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Pre Extension Demonstration of Improved Desho Grasses at Highland Districts of Guji Zone, Southern Oromia, Ethiopia

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Abstract: Food and feed is the most aspect in agricultural sector. Potential land is covered by crop production to feed the increasing human population. Hence, for livestock production feed production is challenging to be solved at farm level. Therefore, balancing the available land for crop and livestock production is critical as the land is fixed resource. This could be achieved by demonstrating year round forage production on small area. This activity was conducted at highland districts of Guji zone to evaluate biomass yield of Desho grasses and to enhance the knowledge and skills of farmers on production of Desho grass. Areka DZF № #590 and Kindo Kosha DZF № #591 desho grasses were planted on 5m×10m with the recommended packages. Knowledge and skills of farmers were taken before and after demonstration. Training and mini field day was organized. Cutting and carry system was used to feed livestock. Measurement, observation and interview were used to collect the data. Plot cover, plant height regeneration and fresh biomass were collected. 17 Knowledge and skills questions were prepared and interviewed to 18 farmers before and after demonstration. Descriptive and t tests were used to analysis the data. The result of descriptive showed that Kindo Kosha DZF № #591 variety had more plot cover (88.47%) than Areka DZF № #590 variety (85.76%). As desho grass is annual forage and regeneration trait was important for livestock feed. Kindo Kosha DZF № #591 variety also provide high in regeneration capacity (85%) than Areka DZF № #590 (83%). More fresh biomass was obtained from Kindo Kosha DZF № #591 (49.78t/ha) than Areka DZF № #590 (47.59t/ha). The result of paired sample test showed that there was a mean significance difference in knowledge and skills before and after on demonstration of desho grasses at 0.001 level. Knowledge and skills of farmers were increased by trainings and field days organized on desho grass demonstration. Both desho grasses were identified and preferred for livestock feed by experimental farmers. Desho grasses were important as feed, soil erosion control and as income generating. Therefore, it is better to pre scaled up these desho grasses at highland areas of Guji zone. To know more advantage of desho grass as livestock feed further research is needed on the effect of desho grass on milk and meat production at the study areas.

Keywords: Desho Grass, Demonstration, Guji, Areka, Kindo Kosha

1. Introduction

Ethiopian livestock populations have been reported as 70.3 million cattle, 52.5 million goats, 42.9 million sheep and 8.1 million camels [1]. Natural pasture based feed supply, inadequate and generally of poor quality in Ethiopia, especially in the dry season, has been predominantly responsible for the low productivity of livestock in crop livestock farming systems [2]. Improved feed production is required to support climate resilient agriculture, reduce greenhouse gas emission and increase livestock productivity in these agricultural systems [3].

In Ethiopia, the livestock sub-sector has significant contributions to the national income [4] and the livelihoods of households. However, livestock productivity is very low attributable to different factors of which poor nutrition is the

major one. The livestock production is constrained by feed shortage in terms of both quantity and quality [5]. On the other hand, the demand for livestock products by consumers in country projected at accelerate rate and it is difficult to satisfy the demand of consumer under such conditions unless urgent measure will be taken [6]. Among the recommended mitigation strategies of feed shortage in the country is the utilization of indigenous adaptable multi-purpose fodder species such as Desho grass [7].

Guji zone is well known by potential of livestock production but there was lack of improved forage species due to lack of demonstration and multiplication of forage varieties in the zone. The sustainable option to solve lack of forage varieties was adapting forage varieties followed by demonstration and scaling up of best forage varieties [8]. Now a day potential land was covered by crop production which is expected to feed ever increasing human population. Most demonstration activities and production is covered by crop than forage. Only small and non-fertile lands left as a livestock feed. This led to shortage of feed for livestock seasonally. Shortage of feed led to low product of livestock (meat and milk). In addition, livestock cannot survive unless they get sufficient feed throughout the year. Therefore, balancing land for crop and livestock production is a mandatory. This will be attained in the form demonstrating improved forage grass like desho grass on farmers' land. This demonstration can help farmers in providing desho grasses for their livestock and maximize livestock products. The specific objectives this study was to evaluate biomass yield of Desho grass under farmers' condition, to enhance the knowledge and skills of farmers on production of Desho grass and to identify farmers' preference on production of Desho grasses.

