FARMERS' PREFERENCE FOR IMPROVED GRASSES AND LEGUME FORAGE SPECIES IN SIX MIXED FARMING SYSTEM DISTRICTS OF SOUTHERN REGION OF ETHIOPIA

Mergia Abera, Tekleyohannes Berhanu

Southern Agricultural Research Institute, PO Box 6, Hawassa, Ethiopia

E-mail: aberamergiya@yahoo.com

Participatory on-farm evaluation of improved forage crops was conducted in six mixed farming system districts of Southern Ethiopia with the objective to identify farmers preferred forage crops (legumes and grasses). Two annual forage legumes *(Vigna unguiculata L.* (cow pea) and *Lablab purpureus* (L.), two perennial legumes *(Medicago sativa (L.)* (alfalfa) and *Desmodium intortum* (Mill.) *Urb*. (green-leaf)), and three perennial grasses (*Chloris gayana Knuth* (Rhodes grass) and two *Pennisetum purpureum Schumach* (elephant grass) accessions (No.16800 and 16798)) were evaluated in the study. The major farmers' criteria considered in the evaluation of forage species were vegetative growth, herbage yield, tillering, protection of soil erosion, palatability, performance under dry weather conditions, performance in marginal area under low input management, multipurpose use (conservation and soil fertility) and fast growing condition. The study showed that elephant grass accession No. 16798, 16800 and *Chloris gayana* adapted well and farmers preferred them for their higher herbage yield, vegetative growth, tillering ability and drought resistance. Even though the annual forage legumes *Lablab purpureus* and *Vigna unguiculata* were superior in their forage yield, the farmers preferred the perennial forage legumes (*Desmodium intortum* and *Medicago sativa*) mainly for their performance under dry weather condition due to their longer growth period. Therefore, the consideration of farmers' preference for forage crops is crucial for increased adoption of improved forage crops in the region.

Keywords: adoption, forage crops, participatory evaluation.

DOI: 10.15407/agrisp4.02.023

Introduction

Livestock production plays a significant role in the livelihoods of households in rural areas of Ethiopia. However, its productivity is low with a low contribution to the national gross domestic product. The poor performance of the livestock sector in the country has been related to different reasons such as large livestock numbers, poor quality of breeds, insufficient amount of good quality feeds and seasonal variation in their availability, poor health of livestock and inadequate health services, inefficient management of livestock, poor infrastructure, poor marketing and credit facilities, inadequate knowledge of integrated mixed farming system and inability of the farmers to exploit this resource due to different priorities. Among the aforementioned problems, feed scarcity is the primary constraint to livestock productivity in crop livestock mixed farming systems (EEA 2006). Thus it is vital to address this constraint if improvements in livestock productivity are to be achieved.

The introduction and subsequent utilization of high yielding improved forage crops could solve the animal feed shortage problem in the country. Moreover, it has been reported that the introduction of forage crops (legumes) into mixed farming systems through intercropping with cereal increases farm income and reduces pressure on land resources (Kassie 2011). Thus far different forage species were identified for various agro-ecological zones of the southern region. However, the level of adoption and utilization of improved forage technologies is said to be minimal in the region (Zekarias 2016). The level of improved forage crops adoption can be accelerated through strengthening the extension and credit services (Hassen 2013) and through enabling farmers to obtain trainings on forage production and utilization, which could be achieved through demonstration or their participation starting from forage crop adaptation or selection (Zekarias 2016). Participatory principles provide farmers' views, their acceptance of the intervention and information on the compatibility of the intervention within the farming

system and an opportunity to further refine (Muhamad *et al* 2012). The current study was initiated with the objectives to evaluate and identify farmers' preferred forage crops for the mixed farming system districts of southern region of Ethiopia.

