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Pre-Extension and Demonstration of Selected Forage Technologies for Small Holder Farmers in South West Ethiopia

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Abstract **– The study was conducted during 2016-2020 cropping season in selected districts namely Yeki, Shey-Bench and Meinit-Goldia, South west Ethiopia with proposed objective of pre-extension and demonstration of selected forage technologies like Desho, Elephant and Rhodes grass and also Stylosantus forage species. A total of 226 number of demonstrations were implemented the demonstration work after the training through lecture and field visiting and suppling of all forage species seed and root split materials. During the feasibility period of the project about 3743.6 ton dry matter forage yield were produced. In field days organized from three districts a total of 75 farmers, 16 kebele extension workers, 10 district and zonal level livestock experts and 4 researchers from Tepi Agricultural research Center were participated. Joint field visit and experience sharing with farmers, extension workers and researchers was done to hold method demonstration especially on forage production. This ad mine to give more works in perspective of extensions through DAs, experts and other stock holder nearby, need supporting in attention for production of improved forage species and breaking the priority by farmers this forage production habit like other food crops.**

Keywords **– Demonstration, Forage, Small-Holders.**

I. INTRODUCTION

Ethiopia has the largest cattle population in Africa that reaches about 39.9 million sheep, 50.5 million goats and 65.4 million heads of cattle. However, large livestock population [4], production and productivity is minimal. The average carcass weight for Ethiopian sheep reaches 10 kg it is lower than the values for neighboring countries [3]. This minimal productivity of animals results from poor feed resources available to all classes of animals which lead to under performance of the sector [10].

Livestock development in Ethiopia is due to limited by insufficient and low-quality feed sources and institutional factors (poor linkages between research centers and end users, limited extension and financial services [11]. However, the Ethiopian govern planed second Growth and Transformation Program (GTP II) has envisaged increasing by 2020 the productivity and total production of livestock through improving genetics and feed resources [12]. Livestock feed depends mainly on natural pastures and crop residues which are often limiting in quantity and nutritional quality [7].

The alleviation means of nutritional constraints, the use of improved forage species which are adaptable to the local agro-ecological conditions and used as feed resources are globally as well as locally recommended as they are adaptable with the smallholder farmers grown with low inputs [1]. Among improved and available multipurpose and potential feed resource in the country, Desho grass (*Pennisetum pedicullatum*) and elephant grass (*Pennisetum purpureum*) is the most appropriate one [5]. These have the potential to meet the challenges of feed scarcity as it not only provides more forage per unit area, but also ensures regular forage supply due to

its perennial nature. Both are a perennial grass and palatable to cattle, sheep and other herbivores [6]. Though some grass species is an excellent and widely used grass in southern and some other highland areas of Ethiopia as livestock feed, it was not yet introduced and used as animal feed. However, no efforts were made to introduce and utilized the potential of this grass at a large scale in most of the study area. Therefore, considering its potential to diffuse the technology at large scale pre scaling up of selected forage species production and utilization technologies were conducted to popularize to demonstrate and promote field production and utilization of selected forage crops.

II. Materials and Methods

2.1. *Study Area*

The study was conducted in three districts Shey-Bench and Menit-Goldiya from Bench-Maji zone and yeki from Sheka zones of South West Ethiopia. The study location; Shey-Bench ranged at latitude of $6^0$81′96″ N and $35^0$82′04″ longitude E, at altitude of 1420 m.a.s.l and Menit-Goldia located $6^0$77′48″ N latitude and $35^0$80′07″ E longitude at altitude of 1395 m.a.s.l and also Yeki district located $7^0$19′04″ N latitude and $35^0$35′44″ E longitude at altitude of 1180 m.a.s.l [8].

III. Results and Discussion

Selected participants were attained in training before the one set of production season and a total of 226 farmers were got the training. After the training was given each participants allowed to get all the forage seed and root split materials thus given by field evaluation through DAs nearby whether they are prepared the land for planting those forage species. Recommended fertilizer rate were used during demonstration whereas, not yet use fertilizer for forage species before our implementation. According to [2] even though using fertilizer for forage production but not respecting the recommendation rate. In field days organized from three districts a total of 75 farmers (12 female), 16 kebele extension workers (4 female), 10 district and zonal level livestock experts (3 female), and 4 researchers from Tepi Agricultural research Center were participated. Joint field visit and experience sharing with farmers, extension workers and researchers was done to hold method demonstration especially on forage production.

