

**MOA/ATA'S TEF VALUE CHAIN PROGRAM:  
2011 ACHIEVEMENTS AND PLANS FOR 2012**

**SUMMARY**

Doubling the grain and straw yield of Tef would significantly contribute to Ethiopia's economy and food security. Techniques being explored by MOA and ATA to achieve such growth include changes in planting methods (such as planting in rows rather than broadcasting), reducing planting density from 25 kilograms to 5 kilograms per hectare, and even transplanting from seedlings.

Accordingly, the ATA along with MoA and Regional Bureaus is planning to scale-up those technologies and practices that have been proven to positively and economically impact farmers' yields, and to expand the scope of the demonstrations of technologies that are believed to have great potential for smallholder Tef farmers. Taking lessons from results of 2011 demonstrations with over 1,400 farmers, more than 50,000 farmers and 1,200 Farmers' Training Centers are expected to participate in tef demonstrations comprising of technologies related to reduced seed rate, row planting, transplanting and different fertilizer applications in 2012.

The selection of these package of technologies came from results of field demonstrations with 1,400 farmers and 90 FTCs which showed that yields can be increased up to 75% on an average, with some farmers obtaining yields up to 50 quintals/ha. To support the above demonstrations, nearly 4,000 Development Agents (DAs) and 50 Subject Matter Specialists will be trained. Other technologies to be demonstrated will include tef row planters and a tef thresher. These technologies are expected to double and sometimes triple yields of both grain and straw because they result in vigorous plant growth, larger panicles, and more tillering.

**Objective:** to introduce and demonstrate productivity enhancing technologies to farmers

**Hypotheses:**

1. The plant density currently used by farmers is too high and is one of the causes for low yielding.
2. The NP fertilizer (Urea & DAP) that is used in Ethiopia is inadequate as plant food, and hence, Ethiopian soils are believed to have deficiencies of K, S, Zn, Cu, Mg, and other micronutrients.

## INTRODUCTION

In 2011, the Ethiopian Government through its newly established Agriculture Transformation Agency (ATA) started giving tef particular and unprecedented attention. Plans were put in place to demonstrate several promising and productivity-enhancing technologies including:

- (1) reduced seeding rate,
- (2) row seeding instead of broadcasting, and
- (3) the use of complex fertilizers that contain essential micronutrients.

Over 1,400 demonstrations were conducted extensively in the four major tef-producing regions of the country: Amhara, Oromiya, SNNPR, and Tigray. The demonstrations were also implemented at four levels with:

- (1) Eight M.Sc. students from Haramaya and Mekelle Universities,
- (2) 90 Farmer Training Centers (FTCs) under the supervision of Agricultural Development Agents (DAs),
- (3) 80 model farmers under SG2000/Ethiopia supervision, and
- (4) 1,350 small-scale farmers, plus
- (5) Six commercial farmers.

In preparation for the season, trainings and briefings were given at Federal, Regional and Woreda levels. Tef seed of the improved variety *Kuncho* was weighed, packaged and provided free of charge by the Debre-Zeit Agricultural Research Center of the Ethiopian Agricultural Research Organization (EARO), while the Ministry of Agriculture (MoA) provided different complex fertilizers weighed and packaged at the National Soils Laboratory. ATA sponsored the fertilizer needs for demonstrations at the FTCs. The Tef Advisor, Dr. Tareke Berhe, fully participated in determining the types and numbers of the demonstrations, in calculating the input needs for the demonstrations, and in the preparation of the overall plan of activities, including the technology package implementation guideline to distribute for end-users.

For a jump-start of the tef activities, the Debre Zeit Agricultural Research Center conducted several trials including transplanting, row seeding, and micronutrient (Zn and Cu) applications during off-season under irrigation. This was done both on-station and on-farm. ATA participated in the monitoring and supervising of the off-station trials. Results from the off-season trials played a key role in giving a good confirmation and direction to the main season demonstrations.