MATERIALS AND METHODS

The study was conducted under rain fed condition in six mixed farming system districts (Shebedino, Awassa Zurea, Amaro, Kochere, Derashe and Keddida-gamela) of Southern Region of Ethiopia. In Shebedino district the average annual rainfall is 900–1,100 mm and the temperature is between 18 and 25 ºC. Kocher is situated on an altitude of 1,900–2,100 m with annual rainfall of 1,750 mm. In Amaro district the elevation varies from 501 to 3,000 meters above sea level and the rainfall ranges from 801 to 1,000 mm while the average temperature ranges from 12 to 25 ºC. In Derashe the mean annual temperature and rainfall ranges from 15.1 to 27.5 ºC and 601 to 1600 mm, respectively. In Keddida gamela district altitudinal range is from 1,700 to 3,028 meters above sea level and the annual rainfall varies from 1,000 to 1,450 mm and the annual mean temperature is from 14 to 24 ºC. In Hawassa zuria district altitudinal and rainfall variation is 1,700 to 1,750 m and 1,000–1,200 mm, respectively.

Two annual forage legumes (*Vigna unguiculata L.* (cow pea) and *Lablab purpureus* (L.), two perennial legumes (*Medicago sativa (L.)* (alfalfa) and *Desmodium intortum* (Mill.) Urb. (green-leaf)) and three perennial grasses (*Chloris gayana Kunth* (Rhodess grass) and two *Pennisetum purpureum Schumach* (elephant grass) accessions (No.16800 and 16798)) were evaluated in the study. The forages were planted in each district in 1.5 m × 3 m = 4.5 m^2 plots in 4 replications (four farmers planted the same forage species in each district). The selection of farmers was done in collaboration with local extension personnel, by targeting farmers who are interested in forage production. The seed rate used was 15 kg/ha (for *Chloris gayana, Desmodium intortum, Medicago sativa)*, 30 kg/ha (for *Vigna unguiculata* and *Lablab purpureus*). Stem cutting was used for planting elephant grass accessions at a distance of intra and inter row spacing of 0.5 m and 1 m, respectively.

The trial farmers participated in all the processes of forage evaluations (starting from land preparation to harvesting). The information on farmers' perceptions on the forage crops was collected using ranking and scoring tools (preference ranking) with a group of 10–15 farmers in each district. The major farmers' criteria considered in the evaluation of forage species were vegetative growth, herbage yield, tillering, growing habit for protection of soil erosion, palatability, performance under dry weather condition, performance in marginal area under low input management, multipurpose use (conservation and soil fertility) and fast growing condition. The farmers have been demonstrated how to rank the criteria in order of importance using ranking cards numbered 1 to 7, where 7 signifies the highest preference and 1 the lowest.

RESULTS AND DISCUSSION

Dry matter yield performance of the grass and legume forage species varied in the six locations tested (Table 1). Dry matter yield of elephant grass accessions ranged from 5.6 to 21.1 t/ha. Among the forage legumes tested, *Lablab purpureus* was the highest yielder with a dry matter yield range of 4.5 to 20.1 t/ha. Amongst the locations, higher elephant grass yield was observed in Kochere, Amaro and Derashe. Farmers' ranking of the forage crops tested was given in Table 2 and the overall farmers' preference for the forage crops tested is presented in Fig. 1. Farmers gave the highest rank to elephant grass accessions due to their higher biomass yield, vegetative growth, tillering, suitability for protection of soil erosion, their good performance under dry weather condition, in marginal area under low input management and due to their suitability for multipurpose use (conservation and soil fertility).

Among the forage legumes tested, farmers gave the highest rank to the perennial forage legume *Desmodium intortum* mainly for its performance under dry weather condition (moisture stress) due to their longer growth period. Tewodros and Meseret (2013) in a participatory on farm forage evaluation trial reported higher farmers' preference for *Desmodium intortum* due to its vigorous growth and competitiveness against weeds compared to the other forage legumes. It has been reported that selection of forage crops by farmers depends on several factors, for example, Denbela *et al* (2015) reported disease and pest resistance as important criteria for the selection of forage legumes, especially in the lowland areas. The choice of forages and integration into farming systems also depended on land availability, soil erosion prevalence and livestock husbandry system (Paul et al 2016). In erosion prone sites most farmers plant grasses (on field edges and hedgerows) for erosion control (Paul et al 2016), some farmers prefer forage crops that are suitable for intercropping with food crops such as maize and cassava, due to land scarcity.

