INTERNATIONAL JOURNAL OF SMART AGRICULTURE (IJSA)

ISSN: 2995-9829 (Online)

VOLUME 2 ISSUE 1 (2024)

PUBLISHED BY

E-PALLI PUBLISHERS, DELAWARE, USA

International Journal of Smart Agriculture (IJSA)

Volume 2 Issue 1, Year 2024
ISSN: 2995-9829 (Online)
DOI: https://doi.org/10.54536/ijsa.v2i1.3657
https://journals.e-palli.com/home/index.php/ijsa

Pre-Extension, Demonstration and Evaluation of Powered Grain De-Huller in Selected Districts of Arsi and West Arsi Zones

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Article Information

Received: August 20, 2024

Accepted: September 23, 2024

Published: November 21, 2024

Keywords

Demonstration, Grain De-Huller, Technology Evaluation, Training

ABSTRACT

This demonstration activity was conducted with the objectives of enhancing farmers' awareness of the importance and use of the powered grain de-huller machine, evaluating the performance of the powered grain de-huller machine under farmer's conditions, and collecting farmer's feedback on the machine at Munessa, Lemu Bilbilo and Adaba districts of Arsi and west Arsi zones. The demonstration site and representative farmers were selected based on location and suitability to involve more farmers in visiting the demonstration sites. Min-field day was organized to enhance farmer-to-farmer learning, information exchange, and experience sharing among Farmers and other stakeholders on technology. The training was organized on grain de-huller technology; a total of 107 participants, of which 25.2% were male and 74.8% were female, participated in both theoretical and practical training on grain de-huller technology. The training was mainly focused on how to operate technology and the relative advantage of technology over local practice, which was de-hulling grain using traditional material. The experiment was carried out to estimate the performance of the grain de-huller machine in comparison with traditional de-hulling practices. The results indicated that grain de-huller technology had a de-hulling capacity of 320kg/hr. for barley with one operator and 390kg/hr. for wheat with operator respectively. Whereas traditional grain de-hulling practices took 33kg/hr. on average with one operator for barley and 38kg/hr. for respectively wheat. This finding indicated us grain de-hulling technology had a huge advantage in terms of time minimization and quality of grain de-hulling. Therefore, livestock feed mixer technology is recommended for further scaling up and wider utilization.

INTRODUCTION

Dehulling or dehusking is a crucial step in the post-harvest processing of millet crops since it removes the inedible outer layer (pericarp and testa) of the grains, thus making the grains available for milling and consumption (Bassey & Mbengue, 1991; Reichert, 1982). Dehulling increases the digestibility (Singh *et al.*, 2010; Verma *et al.*, 2014) of the grains by removing the pericarp (bran) and the testa, which are rich in fiber and anti-nutritional factors (Bassey & Mbengue, 1991).

De-hulling is a process employed to get rid of the outer pericarp and testa (hull) of most cereal grains, grain legumes, nuts, and oilseeds using mechanical means (Omobuwajo *et al.*, 1999). Processing whole grains by dehulling increases the versatility of grain in food use, both for domestic use and industrial purposes. Grain dehulling will result in better market results and improve the economic and nutritional status of farmers.

De-hulling of barley, oats, and sorghum by hand pounding is very tedious and time-consuming. Hand pounding is also inefficient because there will be considerable loss of grain and nutritional value. De-hulling is not uniform in hand pounding, so fine quality cannot be obtained from traditional grain de-hulling.

Mechanical de-hulling by using a de-huller is a very convenient and quicker process. The use of de-huller improves the physical appearance and the functional property of grain making it suitable for use in various products which are usually prepared with other finer grain Ds.

To solve the above-stated problem and avail technology Asela Agricultural Engineering Research Center developed and evaluated Grain De-huller that has a de-hulling capacity of 200-450kg/hr for barley and 1.5-4.5 for wheat depending on their moisture content. Despite these advantages, Grain De-huller was not demonstrated to farmers of the Arsi and West Arsi zones. Therefore, this study is initiated to demonstrate the Grain De-huller machine to farmers of selected districts in the Arsi and West Arsi zones.

Objectives

- To evaluate Grain de-huller technology under farmers' management
- To create awareness of the importance of the technology
- To collect farmers' and other stakeholders' feedback for further technology development/improvement.

Expected Outputs

- Final recommendation made to grain de-huller for wider scaling up.
- At least 90 farmers reached through a demonstration.
- At least 120 farmers expected to attend a demonstration.
- Researchers would know farmer`s technology

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selection criteria, farmers and DA aware of the available technologies, and each FRG site would identify the technology best suited to their practices.

MATERIALS AND METHODS

Materials

Necessary materials such as a Grain de-huller machine, Engine, Barley, Wheat, stopwatch, and traditional de-hulling material were used for this study.

Site and Farmer's Selections

Demonstration of Grain de-huller, selection of PAs and participant farmers should follow certain procedures. The first step was to contact of zone's office of agriculture. Then contact the district's office of agriculture. Finally, a discussion was held on the objectives of the demonstration, the criteria for the selection of district, and the criteria for selecting representative PAs. For the purpose of this study Lemu Bilbilo, Munessa, and Adaba districts were purposively selected because of their accessibility and potential from Arsi and west Ars zones.

