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Original Research Article

Pre-Extension Demonstration of Newly Released Yam Variety (Bulcha) at Gedeo Zone, Dila Zuriya District, SNNPR, Ethiopia

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Abstract: Yam is an important crop for food and nutritional security as a result of high productivity and richness in protein. But its economic, food and nutritional security benefits are becoming constrained due to inappropriate extension attention, poor agronomic practices, less research attention, and lack of improved variety. To overcome these problems, transferring available production improvement technology is one of the important measures. Therefore, this pre-extension demonstration of the new yam variety (Bulcha) was carried out with the objectives; to demonstrate and popularize new yam variety and to evaluate farmers' preference analysis. The demonstration hosted ten purposively selected farmers and one farmer training center. Awareness creation training was given for 10 beneficiary farmers and 11 other stakeholders. The new yam variety (Bulcha) was demonstrated with one local check on a plot size of 10m x 10m. Evaluated of the demonstration was conducted at mid maturity, maturity, and harvesting through field visit, field day, and FGD. Based on criteria of tuber color, disease-resistant, productivity, tuber size, and early maturity, farmers ranked the new variety but food taste was not accepted. Also, yield data were collected by harvesting tuber yield from a randomly selected sample area and analyzed using descriptive statistics. The improved variety has a 60% yield advantage over the local check. Thus, the new variety is recommended to scale up in Dila zuria district and other similar agro-ecologies. Therefore, extension personnel needs to work on expanding the technology and biological breeder need to work on food test improvement.

Keyword: Demonstration, Farmer, Pre-extension, Yam.

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BACKGROUND AND JUSTIFICATION

Yam can be a formidable force in the war against poverty and hunger if R&D measures are implemented to develop and disseminate technologies that can bring the crop into a central focus in national food policies (Maroya *et al*., 2014). The technological innovations are expected to enable yam to benefit from policy programs that can drive down production costs thereby making yam growing attractive to farmers and increasing the supply of the commodity in the sub-region and beyond. It aims at doubling the productivity of yams that would stimulate a sustainable increase in incomes for smallholder yam producers and contribute to their food security and economic development (Mignouna *et al*., 2016).

Yam (Dioscorea spp.) plays a very important part in ensuring food security and livelihood systems. The crop also makes a substantial contribution to protein in the diet, ranking as the third most important source of protein supply. Farmers engage in yam cultivation for household food supply, income generation through marketing ware yams, and production of planting material to meet their own needs and generate some income from the sale of surplus seed yams however, productivity and even total production are stagnating or even declining in some areas (Sanging, 2015).

In Ethiopia, Very few reports deal with aspects of yam production and its diversity the result of research neglects the yam. Consequently, yams are hardly known to many of the researchers, policymakers, and development agents in the country this resulted from inappropriate extension attention, poor agronomic practices, less research attention, and shortage of improved variety access was highly affected the yam productivity improvement of the country, (Muluneh.T,2015).

As indicated in the reviewed research report, yam is an important food and nutritional security crop, by its high productivity potential and richness in

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nutrients, but farming families in our research area has been affected by different yam production problems, among them, inaccessibility of improved variety and lack of awareness of improved yam variety are major ones.

Therefore, this pre-extension demonstration was conducted to contribute productivity and production improvement of yams in the selected area by demonstrating, popularizing high yielder variety (Bulcha), and collecting farmers' preferences to give feedback for the next research direction.

MATERIALS AND METHODS

Description of study the study area

The pre-extension research was carried out in the Dilla zuria district of the Gedeo Zone. Dilla zuria district is among the eighteen (18) rural districts of the Gedeo zone, which is located 300 km southeast of Addis Ababa and 90 km from Hawassa town. More than 95% of the population is engaged in agriculture. The area is known for coffee production and agroforestry. The farming system of the district is characterized by mixed crop-livestock farming. The major crops grown by farmers in the district are root crops (yam, taro, inset, and cassava), fruits (avocado, mango, and pineapple). Domestic animals like cattle, equines, sheep, goats, and chickens are important livestock species reared by farmers in the district (BoA annual report 2019). The agro-ecological zones of the district are highland (0.96%), midland (61.17%), and lowland (37.87%). The altitude ranges from 1203 m to 2204 m.a.s.l. The mean annual temperature of the district is 22o c. The maximum and minimum temperatures are 29o c and 15o c, respectively. The mean annual rainfall is 650mm whereas 900mm and 400mm maximum and minimum annual rainfall are recorded in the district, respectively.

