Client-Oriented Breeding: The Case of Quncho Tef Variety in Ethiopia

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Outline

- What is Tef?
  - Significance of tef crop
  - Constraints of tef production
- Tef Research in Ethiopia: An Overview
- Quncho Innovations
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  - ✓ Sociological innovations
- Impacts
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- Summary/The way Forward

Tef Crop and Its Significance

- **Tef (*Eragrostis tef*) : important cereal of Ethiopia**
  - **About 29% of the total acreage and 19% of the gross grain production of all cereals (CSA, 2012)**
  - **Grown by over 6.3 million farmers' households**
  - **Major staple food for Ethiopians (> 50 million people) (Important in the national food security)**

Table 1. Area, production and yield of cereals for private holdings for 2011/12 (2004 E.C.) main (*meher*) season in Ethiopia (CSA, 2012)

Crop	Area		Production		Av. yield (t/ha)	No. of Farmers (million)
	Million ha	% of cereals	Million t	% of cereals		
Tef	2.73	**28.47**	3.50	**18.61**	1.281	6.30
Maize	2.06	21.48	6.07	32.27	2.954	9.16
Sorghum	1.92	20.02	3.95	21.00	2.054	5.17
Wheat	1.44	15.02	2.92	15.52	2.029	4.33
Barley	0.95	9.91	1.59	8.45	1.672	4.09
Finger millet	0.43	4.48	0.66	3.51	1.507	1.57
Oats/Emmer	0.03	0.31	0.50	2.66	1.618	0.25
Rice	0.03	0.31	0.89	4.73	2.891	0.09
CEREALS	**9.59**		**18.81**		**1.962**	**13.09**

1. Statement of the Problem (Cont'd)

Significance of tef (Cont'd)

- **Relative merits in husbandry**

1) **Versatile agro-ecological adaptation (0-3000 m a.s.l.) : Center of origin and diversity**
   - **Wide genetic variability in phenologic, morphologic and agronomic traits**
2) **Resilience to drought and waterlogging**
3) **Fitness for various cropping systems**
4) **Low-risk reliable and catch crop**
5) **Relatively healthy crop**

Significance of tef (Cont'd)

❖Relative merits in utilization

1) Best quality, consumer-preferred "*injera*"

2) High returns in flour (99%) and in *injera*

3) Minimal post-harvest losses & high storage longevity

4) Fodder value of straw

5) Cash crop (high market prices of both grains and straw)

Significance of tef (Cont'd)

❖ Relative merits in utilization (Cont'd)

6) Nutritive value

- Very nutritious cereal grain
- High mineral contents (Fe, Ca, Cu, Zn, Mg)
- Health food
  - ✓ Gluten-free (Celiac disease)
  - ✓ Slow release carbohydrates – Low glycemic index (diabetics)
  - ✓ High Fe (Anaemia)

Constraints/Limitations of tef

- Low productivity (average 1.281 t/ha)
- Low yield of varieties under cultivation
- Lack of sufficient variability for some traits(e.g. lodging, seed size, shattering, leaf rust)
- Traditional cultural practices
- Culture and labor-intensive
- Abiotic and biotic stresses
- Socio-economic constraints
- Lack of R & D attention (international & local)

Tef Research in Ethiopia: An Overview

- Research on tef began in the late 1950s
- A total of 33 varieties released upto now (MoA, 2012) along with management packages
- Many tef varieties before Quncho, but little adopted ---- Why?
- Quncho innovation breakthrough:
  - ✓ Technological innovation
  - ✓ Sociological innovations (seed and extension system)

Quncho: Technological Innovation

- **PVS**
  - **Identification of farmers' preferences (Yield and very white seed color)**
- **Targeted crossing to combine high yield and white seed color**
- **Quncho is a RIL from the cross :**
  - **(DZ-01-974 X DZ-01-196)-HT-387- (RIL 355)**
    - ✓ **DZ-01-974 (Dukem) released in 1995, pale-white seed, high yielding**
    - ✓ **DZ-01-196 (Magna), released in 1970, very white seed, low yield**