When land tenure was not secured and livestock was freely roaming, most farmers preferred to grow annual forage legumes instead of perennial grasses. Ba (2014) reported that the main factors that influenced farmers' choice of improved forage varieties were yield, palatability to cattle, and ease of establishment (by stem or tiller rather than seed). Therefore, the role of forage crops especially in the mixed-farming systems requires studying economic importance as related to farmers benefit, animal performance and the management of natural resources (Kebede *et al* 2016).
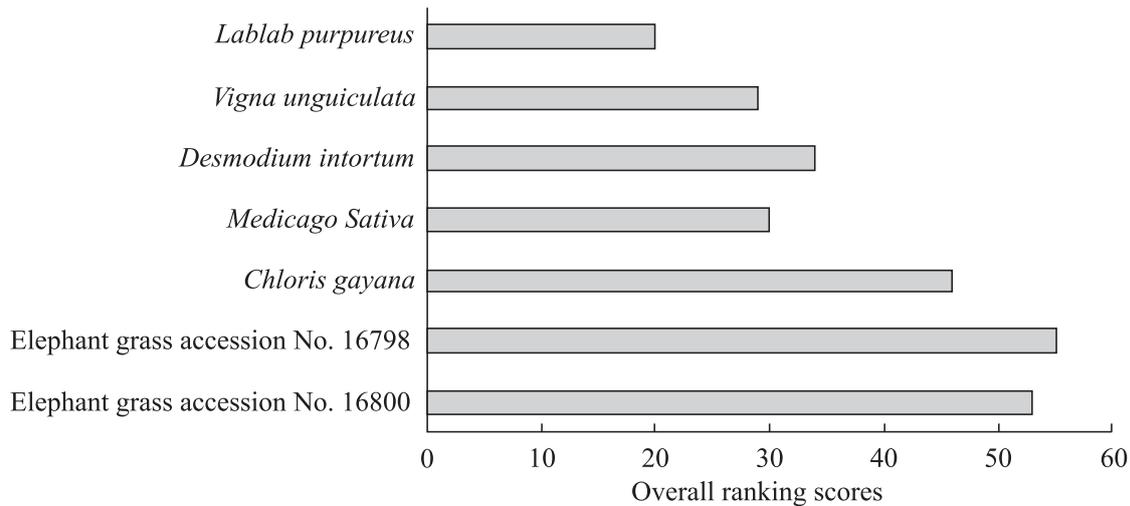
CONCLUSION

In mixed farming system of southern region elephant grass accession No. 16798, 16800 and *Chloris gayana* (Rhodes grass) were well adapted (with high forage yield). Farmers also preferred the grasses for their higher herbage yield, vegetative growth, tillering ability and performance under dry season. Even though the annual forage legumes *Lablab purpureus* and *Vigna unguiculata* (cow pea) were superior in their forage yield, the farmers preferred the perennial forage legumes (*Desmodium intortum* (green-leaf) and *Medica-*

Table 1. Dry matter yield t/ha of the forage legume and grass species tested in six mixed farming system districts of Southern Ethiopia

Forage species	Mean dry matter yield t/ha						Mean	Researcher's Rank	Farmers' Rank
	Shebedino	Hawassa Zurea	Kochere	Amaro	Derashe	Keddida gamela			
Elephant grass accession No. 16800	8.60	7.10	12.16	15.12	17.82	5.64	11.07	2	II
Elephant grass accession No. 16798	10.71	7.35	14.75	21.12	15.71	5.94	12.60	1	I
Chloris gayana	6.55	5.10	8.24	7.10	3.46	3.10	5.64	4	III
Medicago sativa	3.15	1.95	4.64	4.78	4.41	1.55	3.41	7	V
Desmodium intortum	3.86	5.15	4.90	6.02	3.34	2.00	4.21	6	IV
Vigna unguiculata	3.61	4.25	–	8.17	6.20	3.62	5.17	5	
Lablab purpureus	4.46	5.9	12.87	20.12	6.37	4.57	9.05	3	

