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### Participatory scaling-up demonstration of improved Rhodes grass forage with full package in low land area of South Omo Zone, Southern Ethiopia

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#### Abstract

Participatory popularization and pre-scaling up of Rhodes grass production technology was undertaken in agro-pastoralist area under irrigated condition in Dassenech woreda of South Omo Zone during 2018/19 cropping season. Agro-pastoralists research and extension group (PREG) formation, participant agro-pastorals selection and provision of training were undertaken prior to the implementation of actual demonstration of the activity. Land preparation, sowing and overall agronomic management practices were undertaken based on the agronomic recommendation. All activities of Rhodes grass sowing and management were undertaken by participant agro-pastoralists and the members of PREG with frequent monitoring and follow up of researchers jointly with key stakeholders. Participatory on-farm field performance evaluation and organization of field visit were undertaken to

collect agro-pastoralists' feedbacks and perception towards the Rhodes grass technology. The participant agro-pastoralists were preferred the improved Rhodes grass species for its being highly preferred by animals and good field performance of fresh biomass yield, repeated harvest, ease to establishment, early maturity and disease/pest resistance attributes in the area. Biomass data was also collected to estimate the contribution of fresh biomass yield to the dry matter requirement and supplements of feed for animals in the area. Besides, the average fresh biomass yield of 51.25 t/ha was obtained. Therefore, further disseminating and popularizing technology to agro-pastorals/ pastorals would have visible contribution to improve natural pasture through cut and carry system by reducing frequency to grazing.

**Keywords:** Biomass Yield, Demonstration, Popularization, Pre-Scaling

#### Introduction

Livestock perform multiple functions in the Ethiopian economy by providing food, input for crop production and soil fertility management, income source as well as promoting saving, fuel, social functions, and employment. Livestock sector contributes 15 to 17% of GDP and 35 to 49% of agricultural GDP and 37 to 87% of the household incomes<sup>[1]</sup>. However, compared to the potential the contribution of the sector to the country's economy is still disproportionately low due to shortage of feed in terms of quality and quantity as one of the major constraints<sup>[2]</sup>. Different reports showed some variation on the contribution of different feed resources, the major feed resources of the country include natural grazing land (58.67%), crop residues (29.19%), hay (7.35%), industrial bi-products (0.81%), improved forages (0.25%) while other sources contribute 3.71%<sup>[3]</sup>. Shortcomings in feed availability and quality are two of the major factors limiting livestock productivity in Ethiopia. Some feed related constraints include: reduced grazing pasturelands, overstocking, seasonal variation in availability of roughage feeds, poor nutritional quality of forage, low quality of crop residues and its use for other purposes, limited availability and unaffordability of concentrate feeds, low adoption of improved forages and low adoption of silage and hay making practice at smallholder agro-pastorals and pastorals level<sup>[4]</sup>. Similarly, livestock feeding practice in the lowland area of debub Omo Zone is characterized by free grazing and lack of skill on feed conservation and lack of awareness on concentrate supplementation to their livestock. Besides of this fact, the number of livestock and the available feed resources do not match to support profitability from livestock production, which suggest that the primary focus needs improving the existing feed resources through rehabilitation of degraded grazing areas, introduction of adaptable and high yielding fodder species, improving feed utilization practices and introduce feed improvement and conservation technologies<sup>[5]</sup>. Therefore, this pre-scaling up demonstration activity was carried out to popularize the best adapted improved forage grass (Rhodes) in the area.

## Methodology

### Description of study area

The lowland area of South Omo Pastoral Livelihood Zone is distinguished by its semi-arid nature of the climate, with low and erratic annual rainfall and warm temperatures. Temperature ranges from 16°C in the coolest months of the year (April – early June) to 35.5°C in the hottest months (January – late March). The soils are predominantly sandy type in the valley basin.

