



## Research Article

# Pre-scaling up of improved finger millet (Kako-1) variety, at Weyira district, under Halaba zone in Ethiopian

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## Abstract

Pre-scaling up of improved finger millet variety (kako-1) was conducted in 2019/20 mehere season in Halaba Zone, two selected kebeles under Weyira District, southern Ethiopia under rain fed conditions through involvement of farmers in participatory demonstration. The demonstration was carried out with the specific objectives: to popularize and demonstrate improved Finger millet technology (Kako-1) and to collect farmers feedback on improved finger millet variety. The demonstration was conducted at layignawu Badana and kufe kebele on farmers field of Weyira Districts on 10ha land coverage totally 20 beneficiary farmers field. Site and beneficiary farmers selection criteria were conducted purposively by cooperating with woreda and kebele extension personnel by willingness to accept technology, land availability and accessibility of the area. Training was given by focusing on agronomic practices and awareness creation for all selected beneficiary farmers and concerned extension personnel. Also, all necessary inputs (10kg/h kako-1 seed, 100kg/h NPSB and 150 kg /h Urea) were provided from Hawassa agricultural research center. Yield and farmers feedback data were collected and analyzed by using descriptive statistics applying on SPSS software. Accordingly, 2.7 tone/ha average mean grain yield was obtained. According to farmers' feedback, the variety kako-1 has high tilling capacity, high grain yield, early maturity, high biomass yield and quality. Therefore the variety need to extended to wide area. So, all concerned bodies need to work to facilitation of further extension of kako-1 variety for Halaba zone and other similar agro-ecological zones to improve finger millet production and productivity of smallholder farmers.

## Background justification

Finger millet (*Eleusine coracana* (L.) Gaertn) subspecies *coracana* belongs to the family Poaceae [1]. It was earlier thought that cultivated *E. coracana* originated from *E. indica*, of which the distribution is quite wide, from Africa eastwards to Java. Millets are the most important cereals of the semi-arid zones of the world. For millions of people in Africa and Asia they are staple crops. Among millet crops, finger millet figures prominently; it ranks fourth in importance after sorghum, pearl millet and foxtail millet [2].

The global annual planting area of finger millet is estimated at around 4-4.5 million hectares, with a total production of 5 million tons of grains, of which India alone produces about 2.2

million tons and Africa about 2 million tons. The rest comes from other countries in South Asia. The important finger millet growing countries in eastern and southern Africa have been especially the sub-humid regions of Ethiopia, Kenya, Malawi, Tanzania, Uganda, Zaire, Zambia and Zimbabwe. Similarly, in South Asia the crop is largely grown in India, Nepal and, to some extent, in Bhutan and Sri Lanka. Finger millet is reported to be grown in both China and Japan to a limited extent. The archaeological findings of finger millet from Ethiopia date to about the third millennium BC [1].

The crop is mainly grown in the northern, north western and western parts of the country, especially during the main rainy season. The national annual production area of finger millet in 2016/17 cropping season is estimated at around



456,171.54 hectares, with a total production of 10.3 million quintals [3]. Finger millet cultivation is more widespread in terms of its geographical adaptation compared to other millets. It has the ability to withstand varied conditions of heat, drought, humidity and tropical weather [2]. Also, it has high nutritional value and excellent storage qualities. Its grain contains 9.2% protein, 1.29% fat, 76.32% carbohydrates, 2.24% minerals, 3.99% ash and 0.33% calcium.

In Ethiopia, the grain is used for making native bread, injera, porridge, cake, soup, traditional breakfast called “Chachabsa” malt, local beer, and distilled spirit (Areki) alone or in mixture with teff, maize and barley [4,5]. Finger millet can be stored for a period up to ten years or more without deterioration and weevil damage. However, its productivity is very low mainly due to shortage of improved varieties [6], weeds, insect (termite), diseases (blast), rat damage, shortage of rainfall, worm attacks, improper application of inputs (fertilizers and seed) and traditional management practices [7]. Generation and dissemination of new improved varieties, training and demonstration on crop production and management are strategies revealed by different authors for improving productivity of the crop [7].

Though finger millet has high nutritional profile, good tolerance for adverse growing conditions and significant role in household nutrition, there is little research and government attention in Ethiopia as compared to other common cereals such as teff, maize, wheat, barley, sorghum and rice. With the growing demand for small grain in the world, it is a potential innovative and economically promising export crop for the country in addition to contributing food and nutrition security [8].

