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On-Farm Evaluation and Demonstration of Hand Powered Hay Baler Machine in Gursum Woreda, Somali Region, Ethiopia

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ABSTRACT

This study was implemented in the Gursum Woreda. In 2024, it is located in the Somali region, Fafen zone. Hay baller machine helps the pastoral and agro-pastoral communities prepare feed for their livestock that is easily used during the dry season. Only one person operates the hay baler. SoRPARI-Agricultural Mechanization research directorate demonstrated the hay baler and found the output capacity of the hay baler about 15-20 kg per baled 180kg/hr. The machine is moderately cheap, basic, and versatile when compared to other internal manufacturers. 20 agro-pastoralists from Gursum woredas were selected for the hay baller machine demonstration and two hay baller machines were provided for the training section to create wider awareness. Hence, based on the farmer's thought and the significance of this innovation, more popularization and scaling up of the machine is important.

INTRODUCTION

Animals could be a major source of livelihood base for the populace of the Somali Region (Proceeding, 2022). According to the livestock census of CSA (CSA, 2013), The region is assessed to have 23.6 million heads of animals, comprising cattle (20%), sheep (33%), goats (36%), camel (10%) and equines (1%). Making strides in animal efficiency and generation is significant to quickening development, guaranteeing nourishment security, and growing agrarian trades. The government has appropriately paid due consideration to moving forward the efficiency of the division. Rangelands are the major source of forage for grazing livestock for numerous pastoralists and agro-pastoralists, giving year-round nourishment to supporting animals (Kebede *et al.*, 2020). As green plant accessibility is regular in most zones, the arrangement of nourishment for shortage seasons has continuously been a major concern in numerous animal generation frameworks (Gebeyehu *et al.*, 2021). Hence, feed is the foremost imperative, and preserved grub is utilized for this reason. Numerous small-scale farmers/agro-pastoralists within the Somali locale, by their strategy, make roughage and store edit buildups to carry animals through periods of bolster deficiency (Ateye, 2023). It can be arranged at the family level utilizing basic methods.

In Somali region most of the pastoral and agro-pastoralist use conventional methods to prepare hay for the livestock, particularly in our locale, there's no wide hone of making or putting away roughage and straw in bunches; or maybe, most agro-pastoralists and small-scale dairy holders store feed customarily by making piles (Farah & Farah, 2024). In any case, the ordinary strategy of haymaking has a few downsides, such as feed misfortune, keeping up moo supplement substance, and not being helpful in transporting and putting away. These downsides affirm that ranchers need information about

scavenge preservation, change of low-quality feed, and utilization of legitimate innovation for haymaking and putting away (Abdilahi *et al.*, 2023). Studies indicate that the baling of hay by pressing helps to feed animals with little or no wastage, conserves its nutrients for a long time, and simplifies the transport and safe storage conditions and preparation of feed rations (Teffera *et al.*, 2012). The average weight of a bale from natural pasture and crop residues can be 15-20 and 8-15 kg, respectively (Teffera *et al.*, 2012). But tractor-assisted baler can press into bales up to 200-300 kg m⁻³ density when its moisture content is between 18-30% and into briquettes of up to 700 kg m⁻³ density when the moisture content is between 10-12% (Teffera *et al.*, 2012). its moisture content is between 18-30% and in briquettes of up to 700 kg/m³ density when the moisture content is between 10-12% (Tekeste, 2020). Therefore, this project was initiated to evaluate and demonstrate hay baller technology that contributes to minimizing feed shortage during the dry season in the Gursum district of the Somali region, Ethiopia.

MATERIALS AND METHODS

Description of the study area

The research study of the hay baler machine was implemented in Gursum Woredas, in 2024, which is located Fafen zone, Somali Regional, Ethiopia (Figure-1). The woreda is found within the Fafen Zone of the Somali Regional State is 46 km on the western side of Jigjiga town and is found adjacent to the main street from Jigjiga to Harar. It is arranged at an elevation of 1600-1700 m above sea level. The precipitation design of the region is bimodal, summing to a normal of 750 ml and expanding from March to April and the long rain season from June to September. The cruel yearly temperature is 21°C, with a cruel least and most extreme temperature of 14°C and 28°C, separately.