2. Research Methodology

2.1. Description of the Study Areas

Bore and Ana Sora were the most highland districts of Guji zone. Bore and Ana Sora was situated at a distance of 385 KM and 410 KM from Addis Ababa to the South respectively. The districts have similar agro ecology where diverse crops such as bread wheat, food barley, horticultural crops (mostly potato, enset, garlic and head cabbage) and highland pulse crops (faba bean and field pea) were largely produced in each district. These districts are also known for rearing of livestock. Rural women sold of milk to near town to enhance their livelihood. White honey is produced each district from natural vegetation found in their district [9, 10]. Natural pasture is the most feeding livestock in both districts.

2.2. Experimental Farmers' Selection

Demonstration of improved desho grasses were done at Bore and Ana Sora districts. Five kebeles (three from Bore and two from Ana Sora district) were selected. During 2020 year 12 experimental farmers and six experimental farmers were selected in 2021/2022 year. Experimental farmers were selected based on their interest grow desho grasses.

2.3. Materials and Methods

For the demonstration, Areka DZF № #590 and Kindo Kosha DZF № #591 desho grasses were used. Two plant tillers were planted in hole in row of 30cm and 10cm between tillers. 100kg/ha of NPS was applied at planting and 50 kg/ha of UREA was applied after establishment of tillers. The grasses were planted on the area of 5m×10m. Prior to demonstration the selected experimental farmers were asked some questions to understand their prior knowledge and skills on desho grass production. After test, training on desho production was given for farmers. At vegetative stage field day was organized to create demand on desho grasses. At the last, the prepared question was re asked to experimental farmers in order to understand the impact of demonstration on knowledge and skills of farmers on desho grass production. Hand weeding and hoeing was done by experimental farmers (household members). Based on availability of moisture desho grasses were harvested three times in the year. Cutting and carry system was used to feed the livestock (sheep and cattle).

2.4. Methods of Data Collection and Analysis

Measurement, observation and interview were used to collect the data. Plot cover, plant height regeneration and fresh biomass were collected with collaboration of experimental farmers and researchers. These data were taken three times and the mean was used for data analysis purpose. Fresh biomass was taken from $1m^2$ quadrant on random plot area and the result was converted hectare and ton. Randomly, five plant heights were collected and the mean of these randomly taken heights was used for analysis of the data. Knowledge and skills test (17 questions) was prepared on desho grasses production. Interview on questions regarding desho grass production was conducted before and after demonstration. Descriptive statistics and paired sample test was used to analysis the data. Independent t test also employed to test desho grass traits among the varieties.

3. Results and Discussion

3.1. Performance of Demonstrated Varieties

From the demonstrated varieties Areka DZF № #590 variety had higher height (51cm) than Kindo Kosha DZF № #591 variety. One of important trait of desho grass is height which could increase the volume of feeds for livestock because desho grass can be chopped to different size. The larger in heights of grasses the more availability of feeds. Depending on covering of the space Kindo Kosha DZF № #591 variety (88.47%) had more plot cover than Areka DZF № #590 variety (85.76%). The result of this demonstration was in line with the study of [11] who mentioned that Kindo Kosha DZF № #591 had more plot cover than Areka DZF № #590. Their finding also indicated that Areka DZF № #590 variety had more height than Kindo Kosha DZF № #591 like the current demonstration. One aspect of desho grass was covering the land and as much as high number of tillers on the plot. Kindo Kosha DZF №

#591 variety also provide also high in regeneration capacity (85%) than Areka DZF № #590 (83%). As desho grass is annual forage and regeneration trait important was for livestock feed. The ability to regenerate after harvest can determine the amount of desho grass used for livestock. The more regenerate the more volume of feed throughout the year. More fresh biomass was obtained from Kindo Kosha DZF № #591 (49.78t/ha) than Areka DZF № #590 (47.59t/ha) (Table 1). The result of this demonstration was contrary to results of Teshale *et.,* 2021 (Areka DZF № #590 variety with 41.5 t/ha and Kindo Kosha DZF № #591 variety 36t/ha) and [12] who indicated Areka DZF № #590 variety gave more fresh biomass than Kindo Kosha DZF № #591. Variation in fresh biomass could be due to variation in management and soil. However, the result this demonstration was in line with the results of [13] whose finding indicated Kindo Kosha DZF № #591 variety generated good fresh biomass than Areka DZF № #590 variety.