In line with the Ethiopian Governments' goal to double agricultural production within the coming five years, the tef value chain also aims to double tef production within the same period. *By reducing the seed rate from the commonly used 25 kg ha<sup>-1</sup> to only 2.5 kg ha<sup>-1</sup>, by transplanting the seedlings in a row instead of sowing by broadcasting, and by applying appropriate types of fertilizer, three-fold increases in both the seed and straw yields were obtained. Nothing can be more exciting than to imagine doubling the 3.4 million tons of annual production to 6.8 million tons, or tripling it to 10.2 million tones*

## **LEVELS OF TRIALS and RESULTS**

### **1. M. Sc. Students**

**Title: Evaluating the effect of low seeding rate on (and row planting) and blended fertilizer application on tef yield**

#### **Background**

A report published in 2010 revealed that reducing the seeding rate on tef to about one-fifth, coupled with transplanting and together with a compound fertilizer application, has resulted in a grain yield of about 6 t/ha. This is the latest breakthrough in tef research and development. The Ministry of Agriculture and the Agriculture Transformation Agency have therefore planned to verify these results in four regions, and in 90 Weredas in the country, both on farmers' fields and at FTCs. The Ministry also resolved that it will be appropriate to engage some M.Sc. students in this verification study, who can do a focused research with selected treatments and come up with their findings, so that the analysis and conclusions of results from all these research studies can lead to a better understanding of the situation and help in clarifying the way forward.

Based on the above, the Ministry invited five M.Sc. candidates from Haramaya and three from Mekelle Universities to participate in the tef research. The students were financially supported by the Ethiopia Agricultural Transformation Agency (EATA).

#### **Research details for M. Sc. Students**

A. Treatments: 5

1. 100 Kg/Ha of 23-10-5 + 3S + 0,3 Zn +100 Kg/Ha Urea + 50 Kg/Ha Potassium Sulphate + 80 Kg/Ha TSP; both seed and fertilizers row-planted with seed rate = 5 kg/Ha
2. Same as # 1, but both seed and fertilizer broadcast sown: seed rate = 25 Kg/Ha
3. 100 Kg/Ha DAP + 100 Kg/Ha Urea (both seed and fertilizer row-seeded): seed rate =5 Kg/Ha
4. 100 Kg/DAP + 100 Kg/Ha Urea ; seed rate = 25 Kg/Ha – both seed and fertilizer broadcasted
5. Control: No fertilizer, and seed rate = 25 Kg/Ha

- Replications: 3
- Sites: 2
- Plot size : 5m x 4 m = 20 sq. meters
- Number of plots/student: 5 treatments x 3 replications x 2 sites = 30 plots/student

**Co-advisors:** The Ministry recommends Drs Marco Quinones and Tareke Berhe to co-advise a total of three students each from the six M. Sc. candidates (two more students were added to work on slow-release urea, thus making the number of students 8).

## 1. RESULTS OF THE M. Sc. Tef Research Trials

Table 3. Results (grain yield in t/ha) from tef trials by six M.Sc. students

STUDENT	CONTROL, BROADCAST	DAP + UREA BROADCAST	YARA MILA BROADCAST	DAP + UREA ROW	YARA MILA ROW
Birhane	1.17	2.68	3.14	3.73	4.06
Shiferaw	1.37	3.33	3.26	3.77	3.86
Seate	0.92	1.66	1.33	1.14	1.20
Lemlem	0.82	1.29	1.18	1.20	1.33
Teklay	0.64	1.99	2.24	3.43	3.93
Refissa	0.47	3.34	3.21	3.54	3.63

The results from the M. Sc. research trials can be considered the most scientific and accurate as they were conducted with three replications, in two adjacent sites, and also two soil types (heavy clay and light). The data were statistically analyzed, and significant differences among treatments identified.

Table 1. Results of six M. Sc. Tef Trials Conducted in Different Regions of Ethiopia



M. Sc. Student, Teklay Tesfay of Mekelle Univ., Tigray, in his plot around Shire, Endaselassie

## 2. Tef Demonstrations Conducted by 80 Model Farmers Supervised by SG2000/ETHIOPIA and Results Obtained

**80 Model Farmers:** An NGO, Sasakawa Global 2000/Ethiopia was selected to be partner in this and will execute/supervise the work with 80 farmers. Of course, the DAO's in the respective Districts are also to be responsible.