The yields of finger millet are low in Ethiopia due to different production problems including: shortage of improved varieties, little research emphasis given to the crop, non-adoption of improved technologies, poor attitude to the crop, disease like blast which is the most serious disease, lodging and moisture stress in dry areas, threshing and milling problem are some of most serious production constraints in finger millet production in Ethiopia [9-12].

Pre extension demonstration of these finger millet variety kako-1 and local check (tadesse) in 2018/19 two selected kebeles (Gedeba and Dinoqosa) in Halaba zone to create awareness and evaluate it under farmers-based condition. So, the variety of kako-1 showed high grain yield performance and farmers preferred the variety relating to their real situation and other variety on their hand. Additionally, farmers and extension personnel had requested to expand the demonstration area and number of participant farmers by considering to increase seed access and improve finger millet productivity. Therefore, this pre scaling up kako-1 variety aimed to facilitation of extension of this high yielding finger millet variety (kako-1) by popularization of the variety. Ultimately to boost finger millet production and productivity of small holder farmers by well introducing and accessing initial seed of improved finger millet variety (kako-1).

## General objective

To popularize and demonstrate improved finger millet technology and to collect farmers' feedback regarding introduced technology

## Specific objectives

To popularize and demonstrate improved Finger millet technology in order to boost production and productivity of finger millet

To collect farmers' feedback in improved finger millet technology.

## Material and methods

Before starting the demonstration tasks, as starting phase; Strong linkage and discussions were held with stakeholders (extension personnel) at Zone and District level on the objectives and merits of the activity. The site (District and kebele) selection was done purposively, especially by considering the area which pre-extension demonstration of the variety (kako-1) was conducted and additionally based on the convenience of the area to the technology (production potential and accessibility). The farmer's selection was done in collaboration with development agents and District experts by considering cluster-based demonstration principles. The number of host farmers was limited by the amount of area coverage has been planned to implement, thus basic consideration was adjacency farmland, up the achievement of a planned hectare of land

## Training

Before implementation of the demonstration, training was given for host farmers, DAs, and selected experts from district Agricultural and natural resource development office on agronomic practices, objectives, and merits of pre scaling up of finger millet. Also, researchers and other stakeholders (administrative members) have been participated in the training Table 1, Figure 1.

All necessary inputs were provided from HwARC. Indeed, improved finger millet seed (1 tone), fertilizers (1 tone NPSB and 15 tone Urea), awareness creation and capacity building training delivered. Then input prevail was done by considering selected land size for a demonstration from each beneficiary farmers, which was accomplished by collaborative responsibility of Kebele Das coordinators, kebele chief administrative/chairman, experts from District Agriculture and natural resource development office and respective researchers from the research center.

All necessary agronomic practices were done carefully starting from land preparation up yield harvesting by joint

**Table 1:** Participant list in training.

Location	Participant list in training									Total		
	Farmer			Agri- expert			researcher		Other officers			
Weyira district	M	F	Total	M	F	Total	M	f	Total	M	F	Total
		15	5	20	5	2	7	6	2	8	7	2

Source: Training given 2020 Halaba Agri office.



Figure 1: Farmers and experts on training.

responsibility of host farmers, kebele, and district agricultural officers and researchers by playing their respective roles. 100%NPSB and 33%urea were applied at sowing session and remaining 67% urea was applied at 35-40 days stay after sowing, continuous weed and pest management.

Integrative continuous follow up (inclusive of researcher-farmers-extension) was done periodically by strengthening good practices and taking correct measures for miss field management practices by visiting each host farmers field and making discussing and recommending to make a frequent visit each host farmer lonely his/her demonstration field to make communication with DAS.

Each demonstration task was performed by applying a participatory and sharing responsibility approach, starting from planning phase to end, which was done by making effective communication with all stakeholders at each stage (researchers, extension personnel, administrative, and host farmers).

### Achievements

**Field day:** Field day is a method of motivating people to adopt new practices by showing what has already achieved under field conditions. However, the field day was not conducted due to budget constraint. But to fill the gap, different communication methods were conducted. Indeed, conducting FGD with beneficiary and surrounding farmers, key informant discussion and discussing with each beneficiary farmer at yield

harvesting session. According to our observation there was yield gap between research and farmers field.

**Grain yield performance:** Collection of sample grain yield data was done collaborative participation with crop and PED researchers from HwARC and woreda and kebele crop experts from each location. Accordingly, grain yield data were collected from 20 all beneficiary farmer's field at both locations, by randomly selecting 4m\*4m sample area at two times from each farmer field. Then carefully weighting clean grain seed Table 2.

