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Pre-extension Demonstration of Maize (Zea mays L) Technology at Gamo Gofa Zone, Southern, Ethiopia

Solomon Yokamo Melese Lema
Southern Agricultural Research Institute, Arbaminch Agricultural Research Center

Abstract
The pre extension demonstration of maize technology with its full package were done to create awareness of farmers and agricultural extension agents and to enhance the rapid adoption and diffusion of the technology. four varieties of maize MH-140,MH-130,MHQ-138 and Gibe2- were demonstrated with its full package at Gamo Gofa zone, Mirab Abaya Woreda in two FTCs and at 20 farmers field. It was implemented at 100m^2 area by applying all the recommended agronomic practices. Twenty five(25) kilogram per hectare seed rate were used and 100 kg NPS and one third of Urea were used during sowing time. This pre extension demonstration works are farmers oriented and participatory, so farmers(male headed and women headed as well as youth groups) were visiting and evaluating the demonstration maize at three crop growth stages(2 leaf stage, topdressing and maturity stages) and finally field day was organized and different stakeholders from Kebele, Woreda, Zone, and research Institute, and more than 300 farmers were participated and the results promoted through different Media like Brochures, FM radio and Southern TVs. The yield data were collected and partial budget analysis were conducted and {MH-140 myp=64.2, NR=29,168 MH-130 myp=61.3, NR=27,602, MHQ-138 myp=50.5, NR= 21,770, Gibe two myp= 47.53, NR=20,166 ETB}.While myp is mean yield performance and NR is net return. Finally farmers select MH-140 variety as best from all variety through judging it by different defined criteria.
Keywords: Demonstration, Farmers, Maize, Variety and Technology

1. Introduction

Maize (*Zea mays* L) is one of the most important cereals having wider adaptability under varied agro climatic conditions. Globally, maize is known as queen of cereals because it has the highest genetic yield potential among the cereals. It is one of the most important cereal crops used in the human diet in large parts of the world and it is an important feed component for livestock. Maize grain has greater nutritional value as it contains 72% starch, 10% protein, 4.8% oil, 8.5% fiber, 3.0% sugar and 1.7% ash. Maize is the single most important crop in terms of both number of farmers engaged in cultivation and crop yield (Shahidur et al., 2010). The smallholder farmers that comprise about 80 percent of Ethiopia's population are both the primary producers and consumers of maize (Dawit et al., 2008).

Maize is one of the most important cereals cultivated in Ethiopia. It ranks second after Teff in area coverage and first in total production. The results of the year 2011/12, growing season post-harvest crop production survey indicate that total land areas of about 12,086,603.89 hectares were covered by grain crops. Out of the total grain crop areas, 79.34% (9,588,923.71 hectares) was under cereals. Of this maize covered 17% (about 2,054,723.69 hectares) and gave 6069413 tons of grain yields (CSA, 2012). Despite the large area under maize, the national average yield of maize is about 2.95 t/ha (CSA, 2012). This is by far below the world's average yield which is about 5.21t/ha (FAO, 2011). The low productivity of maize is attributed to many factors like frequent occurrence of drought, declining of soil fertility, poor agronomic practice, limited use of input, insufficient technology generation and adoption, lack of credit facilities, poor seed quality, disease, insect, pests and weeds particularly, Striga (CIMMYT, 2004). One of the major problems constraining the development of an economically successful agriculture is nutrient deficiency. It is estimated that some 30 to 50% of the increase in world food production since 1950s is attributable to fertilizer use. Nevertheless, many farmers refrain from using fertilizer due to escalating costs, uncertainty about the economic returns to fertilizing food crops and, more often, lack of knowledge as to which kinds and rates of fertilizers are suitable.

Many research centers releasing different maize variety but the released technology does not reach to the hands of farmers because of Research-Extension-Farmer relation is weak and farmers fear for newly coming technology due to fear of failure. Demonstrating best technologies on farmers field and on FTC is best methods to enhance adoption and finally to increase production and productivity of farmers. Result demonstration of lowland maize technology was undertaken in two selected woreda according to the relevant agro ecology for the crops from Gamogofa zone, Mirab Abaya woreda.

2. Objectives

The objectives of undertaking Pre extension demonstration of maize technology is:-

- To enhance the rapid diffusion and adoption of maize technology
- To assess economical viability of maize technology

Materials and Methods

At the beginning of implementing pre extension demonstration of maize technologies; one woreda(Mirab abaya) from Gamogofa zone and from the woreda two Kebeles(Kola mullato and Molle) were porpusefully selected. When the selection of kebele completed, target beneficiary farmers were selected and training was provided on the maize(*MH-140, MH-130, MHQ-138 & Gibe-2*) technology from production up to marketing. All necessary input are delivered to the farmers from Arbaminch Agricultural research centers(seeds, fertilizers, etc) and farmers sown the seeds on their fields and follow ups and essential advices from respective researchers has been taken place. Finally the data were analyzed by using simple statistics and matrix rankings.