Peasant association selection: Selection of appropriate kebeles took into consideration the applicability of technology, accessibility of kebeles to the road for implementation of the activity, demonstration/result diffusion to other non-participant farmers, and representativeness of kebeles to other similar kebeles around the selected kebele for further diffusion of the technology through field days. Taking into consideration these criteria six kebeles two from each district were selected for the accomplishment of this study.

Farmers Selection: two types of farmers have to be selected as hosting and participant farmers. The selection of hosting farmers was done with the involvement of all members of farmers, DAs, and representative district experts after a thorough discussion. The selection of demonstration member farmers was done in collaboration with respective Development Agents (DAs). Farmers were selected based on willingness to participate in every stage of the demonstration, innovativeness of the farmer willingness to allocate resources for the demonstration purposes, willingness for cost sharing, willingness to share knowledge and experience among others, and gender balance. For the purpose of this study six hosts one from each kebele with fourteen members.

Technology evaluation and demonstration method/techniques

Demonstration of Grain de-huller was undertaken in comparison with traditional grain de-hulling practice. The study was done on two treatments which were grain de-huller and traditional way of de-hulling. The process was replicated on six experimental sites. To facilitate further dissemination of results demonstration method was followed to enable farmers to quickly compare the demonstration`s result with traditional practice and also method demonstration was used to show farmers step-by-step how technology works. In the demonstration process, the mechanisms used to enhance farmer-to-farmer learning and information exchange were field visits/tours and field days.

Method of data collection

The study employed both qualitative and quantitative data from primary data sources. Primary data such as time reduced because of using this machine, labor reduced, the total number of farmers who participated in the training, field visits, and field days by gender, numbers of farmers become aware of the relative advantage of the technology by gender, the role of farmers and other stakeholders in technology demonstration, and farmers' opinion was collected data collection method/technique such as field observation, household/participant interview, focus group discussion.

Method of Data Analysis

A simple descriptive statistics such as mean and frequency were used for quantitative data analysis and qualitative data analysis, respectively.

RESULTS AND DISCUSSION

Training of farmers and stakeholders

This research activity used training on knowledge, skill, and attitude as the main method used to create awareness of grain de-huller technology among farmers, to enable farmers', DAs', and experts' knowledge and skill on grain de-huller technology. Thus, a multidisciplinary team consisting of Engineers, an Extensionist, and a Socio-economist was organized to deliver the training in capacity building and facilitating extension efforts on grain de-huller technology.

The training was organized on grain de-huller technology; a total of 107 participants of which 25.2% were male and 74.8% were female participated in both theoretical and practical training on grain de-huller technology. The training was mainly focused on how to operate technology and, the relative advantage of technology over local practice which was de-hulling grain using traditional material.

Table 1: Training to stakeholders on grain de-huller technology

Districts	Description of participants	Male	Female	Total
Lemu-Bilbilo	Farmers	5	25	30
	Agricultural Experts	2	-	2
	Development agents	2	-	2
	Supervisor	1	-	1

Munessa	Farmers	6	24	30
	Agricultural Experts	2	-	2
	Development agents	1	2	3
	Supervisor	1	-	1
Adaba	Farmers	3	27	30
	Agricultural Experts	3	-	3
	Development agents	-	2	2
	Supervisor	1	-	1
Grand total		27	80	107

The de-hulling capacity of the technology

The experiment was carried out to estimate the performance of the grain de-huller machine in comparison with traditional de-hulling practices. The result from the findings indicated that grain de-huller technology had a de-hulling capacity of 320kg/hr for barley with one operator and 390kg/hr for wheat with one operator respectively. Whereas traditional grain de-hulling practices took 33kg/hr on average with one operator for barley and 38kg/hr for wheat. This finding indicated us grain de-hulling technology had a huge advantage in terms of time minimization and quality of grain de-hulling.

