Global Journal of Science Frontier Research: D
Agriculture and Veterinary
Volume 16 Issue 8 Version 1.0 Year 2016
Type : Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4626 & Print ISSN: 0975-5896

Participatory on - Farm Evaluation and Demonstration of Improved Herbaceous Forage Species in Irrigated Lowlands of Dassench Woreda of South OMO Zone

By Denbela Hidosa & Worikicha Hitiso
Southern Agricultural Research Institute

Abstract- Participatory on farm improved forage species evaluation was conducted at Keelewe Peasant association of Dassench Woreda of South Omo Zone in the 2014 under irrigated condition using the improved forage legumes to identify the adaptable and high biomass yielding forage species. The field experiment was laid out in a Randomized Complete Block Design (RCBD) with four replications per tested species. The improved forage legume species tested in this study were *Lablab purpureus, Lablab intoritum* and *Vigna unguiculatium.* The dry matter yield obtained in this study revealed that there was none significance difference ($p > 0.05$) among the tested improved forage legume species in the study area. The dry matter yield production potential of tested species under irrigated condition in to the study area is 15.91, 14.16 and 15.40 t/ha for *Lablab intoritum, Lablab purpureus* and *Vagigna ungulatium* respectively.

Keywords: *dry matter yield, lablab intoritum, lablab purpureus, vigna unguiculatium.*

GJSFR-D Classification: *FOR Code: 309999p*

Strictly as per the compliance and regulations of :

Participatory on - Farm Evaluation and Demonstration of Improved Herbaceous Forage Species in Irrigated Lowlands of Dassench Woreda of South OMO Zone

Denbela Hidosa [α] & Worikicha Hitiso [σ]

Abstract- Participatory on farm improved forage species evaluation was conducted at Keelewe Peasant association of Dassench Woreda of South Omo Zone in the 2014 under irrigated condition using the improved forage legumes to identify the adaptable and high biomass yielding forage species. The field experiment was laid out in a Randomized Complete Block Design (RCBD) with four replications per tested species. The improved forage legume species tested in this study were *Lablab purpureus, Lablab intoritum* and *Vigna unguiculatium.* The dry matter yield obtained in this study revealed that there was none significance difference ($p > 0.05$) among the tested improved forage legume species in the study area. The dry matter yield production potential of tested species under irrigated condition in to the study area is 15.91, 14.16 and 15.40 t/ha for *Lablab intoritum, Lablab purpureus* and *Vagigna ungulatium* respectively. Out of the tested forge legume species over cropping season under irrigated condition, the one which gave the maximum dry matter yield was *Lablab intoritum* which gave (16 tones ha^{-1}) and *Vagigna ungulatium* (15.40 tones ha^{-1}) are advisable for the study areas. Therefore, it is imperative to evaluate the forage species for more seasons under similar condition and in addition to their feeding value under different intervention, chemical composition, their response to the disease and pest resistance, seed producing potential and dry matter production potential of species under supplementation different level of fertilizer rate.

Keywords: dry matter yield, lablab intoritum, lablab purpureus, vigna unguiculatium.

I. Introduction

Livestock are an important section of agriculture in Ethiopia and has been provided milk, meat, draught power, transport, manure, hides, skins (Funk et al., 2012) and it has been served as a source of income for the country (Feki, 2013). Conversely, it has also contributed about 15-17% of the total gross domestic product (GDP) and 35- 49% of the TADP (ATA, 2012). However, despite of the huge potential in terms of high livestock population and presence of diverse agro-ecologies suitable for livestock production in the country, the productivity and production that generated from the sector is in very low when it compared with other African countries (Belete *et al.,* 2010; Gebremedhin *et al.,* 2004). This is due to poor animal nutrition (Duguma *et al.,* 2012). Similarly, in the study area which is lowland part of Ethiopia, dominated with pastoral production system, the livestock husbandry system has been entirely depended on rangeland feed resources (Aschalew *et al.*, 2004) which is insufficient to provide nutrients requirements beyond their maintenance requirement. Therefore, in order to mitigate such a nutritional issues and improve t the livestock productivity performance, it is imperative to introduce and evaluate high-quality and yielding herbaceous forage legumes species. Among the improved forage species introduced and tested in Ethiopia, herbaceous legume (*Lablab and Vigna ungulatium*) could play a significant role in providing a significant amount and qualified herbages under the smallholder farmers. *Lablab purpureus* one of the herbaceous forage legumes which has been grown in arid, semi-arid and humid regions with rainfalls between 200-2500 mm (Cameron, 1988) and has DM production potential which ranged 3-10t/ha under rain fed condition (Denbela *et al.,* 2015; Cameron, 1988). Conversely, *Vigna ungulatium* is one of the most important forage legume which has been served as source food and feed (Bennett-Lartey and Ofori, 1999) and it could be produced 3.5 – 5.2 t/DM per ha (Denbela *et al.,* 2015). However, in the study area, evaluation the adaptability of these forage legume species under irrigated conditions has not been carried out due to remoteness and mobile nature of pastoralists. Therefore, the study was designed with objectives to identify high yielding improved legume and grass species under irrigated condition.