3.1. *Dry Matter Yield Production of Stylosantus*

The total dry matter yield produced in the demonstrated districtes was indicated in table 1 with respect to the year and Kebeles. Thus showed that from a total of 100 participants each of them cultivated 0.25 hectare area of land and gained around 311 ton dry matter yield of staylosantus species for their stocks.

Table 1. Dry matter yield of stylosanthus demonstrated in three districts.

District	Kebele	2016		2017		2018		2019		2020	
		NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)
Shey-Bench	Ziyagin	5	12.2	5	15.6	5	10.4	2	13.7	2	11.2
	Kuka	5	9.4	3	13.4	5	11.2	2	16.9	2	10.4
	Gay-shama	--	.0.0--	--	--	5	--	--	--	--	--
Menit goldiya	Dulkuba	5	15.9	5	16.7	5	13.8	--	--	--	--

District	Kebele	2016		2017		2018		2019		2020	
		NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)
	Shokach	5	14.2	4	16.2	5	11.2	--	--	--	--
yeki	Kubito	5	17.6	5	21.4	5	19.4	--	--	--	--
	Addis birhan	--	--	3	13.8	5	11.6	--	--	--	--
	Zinki	5	16.7	4	14.3	--	--	--	--	--	--
Total		30	86	29	95.2	35	77.6	2	30.6	4	21.6

NDM = number of demonstration, DM = Dry matter yield.

3.2. *Dry Matter Production of Rhodes Grass*

A total of 146 participants from three districts engaged to cultivate Rhodes grass (table2). Those number of demonstration produced 683.3 ton dry mater yield of rhodes grass with an average cultivated land of 0.50 hectare per participants in each production year. It is annual or perinial tropical and sub-tropical grass and the average yield is in the 10-16 t DM/ha range [9].

Table 2. Dry matter yield of Rhodes grass demonstrated in three districts.

District	Kebele	2016		2017		2018		2019		2020	
		NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)
Shey-Bench	Ziyagin	5	29.4	5	33.2	5	21.7	2	17.9	2	24.1
	Kuka	5	33.2	3	23.5	5	18.8	2	26.7	2	19.2
	keshta	--	--	5	16.9	4	18.6	3	19.4	3	22.4
	Gay-shama	--	--	4	16.3	5	22.4	--	--	--	--
Menit goldiya	Dulkuba	5	24.9	5	29.4	5	13.8	3	17.6	--	--
	shokach	5	27.2	4	21.4	5	27.1	4	19.2	--	--
yeki	kubito	5	28.6	5	31.4	--	--	--	--	--	--
	Addis birhan	--	--	3	13.8	5	11.6	--	--	--	--
	Zinki	5	33.7	4	23.8	4	27.3	--	--	--	--
Total		30	177	38	178.3	43	161.3	14	101	7	65.7

NDM = Number of demonstration, DM = Dry matter yield.

3.3. *Dry Matter Production of Desho Grass*

As indicated in table 3 the total number of demonstration for Desho grass were around 163 from three districts. These participants cultivated about 0.5 ha of land so that produced total dry matter yield was recorded about 939.3 ton with an average 5.8 ton dry matter yield per demonstration which could be 1 ton dry matter yield desho grass obtained per participants in each year. The average dry matter yield of desho grass during the project feasibility period produced about 11.5 t/ha which was some variation with the result 13.5 t/ha similar finding by [13]. This variation may be due to difference in agro - ecological and weather conditions of the study

locations and the variation in time and variety of the forage materials.

Table 3. Dry matter yield of Desho-grass demonstrated in three districts.

District	Kebele	2016		2017		2018		2019		2020	
		NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)	NDM	DMY (ton)
Shey-Bench	Ziyagin	5	21.6	5	26.2	5	20.7	5	19.7	5	23.4
	Kuka	5	36.2	3	29.3	5	35.7	2	26.7	2	29.2
	keshta	--	--	5	27.2	4	17.6	3	26.7	3	23.9
	Gay-shama	--	--	5	33.3	5	28.4	4	24.3	5	24.3
Menit goldiya	Dulkuba	5	24.9	5	29.4	5	13.8	3	17.6	--	--
	shokach	5	27.2	4	26.4	5	27.1	4	19.2	--	--
Yeki	kubito	5	31.6	5	31.4	--	--	--	--	--	--
	Addis birhan	--	--	3	13.8	5	11.6	--	--	--	--
	selam	7	33.4	7	38.2	6	31.1	--	--	--	--
	Zinki	5	33.7	4	26.8	4	27.3	--	--	--	--
Total		37	209	46	282	44	213.3	21	134	15	101

NDM = Number of demonstration, DMY = dry matter yield.

