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Pre-extension demonstration of sorghum thresher in Diga and Guto Gidda Woreda, western Oromia

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Abstract

The pre-extension demonstration of engine driven sorghum thresher was conducted in 2021 with the objectives of demonstrating and evaluating, creating awareness through giving training and enhance stakeholder's participation. A total of 30 farmers were selected from two potential sorghum growing kebeles of the two districts; Lalisa Dimtu kebele of Digga and Meti kebele of Guto Gidda woredas of East Wollega zone. Two FRGs having 30 farmers (24 male and 6 female) were established. Theoretical and practical training on advantage, usage and handling of an engine operated sorghum thresher was given to 30 (24 male and 6 female) farmers, 6(1 female) Development agents and 3 experts at Llisa dimtu and Meti kebeles. Data was collected through focus group discussions and observation. The collected data was grouped, summarized using Microsoft excel and analyzed qualitatively through narration and quantitively by simple discriptive statics like mean and percentage. The results indicated that the machines were demonstrated and found to be 95.88-97.2% efficient with output capacity of about 500-600 kg hr^{-1} at 520 rpm with no grain breakage. The traditional practices are inefficient; requiring a lot of labor and time and also it is one of the major problems which facilitate physical damage. Hence farmers preferred an engine driven sorghum thresher to alleviate sorghum post-harvest loss, save labor and time, minimize seeds wastage. Therefore, the thresher is preferred from every angle and thus should be widely available and disseminated.

Keywords: Demonstration, sorghum thresher, sorghum, awareness, training

1. Introduction

Sorghum (Sorghum bicolor) is the third most widely cultivated crop, next to teff (Eragrotis teff) and maize (Zea mays) in Ethiopia as well as in Oromia region. Areas of greater concentration of sorghum production include much of north central, northwestern, western and eastern mid-altitude area of Ethiopia (Wortman C.S. *et al*., 2009) [5].

In Ethiopia, Men do most of the work for sorghum production, Women are also primarily responsible for the field operations and Children account for about 16% of the labor invested in production. Among the major sorghum production activities, threshing is one the most difficult post-harvest activity, mainly due to the nature of the seed firm attachment to scaly, inedible chaff that surrounds it and lack (unavailability) of improved threshing technologies. Although the traditional methods of threshing are tedious time consuming and inefficient in operation, But, in most development countries, including Ethiopia, women are primarily responsible for post-harvest handling which generally is understood to include threshing, winnowing, and storage of the sorghum (D.B. Naveen Kumar, 2013) [3].

Fadis Agricultural Research Center (FARC) has developed an engine driven sorghum thresher in its area, the Hararghe major sorghum producer area. Accordingly, the machine has been evaluated and attained the threshing efficiency and output capacities of 88.97-97.08% and 7-12 qt/h respectively, and proven to reduce labor power, cost of threshing, and grain loss in comparison with traditional methods of threshing in the area (Bedada T., 2018 and Teha *et al*., 2020) [2, 4]. The machine is powered by a 5-horsepower petrol engine KAMA and can process. It is easily portable. In addition to the satisfactory performance capacity, the machine has been also reported as of low in its cost and construction and operation is simple and easily repairable. So that, this activity was aimed at demonstration of the FARC engine operated sorghum thresher in Diga and G/Gidda District of East Wollega, Western Oromia with the following objectives.

Objectives

- To create awareness and demand on engine operated sorghum thresher
- To evaluate the performance of the sorghum thresher under farmers' condition
- To assess feedback on the engine operated sorghum thresher

2. Materials and Methods

2.1 Description of the study area

The on-farm demonstration of the machines was conducted in Guto Gida and Diga districts of East Wollega zone. The selected districts were known for sorghum production.

Guto Gida is one of the 18 districts in the east Wollega zone covering an area of 1091.5 square kilometers. Guto Gida district is bordered to the east by Wayu Tuka, to the west by Sasigga and Digga, to the north by Gidda Ayana and Gudaya Bila, and to the south by Leka Dulacha. This district is divided into three distinct geographical areas with varying proportions: the high land (2.8 percent of the district), the midland (57.8 percent), and the low land (39.4 percent).