Despite numerical variation of Kindo Kosha DZF № #591 and Areka DZF № #590 in plot cover, plant height, regeneration and fresh biomass at the study area there was no statistical significance difference between the two varieties. The result of independent t test showed that there was no statistical significance difference between plot cover, plant height, regeneration capacity and fresh biomass of Areka DZF № #590 and Kindo Kosha DZF № #591 variety (Table 2). This indicated that farmers can use either Areka DZF № #591 or Kindo Kosha DZF № #591 variety for livestock feeding at the study areas.

Table 1. *Performance of demonstrated desho grasses.*

Variety demonstrated	Data collected	N	Mean	Std. Deviation
Areka DZF № #590	Plot cover in %	18	85.76	7.570
	Height in cm	18	51.28	7.934
	Regeneration in %	18	83.57	6.122
	Fresh biomass yield (t/ha)	18	47.59	7.093
Kindo Kosha DZF №#591	Plot cover in %	18	88.47	6.813
	Height in cm	18	50.81	7.014
	Regeneration in %	18	85.11	4.772
	Fresh biomass yield (t/ha)	18	49.78	10.811

Table 2. *Independent t test on desho grass traits.*

Desho grass traits		t-test for Equality of Means			
		t	df	Sig. (2-tailed)	Mean Difference
Plot cover	Equal variances assumed	-1.129	34	.267	-2.709
	Equal variances not assumed	-1.129	33.629	.267	-2.709
Plant height	Equal variances assumed	.185	34	.854	.462
	Equal variances not assumed	.185	33.496	.854	.462
Regeneration capacity	Equal variances assumed	-.840	34	.407	-1.536
	Equal variances not assumed	-.840	32.086	.407	-1.536
Fresh biomass	Equal variances assumed	-.719	34	.477	-2.191
	Equal variances not assumed	-.719	29.348	.478	-2.191

3.2. Knowledge and Skills of Farmers on Desho Grass Production

Agricultural extension system is not merely technology transfer but also knowledge and skills of farmers on the production of recommended technology should be improved in order to sustain the use of technology in their farming system. This knowledge and skills is mainly improved by training, advising and showing the technology to the farmers on the field. In this activity training was used as knowledge and skill improvement extension method. Two times training of farmers was conducted on desho grass production. Mini field day was also organized to create demand and important information (importance of desho grass and way of production) was delivered during the event. Training and mini field day enhanced farmers' knowledge and skills on desho grass production.

Table 3. *Number of participants on training and mini field day on desho grass demonstration.*

Extension method used	Participants	Numbers of participants by sex		
		Male	Female	Total
Training	Farmers	83	37	120
	Development agents (DAs)	17	2	19
	Subject matter specialists (SMSs)	8	-	8
Mini field day	Farmers	94	19	113
	Development agents (DAs)	31	4	35
	Subject matter specialists (SMSs)	20	3	23
	Others	7	1	8

The result of paired sample test showed that there was a mean significance difference in knowledge and skills before and after on demonstration of desho grasses at 0.001 level (Table 4). This meant trainings given, field days, researchers'

follow up and monitoring on demonstration increased farmers' knowledge and skills on desho grass production. This result was similar to [14] who indicated that demonstration had improved knowledge and skills of beekeepers.

Table 4. *Knowledge and skills test result.*

NS	Test exam	Mean	N	Std. Dev	T	Df	Sig. (2-tailed)
1	Knowledge and skills after demonstration	10.00	18	2.18	-	-	-
2	Knowledge and skills before demonstration	2.89	18	.850	-	-	-
3	Knowledge and skills after demonstration - knowledge and skills before demonstration	7.11	18	1.71	17.63	17	.001

Female farmers obtained fresher biomass yield than the male farmers in both varieties. This could be due to females farmers well manage their backyard field than male experimental farmers. In addition, female experimental farmers harvested fresh biomass yield of Areka than Kindo Kosha variety. However, knowledge and skills' of female farmers before and after demonstration was less than their counter parts (Table 5). This showed that male farmers could easily understand the knowledge and skills needed for desho grass production due to their more social interaction with Development Agents and researchers.