3.4. *Dry Matter Production of Elephant Grass*

Table 4 showed that number of demonstration in each year and dry matter yield for elephant grass produced. The total number of demonstration was 139 out of which around 1,718.7 ton dry matter yield elephant grass was produced during five years of visibility period of the project. Each demonstration cultivated around 0.5 hectare land in the feasibility periods.

Table 4. Dry matter yield of Elephant grass demonstrated in three districts.

District	Kebele	2016		2017		2018		2019		2020	
		NDM	DMY	NDM	DMY	NDM	DMY	NDM	DMY	NDM	DMY
Shey-Bench	Ziyagin	--	--	--		5	59.7	5	73.7	5	69.4
	Kuka	--	--	3	66.3	5	72.7	2	69.7	2	61.2
	keshta	--	--	5	65.2	4	49.6	3	61.7	3	53.9
	Gay-shama	--	--	5	56.3	5	64.4	4	55.3	5	67.3
Menit goldiya	Dulkuba	--	--	5	69.4	5	71.8	3	67.6	--	--
	shokach	--	--	4	67.4	5	54.1	4	69.2	--	--
Yeki	kubito	5	31.6	5	31.4	--	--	--	--	--	--
	Addis brhan	7	73.2	7	59.8	7	63.4				
	selam	--	--	3	13.8	5	11.6	--	--	--	--
	Zinki	5	33.7	4	26.8	4	27.3	--	--	--	--

District	Kebele	2016		2017		2018		2019		2020	
		NDM	DMY	NDM	DMY	NDM	DMY	NDM	DMY	NDM	DMY
Total		17	138.5	41	456.4	45	474.6	21	397.2	15	252

NDM = Number of demonstration, DMY = dry matter yield.

3.5. *Dry Matter Yield and Participants*

The total number of participants during the feasibility period of the project was around 226 and the total dry matter yield for all species was 3,743.6 tones (table 5). The higher number of demonstration was implemented for desho grass in Shey-Bench district followed by elephant grass in the same area with dry matter yield of 474.4 t/ha and 946.4 t/ha respectively. In other hand lower participants engaged for Stylosanthus spp in Menit-Goldiya. Thus might be due to the priority of interest by the participants.

Table 5. Participants and Dry matter yield of forages species across the districts.

District	Forage species	Number of Demonstration	DMY (t/ha)
Shey Bench	Stylosantus	41	124.6
	Rhodes grass	60	363.7
	Disho grass	76	474.4
	Napier/elephant grass	61	946.4
Menit Goldiya	Stylosantus	29	88.0
	Rhodes grass	36	181.0
	Disho grass	36	185.6
	Napier/elephant grass	36	399.5
Yeki	Stylosantus	32	114.0
	Rhodes grass	51	278.5
	Disho grass	51	215.9
	Napier/elephant grass	52	372.0
Total		226	3,743.6

DMY = Dry matter yield.

Fig. 1. Image of forage species from field of demonstration.

IV. Conclusion and Recommendations

Production and productivity of livestock were highly affected by the availability and production shortage of forage species in small holder farmers. Even though large number of livestock in Ethiopian the gain from the sector is still behind, the quality and quantity of feed produced. Demonstration work for such type of improved forage species were the pre-conditions for the sector.

The production strategies for such type of forage species were implemented and planted near by the road and around the compound which indicate that the priority for forage production by the farmer was still minimal. Even though, elephant grass was priory acceptance than other forage species due to higher production performance and short cutting intervals. A total of 226 number of demonstration produces about 3743.6 tone dry matters from four type of forage species were produced during the feasibility period of the project.

These recommended to scale up such improved forage species among the stock holders and more effort need in next implementation programs in terms of funding for training more number of farmers, and involvement of other stock holders like higher institutes and other governmental and non-governmental bodies need to suppling planting materials and seed and also policy makers give priority for this sectors to reach the technologies throughout small scale farmers in the country.

V. Conflict of Interest

The author declared no conflict of interest.

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