Demonstration Site Selection procedures

Before the selection of demonstration sites (woreda and kebele), effective discussion regarding yam technology, objectives, and expected output of demonstration had been done at the zonal level. Then demonstrating woreda (Dilla zuria) and specifically, the demonstration kebele (Handida kebele) were selected purposively, by considering yam production potential and accessibility (road and land). Also, at the woreda level, the further discussion had held on objectives, expected outputs, and expected share responsibility to conduct and supervise demonstration. Accordingly demonstrating kebele (Handida) was selected purposively based on production potential, accessibility, and representativeness to surrounding kebele.

Beneficiary farmers Selection Procedures

Beneficiary farmers were selected by cooperating with kebele development agent coordinator and crop expert, by considering representativeness (model role player to others), background experience of yam production, willingness to participate in the demonstration, willingness to cooperate every means of data question, and willingness to share a lesson learned and good result obtained from demonstration to surrounding farmers. Finally, this due consideration of the aforementioned issues 10 beneficiary farmers and 1 FTC were selected from Hadida kebele.

Demonstration design

The demonstration consisted of two treatments; plot1 with newly introduced yam variety (Bulcha) from Hawassa agricultural research center and plot2 with local check collected from beneficiary farmers were planted on separated pilot size of10*10m=100m each variety on 1FTC and 10 farmers' field. The seed intera and interspacing were 10cm and 80cm respectively and only organic fertilizer (compost) was applied during panting and after planting (harrowing time).

Mode of implementation and evaluation

Before starting implementation, as the activity opening phase, farmers were well trained about newly released yam variety, its agronomic practices, required organic fertilizer(compost) preparation and application, and overall awareness of variety from planting to marketing (consumption) by the biological breeder

Table-1: Participant list in training

S.no	Participants	Sex			Location
		Male	Female	Total	
1	Farmers	8	2	10	Handida
2	Agri-experts	4	1	5	
3	Researchers	2	2	4	
4	TA	1	1	2	
5	Other stakeholders	6	1	7	
6	Total	21	7	28	

Then necessary input (newly introduced yam tuber) was delivered to the farmers from Hawassa agricultural research center (HwARC). Also, periodic follow-ups and essential technical support (advice) were given from the respective research discipline.

The demonstration plots were evaluated four times (at late germination, mid-growing, early maturity/tuber setting, and late maturity/harvesting stages). Also, further evaluation and popularization of the variety was conducted by participating the beneficiary and surrounding farmers, multi-disciplinary researchers, extension personnel, and other concerned bodies at the field day session. At the field day, session participants evaluated the variety by observing field performance, tuber size, number of tubers per single pit, and checking its food test and nutritional value by eating boiled yam.

Table-2: Participant list in field day

S.no	Participants	Sex			Location
		Male	Female	Total	
1	Farmers	36	15	51	Handida
2	Agri-experts	7	2	9	
3	Researchers	6	2	8	
4	TA	1	1	2	
5	Other stakeholders	6	1	7	
6	Total	56	21	77	

METHODS OF DATA COLLECTION

The agronomic data were collected by observing the growth stage and field performance of the plant. Also, yield data were directly collected by harvesting tuber yield from the selected sample area and measuring by using sensitive balance. Farmer's preference related data regarding emergence rate, resistance to disease, number of tubers per single plant, ability to tolerate drought, earliness, tuber size, and marketability were collected through a prepared checklist by asking and registering responses from focused group discussion (FGD) and individually interviewed was made with host farmers, Keble development agents, and surrounding farmers of host farmers**,** at the time of the different evaluation session. data related to food taste was collected by accessing cooked yam roots to farmers who were participating in field days and discussing with hosted farmers independently. Then recording farmers' responses based on the criteria of appearance/color, taste, flavor, starchiness, and fibrousness. They were asked to give scores for the above criteria using a prepared checklist including preference measuring questions (very good, good, and poor) for each preferring criterion.

METHODS OF DATA ANALYSIS

Yield data collected from the field were analyzed by using descriptive statistics such as mean; mean difference and standard deviation and inferential statistics (independent t-test) were used to measure significant mean differences by applying on SPSS ver.20. Also. Qualitative data specifically farmers preferences and food taste were analyzed by using simple ranking the mean score value.

RESULT AND DISCUSSION

Table -3: Yield performance in ton/hectare

variety	Min tuber yield in a ton	max tuber yield in a ton	mean tuber yield in a ton	Mean Yield on FTC in ton/ha	Mean difference yield on a farmers field	Relative yield. adv.
New(n=10)	24	36.7	30.7	29.4	11.5	60%
Local(N=10)	13.00	20.6	19.2	19.4		
t-value			6.8*** significant			

As yield performance data are shown in above table-3, yield performance of newly introduced yam variety has a statistically significant yield difference at $P<0.05$, and the mean yield difference among them was 11.5 tons/ha. This result approves that extending the production of this newly introduced yam variety (Bulcha) is plays a great role in food and nutritional security for smallholder farmers.