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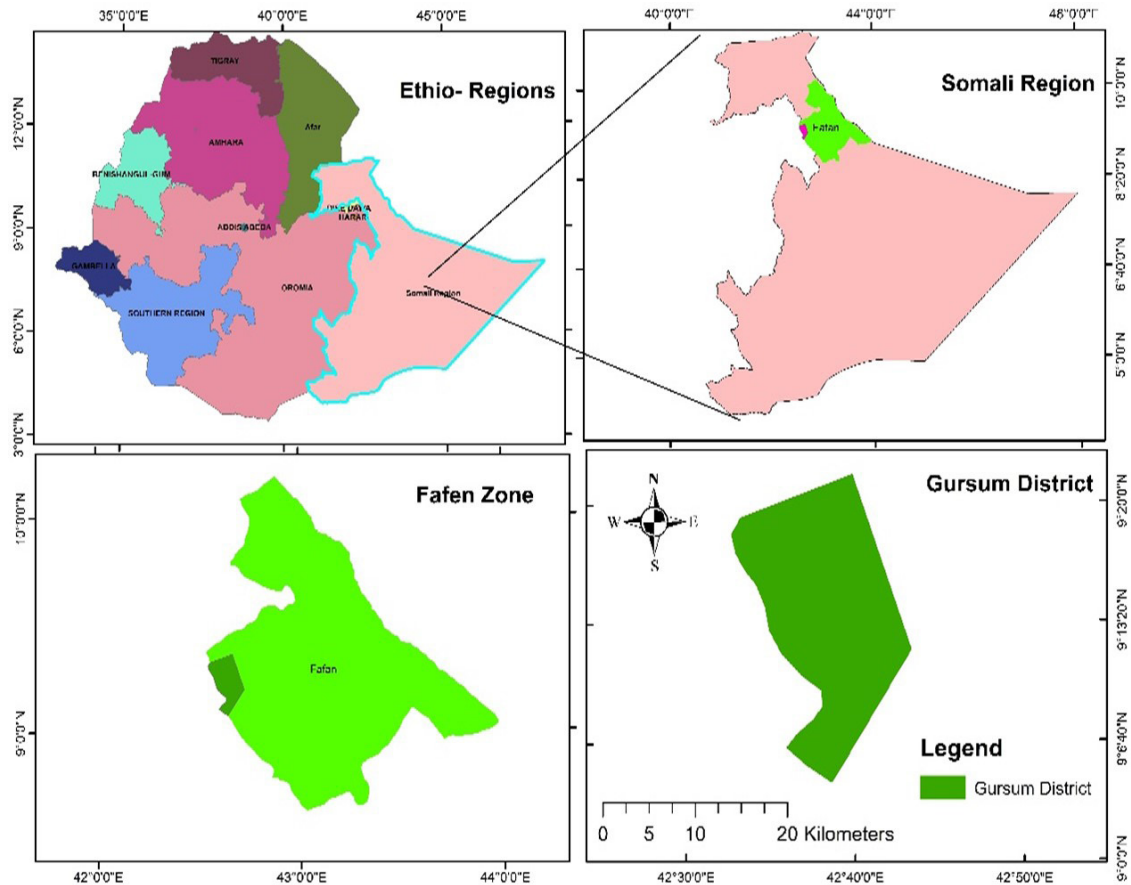


Figure 1: Map of the study area

Agro-pastoralist Selection

Agro-pastoralists were chosen purposively based on their intrigue and advancement in utilizing hay baling machine, willingness to use the machine, common shelling problem, sharing information, and capability to manage the ordered activity in collaboration with the Somali Region Livestock and Agricultural Research Institute (SoRLARI) Fafen

center. 20 agro-pastoralists from the woreda were selected (Table 1). The selected agro-pastoralists were divided into two sub-groups having 2 members in each sub-group in thought of sex issues (ladies, men, and youth)). The training was provided in the established group containing 20 participants (15 male and 5 female) and two hay baler technology was delivered for the Gursum woreda .

Table 1: Summary of selected woredas and number of agro-pastoralist

District	Type of	Qt of	Number of	Male	Female
Gursum	Hay baler	1	20	15	5

Methods and Techniques for Evaluating and Demonstrating of the Technology

The methods and techniques for evaluation of the demonstration were implemented at Fafen Center to raise awareness to create awareness about the hay baller machine's performance and preventive maintenance.