Quncho: Technological Innovation (Cont'd)

- ✓Cross made in 2000

- Rapid generation advancement (by SSD from F2) (up to 3 generations/year)
- Released in 2006
- Branding: Quncho = "at the helm", "top most", "top brass"

Quncho: Sociological Innovations

1) Integration of the formal and informal seed system for seed multiplication and distribution

- **Tef research**
  - ✓ **Spear-headed the on-farm seed production approach**
  - ✓ **Instigated formation of seed grower farmers' associations**

2) Coordinated multi-stakeholder partnership approach in technology dissemination

- **Large farm size**
- **Revolving seed loan**
- **Facilitation of provision of inputs and market**
- **Periodic training**
- **Regular supervision (multi-disciplinary research team)**
- **Farm-level intervention**
- **Multi-stakeholder partnership including government administration, research, extension, NGOs, private inst., etc.**

Impacts

- **Farmers directly reached through technology scaling up**

1) **National (2009/10-2012/13): 36,314**
2) **Center (2006/07-2012/13) : 12,765**

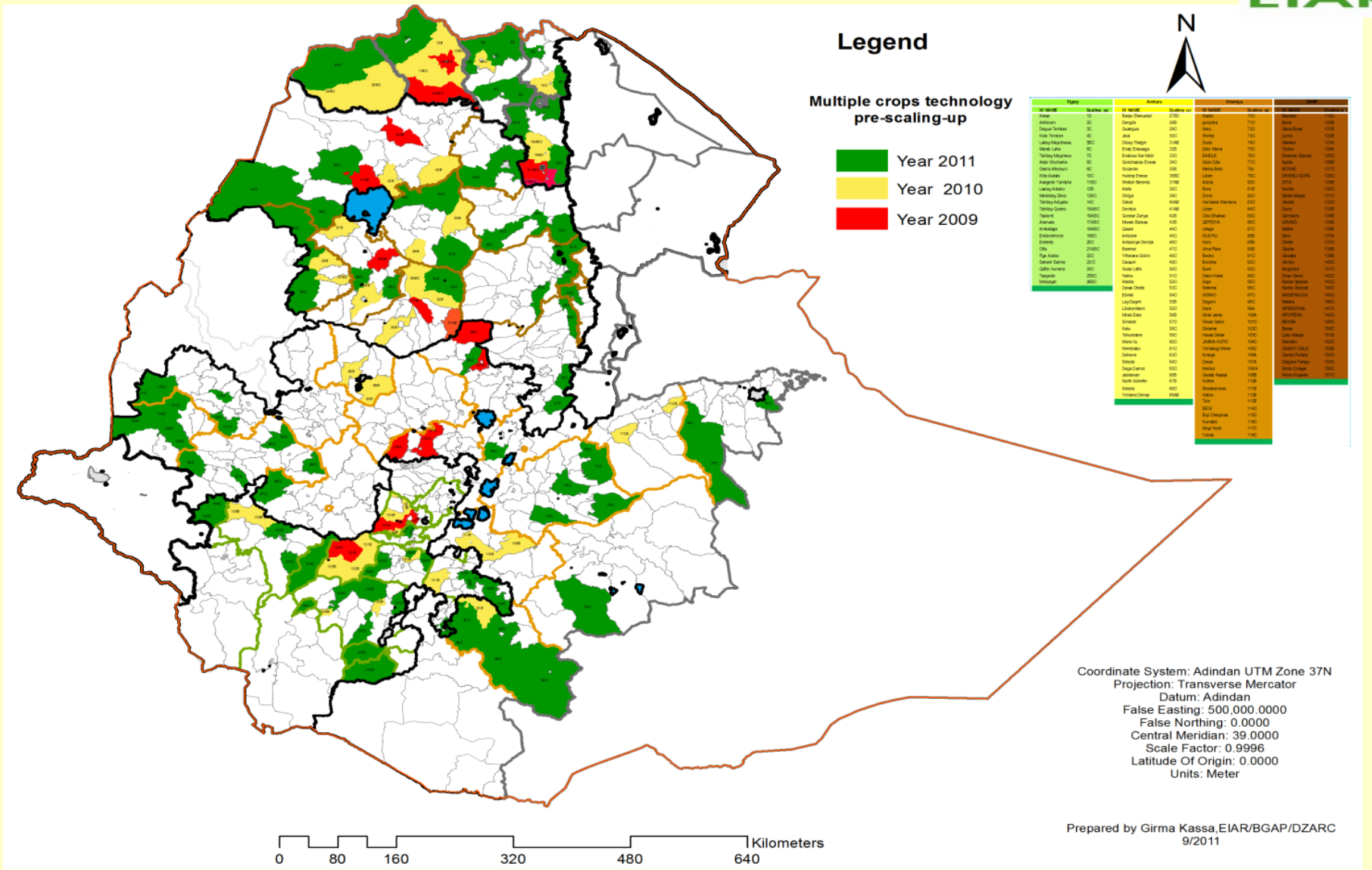
Total 49,079

- **Improved incomes and livelihoods**
- **Establishment of seed grower framers' associations**

National Technology scaling up 2009/10 - 2012/13

Region	Amount of seed in tons	Area(ha)	No. of Farmers
Tigray	18.90	812.50	3250
Amhara	82.63	2697.00	10788
Oromia	101.99	3327.00	13308
SNNP	63.70	2242.00	8968
Total	267.22	9078.000	36314

National Tef technology scaling up (2009-2011/12)*



Center Technology scaling up 2006/07-2012/13

Year	No. households participated	Farm area covered (ha)	Total yield obtained (t)	Average grain yield (t/ha)
2006	300	150.0	300.0	2.0
2007	506	253.0	556.6	2.2
2008	1060	530.0	1166.0	2.2