Table 5. *Fresh biomass yield and knowledge and skills based on sex of farmers.*

Sex of experimental farmer		Fresh biomass yield of Areka (t/ha)	Fresh biomass yield of Kindo Kosha (t/ha)	Knowledge and skill before demonstration	Knowledge and skill after demonstration
	N	3	3	3	3
Female	Mean	52.20	51.20	2.67	8.67
	Std. Dev	6.58	3.06	.577	1.53
	N	15	15	15	15
Male	Mean	46.67	49.50	2.93	10.27
	Std. Dev	7.03	11.84	.904	2.23
	N	18	18	18	18
Total	Mean	47.59	49.78	2.89	10.00
	Std. Dev	7.09	10.81	.85	2.18

3.3. Farmers' Perception on Desho Grasses

Experimental farmers mentioned that both demonstrated desho grasses were nominated for further promotion due to their plot cover, good regeneration after harvest and fresh biomass yield. In addition, both varieties were palatable for livestock (mainly sheep and cattle) during wet and dry seasons. Areka DZF № #590 and Kindo Kosha DZF № #591 varieties of desho grasses were identified and preferred for livestock feed by experimental farmers. Farmers' mentioned that desho grass also used as soil erosion control. In the highlands there was high influence of erosion. Most land of highland areas of Guji affected by erosion. Demonstrated desho grass was effective to control soil erosion on the selected experimental farmers. Some farmers mentioned that desho grass is becoming income generating feed as the grass is sold for NGO and local farmers. The result of this study was similar with [15] who reported that Desho grass provides a small business opportunity for farmers and [7, 16, 17] Desho grass was used as feed and for soil conservation.

4. Summary, Conclusions and Recommendations

Land is a fixed production resource for farmers. The amount of land covered by crop and livestock production is not balanced as crop production takes the larger portion to feed the increasing human population. Though more land is covered by crop production there is food insecurity at many households. Food and feed is the most aspect in agricultural production. As far as crop production is needed the role of livestock as ploughing and threshing in crop production is unnoticed and quality and quantity of feed determine productivity of livestock. In addition, there is also high a demand of livestock products (mainly milk and meat) by rural and urban dwellers. Therefore, production of forages for livestock is important to get optimum livestock product. Due to lack of feed in quality and quantity many animals were not provided good livestock product. Furthermore, many animals were not survived from drought and diseases due to lack of feed. Hence, demonstration of forages at farm level is important to solve livestock feeds.

Pre extension demonstration was conducted on two improved desho grasses at highlands of Guji zone. Desho grass was mainly used as a livestock feed and soil erosion control which affected highland areas since there was high rainfall in the highlands of Guji zone. The result of demonstration showed that Areka DZF № #590 and Kindo Kosha DZF № #591 variety gave good fresh biomass throughout the year. Therefore, cutting and carry system is important to feed livestock at home (for fattening purpose or for sick animals). Areka DZF № #590 and Kindo Kosha DZF № #591 varieties were good at plot cover, plant height, regeneration and fresh biomass at highland of Guji zone. Therefore, they can to solve current feed shortage at highland areas. The production of Areka DZF № #590 and Kindo Kosha DZF № #591 has no statistical difference in plot cover,

plant height, regeneration and fresh biomass. Hence, farmers can use either Areka DZF № #590 or Kindo Kosha DZF № #591 variety for their livestock feeding. The result of knowledge and skill analysis showed that trainings and field day organized on demonstration had improved farmers knowledge and skills on desho grass production. Similar to crop production forage production needs effective trainings to sustain forage production at farm level. Knowledge and skills of farmers on forage production can be increased by trainings and field days. Experimental farmers liked Areka DZF № #590 and Kindo Kosha DZF № #591 varieties for their livestock feeding. Therefore, it is better to pre scaled up these desho grasses at highland areas of Guji zone. To know more advantage of desho grass as livestock feed further research is needed on the effect of desho grass on milk and meat production at the study areas.

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Appendix

Test of farmers' knowledge and skills on desho grass production
District _____ Name of farmer _____Sex ____Mark _____
Say true or false
1) Producing desho grass at highland area is difficult
2) Planting desho grass can solve feed shortage
3) Desho grass should be weeded
4) Desho grass is used to feed cattle during dry and wet seasons
5) NPS fertilizer is not needed at plantation
6) Backyard is a not suitable area for desho grass production

Explain the following questions
1) Mention three important advantages of desho grass
2) When you plant desho grass how many centimeters you should insert desho tiller into the soil?
3) During planting why the consideration for the depth of desho grass is important?
4) To obtain maximum biomass from desho grass what is the recommended space between rows?
5) When you plant desho grass what is the recommended space between tillers?
6) For early growth of desho grass how many tillers per hole can be planted?
7) At what height the desho grass should be harvested?
8) What is the problem if you did not harvest as soon as desho grass mature?
9) Describe two methods of desho grass of utilization
10) Once the desho grass is established, how many years it can stay on the land?
11) Name two of desho grass varieties

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