Diga district is approximately 346 kilometers from Addis Abeba and 15 kilometers from the town of Nekemte to the west. The area is bounded on the west by West Wollega Zone, on the east by Guto Gida district, on the south by Sasiga, and on the north by Leka Dulecha. Based on agro-climatic conditions, the study area is divided into two sections: middle altitude ranges (2100-2342 M.A.S.L.) and low land ranges (1200-2100 M.A.S.L.). Middle altitude accounts for 42 percent of total land area, while low land accounts for 58 percent. The district's total area is estimated to be 40788 hectares. This total land area is divided into arable land, grazing land, forest land, bushes and shrubs, construction, and other uses.

2.2 Materials

The engine operated sorghum thresher with KAMA engine with 5 hp. was used for the on farm demonstration,

2.3 Sites and Farmers' Selection

Guto Gidda and Diga districts were selected purposively based on AGP-II target area as well as sorghum production potential and one Kebeles from each district was selected purposively based on sorghum production potential. Accordingly, Lalisa Dimtu Kebele of Digga district and Meti kebele of Guto Gidda district of East Wollega zone were selected. Fifteen (15) farmers per kebele were selected purposively. One host farmer was selected based on their willingness and production of sorghum on his farm. The farmers that hosted the demonstrations were selected in collaboration with development agents (DAs).

2.4 Technology evaluation and demonstration methods

Demonstrations of new agricultural technologies, especially when done in farmers' fields, are an effective and commonly used technique for showcasing the potential benefits of good farming practices (AGRA, 2016). On farm demonstrations were organized in each Kebele, and farmers came to learn about and evaluate the demonstrated engine operated sorghum thresher and farmers were able to compare with their traditional practices. Method and result demonstrations were used. Method demonstration was used to show the farmers how the technology thresh sorghum. The result demonstration was used to show the capacity of the machine and the threshed sorghum.

2.5 Trainings of farmers and other stakeholders

Training was organized for farmers, DAs, SMS to upgrade their skills on importance, operation, management, and handling of Sorghum Thresher

2.6 Method of data collection

Both secondary and primary data were used. Primary data was collected through observation and focus group discussions. Data was collected through observation during demonstration and FGD after demonstration. The capacity, time and labor required for the machines was collected during demonstration while for traditional processing the labor and time required and the capacity was agreed during FGD among the participant.

2.7 Method of data analysis

The data was analyzed using descriptive statistics, average, for time and labor required for threshing sorghum and through clustering the qualitative data. The result was interpreted and discussed in comparison with other findings. Recordings of focus group discussions were transcribed and translated. The results were organized using Microsoft Excel to combine and compare the results from the two focus group discussions.

3. Results and Discussions

3.1 Awareness created and capacity building on engine operated sorghum thresher

In order to help raise awareness and understanding among farmers, DAs and experts, demonstrations were conducted and training was given for 30 farmers, 3 subject matter specialists (SMS) working on mechanization at woredas and 6 DAs at Lalisa Dimtu kebele of Digga and Meti kebele of Guto Gidda woredas of East Wollega zone in 2021 (Table 1).

Table 1: Number of farmers, DAs and SMS attended the training on engine driven sorghum thresher

Title of training	Location	Participants								
		Farmers			DAs			SMS		
		M	F	Total	M	F	Total	M	F	Total
Usage, handling and advantage of Sorghum thresher	Digga & Guto Gidda	24	6	30	5	1	6	3	-	3

Note: M-male, F-female, DAs-development agents, SMS-subject matter specialists

These training sessions are complemented by demonstrations, to ensure comprehensive knowledge transfer. Demonstration used to showcase the appropriate use of the machines, to improve the flow of information between farmers and researchers about technology performance and appropriateness under farmers' conditions (Snapp, 1999). On farm demonstration were organized in each kebele so that farmers could learn about and evaluate the sorghum thresher, to show how the demonstrated thresher can be operated and to get feedback on performances of the machine. In the demonstration, comparisons were made between: the sorghum thresher and traditional threshing. More than 100 farmers and experts made aware on the availability and importance of the sorghum thresher which was new to the demonstration site and the potential benefits of sorghum thresher across the two kebele where demonstrations were carried out.