Treatments: 3; Plot size = 200 sq. meters

1. 100 Kg/Ha of 16-17-17 + 65 Kg of TSP/Ha + 50 kg/ha Potassium Sulfate +100 Kg/Ha Urea (row-planted at 5 kg/ha seed rate)
2. 100 Kg/Ha DAP + 100 Kg/Ha Urea (row-planted at 5 Kg/ha seed rate)
3. 100 Kg/Ha DAP + 100 kg/ha Urea (broadcast, planted at 25 Kg/Ha seed rate )

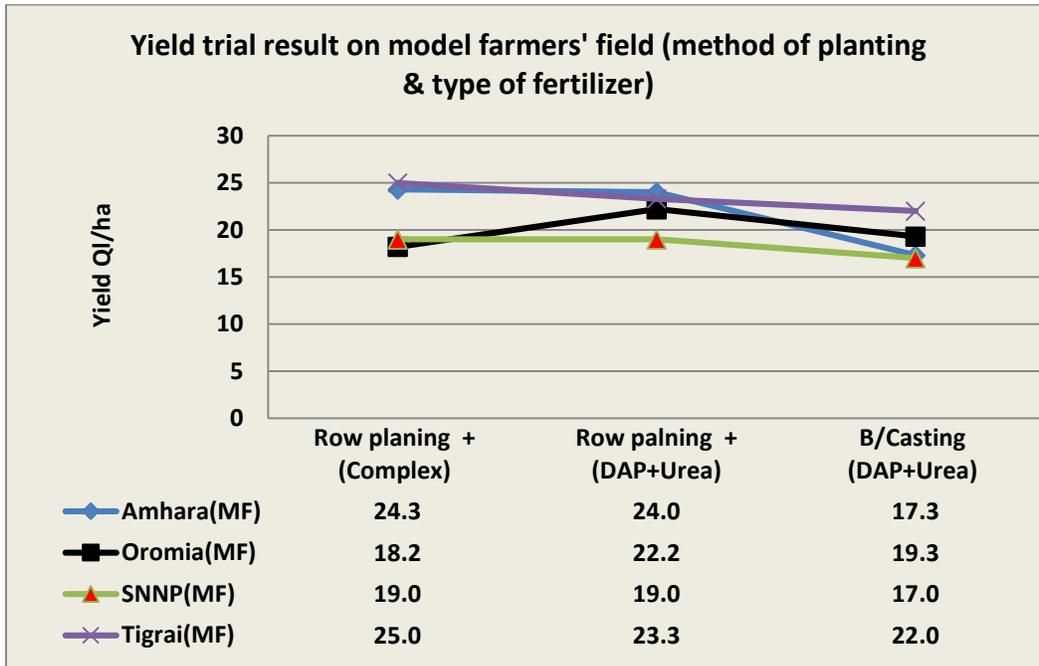
No. of Farmers/Region

1. Amhara: 25
2. Oromia: 25
3. SNNPR: 20
4. Tigray: 10

### Summary of the results from 80 SG2000 Model Farmers

It is interesting to note that high yields of 40 quintals (4 tons) and 47.7 quintals (4.7 tons) are recorded Here (see Table 2.). Average yields range otherwise from 16 quintals to 27.5 quintals. The results are very clear in that row planting is superior to broadcast planting. On the average, row planting outyielded broadcast planting by at least five quintals. Additional yield of two/three quintals is obtained from the complex fertilizer as compared to DAP +Urea. In most cases, the complex fertilizer 16-17-17 gave higher average yields as compared to DAP + Urea.

Table 2. Yield (qt/ha) on 80 Model Farmers' fields for different fertilizer types and planting methods



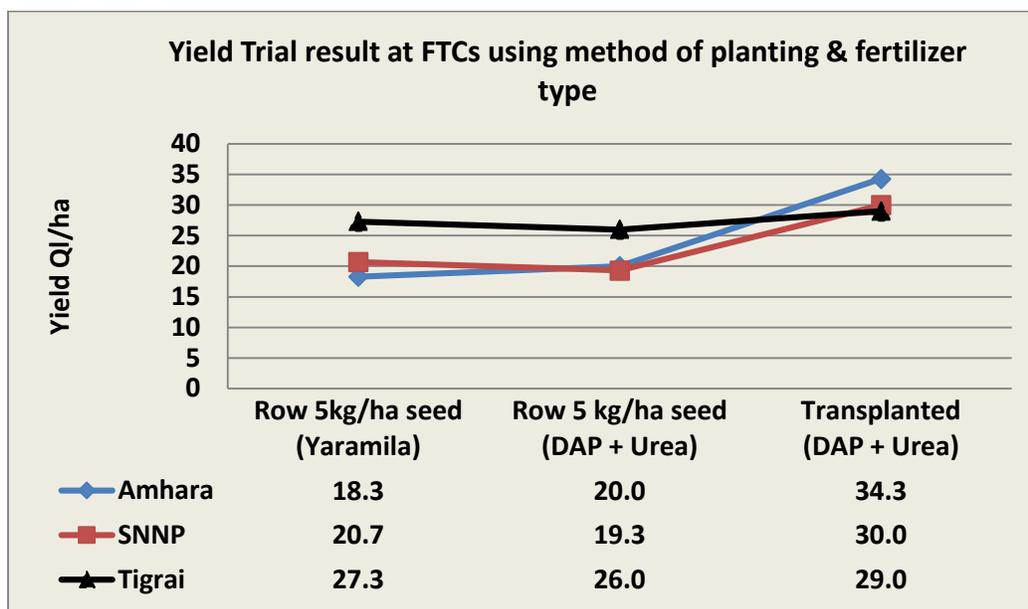
3. **Demonstrations Conducted at 90 Farmers' Training Centers (FTCs) in 4 Regions and Results Obtained:** These were supervised by Development Agricultural Officers (DAOs) that reside in place.