Table 2. Farmers' ranking and criteria for selection of forage crops tested in six mixed farming system districts of southern Ethiopia (Best 7 and least preferred 1), the number of evaluating farmers – 90

Forage Species	Vegetative growth	Biomass yield	Tillering ability	Protecting soil erosion	Palatability (acceptability by cattle)	Performance in dry season	Performance in marginal areas	Role in soil fertility maintenance	Fast growth	Total score	Overall Performance (%)	Rank
Elephant grass accession No.16800	7	6	6	6	5	7	7	2	7	53	84.1	2nd
Elephant grass accession No. 16798	6	7	7	7	5	7	7	2	7	55	87.3	1st
Chloris gayana	5	4	5	5	6	6	6	3	6	46	73	3rd
Medicago Sativa	1	1	4	2	7	4	4	4	3	30	47.6	5th
Desmodium Intortum	2	2	3	4	4	5	5	5	4	34	53.9	4th
Vigna unguiculata	4	3	2	3	2	1	2	7	5	29	46	6th
Lablab purpureus	3	5	1	1	1	1	1	6	1	20	31.7	7th

Overal farmers' ranking scores for the forage crops tested (scores out of 9*7 = 63 points, higher score indicates higher preference

go sativa (alfalfa)) mainly for their performance in dry weather condition due to their extended growth period. Therefore, the consideration of farmers' preference for forage crops is crucial for increased adoption of improved forage crops in the region.

Вибір фермерів щодо удосконалених кормових сортів трав та бобових у шести районах зі змішаною системою землеробства в південному регіоні Ефіопії

Mergia Abera, Tekleyohannes Berhanu

У шести районах Південної Ефіопії зі змішаною системою землеробства було проведено колективну місцеву оцінку удосконалених кормових рослин з метою визначення того, яким кормовим рослинам (бобовим та травам) фермери віддають перевагу. У дослідженні було оцінено два сорти однорічних кормових бобових рослин (Vigna unguiculata L. (вігна) та Lablab purpureus (L.), два сорти багаторічних бобових рослин (Medicago sativa (L.) (люцерна) та Desmodium intortum (Mill.) Urb. (десмодіум кручений)), а також три сорти багаторічних трав (Chloris gayana Knuth (хлорис гаяна) і два зразки Pennisetum purpureum Schumach (слонова трава) (№16800 та №16798)). Основними показниками для оцінки фермерами кормових рослин були вегетативний розвиток, результати росту трав'яного покриву, кущіння, захист від ерозії ґрунтів, смакова привабливість, продуктивність в сухих погодних умовах, продуктивність на бокових полях з невисоким рівнем затрат, використання для багатьох цілей (зберігання та родючість ґрунтів) і умови швидкого росту. Дослідження продемонструвало хорошу адаптацію зразків слонової трави та Chloris gayana, яким фермери віддали перевагу за високі показники росту трав'яного покриву, вегетативний розвиток, здатність до кущіння та стійкість до посухи. Хоча однорічні кормові бобові Lablab purpureus та Vigna

unguiculata показали кращі показники урожаю кормових, фермери віддали перевагу багаторічним кормовим бобовим (Desmodium intortum та Medicago sativa), що здебільшого зумовлено їх продуктивністю у посушливих умовах завдяки довшому періоду росту. Таким чином, врахування вибору фермерів щодо кормових рослин є надзвичайно важливим для посиленого впровадження удосконалених кормових рослин у регіоні.

Ключові слова: запровадження, кормові рослини, колективна оцінка.

Выбор фермеров по усовершенствованных кормовых сортов трав и бобовых в шести районах со смешанной системой земледелия в южном регионе Эфиопии

