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# Pre-Scaling up of Animal Drawn Wheat Row Planter in Selected Districts of Arsi, West Arsi and Bale Zones

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## ABSTRACT

Pre-scaling up of the animal-drawn wheat row planter was done in three specifically chosen districts: Tiyo from Arsi, Dodola from West Arsi, and Sinana from Bale zones. The goals were to increase wheat production and productivity using this technology, improve farmers' knowledge and skills in using the improved technology, and build local capacity for future technology scaling up. Six peasant associations from these districts were specifically chosen based on their accessibility from a list of peasant associations. Then, in order to scale up the technology, a total of six groups, one at each peasant association, each with an average of fifteen farmers made up of men, women, and youth, were formed. A total of 69 participants from three districts, including 62.3% men and 37.7% women, took part in the theoretical and practical training. The major emphasis of the instruction was on how to use technology and its respective advantages. Additionally, training was given to competent microenterprises that might close the technological gap, and connections with other stakeholders were also made. The purpose of the mini-field day was to exchange knowledge and experiences, and all of the farmers who saw the demonstration recognized the benefits of this technology. Therefore, it is advised that the technique for animal-drawn wheat row planting be further promoted, made more widely known, and spread around the wheat-producing farm families around the study area and similar areas.

## INTRODUCTION

Agriculture is crucial for poverty reduction and income growth in less developed countries, particularly Sub-Saharan Africa (World Bank, 2014). However, low productivity and technological adoption hinder its growth (Abraham *et al.*, 2014; Hagos, 2016). Agriculture is the backbone of Ethiopia's economy, employing 83% of the population, contributing 90% of export earnings, 43% of GDP, and 70% of raw material requirements (MOFED, 2013). The sector's performance significantly impacts the entire economy and the country's agriculture development-led industrialization strategy.

The key agricultural issues in Ethiopia are low productivity, low acceptance of new agricultural technology, low use of better farm inputs, and reliance on traditional farming and rainfall. As a result, food insecurity and poverty are widespread throughout the country. While traditional agricultural methods are still used, the Ethiopian government has made steps to ameliorate the situation by disseminating new agricultural technologies to farmers. Since 1991, the Ethiopian government has conceived, introduced, and executed the well-known Agricultural Development Led Industrialization (ADLI) strategy to alleviate extreme poverty (Berihun *et al.*, 2014). As policy, the Ethiopian government has implemented various new agricultural technologies, such as fertilizers, certified seeds, irrigation, and row planting techniques.

Wheat is the most significant food crop in Ethiopia and is consequently planted on 1.63 million hectares yearly. According to CSA (2014), the expected yearly output of 3.43 million tons, or 17% of all cereal crop production, was made. The average national productivity is 2.01 tons per hectare, which is among the lowest in the world when compared to the global average wheat production per hectare, which is 4 tons (FAO 2009), according to data that was available in (CSA, 2014).

The need for row planting tools and techniques has increased recently as farmers' understanding of the practice grows as a result of their own shifting traditional practices and extension campaigns. According to Alemu *et al.* (2014), farmers in several locations are experimenting with undesigned things like "masti" (designed for baking injera), different bottles, and other containers, leading to a large number of efforts for wheat and teff row planting. Farmers, DAs, and experts have reported a huge increase in production and a decrease in the amount of seed needed with such conventional and untested techniques of row planting. According to the research study carried out by Alemu *et al.* (2014) in high and low lands in the Arsi zone, there is a substantial yield difference between row-planted and broadcasted wheat farms in high lands (13.9%), whereas there is only a little difference in lowland regions.

Row planting has an advantage over conventional broadcasting and conventional row planting using hand or local materials (Gebiso *et al.*, 2017). Moreover, the authors proved that the net income after the cost that varies due to technological intervention (in this case, we took the OARIAAMRC planter) in relative to each technology with respect to/against the rest of the planters: OARI-JAMRC animal drawn, OARI-JAMRC manual, EIAR-MARC wheat planter, Sisay type, Mamuye



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3-row, Mamuye single row wheat planter, Check (local row planting method), and Check (broadcasting method) were 14572.00, 5142.00, 2707.00, 5178.00, 4114.00, 4558.00, 3283.00, and 5641.00 Birr/ha, respectively.

