial AK42
 Sasikala BV212
 Sauer P.....12
 Saunders AR228
 Savenije HH.....118, 142
 Sayers R.....226
 Scafer AE.....12, 210
 Scarpa J.....210
 Scatena VL285
 Scheetz WJ66
 Scheiber SM281
 Schipper O12
 Schluter U39
 Schmidt E23
 Schmidt J63
 Schnedler W13
 Schneider R.....195
 Schultz B.....197
 Schulze SR.....88
 Schwartz JW283
 Schweizer J205
 Scott RL.....283, 286
 Seboka B.....275, 276
 Selinus R.....13
 Selva JP.....281, 285
 Selvaraj JC.....183
 Semeane Y.....188
 Sendek E37
 Sengooba T94
 Seyoum K242
 Seyoum M.....242

- Seyoum Y275
 Shapouri S.....262
 Sharp K.....248
 Shaw T30
 Shawel S21
 Shekour G21
 Shekur G108
 Shen A.....284
 Shenkoru T.....228
 Shenkute B.....224
 Sherif AM110, 155, 156,
 160
 Shewry PR13, 200, 210
 Shiferaw B97, 195
 Shock C..111, 138, 226, 228
 Shoemark VF284
 Siebke K.....287
 Siegenthaler IE.....13
 Siemonsma JS13
 Sileshi Z215, 228
 Silva TD.....88
 Simane B.....60, 85, 196
 Simoni G197
 Simoons JF.....31
 Sinebo W.....98
 Singh BR.....117, 132
 Singh H65
 Singh HP88
 Singh J.....176
 Sisay Z228
 Sitaula B.....139
 Skerman PJ228
 Slangen AVE .237, 242, 248
 Slimak KM.....210
 Slotvsov RI160, 161
 Slowik M.....205
 Smirnoff N84, 195
 Smit GN220
 Smith J75, 111, 138, 228
 Smith MF69
 Smith SM88
 Smithson JB38
 Snyman HA.....287
 Soller H.....227
 Solomon S.....213
 Solomon T.....213
 Solomon WK86
 Someya S108
 Sommerfeldt J.....216
 Sorrells ME...60, 61, 89, 90,
 91
 Sosebee RE288
 Souza IF154
 Spaenij-Dekking L.....210
 Spangenberg G.....281, 284
 SPL22, 188, 189
 SRC.....75, 76
 Sridhara H.....45
 Srivastava KL117, 138
 Staden JHV222
 Staggenborg S108, 211
 Stahr K116
 Stallknecht GF13, 66
 Staniar WB.....228, 229
 Starke J.....206
 Steduto P192
 Stewart BR.....210
 Stewart RB.....189
 Stiehler W25
 Stne NE.....286
 Stoecker BJ199
 Stojceska V199, 201, 210
 Stomph TJ40, 85, 192
 Strekozov B161
 Stretch C176
 Stroosnijder L23, 83, 191
 Stroud A..13, 117, 161, 162,
 275
 Sufian S.....210
 Sullivan P.....12
 Sun D287
 Sun Q90
 Surur OO.....275
 Suzuki H25
 Taboada C.....192
 Tadele Z6, 13, 14, 25, 66,
 76, 83, 84, 85, 89, 90,
 111, 117, 118, 154, 161,
 162, 195, 243, 244, 276
 Tadesse A42, 112, 175, 176,
 220
 Tadesse B62, 107
 Tadesse D.....36, 38
 Tadesse E186
 Tadesse M.....262
 Tadesse N.....186
 Tadesse T62, 136
 Tadesse Y.....34
 Tadious T109, 111, 118,
 162, 242
 Tafere K.....253
 Tafesse H242
 Tafesse T.....69, 72, 79, 110,
 186, 189
 Taffesse AS.....262
 Takele A24, 66, 67, 85, 109,
 111, 162, 195, 196
 Tamiru S253
 Tamminga S.....222, 231
 Tamrat T19
 Tanner DG135, 162, 244
 Tatham AS200, 210
 Tavassoli A29, 43
 Taylor JRN 3, 201, 202, 213
 Taylor R.....230
 Tebikew T262
 Teclmedhin G249
 Tedla A ..112, 218, 238, 247
 Tef Company262
 Tefera H..14, 39, 42, 45, 60,
 61, 62, 65, 68, 70, 76, 77,
 78, 87, 89, 90, 91, 93, 94,
 95, 97, 107, 110, 196, 269
 Tefera T68, 77, 162, 196
 Teferdegn T162
 Teferi A.....177
 Teferi T158
 Tegegn T.....160, 161
 Tegegne A.....218, 222, 223,
 224, 228, 231
 Teka T211
 Tekabe F213
 Tekalign T.....97
 Tekle G262
 Tekleab K176
 Teklemichael A.....60
 Teklewold H ..131, 236, 248
 Teklu Y77, 78, 79
 Temesgen A.....66
 Temesgen M ..117, 118, 142
 Terefe A.....201
 Tesema T163
 Tesemma T77, 79
 Tesfaye A.....243, 244, 259
 Tesfaye T276
 Teshome.....271
 Tesso T68
 Thaipakdee S237
 Therion JT.....229
 Thiex N216
 Thompson TL283
 Thomson P.....211
 Till BJ76