3. Results and Discussion.

3.1 Establishment of Farmers Research Group(FRG)

During implementation of pre extension and demonstration of maize technology, farmers were organized under farmers research group(FRG). The group would contain 30-45% womens and they assigned the leader and secretary and they could work in close relationship with researchers. They were capacitated with different trainings, experience sharing and workshops to build their capacity to solve their problems by themselves.

3.2. Provision of Training

During the implementation of technology pre extension demonstration and popularization of maize technology, training for the beneficiary (participant) farmers and for different stakeholders was provided. Participant farmers from the woreda were selected by collaboration with woreda agriculture and natural resource office and kebele development experts. Beneficiary farmers , Kebeles development Agents and woredas experts were selected for the training. The training was provided on maize technology pre extension demonstration of agronomic practices from land preparation to final consumption. The main objectives of training were to create awareness of farmers, development agents(DAs) and woreda's expert on maize technology and to compare the results finally obtained from demonstration.

3.3 Yield Performance on farmers field.

The maize demonstration work were implemented in Gamogofa zone Mirab abaya woreda in two FTC and seventeen farmers field. The yield data were collected from farmers field and in both kebeles, MH-140 had better yields and showed better performance followed by MH-130, MHQ-138 and gibe-2 respectively.

Table 1:-Yield data of farmers field quintals /ha

S.N	MH-140	MH-130	MHQ-138	Gibe-2(st check)
F1	68.5	65.5	56	53
F2	66	62	55	51
F3	62	60	45	45
F4	58	57	43	42
F5	67	64	55	42
F6	67	64	54.5	52
F7	66.5	62.5	55.5	52.5
F8	67	61	56	53
F9	63	60.5	52	53
F10	64	62	57.5	49
F11	65	65	51.5	47.5
F12	65.5	65	44	46
F13	64.5	59	43.5	43
F14	64.5	59	43	43
F15	61	58.5	47	44.5
F16	60	58	48	42.5
F17	62	59	52	49
Mean	64.2	61.3	50.5	47.53
Variance	8.16	7.35	28.06	18.51
St.dev	2.86	2.71	5.3	4.3
LSD	0.18			
CV %	4.7			

The above table indicated that, the mean yield performance of MH-140 were 64.2 quintals per hectare and that of MH-130 were 61.3 quintal per hectare,MHQ-138 is 50.5 quintal and Gibe-2 were 47.53 quintal per hectare.

This indicated that MH-140 had the yield advantage of 4.5%, 21.4% and 25.96% over the MH-130, MHQ-

138 and Gibe-2 respectively.

3.4. Yield performance on FTC

Farmers training centers(FTC) is one of the best learning stations for farmers. It is known as school without walls because of farmers learn many things through agricultural experts and builds their capacity to solve their problems by themselves for further. So, our demonstration work implemented in two FTCs for the sake of demonstrating the maize varieties for non participant farmers with in and around the Kebele.

Table 2:- Yield Performance of FTCs

Location	**Quantity**	**Yield Performance**			
		MH-140	MH-130	MHQ-138	Gibe-2
Kolla mullato FTC	Qt/ha	69	60	58	53
Molle FTC	>>	67.5	58	54	54
Over all Mean yield of FTC	>>	**68.3**	**59**	**56**	**53.5**
Farmers mean yield (N=17)	>>	64.2	61.3	50.5	47.53

The yield obtained from kolla mullato FTC were *69 qt/ha, 60qt/ha,58qt/ha,53qt/ha* of MH-140, MH-130, MHQ-138 and Gibe-2, respectively and that of Molle FTC were *67.5 qt/ha, 58 qt/ha,54 qt/ha,54 qt/ha* of MH-140, MH-130, MHQ-138 and Gibe -2 respectively. AS shown in the table, MH-140 and MH-130 gave better yields.

3.4 Farmers Preferences

Farmers rank the four varieties (MH-140,MH-130, MHQ-138 and Gibe-2) by 13 different criteria. The preference results shown as below the table.