II. Material and Methods

a) Description of study site

The study was conducted in Dassench Woreda, which is found in South Omo Zone of in SNNP and it is bordered by Kenya in the South, Salamago Woreda in the North and Hammer Woreda in the East. It was lied astronomically (5^0.14'N latitude, 36^0.44'E longitude) and

Author α σ: Southern Agricultural Research Institute, Jinka Agricultural Research Center P.O.box.96, Jinka, Ethiopia Principal.
e-mail: denbelahidosa@gmail.com

225 km from Jinka, the capital city of South Omo Zone. It has high temperature and low annual rainfall, which has ranged from 25-40°C and 350-600 mm respectively with bimodal rainfall and erratic distribution. Altitude of the study area is in the range of 350 - 900m.a.s.l. The most common and dominating soil brand of the area is silt alluvial. The district is highly dominated by short growing woody acacia species and highly grazed and browsed lower altitude area is dominated by *Merea macrenatha.*

b) Trial site and pastoralists

The Keelewe peasant association was selected in collaboration with Woreda pastoral affairs' office experts and Developmental agents after discussion on the objectives of the research activity. One pastoral research group which consisted of twelve household members with three trial pastoralist per pastoralist's research group were selected after community meeting. The criteria for selection of trial pastoralists were availability of land, suitability of site for irrigation, interest pastoralists in research process and irrigation experience of the pastoralist. Finally, training was delivered to Development agents, pastoral research group member, Kebele leaders, and non trial pastoral research members on forage production, irrigation management and benefits of forage productions.

c) Experimental Treatments and Design

The planting materials used for this experiment were the herbaceous forage legume species such as *Lablab intoritum*, *Lablab peruperus* and *Vigna ungulatium*. Completely randomized block design (RCBD) was used with four replications per each tested forage legume species which were arranged in 10 rows of 5m length which have 50cm between rows and 30cm between plants. The supplementary irrigation was used and all plots were irrigated uniformly at six day intervals.

d) Crop management and Data collection

The planted species management activity such as hoeing, weeding, diseases and pest inspection was carried out and trial farms were had been continuously monitored. The yield data such as FBYand DMY were collected from the each tested species at age of eight week after establishment to DM and FBY production potential under irrigated condition in Dassench Woreda. The four samples were randomly taken per tested species at quadrates which has a plot size area 50cm x50 cm = 2500cm^2 by using sickle and transported to Jinka Agriculture research Center and allotted to cut in to small pieces and made pooled it. The representative samples were subjected to oven dried at 105°c for 24hrs at Jinka Agricultural Research Center Animal Feed and Nutrition Laboratory. Then the dry matter yield per each species was calculated by the final weight collected from oven dried was divided by initial weight before the subjecting to the oven dried.

e) Statistical Analysis

Analysis of data was performed using GLM procedure of SAS (Statistical soft ware, 2009). Effect of tested species was considered significantly in all statistical calculation if ($P \leq 0.05$). The least means squares were separated by using Duncan's least significant difference (LSD) test with following model;

$$Y_{ij} = A + \beta_i + t_j + e_{ij}$$

Where: Y_{ij} = Yield parameters measured,
A = General mean of the tested species,
ßi = block effects,
tj = treatment effects and
eij = Random error