The contribution of livestock and livestock products (milk, butter, meat, and blood), to the improvement of livelihoods of household in the pastoral area is higher as compared to mixed crop-livestock farming communities. The number of livestock owned by individual household affects the level of crop production. As the livestock number increases much of the family member involved in herding hence, time spent for crop production reduced. In the area those who involved in crop production are considered as poor. Most common crops grown in the area include Sorghum, maize and haricot bean.

### Site and Pastorals/agro-pastorals Selection

Cluster based Popularization and scaling up of improved forage grass (Rhodes) was demonstrated in Dassenech woredas. One kebele was selected purposively based on access to irrigation water and high potential to livestock production. About 14 males and 11 female participants were selected due to their accessibility to irrigation facilities of farmland by participating all women and youth in the cluster. The selection of participant agro-pastorals and host kebele were undertaken by active participation of Jinka agricultural research center (JARCO researchers jointly with the Zonal and perspective woreda and kebele' agricultural experts.

### Demonstration design

The demonstration of improved Rhodes grass species was conducted on one hector of farmland. The recommended seed rate of 5 kg/ha and 60 cm spacing between rows were applied during sowing and by drilling in the row.

### Approaches followed

#### Land preparation and plantation

Land preparation was operated by hand digging using shovel and other locally available digging tools. Pertaining to implementation of scaling-up demonstration of improved Rhodes grass technology, about four participatory pastoral groups were organized to enable active participation and develop group working culture of participant pastorals in the area. Five to seven members were participated in each group based on their willingness to participate and having clustered farmland with group members. The amount of land allocated for planting by individual varies depending on the farmland owned. In the cluster team prepares the land by group and /or by team; after land preparation seeds were distributed to all participant pastoralists according to farmland size they have contributed. Frequent follow up was conducted by PED and agronomy researchers from JARC

and kebele's DAs during implementation.

### Training

Prior to implementation, training was provided to participant pastoralists, members of PREG and DAs and administrators of the respective kebele to enhance awareness and skills towards improved forage (Rhodes) production technology and their associated management practices. Totally, 24 pastorals, 2 DAs and 2 administrators of the kebeles were participated on training.

### Field visit and group discussion

Field visit is one of the extension events which were organized in collaboration with kebele level administrators and agricultural development agents. The extension event was organized to enable experience sharing and to evaluate field performance of improved Rhodes grass species among participant and non-participant households during demonstration process. Group discussion was undertaken to enable pastorals to give feedback and express their opinion towards important attributes of improved forage (Rhodes) grass technology. Accordingly, about 35 pastorals, 2 development agents and 2 administrators of the kebele were participated during field visit and group discussion.

### Type of data and method of data collection

Both perception and biomass data were collected. Perception data was collected from twenty-three randomly selected households who participated on field visit. Whereas fresh biomass data was collected by taking 2m X 2m plot size sample from demonstration fields of ten randomly selected participants. Participant Pastorals'/agro-pastorals' perception, lessons learned and feedback towards important attributes of improved Rhodes grass technology were collected from two group discussions. The organization of groups were based on pastoralists' participation on improved forage technology demonstration and each group consists of seven to nine different categories of social members such as; elders, women and youths pastorals.

### Method of data analysis

Quantitative data such as perception data and fresh biomass yield data were analyzed using simple descriptive statistics (percentage, mean and maximum and minimum) and pair wise ranking matrix was used by SPSS V.20. Furthermore, all important feedbacks/ opinions and lessons learned were summarized qualitatively.

## Results and discussions

### Training

Trainings were provided to participant/host agro-pastorals, PREGs members and DAs to improve practical skill and knowledge, and enhance awareness on the improved Rhodes grass technology through enabling them to participantin groups while implementing the demonstration activities in the kebele. Totally, 24 agro-pastorals, 2 DAs and 2 administrators of the kebeles were participated on training.