The Asella Agricultural Engineering Research Center created a wheat row planter that can address this issue and carried out a collaborative assessment of several planters from various sources. According to the findings of the participatory assessment of several planters, the OARI-Asela AERC wheat row planter comes out on top thanks to its low labor requirements, suitable seed rate that is nearly similar to the recommended seed rate, and quick one-hectare coverage. The OARI-Asela AERC wheat row planter assessment and demonstration procedure likewise placed the participant farmers first. Pre-extension demonstrations of wheat row planters were conducted in the Arsi and west Arsi zones based on the findings of the technological evaluation. Results from a prior pre-extension trial showed that it took eight hours to plant one hectare with a pair of oxen and two people, as opposed to four pairs of oxen and twelve people. The yield of the wheat row planter was 70 quintals, compared to 60 quintals for the traditional one, and the seed rate of this technique was 120 kg/h, as opposed to 200 kg/h for traditional planting methods. As a result, the goal of this research was to expand and scale up animal-pulled wheat row planters to particular districts in the Arsi, West, and Bale zones.

### Objectives of the Study

- To create a wider demand pull by reaching a large number of users
- To enhance the production and productivity of wheat using this technology.
- To improve farmers' knowledge and skill of application of the improved technology
- To increase local capacity for future scaling up of the technology

## METHODOLOGY

### Site and Farmer Selection

Due to their suitability and representativeness, the first three districts Xiyo from Arsi, Dodola from west Arsi, and Sinana from Bale zones were purposefully chosen to undertake the pre-scaling up of an animal-drawn wheat row planter. The location, soil type, and suitability for more farmers to visit the plot with the DA and district expert for the experiment were taken into consideration while choosing the experimental site and representative farmers. To carry out the pre-scaling up of an animal-drawn wheat row planter, the Farmers' Training Center (FTC) was utilized as an experimental site.

### Technology Evaluation and Demonstration Method/ Techniques

In the presence of farmers and other stakeholders, the pre-scaling up of the animal-pulled wheat row planter took place in the three districts of the three zones. The evaluation of the technology was held in comparison with traditional wheat row planting practices. The Farmers Research Group technique was used to popularize this technology among a larger portion of farm families. This group consists of fifteen people, including male, female, and young farmers of various categories. Each of these groups receives a wheat row planter from the Asella Agricultural Engineering Research Center, which is produced for each group. Since this research was pre-scaling up, the existing method was training competent micro-enterprises as well as training, exhibiting the performance of the technology, field days, leaflets, and mass media coverage on the production of the technology, and connecting them with other stakeholders.

### Data Type and Method of Data Collection

Both qualitative and quantitative data from the original data source were used in this investigation. Primary data, including the uniformity of seed dropped, the amount of time needed to cover one hectare, labor savings, agronomic and yield data, the total number of farmers who participated in training, field visits, and field days by gender Farmers learn about the proportional benefits of the technology by gender. Data was gathered utilizing methods including field observation, household/ participant interviews, and focus group discussions to understand how farmers and other stakeholders fit into the scaling up of technology.

### Method of Data Analysis

For data analysis, the study used straightforward statistical analytical methods including percentage and mean value.

### Stakeholder Analysis

The research center closely collaborated and frequently consulted with its respective stakeholders to improve the distribution of animal-drawn wheat row planter technology and increase wheat yield and productivity. Different actors should work together and in collaboration on pre-scale activities. Therefore, doing a stakeholder study before beginning the pre-scaling-up activity was crucial for institutional arrangements. Stakeholder analysis was thus carried out to find possible stakeholders. the following issues: Who are the stakeholders? How much was the project closer to them? What were their responsibilities, roles, and tasks in carrying out the activity? Finally, each actor's roles, obligations, and tasks in carrying out the action were made clear. In light of this, four (four) accountable and cooperatively participating stakeholders or actors were found. These include the Agricultural Engineering Research Center, the offices of agriculture and natural resources for each zone, micro-enterprises, and the offices for agriculture and natural resources in the Tiyo, Dodola, and Sinana Districts. In addition, a stakeholder forum was set up for a meeting of consultation; stakeholder platforms were created at the zone and district levels, and a Memorandum of Understanding (MoU) was signed.