III. Result and Discussions

The yield parameters such as FBY and DMY of the tested herbaceous forage legume species under irrigated conditions of Dassench Woreda was illustrated in (Table 1). The least square FBY obtained in this study revealed that there was none significance difference ($P > 0.05$) observed among the tested herbaceous forage legumes in the study area. However, the *Lablab intoritum* had produced relatively better (33t/ha) FBY over *Lablab purpurue* (31.52 t/ha) and *Vagigna ungulatium* (30t/ha).The FBY obtained in this study for *Lablab intoritum* is lower than value (62.20t/ha) reported by Denbela *et al. (*2016) in Woito PAs, in Bena-Tsemay districts under irrigated conditions. Similarly, the FBY obtained in the current study for *Lablab purpureus and Vagigna ungulatium* is also not in agreement to previously reported values by different authors (Denbela *et al*.,2016; Muna et al., 2011; Abusuwar and Al-Solimanin,2013) which ranged 38-51t/ha. Conversely, the DMY obtained in this study revealed that there was none significance difference ($p < 0.05$) among the tested species in the study area. The average DMY production potential of tested forage legume species under irrigated condition in to the Dassench lowland is 15.91, 14.16 and 15.40 t/ha respectively for *Lablab intoritum, Lablab purpureus* and *Vagigna ungulatium*. The finding obtained in this study for *Lablab purpureus* is corroborated to the values that reported by Muna et al.(2011) and Abusuwar & Al-Solimani (2013) which ranged from 12.47-22.24 t/ha under irrigated conditions. However, for the Lablab intoritum, value obtained in this study is lower than what Denbela *et al. (*2016) reported value (23.6t/ha) in Woito PAs, in Bena-Tsemay districts under irrigated conditions. On the other hand, the DMY obtained from the current study for the *Vagigna ungulatium* in irrigated condition is three time higher than what Denbela *et al.*(2015) reported values which ranged from 3.5 – 5.2 t/ha under rain fed condition at Chali and Kako peasant association and Bilatu *et al.(*2012) who reported that DMY released different *Vagigna ungulatium* accessions which was (4.28 t/ha)

at North West lowland area of Ethiopia. However, the encouraging DMY is obtained in this study than what previously Denbela *et al. (*2016) studied value (12.21t/ha) in Woito PAs, in Bena-Tsemay districts under irrigated conditions. In general, the inconsistency in both FBY and DMY of the tested species in this study from previously reported studies, it might be related to difference in tested agro ecology, irrigation management practice, soil fertility and varietal difference (Anele UY. *et al.,* 2011a; Rivas -Vega *et al.,* 2006; Anele UY. *et al. ,* 2011b).

Table1: The Least Square mean of fresh biomass yield of tested improved herbaceous forage species in irrigated lowland of Dassench Woreda in 2014 cropping season

Tested legume species	Yield parameters measured						
	FBY(g/plot)	FBY/ha	CV	LSD	F-value	P- value	SEM
Lablab *intoritum*	823.63[a]	33.00	6.55	20.59	0.02	0.98	NS
Lablab *purpureus*	813[a]	31.52	6.55	20.59	0.02	0.98	NS
Vagigna ungulatium	792[a]	30.68	6.55	20.59	0.02	0.98	NS

FMY = Fresh biomass yield; g = gram; CV = Coefficient of variance; LSD = Least significance difference; SEM = Standard error of mean; NS = Non-significant; ha = hectare

Table 2: The Least Square mean of dry matter biomass yield of tested improved herbaceous forage species in irrigated lowland of Dassench Woreda in 2014 cropping season

Tested legume species	Yield parameters measured						
	DM(g/plot)	DM/ha	CV	LSD	F-value	P- value	SEM
Lablab *intoritum*	395.75[A]	15.91	5.37	14.04	0.01	0.99	NS
Lablab *purpureus*	354[A]	14.16	5.37	14.04	0.01	0.99	NS
Vagigna ungulatium	385[A]	15.40	5.37	14.04	0.01	0.99	NS

FMY = Fresh biomass yield; g = gram; CV = Coefficient of variance; LSD = Least significance difference; SEM = Standard error of mean; NS = Non-significant; ha = hectare

