



Participatory Evaluation and Demonstration of Improved Cassava Varieties at Fedis District

Abdulaziz Teha Omer^{*}, Oromia Megersa Gelana, Badasso Urgessa Wakane Kibrat Ketema Desse

Oromia Agricultural Research Institute, Fedis Agricultural Research Centre, Harar, Ethiopia

Email address:

abdulaziztaha@gmail.com (A. T. Omer)

^{*}Corresponding author

To cite this article:

Abdulaziz Teha Omer, Oromia Megersa Gelana, Badasso Urgessa Wakane Kibrat Ketema Desse. Participatory Evaluation and Demonstration of Improved Cassava Varieties at Fedis District. *American Journal of Engineering and Technology Management*. Vol. 7, No. 4, 2022, pp. 66-70. doi: 10.11648/j.ajetm.20220704.11

Received: June 13, 2022; Accepted: July 29, 2022; Published: August 5, 2022

Abstract: Fedis is one of the major food insecure districts found in East Hararghe Zone that due to influence by shortage and unevenly distribution of rainfall pattern in the area. Introducing drought tolerate crops are an option to reduce food insecurity problems. The objectives of this activity was to demonstrate and evaluate the productivity and profitability of adapted cassava varieties by build farmers' knowledge and skill through training on cassava production and management techniques on farmers' field at moisture stress areas of East Hararghe Zone. The activity was undertaken for the consecutive two yeras (2015-2016). In this activity, 30 farmers were involved for the consecutive two years. Two improved cassava (Kelo and Kule) varieties were introduced from Awasa Agricultural Research Center (AARC) and checked at Fedis Agricultural Research Center (FARC) for their adaptability in the area. However, the adaptability and socio-economic and farmers' preference was not evaluated under farmers condition. Therefore to do this, both kelo and kule improved varieties and one standard check varieties were used. Since this technology was not well known by the community, target farmers, Development Agents (DAs) and expert of districtare were trained before starting the activities.. Two years result indicated that the average total tuber yield ranges from 7.28 to 8.59 ton/ha. Under farmers condition, Kelo variety was gave higher tuber yield (8.59 ton/ha) followed by Kule (7.39 ton/ha) and lower tuber yield by standard check variety (7.28 ton/ha). In study area, farmers were able to internalize cassava processing and utilization for food purpose. For this purpose from cassava processed root flour with mix of wheat it was made Injera, Kukis, Porridge, Bread and Bobolino food types. Kelo variety was the first and Kule the second selected crop varieties by farmers based on their set criteria of selection. Therefore, these selected varieties by farmers should be more popularized through facilitating the technologies and by participating the concerned body.

Keywords: Cassava, Demonstration, Improved Technology, Food Processing and Utilization

1. Introduction

Cassava (*Manihot esculenta* Crantz) is the fourth most important crop for farmers in tropics after rice, wheat and sugar, consumed by up to a billion people globally [5]. Cassava is a perennial woody shrub with an edible root, which grows in tropical and sub-tropical areas of the world. Among the most important tropical crops in terms of source of calorie which are rice, sugarcane, maize and cassava; it is more cheaply cultivated [10, 11, 13]. It is very important for the agro-economy of several tropical countries because of its broad adaptation to a variety of soil, climate, drought tolerance, and ability to grow on marginal soil [9, 10, and 13].

In sub-Saharan Africa cassava is mainly a subsistence crop grown for food by small-scale farmers who sell the surplus. It grows well in poor soils with limited labor requirements. It provides food security during conflicts when the invader cannot easily destroy or remove the crop, since it conveniently grows underground. Cassava is usually intercropped with vegetables, plantation crops (such as coconut, oil palm, and coffee), yam, sweet potato, melon, maize, rice, groundnut, or other legumes [8]. In Ethiopia, cassava grows in vast areas mainly in Southern Region. According to [4], cassava was introduced by some NGOs to

drought prone areas of southern part of the country such as Amaro, Gamogoffa, Sidama, Wolayta, Gedeo primarily to fill the gap for subsistence farmers due to failure of other crops as a result of drought. Although its first introduction in to the country is not yet known, the crop had been growing in south, south west and western part of Ethiopia for several years. Its use as a potential food crop in Ethiopia has been appreciated since 1984 famine [1].