**Table 1:** Participants on Rhodes technology training

R/n	Training participants	Numbers of participants on training		
		Male	Female	Total
1	Agro-pastorals	14	11	25
2	Das	1	1	2
4	Administrators	1	1	2
	Total	16	13	29



**Fig 1:** Shows pictures taken during conducting on-farm training and land preparation in Dassenech district

**Field visit**

Field visit is one of the extension events used to disseminate agricultural information and hasten the diffusion of technology adoption. It was organized at crop maturity stage in lobet kebele demonstration site. Accordingly, a total of 27

males and 13 women participant pastoralists, DAs and kebele administrators were participated and had got awareness on the technology through discussion, experience sharing and visiting field performances of grass on demonstration fields of farmers.

**Table 2:** Participants on field visit of the technology

R/n	Field participants	Numbers of field participants		
		Male	Female	Total
1	Agro-pastoralists	24	11	35
2	DAs and Administrators of kebele	2	2	4
3	Experts	1	-	1
	Total	27	13	40



**Fig 2:** Shows photos taken during field visit in lobet Kebele demonstration field

**Selection of Pastoralists’ variety selection criteria**

A group discussion was undertaken with pastoralists to collect their perception on forage grass production technology in the area. Accordingly, pastoralist wanted the improved forage production technologies should fulfill attributes of early maturity, long plant height, high biomass yield, palatability, repeated frequency of harvest, resistance to moisture stress and ease to be established. Pairwise

ranking result showed that the improved forage technologies should primarily met the criteria of tolerant of moisture stress and high biomass yields and palatability was next most important one. Plant height, seed yield, ease of establishment, frequency of harvest per year and early maturity were highly important characteristics of forage technology identified during group discussion held in the area as showed in the table 3 below.

**Table 3:** Matrix ranking pastoralist perception on improved forage technology

Rhodes Technology characteristic	A	B	C	D	E	F	G	H	T.score	Rank
A Early maturity	*	B	C	D	A	F	G	H	1	5 <sup>th</sup>
B Plant height		*	C	D	E	B	B	H	3	3 <sup>th</sup>
C Biomass yield			*	C	C	F	C	C	6	1 <sup>nd</sup>
D Animal preference				*	D	F	D	D	5	2 <sup>nd</sup>
E Repeated harvest (no. of harv/yr)					*	F	G	E	2	4 <sup>th</sup>
F Resistance to moisture stress						*	F	F	6	1 <sup>rd</sup>
G Seed yield							*	G	2	4 <sup>th</sup>
H Ease of establishment								*	2	4 <sup>th</sup>

### Pastorals' perception on field performance of Rhodes Grass Technology

Perception data was collected from pastorals who were invited to visit and evaluate field performance of improved Rhodes grass species right in the demonstration field. About 35 Agro-pastoralists participated in field visit and 40% of the participants were female. Accordingly, pastoralist perception data was collected from 23 randomly selected participants who participated in field visit. The perception of households on Rhodes grass indicated below in table 4, With regard to disease/pest resistance and animal preference characteristics, all respondent pastoralists' perceived Rhodes

grass species as very good. Similarly, about 95.7% of the respondent pastoralists perceived Rhodes grass species as very good in terms of its early maturity and fresh biomass yield. On the other hand, about 91.3%, 78.3%, 73.9%, and 69.6% respondents perceived parameters like numbers of harvest per year, field performance of plant height, yield performance and ease to establishment attributes of the technology as performed very good in the vicinity. About 69.9% of the respondent pastorals were perceived resistance to moisture stress attributes of the demonstrated technology at satisfactory level.