**Communication Methods Used**

During the execution of the pre-scaling-up activity, appropriate extension approaches and all extension teaching techniques (individual, group, and mass contact methods) were applied alone or in combination depending on the scenarios.

- Phone, either landline or mobile
- Field day Workshop (for status evaluation)
- Study trip or field visit and supervision
- Demonstration: Technique and outcome demonstrations
- Group meeting and discussion session

**Table 1:** Stakeholder roles and responsibilities in implementing the activity

| | |
|---|---|
| Asella Agricultural Engineering Research Center | Coordination and facilitation |
| | Provision of animal-drawn wheat row planter technology |
| | Provision of inputs |
| | Provision of training |
| | Technical backstopping |
| | Organize field days and Supervision and joint monitoring and evaluation |
| Micro-enterprises | Production of animal-drawn wheat row planter |
| | Availing technology to users at a reasonable price |
| District and zone-level Agricultural and natural resources offices | Assist in site and participant farmers' selection |
| | Follow up day to day activities |
| | Assist in providing training |
| | Facilitate technology distribution |
| | Jointly organize and participate in field days |
| Farmers | Allocate land and perform required practices |
| | Actively participate in the training |
| | Share skills and experiences to neighbor farmers |

## RESULTS AND DISCUSSIONS

**Training**

A total of 69 participants, roughly 37.7% of women and around 62.3% of men, successfully completed the course. The primary objectives of the training were the promotion of technology and raising farmer and participant stakeholder awareness. Following training, an animal-pulled wheat row planter with a modified spike tooth harrow was given to each FRG for land preparation.

**Table 2:** Training given for farmers, development agents, and districts experts

| **Districts** | **Participants** | **Male** | **Female** | **Total** |
|---|---|---|---|---|
| Dodola | Farmers | 18 | 12 | 30 |
| | Experts | 2 | - | 2 |
| | Das | 1 | - | 1 |
| Tiyo | Farmers | 9 | 6 | 15 |
| | Experts | 2 | - | 2 |
| | Das | - | 1 | 1 |
| Sinan | Farmers | 9 | 6 | 15 |
| | Experts | 2 | - | 2 |
| | Das | - | 1 | 1 |
| **Total** | | **43** | **26** | **69** |

**Time and Labor Taken**

According to the results in the graph below, one pair of oxen can plant one hectare of land in about 7-8 working hours using an animal-drawn wheat row planter. The information in the graph below demonstrates that it takes farmers nine working hours to plant one hectare of land with four pairs of oxen in eight working hours. Because of this, time is wasted while planting wheat with a traditional practice.

The workforce required to plant one hectare of land with a pair of oxen was reduced from twelve to two people when using an animal-drawn row planter. This offers benefits in terms of price and other factors. The following is a graphic illustration of this.