Cassava contains the potentially toxic compounds cyanogenic glucosides. If present in sufficient quantities, these compounds can cause acute cyanide poisoning and death in humans and animals when consumed. At concentrations less than 50 ppm, cassava products are considered harmless. Consumption of such non-toxic cassava over long periods of time results however in chronic toxicity [6]. There are over 5000 known phenotypically distinctive cassava cultivars. All contain varying concentrations of the cyanogenic glucosides linamarin and lotaustralin, which are hydrolyzed to hydrogen cyanide (HCN) by endogenous linamarase when the tissue is damaged [7, 15]. The cyanogenic potential of known cassava cultivars ranges from less than 10 mg kg⁻¹ as HCN fresh weight basis to more than 500 mg kg⁻¹ as HCN fresh weight basis [12]. Consumption of cassava and its products is thought to cause cyanide poisoning with symptoms of vomiting, nausea, dizziness, stomach pains, weakness, headache and diarrhea and occasionally death. Moreover, high dietary cyanogen exposure from poorly processed cassava roots may be associated with the occurrence of the neurological disorder konzo –an irreversible paralysis of the legs. It is therefore crucial to characterize cassava cultivars based on their cyanogenic potential and assess factors affecting level of HCN in cassava roots such as growing conditions and plant nutrients so that cultivars for household consumption and industrial use can easily be identified and better strategies to reduce HCN content in cassava can be devised.

In East Hararghe zone, cassava production and its utilization is not known by the local farmers even though there are some local varieties that were introduced by NGOs for food security purposes at different time and at different places of drought prone areas [3]. There are farmers who don't know what cassava is and those who know and have the crop use it more for animal feed as 2011 survey indicated. This implies that there are knowledge and skill gaps about cassava production, management, utilization and benefits. Taking all the above reviewed cassava potentials, its nature of toxicity and existing gaps into consideration, Fedis Agricultural Research Center horticultural research case team has brought improved cassava varieties (kule and kelo) from Hawassa Agricultural Research Center to conduct adaptation trial at moisture stress areas of the center research stations of Fedis and Babile districts. Since the performance of these varieties were checked for their adaptability on station and recommended to reach out to the farmers. Therefore, this research was proposed with the objective of demonstrating and evaluating of the cassava technology under the farmers condition.

2. Objectives

- 1) To evaluate and demonstrate of adapted cassava varieties on farmers' field at moisture stress areas of east Hararghe.
- 2) To build farmers' knowledge and skill of production and management of cassava production.
- 3) To create awareness among farmers, development agents, subject matter specialist and other stakeholders on cassava technology.
- 4) To enhance linkage among the relevant stakeholders.

3. Materials and Methods

3.1. Description of the Study Area

The study was carried out in the rural areas of Fedis district, Eastern Ethiopia situated in the northeastern part of the East Hararghe zone of Oromia regional state. The district has latitude between 8°22' and 9°14' north and longitude between 42°02' and 42°19' east, in middle and lowland areas: altitude range is from 1200-1600 m.a.s.l. with a prevalence of lowlands. The area receives average annual rain fall of 400-804mm. The minimum and maximum temperature of the area is 20–25°C and 30–35°C, respectively. The population's livelihood mainly consists of agriculture, husbandry and small-scale trade. The farm units are small family holdings with an average agricultural land area of less than one hectare.

3.2. Site and Farmers Selection

One district and two PAs were selected purposively by researchers in collaboration with experts and DAs from the Fedis office of agriculture and natural resource. The site was selected based on the potentiality of cassava production, appropriateness of the land for the technology and easily access to the road for experiment monitoring. Two FRGs (Farmer Research Groups) were established in the district i.e. one FRG per PA was formed which consists of 15 members and a total of 30 farmers were involved in the activity. Three trial farmers and one FTCs from each FRG members were selected based on their interest on technology, willingness to cost sharing like land provision and experience sharing for members as well as non-members and activeness/innovativeness.