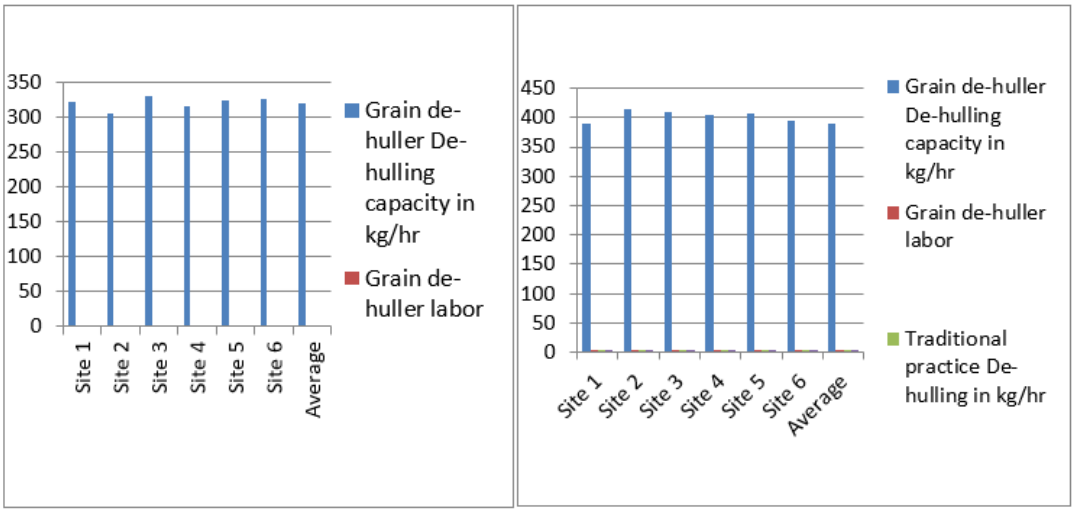

Figure 1: Mean comparison of grain de-huller with traditional practice

Farmer Perception

Five scales Likert scale method was used to measure respondents' opinions/views towards the new technology with respect to the traditional way of grain de-hulling. Among the farmers interviewed about 51.1%, 30%, & 12.2% of participant farmers responded that the operation of the machine was very simple, simple, and medium to operate grain de-hulling. About 7.7% of the respondents responded that it was difficult to operate and required some modification of the technology. As far as maintenance of the technology was concerned; about 42.2%, 26.7% & 11.1% of respondent farmers responded that the maintenance of technology was very simple, simple, and medium respectively to maintain grain de-huller. Whereas about 13.3% and 6.7% of the respondents responded that it was difficult and very difficult to maintain technology. In addition to that about 15.5%, 30%, and 40% of the respondent farmers also indicated that the affordability of the technology was very high, high, and medium respectively. Whereas only 25.5% of respondents responded that it was low to afford technology.

Table 2: Farmer's response to the technology

No	Criteria	Attributes	No of respondent	Percentage (%)
1	Ease of operation	Very simple	46	51.1
		Simple	27	30
		Medium	11	12.2
		Difficult	7	7.7
		Very difficult	-	-

2	Maintenance	Very simple	38	42.2
		Simple	24	26.7
		Medium	10	11.1
		Difficult	12	13.3
		Very difficult	6	6.7
3	Price to afford the technology	Very high	14	15.5
		High	27	30
		Medium	36	40
		Low	23	25.5
		Very low	-	-

Stakeholders' Feedback and Reaction

In the process of demonstrating grain de-huller technology, a mini-field day was organized. In the course of the min-field day, about one hundred and seven (107) different stakeholders such as hosting farmers, non-hosting farmers, Development agents, supervisors, experts, and researchers participated and reacted to what they observed during the operation of grain de-huller technology and compared it with the traditional way of de-hulling grain. Data like labor and time reduction, de-hulling capacity, and feedback were collected and analyzed in comparison with local practice. Because of the above-stated quality grain de-huller technology has a relative advantage over traditional practice. As a result, all participant farmers and stakeholders chose grain de-huller technology.

CONCLUSIONS

Mechanical de-hulling by using a de-huller is a very convenient and quicker process. The use of de-huller improves the physical appearance and functional properties of grain making it suitable for use in various products which are usually prepared with other finer grains. The purpose of this research was to demonstrate and evaluate Grain de-huller technology under farmers' management, to create awareness of the importance of the technology, and to collect farmers' and other stakeholders' feedback for further technology development/improvement. Demonstration of Grain de-huller was undertaken in comparison with traditional grain de-hulling practice. The study was done on two treatments which were grain de-huller and traditional way of de-hulling. Then the process was replicated on six experimental sites. To facilitate further dissemination of results demonstration method was followed to enable farmers to quickly compare the demonstration`s result with traditional practice and also method demonstration was used to show farmers step-by-step how technology works. The result from the findings indicated that grain de-huller technology had a de-hulling capacity of 126kg/hr with one operator. Whereas traditional grain de-hulling practices took approximately around 0.25kg/hr with one operator. In the course of field day, different stakeholders such as hosting farmers, non-hosting farmers, development agents, supervisors, experts, and researchers participated and reacted to what they observed during the operation of grain de-huller technology and compared it with the traditional way of de-hulling grain. Data like time reduction, de-hulling capacity, and feedback were collected and analyzed in comparison with local practice. Because of the above-stated quality grain de-huller technology has a relative advantage over traditional practice. As a result, all participant farmers and stakeholders chose grain de-huller technology.

Recommendations

Improved grain de-huller has good capacity and efficiency of de-hulling grain over the traditional by saving labor and time. Therefore, the research center and district agriculture office should work in collaboration for a wider scaling up of the technology in the study area.

Acknowledgment

We extend our deepest gratitude to colleagues who collaborated with us on this project. We would like to thank the Oromia Agricultural Research Institute (IQQO) for their willingness and valuable input throughout the project. Their expertise and contributions have significantly enhanced the quality of this work. Our collaboration fostered a creative and productive environment, leading to the successful completion of this project.

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