2009	5875	2938.0	6763.6	2.2
2010	780	195.0	448.5	2.3
2011	1066	312.5	750.0	2.4
2012	3178	794.5	2065.7	2.6
Total	**12765**	**5173.0**	**12050.0**	**2.3**

Area coverage of Quncho in some districts (2011/12)

Wereda	Total area coverage of tef (ha)	Quncho coverage (ha)	% over total
Ada	28744	28039	97.50
Lume	15500	9300	60.00
Minjar	19943	4008	20.09
Gimbichu	2231	112	4.99
Total	66418	41458	62.40

Adoption rate and intensity of tef varieties in three districts (2012/13)

Variety	Adoption rate (%) (N=450)	Adoption rate (% of tef area)
Quncho	76	66
DZ-01-196	40	26
DZ-Cr-37	3	2
DZ-01-354	2	3
Others/local	16	5

Impacts (Cont'd)

- Improved incomes and livelihoods
- Establishment of seed grower framers' associations
- Entry of the private sector into the tef seed system
- Government recognition and emphasis (National Gold Medal Award in Nov. 2013)

Beneficiaries

- **Seed growers**
  - ✓ Parastatal/public seed enterprises (ESE, OSE, ASE, SSE, TSE, etc.)
  - ✓ Farmers and farmers' associations and unions
  - ✓ Private seed growers
- **Tef Growing smallholder farmers**
  - ✓ More than 6.3 million households
- **Tef consumers:**
  - ✓ Staple food for over 50 million Ethiopians

Summary/Way Forward

- Quncho combines high yield and white seed color
- It is relatively lodging tolerant
- It is developed with the new insight of applications of the science of breeding including both conventional and participatory approaches
- Intensifying Tef R&D

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Reference

- Kebebew Assefa, Sherif Aliye, Getachew belay, Gizaw Metaferia, Hailu Tefera and Mark E. Sorrells. 2011. Quncho: the first popular variety in Ethiopia. International Journal of Agricultural Sustainability 9 (1): 25-34

THANK YOU!!!