3.3. Research Design

The trial was undertaken on farmers and FTCs land in each PAs. For this trial two improved (Kelo and Kule) and one standard check varieties were used and planted side by side with equal plot size. The plot size was 10mx10m with 25 cutting per plot and farmers replicated. The plant was applied as usual farmers practice that occupied farmers land with different crops like khat, sorghum and maize that intercropped with this technology.

3.4. Training and Field Day Organized

Training is an important core component of this activity.

Accordingly well-organized training was given to the target groups, 30 target farmers (18 males and 12 females), 6 DAs and 2 experts. During training different professionals researchers were participated and share their knowledge and skills through Power Point presentation and distribution of extension materials such leaflet, manual and field day organized. During mini-field day a total of 40 farmers which are 10 females and 30 are males were participated.

3.5. Data Collection and Analysis Method

Both quantitative and qualitative data were collected during implementation. The quantitative data was collected through measuring basic data and using checklist format while qualitative data was collected using through personal observation, interview of farmers and their feedback and focus group discussion. As a result, quantitative data collected from the field was analyzed using simple descriptive statistics and compare means by SPSS version 20 while qualitative data collected using focus group discussion and key informant interviews and field observation were analyzed using narrative explanation and argument. Finally data from different sources were triangulated to get reliable information.

4. Results and Discussion

4.1. Capacity Building/Training

At demonstration stage, training is the most important thing in the extension approach. As a result training is an impart knowledge and develop skill of farmers to adapt new practices. In order to utilize the technology successfully, farmers, DAs and experts need training. Intensive knowledge and skill based training from launching the activity up to food utilization were given for target groups. A total of 38 target groups were participated during processing of training. Among them, 30 farmers, 6 DAs and 2 experts were involved. From the total of the participants 14 females were involved to keep the gender balance. The training was given by multidisciplinary team on cassava production and management (utilization and input application method, weeds, disease and insect controlling mechanism), information exchange. Thirty eight manuals prepared and delivered for the participants.



Figure 1. Pictorial supporting data taken during training (theory plus practice) given.

Table 1. Number and participants of target group on the training given in the areas.

No.	Participants	Fedis				Total
		Agdora		Tuta kenisa		
		Male	Female	Male	Female	
1	Farmers	9	6	9	6	30
2	DAs	2	1	2	1	6
3	Experts	2	0	0	0	2
	Total	13	7	11	7	38

Source: Own computation 2008/09 E.C.

4.2. Yield Performance

The performances of the cassava varieties during their growing season together with the total yields were collected and analyzed. Two years result indicated that the average yield of improved cassava varieties (Kelo and Kule) were 8.59 and 7.39 and that of standard check variety was found to be 7.28 with standard deviation of 0.21, 0.55 and 0.24 respectively in terms of tone/ha. The average yield of Kelo was higher than

that of Kule and standard check variety in which that using improved cassava variety increase the yield of production of farmers in the areas. And also the average yield of Kule variety higher than that of standard check. Kelo and Kule varieties were showed 18% and 1.5% yield advantage over local check variety respectively. The result indicated that the average yield of Kelo variety was higher than that of Kule and standard check in which that using this cassava variety increase the yield of production of farmers in the areas.

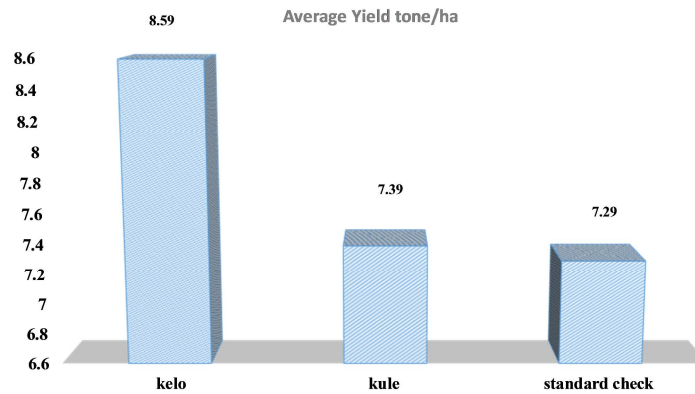


Figure 2. The average yield performance of cassava varieties under farmer's condition.

