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RESEARCH ARTICLE

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DEMONSTRATION OF OARI-ASSELA MODEL-3 MULTI CROP THRESHER IN ARSI ZONE, ETHIOPIA

TAMRAT GEBISO CHALLA
Oromia Agricultural Research Institute, P.O.Box 06, Asella, ETHIOPIA

TAMRAT GEBISO CHALLA

ABSTRACT

This activity was done in 2012/13 budget year. From the result of this demonstration activity and simple need assessment survey made for this demonstration purpose, it is clear that farmers of Arsi highlands who are producing cereal crops like wheat and barley and do not have combine harvesting technologies access, are suffering from alternative harvesting technologies and they are completely using traditional ways of harvesting and threshing methods like trampling on flat plain of fields plastered by mud and animal dung called "Awudima/Hogdi" by animal foots and biting by stick in the house or on Awudima/Hogd. This way of traditional threshing method, even though it needs further research, obviously consumes more time, more labor and moreover contributes more to postharvest loss. In this research (demonstration) activity, OARI-Asella model-III thresher was demonstrated in two districts of Arsi zone and simple need assessment on the threshing technologies of the farmers was also done. From the result it was concluded that the technology is more important for the area. Moreover the result shows that most farmers of these areas have interest in using this threshing technology and they prefer if they can get this technology on credit basis even though considerable number of farmers shows their willingness to buy it on cash basis. Therefore, it was recommended to make available the technology in the market by training and awareness creation to technology producers, availing credit facilities to agricultural mechanization technologies, and conducting extensive further demonstration of the technology.

Key words: OARI-Asella model-III, thresher, demonstration, Likert scale

1. BACKGROUND AND JUSTIFICATION

In crop production, where traditional way of production is followed, the lion-share of labor requirement goes to threshing and harvesting which accounts for about 40% of its total man-day. Moreover, in traditional method (manual and animal trembling methods) of harvesting and threshing, huge amounts of harvest and post harvest loss is recorded which was estimated to about 12.9%, 13.6% and 10.9% for teff, wheat and maize respectively per annum ((Derege A. *etal* 1989). According to African Post Harvest Loss Information System (APHLIS) a report by Hodges, R.J *et.al* in 2010, shown that there is highest losses in agricultural outputs for small farms than large farms both during harvest and post harvest period until consumption. Ethiopian agriculture, which is highly characterized by small-scale and subsistence

farming system, faces great problem of post harvest loss also (Abebe H. Gabriel and Bekele Hundie, 2006). Most grain loss was also recorded during harvesting/field drying, platform drying, threshing hulling and winnowing (Hodges, R.J *et.al*, 2010). Until recent days, the main reason for this was due to the improper utilization and/or absence of appropriate intermediate threshing technologies for small-scale farmers in Ethiopia. But thanks to technology, Assela Agricultural Mechanization research center developed a cereal threshing machine with good and promising capacity. According to the report by the center's harvest and post harvest research team, the currently modified and improved machine has a capacity of 250kg to 1700kg per hour for different crops. The next table shows the machine capacity for different cereals per hours.

Table 1: Machine capacity per hour for different crops

№	Crop varieties	Average threshing capacity in kg/hr
1	Wheat	350
2	Teff	250
3	Barley	500
4	Sorghum	1700

Source: Assela AMRC harvest and post harvest team, 2012

With optimum straw moisture content, rotation per minutes of the machine parts and feeding rate, the machine performance was reported as: cleaning efficiency, threshing efficiency, and grain breakage percentage to be 98.97%, 99.50% and 0.05% respectively (Ibd). The fuel consumption is 1.47/hr at optimum feeding rate. The machine was found to be superior in all its performance quality compared to other machines so far developed in the country and even imported from abroad. And considering this fact, Assela Agricultural mechanization research center planned to make the machine to be utilized in a wider basis by small-scale farmers of cereal producers. To achieve this goal the center organized training programs for different private and non-private manufacturers on how to manufacture this machine and avail the machine in market in enough amounts. Simultaneously, demand creation activity for these manufacturers was also planned so that these trained manufacturers could engage to production of the machine immediately after the training.

2. Objectives of the research activity

After a technology is developed, adapted or modified, the next step is obviously to address the end-users with all its benefits over the previous practices and this should be effective through demonstration, workshops and other activities.