Distribution of FTCs: 30 Amhara, 30 Oromiya, 20 SNNPR, 10 Tigray

Treatments: 3 (No. of replications); Plot size = 200 sq. meters

1. 23-10-5... 100 Kg/Ha of 23-10-5 + 3S + 0,3 Zn + 100 Kg/Ha Urea + 50 Kg/Ha Potassium Sulfate + 80 Kg/Ha TSP; both seed and fertilizers row-planted; seed rate = 5 kg/Ha
  2. 100 Kg/Ha DAP + 100 Kg/Ha Urea (both seed and fertilizer row-seeded; seed rate = 5 Kg/Ha)
  3. 100 Kg/DAP + 100 Kg/Ha Urea ; seed rate = 25 Kg/Ha (both seed and fertilizer broadcasted)
  4. 100 kg DAP + 100 kg Urea, 5 kg/ha seed rate, transplanted\*
- Newly added Treatment

Table 3. Results (grain yield t/ha) from Tef Demonstrations at ----- FTCs (DAP+ Urea) –  
 Add data from More FTCs



REGION	BROADCAST	ROW	TRANSPLANTING	HIGHEST YIELD OBTAINED
Tigray	1.5.	2.88	3.18	42.5, Transplanting, DAP + Urea
Oromiya	2.14	2.86	3.16	42.5, Transplanting, DAP + Urea
Amhara	18.9	39.0	64.0	64.0, transplanting, DAP + Urea
				58.0, Row planting, DAP + Urea
SNNP	25.0	34	50.0	50.0, Transplanting, DAP + Urea 44.0, Row planting, Complex



Tef Field Day in 2011 at DAO Farmer Training Center, Oromia Region

**4. 1,350 tef-producing farmers from 4 Regions (Amhara, Oromiya, SNNPR, Tigray)**

**A. Demonstrations with 1,350 farmers in 4 regions:** planned by Tef Technical Committee; these were sub-divided into two groups as follows:

**Group I:** Will do three treatments – reduced seed rate, row planting and complex fertilizer as described below (100 farmers from each region).

**B. Treatments: 3**

**C. Plot size: 100 m<sup>2</sup>**

Reduced seed rate (2.5 kg/ha) + row planting with 280 kg/ha of 23-10-5.... + 39 kg/ha TSP

Reduced seed rate (2.5 kg/ha) @ 100:100 kg/ha DAP and Urea

Normal seed rate (25-30 kg/ha) @ 100:100 kg/ha DAP and Urea, farmer practice

- **Inputs for Treatment 1:** fertilizer to be provided; seed: farmers use their own
- **Inputs for Treatments 2 & 3:** both seed and fertilizer will be the farmers' own

<b>Group 1: 400 farmers out of 1.350</b>	<b>Package</b>	<b>Total amt</b>
<b>Amhara:</b> the required amount of fertilizer in the form of NPK & TSP will be provided to 100 farmers only.	100 bags: 2.8 kg each 23-10-5	280.0 kgs
	100 bags: 0.85 kg each of TSP	85.0 kgs
	<b>subtotal 1</b>	<b>365kg</b>
<b>Oromia:</b> the required amount of fertilizer in the form of NPK & TSP will be provided to 100 farmers only	100 bags: 2.8 kg each 23-10-5	280.0 kgs
	100 bags: 0.85 kg each of TSP	85.0 kgs
	<b>subtotal 2</b>	<b>365kg</b>
<b>SNNPR:</b> the required amount of fertilizer in the form of NPK & TSP will be provided to 100 farmers only	100 bags: 2.8 kg each 23-10-5.	280.0 kgs
	100 bags: 0.85 kg each of TSP	85.0 kgs
	<b>subtotal 3</b>	<b>365kg</b>