4.3. Cassava Utilization, Food Taste and Farmers Preference Variety

Cassava has the potential to increase farm incomes, reduce rural and urban poverty and help close the food gap. Without question, cassava holds great promise for feeding Ethiopia's growing population. In the southern Ethiopia, cassava is almost used as a staple food. For instance, in Wolayta and Sidama Zone, cassava roots are widely consumed after washing and boiling or in the form of bread or "injera" (Ethiopia staple food) after mixing its flour with that of some cereal crops such as maize (*Zeamays*), wheat (*Triticum aestivum* L.), sorghum (*Sorghumbicolor*), or tef (*Eragrostis tef*) [14]. Processing methods, storage experience and modes of consumption are not yet documented in Ethiopia, unlike most of cassava producing and consuming African countries. But it is one of the underutilized root crops in the country. The bitter variety of cassava must be processed to improve palatability, eliminate or prevent acute toxicity in humans or reduce the level of cassava cyanide contents [2].

In study area, for this purpose cassava root processed mixed with wheat it can be Injera, Kukus, Porridge, Bread Bobolino food types. Therefore, the mixing ratios of cassava versus wheat 75% and 25%, 50% and 50% and 100% cassava only were used for food utilization. In case of

cassava and wheat mixing with 75% and 25%, Kelo mixing with wheat was the most preferred taste and first rank in food utilization and followed by Kulo mixing wheat.

Similarly, cassava and wheat mixing with 50% and 50%, Kelo mixing wheat was the most preferred taste and first rank in food utilization and followed by Kulo mixing wheat and the same result was found with no mixing of cassava and wheat varieties. Moreover, in the case of kukusi and bonbolino; kelo, kule and standard check mixing ratio of (50%, 50%) with wheat flour were the most preferred by participant's farmers ranking respectively. In case of Injera and Bread/Kita; kule, kelo and standard check mixing ratio of (50%, 50%) with wheat flour were the most preferred by participant's farmers ranking respectively. Similarly in case of Porridge; kule, kelo and standard check mixing ratio of (50%, 50%) with wheat flour were the most preferred by participant's farmers ranking respectively.

Among the mixing percent, 50% cassava and 50% wheat flour were the most preferred and selected by farmers. Based on the color preference kule, kelo and standard check varieties were selected and accepted by farmers respectively. The farmers were interested in the production of cassava in the future for their consumption, marketing and promised to allocate their land for cassava planting in percent correlate to other crops they have been producing for long time.



Figure 3. Pictorial supporting data taken during cassava processes and farmers' food tasting.

Table 2. The cassava and wheat mixing ratio and food utilization.

S. no.	Mixed crops' flour	Mixing ratio	Taste and farmers preference rank	Overall farmers preference ranking
1	kelo + wheat	75, 25	1	2
2	kule + wheat	75, 25	2	
3	S. check + wheat	75, 25	3	
1	kelo + wheat	50, 50	1	1
2	kule + wheat	50, 50	2	
3	S. check + wheat	50, 50	3	
1	kelo + wheat	100, 00	1	3
2	kule + wheat	100, 00	2	
3	S. check + wheat	100, 00	3	

Source: Own computation 2015/16.