Therefore, this demonstration research activity was initiated with the main objectives of demonstration and popularization of the OARI-Assela model-3 multi crop thresher in Arsi zone while the specific objectives of the activity were:

1. to demonstrate the machine and create demand for the technology so that trained manufacturers could engage to manufacturing
2. to collect feedback on the machine
3. to facilitate the transferring of the technology
4. to assess need of the engine-driven threshing technology in Arsi zone

3. Research methodology

3.1 Study area

The research was conducted in three selected districts of Arsi zone namely Lemu-Bilbilo, Digalu-Tijo and Tiyo districts. These districts of the zone were selected purposively because of the fact that they are known for their high production potentials of wheat and barley crops. Arsi zone is known as wheat-belt of Ethiopia and these districts, Lemu-Bilbilo, and Digalu-Tijo are found 56 km, and 25km to south of Assela the capital of Arsi zone while Tiyo district is around Assela. The main crops produced in these areas are wheat and barley with barley dominating in some high land of Digalu-Tijo and Lemu-Bilbilo around the base of mountain Chilalo.

3.2 Demonstration site selection and Methods of demonstration

Demonstration was conducted in a total of three PAs namely Digalu-Kidame, Lemu-dima and Duna which were selected from each Digalu-Tijo,

Lemu-Bilbilo and Tiyo districts respectively. After site (PAs) selection being with districts' experts, a Farmers Research Extension Groups of 15 members were organized at each site and one experimental (demonstration) farmer was selected from each group. The rest members and non-member farmers were invited at each site during the demonstration period and 7 to 14 hours of threshing wheat and barley crop was done at each site. Checklist was developed to collect farmers' views and comments and to record the machine performance. Totally 40 (forty) FREG members who took training on how to use the technology and other 68 (sixty eight) farmers participated on demonstration.

3.3 Demonstration Methods

Basically, there are two principal types of demonstration used by both extension agents and agricultural researchers; method demonstration and result demonstration. In method demonstration the researcher basically shows farmers how to do something. In the method demonstration, the farmer is shown step by step how, for example, to plant seeds in line, to use a mechanical duster to control insects, or how to operate a machine to thresh his crop. The second type of demonstration is a result demonstration method in which a farmer is shown how a particular recommendation is superior (better than) to the local existing practice and practicable under local conditions, for example, the comparison between uses of engine-driven threshing machine and traditional way of threshing by using animal trampling.

For this purpose both method demonstration and result demonstration types of demonstration were used. Under method demonstration type of demonstration, the farmers were trained how to give simple services and how to operate the thresher safely while under result demonstration comparison of cleanness of grain, grain breakage, cost of threshing, drudgery of work(work easiness) and post harvest loss between traditional (manual) and engine-driven machine threshing was conducted.

3.4 Data Type, methods of data collection and analysis

Simple socioeconomic and perception and opinion of farmers on the thresher were collected using semi-structured questionnaires. In addition to this, efficiency of the thresher like cleaning efficiency, threshing efficiency, and grain breakage percentage were collected and compared against the result reported by the post-harvest research team. Finally the data was analyzed descriptively using mean, standard deviation, percent, Liker scale method.

Picture1. Training farmers on advantages and how to operate OARI-multi-crop thresher

4. RESULT AND DISCUSSION

4.1 Socioeconomic Characteristics of the participants

A total of forty (40) farmers were participated on full-demonstration process and out of them eight (8) were females and the rest was male. Average age of the participants was 39.48 years with standard deviation of 12.94 and average family size was 5.43 persons. Average land holding was 2.36 hectare. The educational background of the participants shows that more than a half of them followed at least primary education and eight (2%) of them are illiterate and 25% of the respondents completed secondary education. But as it was mentioned above other 68 (sixty eight) farmers also participated on demonstration simply during the machine operation.

Table 2 Sex and educational background of the respondents

		Frequency(%)
Sex	Male	8(20)
	Female	32(80)
Education	Illiterate	8(20)
	Primary	20(50)
	Secondary	10(25)
	Above secondary	2(5)

	N	Minimum	Maximum	Mean	Std. Dev.
Age of participant	40	23.00	60.00	39.48	12.94
Rented in land size	40	.00	8.00	.8125	1.41393
Family size of participant	40	2.00	10.00	4.38	2.03416
Participants' landholding	40	.50	5.00	2.25	1.04609

Source: own survey (2012)

4.2 Participants response to the demonstrated engine-driven OARI-Assela Model-3 Multi-Crop Thresher

The demonstration process was conducted by giving simple training for all member farmers. At Lemu-dima PA threshing was done for 15 hours and a total of 7100 kg (7.1 quintals) of wheat was threshed and the average threshing capacity per hour was found to be 4.73quintal. At Digalu kidame and Duna PAs total time of threshing were 5hr and 8hrs and average threshing capacity per hour were found to be 4.65 quintal and 3.95 quintals respectively. Average cleaning efficiency of machine during demonstration was 97.75% with 98.5, 96.5 and 98.25% at Lemu-Bilbilo, Digalu-Tijo and Tiyo districts respectively. While average threshing efficiency was 98.34 with value of 97.75, 98.5 and 98.77% at Lemu-Bilbilo, Digalu-Tijo and Tiyo districts respectively and average grain breakage for the three sites was 0.06% with value of 0.07, 0.058 and 0.052% at Lemu-Bilbilo, Digalu-Tijo and Tiyo districts respectively.