**Table 4:** Summary of pastoralists' perception towards Rhodes grass species

Characteristics of variety	Rate of scale (1= poor, 2=Satisfactory, 3= very good)					
	Very good		Satisfactory		Poor	
	N	%	N	%	N	%
Early maturity	22	95.7	1	4.3	0	0
Plant height	18	78.3	5	21.7	0	0
Plant biomass	22	95.7	1	4.3	0	0
Animal preference	23	100	0	0.0	0	0
Repeated harvest	21	91.3	2	8.7	0	0
Resistance to moisture stress	7	30.4	16	69.6	0	0
Seed yield	17	73.9	6	26.1	0	0
Disease and pest resistance	23	100	0	0.0	0	0
Ease to establishment	16	69.6	7	30.4	0	0

### Fresh biomass yield

Biomass yield is one of the most important selection criteria for forages growing in the pastorals area. During group discussion pastoralists reported that growing forage in wider area of land is highly challenging due to lack/shortage of irrigation facilities, shortage of water in dry season and frequent occurrences of drought in the area. They also perceived that growing high biomass yielding forage species is highly advantageous to supplement their animals in small plot of land. Pertaining to biomass yield, herbage biomass was cut from 2m X 2m plot size of sample from five randomly selected pastorals' fields of demonstration when the grass component reaches 50% and above flowering stage. The weight of the total fresh biomass yield was recorded from each plot in the field. Therefore, the result of this study shown that the average fresh biomass yield of 51.25 t/ha was recorded, whereas the minimum and maximum weight of the improved Rhodes grass fresh biomass yields were 45 t/ha and 62.5 t/ha respectively in the area.

### Challenges faced

Different challenges were encountered during the course of pre-scaling up demonstration of improved forage (Rhodes) technology. Conducting timely follow up and feed backs collection from kebele' stakeholders was constrained due to a frequent mobility turnover of development agents (DAs), Similarly, lack of sufficient amount of irrigation facilities (especially shortage of water pump and fuel) and irregular distribution of existing irrigation water were the major constraints which affected the potential forage demonstrated in the field of some pastoralists.

### Feedbacks given

During the final stage of the pre-scaling up demonstration, an assessment was done to know how the pastorals perceived the technology. The result of assessment revealed

that Rhodes grass species was accepted by pastoralists mainly due to its high biomass yield, high animal preference and also repetitive harvest (possibility of harvest about 5 to 7 time in a year depending on access to water).

### Lessons learned

Cluster based technology demonstration was found to be efficient and effective approach in disseminating and popularization of improved forage (Rhodes) grass technology in the area. Use of participatory pastoralists group was found to be effective in improving implementation of the technology demonstrated in the area.

### Summary and suggestion forward

Based on the result of participatory evaluation, the field performance of improved Rhodes grass species was highly performed under irrigation in agro-pastoralists management practices. The participant agro pastoralists preferred the improved Rhodes grass species because of its high animal preference good field performance, repetitive harvest, ease to establishment, early maturity and disease/pest resistance attributes. Therefore, disseminating the improved forage (Rhodes) grass technology to agro pastorals/ pastorals would minimize pressure on communal grazing trough cut and carry approach.

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### References

1. Birara Endalew, Zemen Ayalew. Review paper on Assessment of the Role of Livestock in Ethiopia, 2016.
2. Legesse G, Abebe G, Siegmund-Schultze M, Valle

- Za'Rate A. Small Ruminant Production in Two Mixed-Farming Systems of Southern Ethiopia: Status and Prospects for Improvement. *Experimental Agriculture*. 2008; 44.
3. CSA (Central Statistical Agency). Agricultural Sample Survey, 2010/11(2003 E.C). Report on Livestock and Livestock Characteristics, Vol. II (Accessed February, 2011), Addis Ababa, Ethiopia, 2011.
  4. Alemayehu A. Smallholder dairy production in mixed farming systems of Southern Ethiopia: Constraints and opportunities. M.Sc. Thesis. Wageningen University and Research Center, Wageningen, 2012.
  5. Hidosa D, Tesfaye Y. Assessment Study on Livestock Feed Resource, Feed Availability and Production Constraints in Maale Woreda in South Omo Zone. *J Fisheries Livest*. Jinka Agricultural Research Center, Jinka, Ethiopia, 2018.