Criteria (N=17)	**Farmers rank**											
	MH-140			**MH-130**			**MHQ-138**			**Gibe -2**		
Germination rate	5	12	0	9	8	-0	0	5	12**12**	3	8	6
Height of the variety	10	7	0	2	7	8	2	8	7	3	8	6
Resistance to disease	5	11	1	5	11	1	4	6	7	3	9	5
Resistance to pest	5	11	1	4	11	2	4	6	7	4	8	5
Cob size	7	9	1	3	10	3	2	7	8	5	7	5
No. of cobs per plant	7	8	2	4	10	3	2	6	9	4	5	8
No. of seeds per cob	6	11	0	4	9	3	4	7	6	3	8	6
Resistance to lodging	2	15	0	7	9	0	4	11	2	4	10	3
Early maturity	3	13	1	11	6	0	0	4	13	3	6	8
Ability to tolerate drought	4	13	0	5	11	1	4	8	5	4	11	3
Seed size	5	12	0	4	9	3	3	7	7	5	6	6
Taste	2	12	3	3	9	5	9	8	0	3	10	4
Marketability	8	9	0	3	11	3	2	8	7	4	9	3
Average	**32**	**65**	**3**	**29.5**	**55**	**15.5**	**18**	**41**	**41**	**22**	**43**	**35**
Continuity Yes	**17**17			**15** 15			**9** 9			**11**11		
No	0			2			8			6		
Average	**100:0**			**88:12**			53:47			65:35		
Rank	**1st**			**2nd**			**4th**			**3rd**		

Farmers select according to thirteen different criteria of selection and gave 32% of MH-140 as best followed by MH-130 by 29.5%, MHQ-138 by 18% and Gibe-2 by 22%.

Farmers were selected MH-140 by its ability to tolerate drought, height of variety, resistance to pest, large cob size, number of cobs per plants, number of seeds per cobs, seed size and marketability. Secondly they were selected as best of MH-130 by criteria of fast emergency rate, early maturity, resistance to disease, resistance to pest, resistance to lodging, and ability to tolerate drought. Also they selected MHQ-138 and gibe-2 as best by criteria of resistance to pest, and ability to tolerate disease. Farmers ranks MH-140 variety were good and they can continue to use for the future followed by MH-130.

3.6. Partial Budget Analysis

Economic analysis (cost-benefit analysis) is the best tools for checking the technology is cost effective or not by adding each costs and gains obtained from yields and yield products. Net benefit is calculated through reducing the gross field benefit less the total costs that vary.

Table 4:- Partial Budget Analysis

Items	Quantity	Unit price/cost	Maize Variety			
			MH-140	MH-130	MHQ-138	Gibe-2
Average yield (kg/hectare)	kg	6	**6420**	**6130**	**5050**	**4753**
Adjusted yield(-10%)			5778	5517	4545	4277.7
Sales In birr	Birr	**6**	34,668	33,102	27,270	25,666
Maize stalk	>>		2000	2000	2000	2000
Total gain in birr			**36,668**	**35,102**	**29,270**	**27,666**
Seed Purchase	Birr	40	1000	1000	1000	1000
Fertilizer costs in kg	NPS	100	1250	1250	1250	1250
	Urea	100	1100	1100	1100	1100
	Total	200	*2350*	*2350*	*2350*	*2350*
Land preparation	ha	1000	1000	1000	1000	1000
Labor costs per day	Sowing	2d*5p*35b	350	350	350	350
	1st & 2nd Weeding	2d*20p*35b	1400	1400	1400	1400
	Fertilizer application	2d*10p*35b	700	700	700	700
	Harvesting	2d*10p*35b	700	700	700	700
Total costs			***7500***	***7500***	***7500***	***7500***
Net Benefit			**29,168**	**27,602**	**21,770**	**20,166**

Note:- The value that are used here is by ETB. "d" stands for days, "p" stands for person and "b" stands for birr.

The net benefits of the varieties that were demonstrated were 29,168 ETB, 27,602 ETB, 21,770 ETB, and 20,166 ETB of MH-140, MH-1330, MHQ-138 and Gibe two respectively. So MH-140 showed that good benefit than the other varieties that were demonstrated.

3.7. Farmers comment toward new variety

Field day were organized and many farmers with in and around the Kebele were participated and the technology were promoted through different media and televisions. Farmers visits the demonstration plots and evaluated it by different criteria.

Strength

- MH-140 are long and are good for far farms and have good bearing than others and its stalk are strong. It is drought resistant, early maturing next to MH-130, and disease resistant.
- MH-130 are short, resist wind break, good bearing and early mature. It is drought and disease resistant. Gibe-2 is short, and good bearing next to MH-130.

Weakness

- MH-140 are long and are susceptible to wind breaks.
- MH-130 are short and easily affected by wild animals.
- MHQ-138 are stays very long times(are not early mature than others).

4. Conclusion and Recommendation.

Four Improved varieties of maize were demonstrated and of those MH-140 were selected by farmers due to its drought tolerance and high yielding performance, followed by MH-130 over the standard checks (Gibe- 2). So that, farmers showed interest to use MH-140 variety followed by MH-130 variety by its various merits.

In order to disseminate the maize technologies to a large number of farmers scaling up is paramount importance.

To enhance production and productivity, farmers need to get agricultural inputs like fertilizer, chemicals and high improved seed and apply it with its full packages and it is better to design effective seed exchange mechanism for fast dissemination of the technology.

Future research should focus on the development of disease resistant and high yielding varieties and to focus on participatory research because of it is important to technology development, evaluation and dissemination to large scale.

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