Farmers' preferences

The demonstration was evaluated different follow-up periods by farmers, researchers, and extension personnel Accordingly, the evaluation was undertaken at the location of the demonstration, starting from the early establishment stage to the late maturity stage, thus, farmers evaluated the demonstration based on their preference criteria which depending on the physical characteristics of each variety show. Additionally, final farmers' preferences data were collected from beneficiary farmers on a prepared check by using the listed preference criterion listed in table-4 below. Farmer's preference result present in table-4, the mean score value of listed criteria of new yam variety is greater than that of the local check. This shows farmers preferred and ranked the new yam variety over the local check.

Table-4: Farmer's preferences

s/no	Evaluation Criteria	Farmers' rank					
		New variety (Bulcha)			Local check (local variety)		
		Very good (3)	Good (2)	Poor (1)	Very good (3)	Good (2)	Poor (1)
1	Earliness	8	1	1	2	3	6
2	Productivity	9	1	-	1	2	8
3	Food test	3	2	5	7	2	1
4	Color	6	4	-	5	4	1
5	Moisture stress resistant	5	3	2	4	3	2
6	Marketability	3	2	5	7	3	-
	Mean score	1.7	0.43	0.22	1.1	0.57	0.6
	Rank	1st			2nd		

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As indicated in table -4, the evaluation means the score value of the newly introduced yam variety (Bulcha) was greater than that of the standard check. This indicates that at demonstration conducted location, farmers selected improved variety (Bulcha) as first by based on their selective criteria: earliness, productivity, tuber color, and moisture stress-resistant.

Profitability (cost-benefit analysis)

Production cost=A

Cost reason	Measurement	Unit cost in ETB	Total quantity	Cost of new variety	Cost of local check
Tuber	kilogram	10	10,000	10,000	10,000
Labor for land preparation	Person/day	30	50	1500	1500
Labor for weeding	Person/day	30	50	1500	1500
Labor for harvesting	Person/day	30	50	1500	1500
Labor for compost	Person/day	30	40	1200	1200
Pole (standing stick) sale	Number	3	125000	37500	37500
Total cost				**143,200**	**143,200**

Total benefit gained=B

Reason of benefit	Measurement	Unit cos in ETB	Total quantity	Total benefit in ETB
Tuber sale of the new variety	Kilogram	9	30700	**276300**
Tuber sale of local check	Kilogram	10	19200	**192,000**

Net benefit

Variety	Production cost=A in ETB	Total benefit=B in ETB	Net benefit(A-B) in ETB
New/bulcha	143,200	276300	**133,100**
Local check	143,200	192,000	**48,800**

As it was presented in the above net benefit table, producing new yam variety (Bulch) on one hectare of land by applying the same agronomic practices and inputs to local check, the new yam variety has a 172% relative net benefit(profit) advantage over producing local check.

CONCLUSION AND RECOMMENDATION

Newly introduced yam variety (Bulcha) showed better yield performance both on farmers' fields and FTC, over its local check. The average tuber yield of variety Bulcha is 30.7 and 29.4tons per hectare on farmers' fields and FTC also local check showed 19.2 tons and 19.4 tons on farmers and FTC respectively. Also producing newly introduced yam variety has 60% relative yield advantageous compare to local check,) which contributes great share for household food security and income generation.

Both on FTC and farmers field only organic fertilizer(compost) was used for demonstration pilots, however: demonstration showed lower yield performance on FTC relative to the farmers' field, this only from soil fertility difference particularly difference of used compost amount.

Also, the newly introduced yam variety has a high mean score value of farmers' preference and was selected as first regarding its selective characteristics; earliness, productivity, marketability, color, and moisture stress-resistant relative to its respective local check, so it was selected as first.

Therefore, expanding the production of the variety (Bulcha) for Dila zuria district and similar argot-ecological conditions are recommendable to improve the yam production and productivity of smallholder farmers, ultimately which leave great share on household food and nutritional security, besides on household income. Thus, all concerned bodies (extension workers, woreda, and zone agricultural officers and seed multipliers) need to play their major role by accessible the technology for farmers.

Also, as host farmers assured, the food test of the local check is better than the newly introduced yam variety, so, the biological researcher needs to give due attention for further research refinement of that parameter (food test).

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