Information Gathering

Quantitative variables hay baling capacity output (kg/hr), baling performance efficiency (%), human labor requirement, Several agro-pastoral who participated in the training, number of stakeholders who participated in the training, and qualitative data were collected through personal field observation, individual interview, Focus Group Discussion by using checklist and data sheet tools. Qualitative data were farmers' perceptions towards the new technology and ranked using pair, wise ranking, and

Matrix ranking.

Data Analysis Quantitative information was summarized utilizing straightforward, clear insights (mean, frequency, and percentage), whereas the subjective information collected utilizing gathered discourse, field perception, and verbal histories was analyzed utilizing story clarification. At last, information from diverse sources was triangulated to urge solid data.

RESULTS AND DISCUSSIONS

Training Farmers and Other Interested Parties

Multi-disciplinary researchers group; The Agricultural Mechanization and Extension research team and other stakeholders actively participated in the theoretical and practical focus training by sharing their involvement and information on haymaking.

Table 2: Type of stakeholders and number of participants during the training

S/NO.	Stakeholders	Gursum		
		Men	women	Total
1	Agro pastoralist	15	5	20
2	Agricultural experts	4	-	4
	Total	19	5	24

Stakeholders among the training participants, 80% were Agro-pastoralists. Of those, 14.3% are female agro-pastoralist participants. During the preparation, diverse questions, suppositions, and recommendations were raised and responded to by the concerned bodies. Most

agro-pastoralists/farmers appeared tall and intrigued by the innovation. Subsequently, all concerned bodies shared their duty for long-term intercession and more extensive reach of the innovation.

Table 3: The performance of indicator of hay baller machine

Performance Indicators	Machine Specification
Machine Function	Used in Baling different types of grass for Livestock folder.
Power Requirement	Manual (Operated by 1 person)
Capacity	15-20kg per baled (180kg/hr)
Weight	75kg
Remark	The machine includes two wheels

Agropastoralist Views and Attitudes

The views and attitudes of agro-pastoralists on the hay baller machine Execution data were collected from members amid the machine show. The major criteria utilized by ranchers were the machine's roughage baling

capacity, baling proficiency, minimizing human effort/tiredness, and decreased time of roughage baling. Consequently, the majority of agro-pastoralists favored the improved hay-balling machine over traditional methods.

Table 4: Ranks of the varieties based on farmers’ selection criteria.

Implements	Agro-pastoralist/ farmers rank	Reasons
Improved hay baller machine	1 st	Minimize feed loss, conserve its nutrients, Simplify the preparation, storage, and transportation processes. of feed rations.
Traditional haymaking	2 nd	Feed loss; maintains low nutrient content, is not convenient in transporting and storing, is labor intensive, and time of time taking.

Table 5: A pairwise ranking matrix is used to rank some characteristics.

Code no.	Traits	Hay baling capacity	Balling Efficiency	Reduce labor	Minimize Effort/ tiredness	Reduce time of baling	Frequency	Rank
1	Hay baling capacity		2	1	1	1	4	2 nd
2	Balling efficiency			2	2	5	5	1 st
3	Reduce labor				3	2	2	4 th
4	Minimize human ffort/ tiredness					5	1	5 th
5	Reduce time of baling						3	3 rd

Based on the result of pair-wise ranking matrix the agro-pastoralist/ farmers highly preferred the hay baller with high hay baller efficacy.

minimal running costs. The machine can quickly pay for itself with the savings it generates from use.

RESULTS AND DISCUSSION

The demonstration of the hay baller machine reduces human labor with the process. The machine has a great future scope for farmers due to its ease of use and cost-effectiveness. The main advantage is its time savings and

CONCLUSION

Livestock feed preparation is one of the main operations for pastoral and agro-pastoral communities. Farmers learned the value of baling hay through the instruction and demonstration of the mechanical hay-balling machine. They claimed that using these devices would



Figure 2: Practical Training of the Participant of the study



Figure 3: Performance evaluation of the Hay Baler Machine at on-farm level

enable them to minimize feed loss and conserve the feed nutrients that can be stored and used for dry periods. The traditional feed loss keeps nutrients low and is inconvenient to transport and store., is labor-intensive, and time of time time-consuming. Thus, considering the farmer's and agro-pastoralist concept and the significance of this technology the following suggestions were drawn:

- Gaining popularity and expanding technology is significant.
- For subsequent promotion, capacity building (training) can be necessary.

More work needs to be done to make the technology available, distribute it, and demonstrate it. Future research may call for technology in several fields to reduce post-harvest losses and boost animal feed output and

production.

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