IV. Conclusion and Recommendations

In the current study different improved forage legume species were evaluated for their herbage dry matter yield production potential under irrigated lowland area. Accordingly, *Lablab intoritum* was produced better DMY than *Vagigna ungulatium and Lablab purpureus in that order.* However, the similarity is observed in DMY production potential among the tested species which indicated that the pastoral communities can be used one of the tested species to their vicinity as supplementary feed source in order to mitigate the critical feed shortage especially dry season over the low quality feed(Natural pasture). From the current study on the other hand, it is concluded that better improvement observed in both fresh and dry matter yield of tested species in under irrigated condition than non irrigated condition especially in lowland area which is characterized by high coefficient variability in rainfall distribution patterns. In general, the result reported in the current study is from one cropping season. However, for the forage species fresh and dry matter yields obtained in this study season may be variable in other seasons. Therefore, it is imperative to evaluate the forage species for more seasons under similar agro ecology and addition to their feeding value under different intervention, chemical composition, their response to the disease and pest resistance, seed producing potential and dry matter production potential of species under supplementation different level of fertilizer rate. On the other hand, also it is recommended that the information obtained from this study would benefit the pastoral communities, so the promotion of the tasted species will be demonstrated and scaled out in wider range through pre-scale-up and pre extension demonstrations.

V. Acknowledgments

We are extremely thankful to the Ethiopia Institute of Agricultural Research, Pastoral and Agro pastoral Research and Capacity Building Coordinate Directorate for financial support and Jinka Agricultural Research Center for Research material and vehicle support. Finally, we are grateful acknowledged the Dassench Woreda Agricultural extension developmental agents for their continuous monitoring the experimental site and our pastoralists who donated their land without restraint.

References Références Referencias

1. ATA (2012) (Agricultural Transformation Agency) Livestock value chain programs).
2. Aschalew Tsegahun, Sisay Lemma, Ameha Sebsbie, Abebe Mekoya and Zinash Sileshi. 2004. National goat research strategy in Ethiopia. In:

Markel, R.C., Abebe, G. and Goetsch, A.L. (eds), The opportunities and challenges of enhancing goat production in East Africa: Proceeding of a conference held at Awassa, Debub University. pp. 1–5

3. Anele UY, Sudekum KH, Hummel J, Arigbede OM, Oni AO, Olanite JA, Bottger C, Ojo VO, Jolaosho AO (2011a). Chemical characterization, *in vitro* dry matter and ruminal crude protein degradability and Microbial protein synthesis of some cowpea (*Vigna unguiculata* L. Walp) haulm varieties. Anim. Feed Sci. Tech., 163: 161-169. 18.
4. Anele UY, Sudekum KH, Arigbede OM, Welp G, Adebayo OO, Jimoh AO, Olubunmi VO (2011b). Agronomic performance and nutritive quality of some commercial and improved dual-purpose cowpea (*Vignaunguiculata* L. Walp) varieties on marginal land in Southwest Nigeria. Grassland Sci., 57: 211-2
5. Cameron, D G 1988 Tropical and subtropical pasture legumes.Queensland Agricultural Journal. March-April: 110-113.
6. Denbela Hidosa, Tekleyohanus Brehanu and Mesfin Mengitu (2016). On Farm Evaluation and Demonstration of Improved Legume forage Species in Irrigated Lowlands of Bena-Tsemay Woreda, SouthOmo Zone, International Journal of Research and Innovations in Earth Science Volume 3, Issue 2, ISSN (Online): 2394-1375.
7. Denbela Hidosa, Bizuayehu Ayele and Mesifin Mengistu (2015). Participatory On - Farm Evaluation and demonstration of improved Legume Forage Species in Benatsemay Woreda of South Omo Zone, Southern Agricultural Research Institute, Jinka Agricultural Research Center, P. O. Box 96 Jinka, Ethiopia.
8. Duguma, B., Tegegne, A., and Hegde, B. P. (2012). Smallholder livestock production system in Dandi district, Oromia Regional State, central Ethiopia. *Global Veterinaria 8*(5):472–479.
9. Feki Misbah. 2013. Community-based characterization of Afar goat breeds around Aysaita district of Afar region. MSc thesis. Jimma, Ethiopia: Jimma University.
10. Tsedeke K. 2007. Production and marketing systems of sheep and goats in Alaba, southeren Ethiopia. MSc thesis. Awassa, Ethiopia: Hawassa University.