Farmers were asked for their preference to the new technology and traditional one and all of them preferred the new technology in terms of its given features/attributes like, time saving, cleaning efficiency, and capacity of threshing per hour and in general its cost minimization compared to traditional method of threshing. Likert scale method was used to measure respondent's opinion/views towards the attributes of the new technology with respect to traditional ways of threshing. A Likert scale is an ordered scale from which respondents choose one option that best aligns with their view. It is often used to measure respondents' attitudes by asking the extent to which they agree or disagree with a particular question or statement. In this case an odd number of response categories having five responses (strongly disagree, disagree, neither disagree nor agree, agree, and strongly agree) were used.

From table 3 it is clear that the participants more or less agree with the attributes of the technology and clearly evaluated the technology with respect to traditional way of threshing and cleaning methods. More than half of the participants at least agree or strongly agree with cleaning efficiency (on which 100% of respondents strongly agree), ease of transportation, economical in all its aspects like price to buy the technology and to rent the service, and in terms of its complication to operate. But 50% of the participants disagree with the best threshing capacity of the thresher and they opt for more capacity thresher in the future from the technology owners.

Following this, the participants were asked if they need to use the technology in future either in buying or by renting from others and if they want to buy how (in group, individually, and if in group maximum number of group members)? Accordingly, most participants want to buy the technology and use it in group (32%) with maximum number of group

members of five and minimum of two. Considerable number of participants (eight out of forty which is 20% of total) wants to buy the thresher individually.

Table 3: Likert scale on technology attributes

Attributes	Percent of respondents in Likert scale				
	Strongly disagree	Disagree	Neither disagree nor agree,	Agree	Strongly agree
Best cleaning					40(100)
Easily transportable			13(32.5%)	27(67.5%)	
Best threshing capacity		20(50%)	5(12.5%)	15(37.5%)	
Economical to use		5(12.5%)	5(12.5%)	15(37.5%)	15(37.5%)
Not complicated to operate			6(15%)	7(17.5%)	27(67.5%)

Source: own survey (2012)

Figure 2: The planter on operation

Table 4: Participants willingness to use the thresher and their mode of use

	Group basis			Individual basis	
Number of participants	32(80%)			8(20%)	
	No. of preferred group members			Mode of owing	
	2	3	5	Credit base	Cash base
Number of participants with respect to their preferences	5(12.5)	11(27.5%)	16(40%)	27	13

Source: own survey (2012)

5. Conclusion and Recommendations

From the result of this demonstration activity and simple need assessment survey made for this demonstration purpose, it is clear that farmers of Arsi highlands who are producing cereal crops like wheat and barley and do not have combine harvesting technologies access, are suffering from alternative harvesting technologies and they are completely using traditional ways of harvesting and threshing methods like trampling on flat plain of fields plastered by mud and animal dung called *"Awudima/Hogdi"* by animal foots and biting by stick in the house or on *Awudima/Hogd*. This way of traditional threshing method obviously consumes more time, more labor and moreover contributes more to postharvest loss. Moreover the result shows that most farmers of these areas have interest in using this threshing technology and they prefer if they can get this technology on credit basis even though considerable number of farmers shows their willingness to buy it on cash basis.

In general in order to able all farmers having interest to use this technology, the following activities are recommended

1. Availing the technology in the market: the main gap created in agricultural mechanization technology utilization is that once the technologies are recommended by research centers, there is no as such concerned body to

produce and distribute such technologies. Even though there are some microenterprises which want do produce such technologies, there is no linkage between such enterprises and end users. Therefore, in order to make sure of the utilization of such technologies and avail the technologies in the market, two things have to be done (1) there must be promotion of such technology and microenterprises to farmers and show where they can get and buy it and (2) guaranteeing the microenterprises that their product will be purchased by farmers and enable them produce the machine by creating linkage between them.

2. Credit facility: Farmers need some amount of credit to buy such huge machineries which they can repay with some down payment of 2 to 5 years. Therefore, to facilitate such things government intervention and some other non-governmental organization and cooperatives is very important.
3. Extensive further demonstration: in line with all these activities, further extensive demonstration is very important to create more need and demand/market for manufacturers and make ease of technology transfer and this should not be the task of only research center and it has to be the assignment for all development agents and moreover the extension wing of the agricultural development sector should take lion-share of the task.

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