- Tilley M211
 Tirfe K.....263
 Tiruneh A.....243
 Tiruneh R229
 Tischler CR.....287
 Titshall LW196
 Toborn J276
 Tolera A228
 Tolessa B.....276
 Touraev A42
 Trotter A31
 Tsegaye S.....23
 Tsegaye T.....138
 Tsgie A.....139
 Tsiganok V.....161, 164
 Tuah AK216, 217
 Tucho TA.....229
 Tuinstra M.....196
 Tuku B211
 Tulema B118, 136, 138, 139
 Tulu B79
 Tuwafe S15, 79
 Twidwell EK.....216, 229
 Uehara T108
 Umeta M209, 211
 Umunna NN..216, 217, 218,
 219, 222, 226, 229, 231
 UNDP/FAO15, 243
 Unger J.....97, 156, 163
 University of Bern15
 Urga K.....212
 Vahlquist B204
 Van Bruchem J.....222
 Van Damme P.....212
 Van Delden SH.....40, 85
 Van der Linde EJ188
 Van der Merwe HJ.....230
 Van der Walt SI188
 Van Duran M95
 Van Ekris L.....203
 Van Gylswyk NO.....230
 Van Houten H.....235, 236
 Van Jaarsveld L188
 Van Niekerk CH230
 Van Niekerk FE230
 Van Nieuwenhuizen LC...40
 Van Rensburg LJJ230
 Van Staden J82
 Vancampenhout K230
 Vander Willigen C287
 VanDuren M41
 Vangylsw NO230
 Vanlauwe B118
 VanRensburg WL287
 Varshney RK91
 Varvikko T.....223
 Vaughan JG15
 Vavilov NI31
 Vazzana C.....282, 286
 Vecchio V197
 Veldkamp E133
 Venter WD.....287
 Verbeke W237, 259
 Verheye WH.....25
 Vermaak LM.....230
 Verplancke H.....137
 Veselovsky M ..79, 189, 190
 Viaene J237, 259
 Vishwanatha S212
 Vohwinkel F85
 Voigt PW281, 283, 286, 287
 Vollmann J.....62, 130
 Von Caemmerer S.....287
 Von la Chevallierie M....230
 Vorster JH.....188
 Vos J40, 85, 192
 Voss JBN220
 Vough LR230
 WADU276
 Waktola A.....276, 277
 Wale M163
 Walker DJ177
 Wallace RJ219
 Wan CG288
 Wang MB.....282
 Wang Z157
 Wanous MK.....31
 Waterhouse DB.....285
 Watson L.....212
 Watt I263
 Watts K230
 Wehrmann J85
 Weibye C230
 Weldeclassie A.....97
 Welty LE.....66
 Weltzin JF.....283, 285, 288
 Wennergen U173
 Wentworth-Sykes J.....15
 West CE211
 Westphal A95, 129, 134,
 139
 Westphal E.....243
 White LM288
 Wichman DM66
 Wickens GE.....212
 Wiegand RO231
 Wikipedia.....15
 Williams DG..283, 285, 288
 Williams GH.....263
 Willigen CV...192, 281, 288
 Wilson AK.....163
 Wilson RT.....212
 Witkowski ETF.....155
 Wodajeneh A260
 Woldeab A.....139
 Woldeamanuel Y228
 Woldearegay M213
 Woldegiorgis A.....184
 Woldekidan T190
 Woldemariam M.....263
 Woldemariam W.....263
 Woldemeskel M.....231
 Woldemichael T231
 Woldesemait B243
 Woldesenbet S143
 Woldetatos T25
 Woldeyesus K.....97, 263
 Woldeyohannes L85
 Woldu Z.....171
 Wondimu A213
 Wood RA.....117
 Wood RT213
 Woodward A.....227
 Worede M.....35, 38
 Workayehu T.....112, 236
 Worku M.....79, 158
 Worku W112
 Worku Z.....19
 Woyessa D.....97
 Wright D97
 Wuisman M205
 Wynia R.....216
 Yadav OP.....90
 Yadeta K243, 244
 Yalew A.....236, 244
 Yami A218, 219, 231
 Yamoah CF.....117, 132
 Yao S244
 Yehualawork Y.....263
 Yemane A174
 Yepez EA.....288
 Yeshalem B.....116, 153
 Yetneberk S211, 213

-
- Yigzaw Y213
Yihun Y.....197
Yilma A.....188
Yilma Z.....111
Yimane G.....237
Yimegnuhal A.....231
Ying BP.....157
Yirga C..139, 155, 235, 244,
250, 269
Yirgou D163, 189, 190
Yizengaw T.....25, 26
Yokohama Y82
Young BA.....287
Yu JK60, 61, 90, 91
- Yuan Y88
Yuhnin A 161, 164
Zacharias PJ196
Zanazzi D.....281
Zapata F95, 139
Zapata-Arias FJ....41, 42, 97
Zappacosta D281, 285
Zegeye A.....213
Zegeye T 15
Zeid M61, 90, 91
Zelege A.....156
Zelege K.....213
Zelleke H65
Zeller FJ 15
- Zemedu A107
Zerfu E...271, 272, 276, 277
Zewdie M.....85, 86
Zewdu AD40, 86, 143
Zewide L.....244
Zhang D91
Zimmermann H.....206
Zimmermann U.....95
Zinsmeister HD.....214
Zuccagni A31
Zuijderduin W.....205

Tef [*Eragrostis tef* (Zucc.) Trotter] is an orphan crop mainly grown in Ethiopia where it is annually cultivated on about 2.8 mio ha of land, which is equivalent to about 29% of the area allocated for cereals. In this annotated bibliography an attempt has been made to gather all available information on tef regarding research, development and production. The bibliography is divided into 28 chapters and presents comments or major findings for each literature unless the information is not currently available or accessible through diverse search engines.

Zerihun Tadele
Tef Improvement Project
University of Bern

ISBN: 978-3-033-03119-7