Fig 1: Practical training and demonstration of the machine at Lalisa Dimtu kebele, Digga district

Fig 2: Practical training and demonstration at Mei kebele, G/Gidda district

3.2 Capacity of sorghum thresher during on farm demonstration

Traditional sorghum threshing is a laborious, manual and slow exercise which is mainly done by beating the harvested heads with sticks on bare ground. In addition to the torturous exercise which exposes the people threshing to grain dust with skin and respiratory repercussions, it results in losses due to spillage, incomplete removal of grains from the heads, grain damage and contamination with soil, stones and other impurities.

Table 3: Comparison of sorghum thresher and traditional Threshing

Criterions of comparison	Treatments	
	Traditional Threshing	Sorghum thresher
Time Required	8 hrs.	1 hr.
Labor required	5-6 persons	2 persons
Amount of sorghum threshed in (quintal)	5	5-6

Table 2 shows comparison of the demonstrated sorghum Thresher and traditional farmers practice with regard to average time spent and labor required in sorghum threshing. As estimated by the respondents, the average time required to thresh and winnow one quintal of sorghum traditionally is one-man day. Threshing about five quintals of sorghum requires 8 hrs., 5-7 oxen-days and 5-6 man-days are required if it is done traditionally. However, the demonstrated thresher has the capacity to thresh 5-6 Qt per hour depending on the feeding rate and dryness of the heads with no grain breakage at 560-570 rpm. This is in line with the findings of (Bedada T., 2018 and Teha *et al*., 2020) [2, 4]. Farmers could save considerable time and labor using the demonstrated sorghum thresher as compared to traditional sorghum threshing.

3.3 Farmers' opinion and feedback on sorghum thresher

The feedback was collected using focus group discussions (FGDs) in the demonstration site. One FGD was conducted in each kebele to learn about farmers' interests, perspectives, opinions and knowledge about sorghum thresher (Table 3). Knowing the perspectives, attitudes and desires is essential to know support services, and dissemination approaches.

Table 4: Summary of participants in the focus group discussion

Site	Districts	Kebele	# Participants			Date
			Female	Male	Total	
East Wollega	Guto Gida	Meti	3	12	15	Jan 14, 2021
	Digga	Lalisa Dimtu	3	12	15	Jan 15, 2021

The farmers found the demonstrated engine-driven sorghum thresher outperforms traditional practices such as animal trampling and stick beating in terms of reducing unthreshed head, reducing workload, saving time spent and reduce labor required for sorghum threshing, as well as reducing postharvest losses. The thresher that has been demonstrated is portable and can be transported by one person, making it perfect for smallholder farmers because it can be easily moved from one farmer field to another once the harvested heads are ready for threshing. Machine threshing of sorghum, on the other hand, attracted the interest of the youth and men who attended the demonstration which can be a business in the area to provide services with the machine for farmers in the kebeles.

Box 1: Farmers opinion on demonstrated sorghum thresher

Excerpts from one of FGD member at Meti kebele of Guto Gida

'Hojiin isaa warqeedha. Kun dhibbaaf dhibba ce'eera'. In a farmer's word meaning "Its operation is gold. This is passed 100 percent"

This indicates that farmers preferred the demonstrated sorghum thresher comparing with their practices and recommending for further promotion.

Apart from its good features, the thresher does not combine threshing and winnowing which is technically an area for future improvement. The chaff with sorghum grain needs further sieving and winnowing to get clean sorghum grain which is done with locally produced winnowing baskets. Two people (usually women) can be employed to do this. The FGD participants suggested that they gave their feedback to modify certain parts of the sorghum thresher;

the modification suggested by them included widening of the feeding table and feeding inlet, and adding cleaning unit.

4. Conclusions and Recommendations

The demonstrated sorghum thresher is better in terms of capacity, time and labor required as compared to farmer's practice. However, the thresher is not affordable at individual farmers. Therefore, farmers group, cooperatives and investors working in the district could buy the machine and provide threshing services for farmers. The adoption and use of the demonstrated sorghum thresher will also contribute to employment creation and in entrepreneurship opportunities especially for youth to provide threshing, repair and maintenance services to farmers at a fee. Therefore, it is suggested that governments and NGOs working on youth employment in agriculture and rural development can create job opportunity using the demonstrated sorghum thresher. For researchers working on the improvement of the machine, it is suggested to add cleaning unit to the thresher. Based on the findings above the sorghum thresher is recommended for further pre scaling up.

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