Mergia Abera, Tekleyohannes Berhanu

В шести районах Южной Эфиопии со смешанной системой земледелия была проведена коллективная местная оценка усовершенствованных кормовых растений с целью определения того, каким кормовым растениям (бобовым и травам) фермеры отдают предпочтение. В исследовании были оценены два сорта однолетних кормовых бобовых растений (Vigna unguiculata L. (вигна) и Lablab purpureus (L.), два сорта многолетних бобовых растений (Medicago sativa (L.) (люцерна) и Desmodium intortum (Mill.) Urb. (десмодиум витой)), а также три сорта многолетних трав (Chloris gayana Knuth (хлористая Гайана) и два образца Pennisetum purpureum Schumach (слоновая трава) (№16800 и №16798)). Основными критериями при оценки фермерами кормовых растений были вегетативное развитие, рост травяного покрова, кущение, защита от эрозии почв, вкусовая привлекательность, засухоустойчивость, производительность на боковых полях с невысоким уровнем затрат, хранение, плодородие почв и условия для быст-

рого роста. Исследование показало хорошую адаптацию образцов слоновой травы и *Chloris gayana*, которым фермеры отдавали предпочтение за высокие показатели роста травяного покрова, вегетативное развитие, способность к кущению и устойчивость к засухе. Хотя однолетние кормовые бобовые *Lablab purpureus* и *Vigna unguiculata* показали лучшие результаты урожая кормовых, фермеры предпочли многолетние кормовые бобовые (*Desmodium intortum* и *Medicago sativa*), что в основном обусловлено их засухоустойчивостью, обусловленному длинным периодом роста. Таким образом, для усиленного внедрения усовершенствованных кормовых растений в регионе чрезвычайно важным является изучение предпочтений фермеров при выборе тех или иных растений.

Ключевые слова: введение, кормовые растения, коллективная оценка.

REFERENCES

1. *Ba NX, Van NH, Scandrett J, Vy LV, Tung HV, Nghi NT, Tuan DT, Lane P, Parsons D.* Improved forage varieties for smallholder cattle farmers in South Central Coastal Vietnam. *Livestock Research for Rural Development.* 2014;**26**(9).

2. *Denbela H, Bizuayehu A, Mesifin M.* Participatory On – Farm Evaluation and Demonstration of Improved Legume Forage Species in Benatsemay Woreda of South Omo Zone. *Journal of Biology, Agriculture and Healthcare.* 2015;**5**(21):127–31.

3. *EEA*(Ethiopian Economic Association/Ethiopian Economic Policy Research Institute). Evaluation of the Ethiopian Agricultural Extension with Emphasis on the Participatory Demonstration and Training Extension System (PADETES), Addis Ababa, Ethiopia. 2006.

4. *Hassen B.* Factors Affecting the Adoption and Intensity of Use of Improved Forages in North East Highlands of Ethiopia, *American Journal of Experimental Agriculture.* 2014;**4**(1):12–27.

5. *Kassie M.* Economic and Environmental Benefits of Forage Legume-Cereal Intercropping in the Mixed Farming System: A Case Study in West Gojam, Ethiopia, Addis Ababa, Ethiopia: EDRI. 2011.

6. *Kebede G, Assefa G, Feyissa F, Mengistu A.* Forage Legumes in Crop-Livestock Mixed Farming Systems – A Review. *International Journal of Livestock Research.* 2016;**6**(4):1–18.

7. *Muhammad ZA, M Azeem K, Ikram S, Akhtar A, Shafique Z, Abdul M.* Small Farmers perceptions regarding improved fodder and forage varieties: results of Participatory on farm research, *Pakistan J. Agric. Res.* 2012; **25**(4):295–306.

8. *Paul BK, Fabrice LM, Samy BB, Benjamin MMW, Wanjiku LC, Gaston SA, Brigitte LM.* Towards an assessment of on-farm niches for improved forages in Sud-Kivu, DR Congo, *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, 2016;**117** (2):243–54.

9. *Tewodros M, Meseret M.* Production Constraints, Farmers Preferences and Participatory on Farm Evaluation of Improved Forage Technologies in Selected Districts Of Southern Ethiopia, *Greener Journal of Agricultural Sciences*, 2013;**3**(9):628–35.

10. *Zekarias B.* Determinants of Improved Forages Adoption in Doyogena District of Kembata Tembaro Zo-ne, in Southern Nations, Nationalities Regional State, Ethiopia, *Global Journal of Science Frontier Research, Agriculture and Veterinary*, 2016;**16**(3):7–13.