5. Conclusion and Recommendation

Food security in the study area is mainly dependent on crop production. Crops are cultivated for many years. Different agricultural extension systems and packages were disseminated for the last many decades. But farmers in the study areas are still food insecure. To alleviate this problem, the center has initiated the different research proposals that adapted on station and selected better performed varieties in area. Among this, root crop or cassava crop demonstration and evaluation on farm and FTCs was one the technology the center delivered in the area. Therefore, farmers in study areas have less experience in cassava production technology and utilization. Hence, this study was conducted to see overall performance of the improved varieties under farmer's and Farmer Training Centers (FTCs) condition. Two improved (Kelo and Kule) and one standard check cassava varieties were used during activity processing. Kelo variety was shows better than Kule and standard check in terms of yield performance and well accepted by farmers in food utilization. As cassava has bitter taste and hydrogen cyanide by nature and to reduce these cutting cassava root into medium size and drying it in air as well as using wheat flour/other cereal crops (sorghum etc) for mixing purpose to make better taste and multipurpose processing output. Therefore, for this case 25%, 50% and 100% cassava and wheat flour mixing ratio was used. Among the mixing percent, 50% cassava and 50% wheat flour was the most preferred and selected by target groups. Moreover, to consume adequately there should be high production from unit area. To get cassava high yield farmers should have good agronomic practice. In addition to this, promotion and dissemination of improved cassava varieties through on-farm experiment has created an opportunity for farmers to have additional crop that can minimize risk of food deficit resulted from crop failure. As a result, Kelo and Kule cassava varieties were recommended for more promotion in the area and other similar agro-ecological situation to reduce the problem of food insecurity in the areas.

References

- [1] Amsalu N (2006). Phenotypic Diversity of Cassava (*Manihot esculenta* Cranz.) in Ethiopia. Proceedings of the 12th Annual Conference of the CroP Science Society of Ethiopia, 22-24 May 2006, Addis Ababa, Vol. 12, Pp 23-29.
- [2] Cardoso AP, Mirione E, Ernesto M, Massaza F (2005). Processing of cassava roots to remove cyanogens. *Journal of Food Composition and Analysis*. 18: 451-460.
- [3] CSA (Central Statistical Authority). 2010. Agricultural sample survey 2009/2010. Report on area and production for major crops (Private peasant holding, main season). Statistical Bulletin A. A, Ethiopia.
- [4] Feleke A. (1997). Participatory rapid rural appraisal of Abaya Woreda, North Omo, FARM Africa, Addis Ababa, Ethiopia.
- [5] Food and Agricultural Organization (FAO) STAT, 2010. Statistical data base of the food and agricultural organization of the United Nations available at <http://faostat>.
- [6] Food Safety Network: Safe Food From Farm to Fork, March 2005. (<http://www.foodsafetynetwork.ca>) (Accessed on April 19, 2010).
- [7] Haque, M. R., Bradbury, J. H. (2003). Preparation of linamarin from cassava leaves for use in cassava cyanide kit. *Food Chem*. 85: 27-29.
- [8] IITA (International Institute of Tropical Agriculture), 2009. <http://www.iita.org/cassava> Oyo State, Nigeria.
- [9] Le, B. V., Anh, B. L., Soyong, K., Danh, N. D. and Anh Hong, L. T. (2007). Plant regeneration of cassava (*Manihot esculenta* CRANTZ) plants. *J. Agr. Technol*. 3: 121-127.
- [10] Mathews, H., Schopke, C., Carcamo, R., Chavarriaga, P., Fauquet, C. and Beachy, R. N. (1993). Improvement of somatic embryogenesis and plant recovery in cassava. *Plant Cell Rep*. 12: 328-333.
- [11] Nweke, F. (2004). *New Challenges in the Cassava Transformation in Nigeria and Ghana*. Environment and Production Technology Division, Washington D.C., USA International Food Policy Research Institute, pp. 1-10.
- [12] O'Brien, G. M., Wheatley, C. C., Iglesias, C. and Poulter, N. H. (1994). Evaluation, modification, and comparison of two rapid assays for cyanogens in cassava. *J. sci. Food and Agri*. 65: 391-399.
- [13] Raemakers, C. J. J. M., Amati, M., Staritsky, G., Jacobsen, E. and Visser, R. G. F. (1993). Cyclic somatic embryogenesis and plant regeneration in cassava. *Ann. Bot- London* 71: 289-294.
- [14] Taye M. (1994). Cassava in Southern and South Western Ethiopia. Cassava Newsletter, 18: 6-7. CIAT, Colombia.
- [15] Wilson, W. M. (2003). Cassava (*Manihot esculenta* Crantz), cyanogenic potential, and predation in north western Amazonia: The Tukanoan Perspective. *Hum. Ecol*. 31: 403-416.