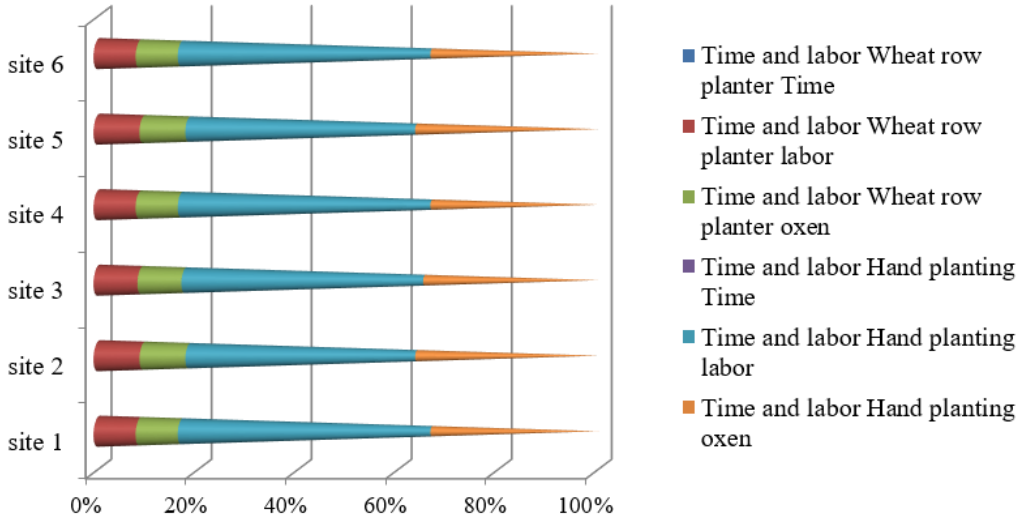


**Figure 1:** Mean comparison of time and labor

**Seed and Yield Comparison**

The average amount of seed needed to plant one hectare of land was 130 kilograms (kgs), as seen in the graph below while planting wheat with an animal-drawn planter. It would take roughly 258 kilograms (kgs) of seed to plant the same area of land utilizing locally prepared planting materials. The relative yield benefit of using an animal-drawn wheat row planter over a local one was, on average, fourteen quintals. It was also visually depicted, as shown below.

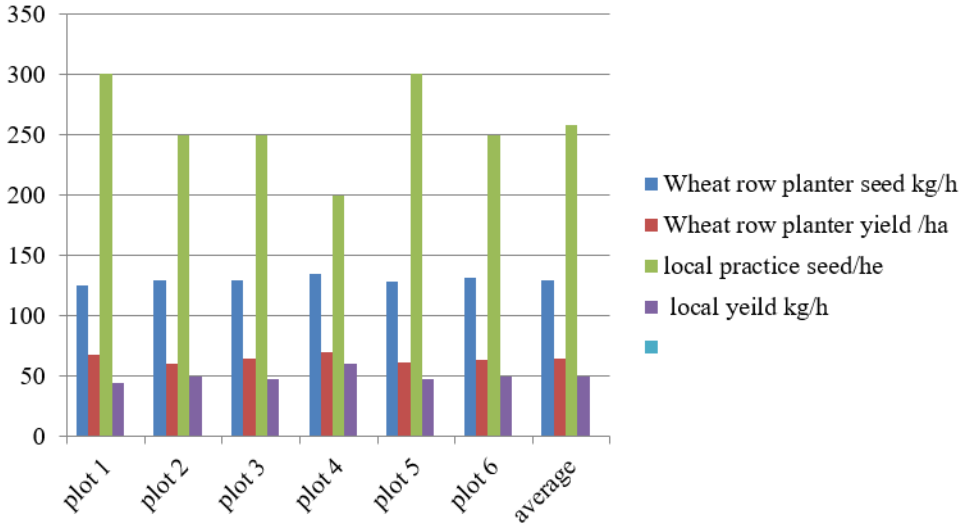


**Figure 2:** Mean comparison of seed and yield

## CONCLUSION

Due to their suitability for the technology being scaled up, the three districts of Tiyo, Sinana, and Dodola in the Arsi, Bale, and West Arsi zones were chosen specifically for this study. Six FRGs were established, with two peasant associations from each district being chosen to scale up this technology. Of these, 37.7% of the FRG were female, and around 62.3% were male. One hectare of land was planted in eight working hours with one pair of oxen. In contrast, it took farmers nine working hours to plant one hectare of land with four pairs of oxen. Because of this, time is wasted while planting wheat in the traditional way. Farmers undertook various farm operations during this period. The workforce required to plant one hectare of land with a pair of oxen is reduced from twelve to two people when using a row planter. As a result of this discovery, wheat producer farmers used less labor force as compared to tradition.

The outcome of this research also shows that one hectare of land required an average of 134 kilograms of seed to be planted. It would take roughly 258 kilograms of seed to plant the same area of land utilizing locally prepared planning materials. The relative yield benefit of using a wheat row planter over a local one was, on average, fourteen quintals.

## RECOMMENDATION

It is advised that the animal-drawn wheat row planter technology be further promoted, made more common, and widely replicated and disseminated.

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