As shown in above Table 2, the grain yield of demonstrated finger milletvariety (kako-1) is best performed at both demonstration locations (clusters). This yield performance has resulted from the actualization of recommended full packages. Thus, results revealing that appropriately using recommended full packages with improved finger millet variety is a major solution for finger millet productivity constraints of smallholder farmers, specifically in Halaba zone and sustaining the result could play important role on household food security of smallholder farmers of Halaba zone.

Table 2: Yield performance.

District	Kebele	variety	Grain yield in tone per hecto			Average grain yield in tone/hec
			min	max	Mean	
Weyira	laygnawu badane (N=12)	Kako-1	2.4.2	2.9	2.6	2.7
	kufe(N=8)	Kako-1	2.5.2	3.0	2.8	

Source: Grain yield obtain in the field Halaba 2020.

### Feedbacks given

Different stakeholders had evaluated the demonstration at periodical follow up sessions, at FGD and yield harvesting, according to that conducted evaluation concerns, each concerned body had given their perspective feedbacks regard to demonstrated technology, the applied approach of demonstration, advantages of the demonstration by focusing on finger millet productivity improvement way, the merits of demonstration to showed the advantage using recommended package to increases production and productivity.

Therefore, farmers highly motivated by seen the result of pre scaling up demonstration approach and accomplishment of the activity. They forwarded their interests and commitments to sustain the good result of the demonstration and they continuous support and supervision to sustain and expand the practices to wide-area coverage the variety.

Also, agricultural experts (extension personnel) expressed that this pre scaling up demonstration approach of improved finger millet variety(kako-1 ) showed intensive use of recommended full packages with newly introduced improved finger millet variety (kako-1) deeply showed the production potential of the variety, sustaining this result could play important role on the improvement of productivity of smallholder farmers which contribute immediately improvement of household food security and regional food



security in general. Besides this integrative approach by shouldering share responsibility among key agricultural productivity role players (researchers–farmers–extension) is best practices to increase agricultural productivity, fast agricultural technology transfer, and to solve productivity constraints. Finally, agricultural experts expressed that the concerned bodies (breeders) to work on stem strength of the variety enable to carry the head without falling.

### Challenges faced

The main aim of this pre scaling up demonstration was popularization of the variety by creating appropriate communication with direct and indirect participants from concerned sectors using all communication means. Field day communication was one of the most important means of communication among these communication means. However due to budget constraint, field day was not conducted. But to fill the gap, different communication methods were conducted. Indeed, conducting FGD with beneficiary and surrounding farmers, key informant discussion and discussing with each beneficiary farmer at yield harvesting session. According to our observation there was yield gap between research and farmers field.

Under yelaygnawu Badane kebele one beneficiary farmer become challenge full by not managing his demonstration field, so his field was periodically infested by weed. However, the correction measure had taken by reporting the issue to concerned kebele up to zone and making effective communication.

### Lessons learned

Pre scaling up demonstration is a bidirectional process where farmers and researchers learn from each other. During the study, farmers had a first-hand observation of the actual performance of full package improved finger millet. Farmers become familiar with and access to improved finger millet technologies were demonstrated to them, had gained better awareness on improved finger millet production and management, the research team exposed to collaborative full package of improved finger millet evaluation and feedback for future research work to improve production and productivity of the varieties and linkage among the research team, experts, DAs, farmers, and other stakeholders were strengthened for the dissemination of the technologies.

Field day was essential for further popularization of the technology and also for cluster based large demonstration in order to increase production and productivity. And using research– extension linkage by putting farmers in the center and making effective communication could play a key role to easily disseminate research findings thereby increase agricultural production and productivity for smallholder farmers.

### Recommendation and Conclusion

Extending this newly introduced finger millet variety (kako-1) with its full package is an important mechanism to increase

production volume and finger millet productivity of smallholder farmers up to 2.7 tone per hecto in the demonstrated locations and similar agroecology. Therefore, expanding this technology would play a great role in household–level food security and income generation for smallholder farmers and also provide great contributes to zone and regional food security.

Thus, farmers need to expand the technology as demonstrated packages to maintain the finger millet productivity as well as further grain yield improvement by incorporating their indigenous knowledge. Also, cooperatives need to play their role in seed accessing for farmers and interested bodies who working on this technology.

Agricultural officers need to play their role in facilitating communication among farmers–cooperatives–researchers and giving technical support on agronomic practices (farming frequency and weed management). Special attention should be given for research–extension–farmers linkage to improve production and productivity of smallholder farmers. It is better to reduce yield gap between research and farmers field through applying continuous management and full agronomic practices on farmer's field. The breeders need to conduct further research refinement specifically on stem strengthen trait.

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