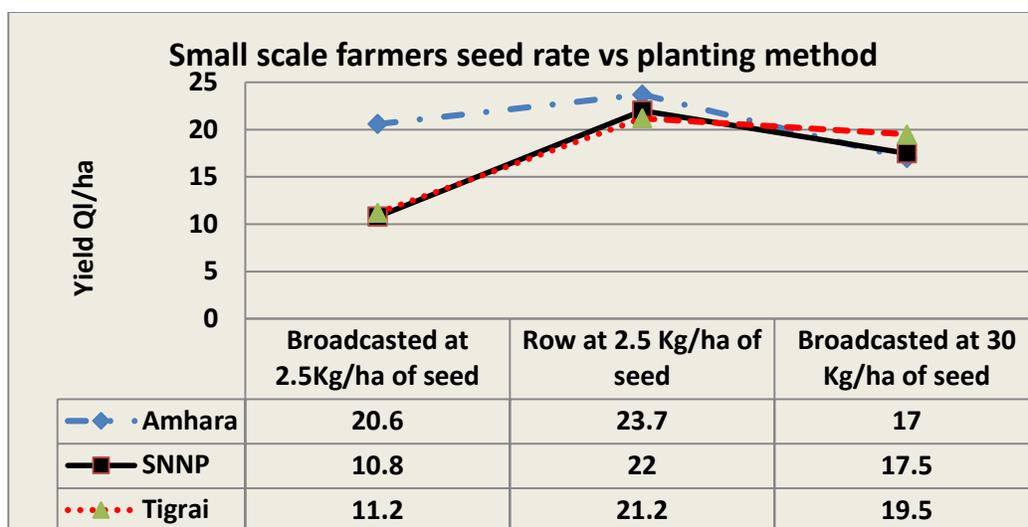
<b>Tigray:</b> : the required amount of fertilizer in the form of NPK & TSP will be provided to 100 farmers only	100 bags: 2.8 kg each 23-10-5.	280.0 kgs
	100 bags: 0.85 kg each Of TSP	85.0 kgs
	<b>Subtotal 4</b>	<b>365kg</b>
<b>Grand total</b>	<b>400 bags: 2.8 kg each 23-10-5</b>	<b>1,120 kgs</b>
	<b>400 bags: 0.85 kg each TSP</b>	<b>340 kgs</b>

**Group II.** The remaining 950 farmers out of the 1,350 who were introduced to two treatments only; reduced (all inputs are from farmers themselves).

**D. Distribution of the Demonstrations:**

- Amhara (30 woredas X 5 kebelles X 3 farmers/kebelle) = 450 farmers
- Oromiya (30 woredas X 5 kebelles X 3 farmers/kebelle) = 450 farmers
- SNNP (20 woredas X 5 kebelles X 3 farmers/kebelle) = 300 farmers
- Tigray (10 woredas X 5 kebbelles X 3 farmers/kebelle) = 150 farmers

Table 4. Results of Tef Demonstrations from ----- out of 1,350 small-scale farmers during 2011



Getachew Legese, from kebeles Hatsebo, L/Maichew, and Tigray: row-seeded, 2.5 kg/ha, NPK, TSP, and micronutrients

Kuncho field at Gedoo, Oromia

**5. Commercial Farmer Results in Ada'a Woreda for Tef :**

- Yield increased by 4.4 to 13.2 q/ha (10.48 to 33.33%) with  $K_2SO_4$  and 5.6 to 14 q/ha (13.33 to 44.26 %) with KCl. This might be due to the higher percentage of K in KCl.

**ATA TEF PRODUCTIVITY ENHANCEMENT PERFORMANCE RESULT (2011)**

Region	Woreda	Name of the farmer	Fertilizer type (broadcasted)		
			DAP + Urea	DAP + UREA + $KSO_4$	DAP + UREA + KCl
Oromia	Dhenkaka	Sisay	2.20	2.86	2.90
		Ermiyas	2.10	2.32	2.38
		Shimels	0.90	0.88	1.46
		Solomon	1.22	1.60	1.76
		Engida	1.20	1.60	1.68