Table 2: The fresh biomass yield (FBY) and dry matter yield (DMY) and standard error (SE) of *Cenchrus ciliaris, Chloris gayana* and *Pancium colaratum* grown under irrigated lowland of Dassench Woreda in 2014

	Yield parameters measured	
Tested grass species	Fresh weight/g/plot ± Std. Error	Dry matter yield /g/plot ± Std. Error
Chloris *gayana*	1339±141.605[b]	380.2±40.169[a]
Cenchrus *ciliaris*	998±141.605[a]	279.880±40.169[a]
Panicum *colaratum*	1587±141.605[c]	451.987±40.169[b]

Pertaining to the tested grass species the fresh biomass yield (FBY) in this study revealed that there was significance difference ($p < 0.05$) among the tested three grass species. However, on the other hand, there was none significance difference ($p > 0.05$) was observed between *Chloris gayana* and *Cenchrus ciliaris* in terms of the dry matter yield(DMY). Meanwhile, there is significance difference ($p < 0.05$) also in terms of dry matter yield (DMY) between *Panicum colaratum* and *Chloris gayana* and *Panicum colaratum and Cenchrus ciliaris.* The fresh biomass yield (FBY) and dry matter yield (DMY) production potential of tested grass species is 53.56t/ha, 39.92t/ha, 63.48t/ha and 15.21t/ha, 11.20t/ha and 18.08t/ha respectively for the *Chloris gayana, Cenchrus ciliaris* and *Panicum colaratum.* The *Pancium colaratum* produced higher fresh and dry matter yield than *Chloris gayana* and *Cenchrus ciliaris* which is not corroborated to what Denbela (2015) finding (40.8t/ha) on station of Jinka Agricultural Research Center under rain fed condition. This yield difference observed might be effect of irrigation, difference in soil fertility, difference in agro ecologies or farm management effect. Conversely, there was double increments in dry matter yield under irrigation than what Denbela (2015) reported (7.6t/ha) at on station of Jinka Agricultural Research Center and similarly also not corroborated to what Tessema (2008) reported on average 14 t/ha DMY under rain fed conditions in Ethiopia. On the other hand, the fresh biomass yield(FBY) for the *Chloris gayana* in this study corroborated to what Tewdros and Messert (2013) reported that ranged from 31.9-98.0 t/ha for Soddo trial location in Ethiopia and where as dry matter yield (DMY) obtained in this study also corroborated to what Denbela(2015) reported (15 t/ha) at on station of Jinka agricultural Research Center under rain fed condition which is equal to result reported in the current study under irrigation in the study area and similarity in yield it might be irrigation effect played a vital role two different agro ecologies . Moreover, the fresh biomass yield in the current study in *for Cenchrus ciliaris* is also not corroborated to what Denbela(2015) reported (33t/ha) on station of Jinka Agricultural Research Center under rain fed condition. However, the dry matter yield

obtained in the current study for the *Cenchrus ciliaris* not comparable to what Denbela (2015) reported (6.68 t/ha) which attested that there is relatively two time higher dry matter yield under irrigation than rain fed condition at on station of Jinka Agricultural Research Center under rain fed condition and relatively comparable to what Ayana (2010) reported which ranges between 10-16 t/ha under rain fed condition in Ethiopia.

VI. Conclusion and Recommendations

In the current study different improved legume and grass species evaluated for their herbage dry matter yield production potential under irrigated lowland area. Among the improved legume and grass forage species tested, *Vagigna ungulatium* and *Pancium coleratum* produced higher dry matter yield under irrigated condition even though the remaining species performed well .On the other hand, there was variability in both fresh biomass and dry matter among the tested species observed under irrigation when it was compared with yield under rain fed condition. Thus it is might be due to irrigation effect, variability in agro ecologies, variability in soil fertility, variability in management system and variability in species potential. From the current study on the other hand, it is concluded that better improvement observed in both fresh and dry matter yield of tested species in under irrigated condition than non irrigated condition especially in lowland area which is characterized by high coefficient variability in rainfall pattern. In general, the result reported in the current study is from one cropping season. However, for the forage species fresh and dry matter yields obtained in this study season may be variable in other seasons. Therefore, it is imperative to evaluate the forage species for more seasons under similar agro ecology and addition to their feeding value under different intervention, chemical composition, their response to the disease and pest resistance, seed producing potential and dry matter production potential of species under supplementation different level of fertilizer rate. On the other hand, it is recommended that the information obtained from this study would benefit the pastoral communities, so the promotion of the tasted species will be demonstrated and scaled out in wider range through pre-scale-up and scale - out.

VII. Acknowledgments

We are extremely thankful to the Ethiopia Institute of Agricultural Research, Pastoral and Agro pastoral Research and Capacity Building Coordinate Directorate for financial support and Jinka Agricultural Research Center for Research material and vehicle support. Finally, we are grateful acknowledged the Dassench Woreda Agricultural extension developmental agents for their continuous monitoring the experimental site and our pastoralists who donated their land without restraint.

References Références Referencias

1. Alemayehu Mengistu (2003) Pasture and forage resource profiles of Ethiopia. EDM printing Press, Addis Ababa, Ethiopia.
2. ATA (2012) (Agricultural Transformation Agency) Livestock value chain programs).
3. Aschalew Tsegahun, Sisay Lemma, Ameha Sebsbie, Abebe Mekoya and Zinash Sileshi. 2004. National goat research strategy in Ethiopia. In: Markel, R.C., Abebe, G. and Goetsch, A.L. (eds), The opportunities and challenges of enhancing goat production in East Africa: Proceeding of a conference held at Awassa, Debub University. pp. 1–5.
4. Cameron, D G 1988 Tropical and subtropical pasture legumes. Queensland Agricultural Journal. March-April: 110-113.
5. CSA (Central Statistical Agency). 2014. Agricultural sample survey 2013/2015 Report on livestock and livestock characteristics. Statistical Bulletin 532. Addis Ababa, Ethiopia: CSA.
6. Denbela Hidosa, Bizuayehu Ayele and Mesifin Mengistu(2015). Participatory On - Farm Evaluation and demonstration of improved Legume Forage Species in Benatsemay Woreda of South Omo Zone, Southern Agricultural Research Institute, Jinka Agricultural Research Center, P. O. Box 96 Jinka, Ethiopia.
7. Duguma, B., Tegegne, A., and Hegde, B. P. (2012). Smallholder livestock production system in Dandi district , Oromia Regional State, central Ethiopia. *Global Veterinaria 8*(5):472–479.
8. Ecocrop, 2014. Ecocrop data base. FAO, Rome, Italy.
9. Ecocrop, 2010. Ecocrop database. FAO.
10. Feki Misbah. 2013. Community-based characterization of Afar goat breed around Aysaita district of Afar region. MSc thesis. Jimma, Ethiopia: Jimma University.
11. Funk, Rowland, Eilerts, Kebebe E, Biru et al. (2012) Climate trend analysis of Ethiopia. Climate\ change adaptation series. U.S. Geological survey famine early warning systems Network-Informing (FEWSNET)Fact sheet 3053. p. 6.
12. Osman,Makawi, M., Ahmed, R., 2008. Potential of the indigenous desert grasses of the Arabian Peninsula for forage production in a water-scarce region. Grass and Forage Sci., 63 (4): 495–50.
13. Tessema Zewdu .2008. The Effect of Variable Seed Rate Proportions on Agronomic Attributes, Dry Matter Production, Biological Potential and Economic Viability of Some Grass-Legume Mixed Pastures.
14. Rafael J. Macedo, Victalina Arredondo, Noe García, Rafael Ramírez, Omar Prado And Luis J. García (2015). Productive performance of three tropical

legumes for protein banks in the dry tropics of Colima, Mexico*, Volume 3, 104−111* 104 DOI: 10.17138/TGFT(3)104-111.

15. Tsedeke K. 2007. Production and marketing systems of sheep and goats in Alaba, southeren Ethiopia. MSc thesis. Awassa, Ethiopia: Hawassa University