Adoption Level and Determinants to Improved Grass and Forage Legumes in Borana Agro-pastoral Systems, Southern Ethiopia

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Research Brief

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Abstract

Feed and nutrition scarcity—especially during drought periods—is amongst the major constraints influencing livestock production and productivity in the Borana plateau of Southern Ethiopia. In order to overcome the problem, national and international research organizations including the International Livestock Research Institute (ILRI) and the Ethiopian Ministry of Agriculture (MoA) have been attempting to develop some improved feed production and utilization technologies. One of the attempts made over the last two decades was the introduction and integration of suitable and productive indigenous and exotic grass species as well as forage legumes into the natural pastures and crop farms of households and farmers training centers (FTCs). According to ILRI and MoA reports, the pasture improvement trials were able to provide up to 7 tDM/ha of extra high quality feed critically needed to feed calves and milking cows during the dry seasons (Coppock, 1994; Thornton and Odero; 1998 and Mengistu, 2002). However, non-empirical evidence on the adoption and use of these grass and forage technologies in the years following the program's introduction has been very limited. The main objective of this research was to assess the ex-post results of adoption of the improved grass and forage legumes and the major socio-economic, technological, and institutional factors determining adoption by agro-pastoralists of the Borana plateau.

Sampling in the Borana Pastoral Plateau

The Borana pastoral plateau (Borana zone) is located in the Southern tip of Ethiopia bordering Northern Kenya between 3°36'– 6°38' N and 3°43'- 39°30' E. The zone is made up of thirteen districts covering 95,000 km^2 divided in two agro-ecological zones: the semi-arid lowlands to the south and the more humid lands at higher altitudes to the north (Boku, 2003). The climate is arid and semi-arid. Rainfall is bimodal, with the long rainy season in March–May and the short rains in September–November, followed by the long dry season. Rainfall is variable with strong effects on range productivity. Average annual rainfall varies from 353 to 873 mm with droughts

Researcher taking samples in the Borana plateau. (Photo credit: Etalemahu Haile)

Figure 1: Map of the Study Area (Source: Skinner, 2010)

occurring once every 5–10 years (Coppock, 1994). Traditional transhumance pastoralism is the main stay of the household economy, followed by thriving agriculture in the highlands. The population of the Borana zone is estimated to be 1.1 million with 84% living in rural areas practicing traditional trans-human pastoralism (CSA, 2008).

For our research, two study districts (Yabello and Dirre) were purposively chosen among the 13 districts of the Borana Zone. The two districts were selected based on previous introduction efforts of improved grass and forage species. Through a systematic random sampling procedure, three agro-pastoral administrative units (Gendas in Afan Oromo)—namely Dida Yabello, Harallo and El-woya—were systematically identified from the two districts. Presuming that adoption of agricultural technologies are often influenced by household variations in socio-economic status, households in the three Gendas were categorized into wealth categories as either rich, medium or poor as identified by the local government administration. Accordingly, a total of 74 sample households were proportionately selected from each of the three Gendas representing the three socio-economic classes.

In order to collect the data required for the research, household survey and farm-level observational studies were used. To this end, a semi-structured questionnaire was developed and translated into the local language, Afan Oromo. The questionnaire was checked and administered via face-to-face interview. Relevant data was collected regarding: the types of forages and grasses currently planted, history of adoption, factors influencing adoption, reasons for non-adoption, role of governmental and non-governmental agencies in forage improvement, perceptions and needs of agro-pastoralists for adopting the grass and forage legumes; and prospective options to that effect. In addition, review of relevant project reports on livestock feed improvement was made to understand the history of forage improvement efforts and challenges encountered.

Results and discussion

Adoption Level and types of Grass and Forage Species planted

Table 2: Adoption level of improved forage and grasses among households in the study Gendas.

Study Village / Genda	# of studied households (n)	# of adopters	%	# of Non-adopters	%
Dida Yabello	25	3	12.00	21	88.00
El-woya	22	4	18.18	16	81.82
Harallo	27	9	33.33	15	66.67
Total	74	16	21.63	58	78.37

** Note that one ago-pastoral household could plant more than one species of grass or legume*

Assessment of currently grown grass and forage species by Borana agro-pastoralists at farm level and through household survey resulted in the 9 species listed in Table 1. Accordingly, the three most cultivated grasses were Mata Gudissa (Afan Oromo), followed by Elephant Grass and

No.	Common names of the species planted	Frequency of observation in study households (ni)				Relative Importance of the spp (ni/N)*100
		Dida Yabello (n= 25)	El-woya (n= 22)	Harallo (n=23)	Total	
1	*Susbania spp*	3	2	5	10	0.21739
2	*Mata Gudissa -local (White grass)*	0	3	5	8	0.17391
3	*Lucinia spp*	1	3	4	8	0.17391
4	*Elephant Grass*	1	2	3	6	0.13043
5	*Hulullo (Local)*	0	1	4	5	0.10870
6	*Lucolle (Local)*	1	0	3	4	0.08696
7	*Alfa alfa*	0	0	2	2	0.04348
8	*Pigeon pea*	2	0	0	2	0.04348
9	*Okola (Local)*	1	0	0	1	0.02174
	Total	**9**	**11**	**26**	**46**	

Table 1. List of improved forage and grass species planted in the three study Gendas.

Hulullo (Afan Oromo). On the other hand, the three most planted forage/fodder plants were *Susbania spp.*, *Lucinia spp.*, and pigeon pea. However, the adoption level of these grasses and forage species was generally low in all three study sites and highly variant between households in the three study villages. As shown in Table 2, only 16 out of 74 studied households (i.e. 21.63%) have adopted one or more of the grasses and forage legumes introduced. In contrast, the majority of the households studied (78.37%) were non-adopters of the grass and forge species. Comparisons between study areas showed that Harallo has the highest rate of adoption (33.33%) while Dida Yabello has the least (12%) with El-woya 18.18%. This is perhaps due to the relatively humid agro-ecology at Harallo in Dire district.

Table 3. Determinants of grass and forage adoption, Tobit regression results

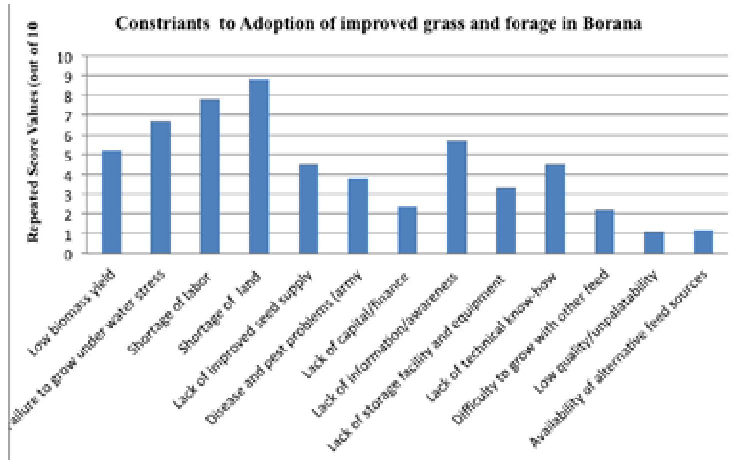
Explanatory variable	Coefficient estimate	T-value	Mean value
Adult equivalent labor size of the household (14–60 years old)	0.1173*	3.2085	2.85
Total land holding per household in ha	1.4251**	5.4121	3.525
Total household cash income/yr in Birr	0.0041**	2.3899	21697.04
Distance to nearest market/town (kms)	–0.0156**	–2.6347	13.47
Experience in forage cultivation	0.5155**	1.9899	3.89
Age of household head (yr)	–0.0011	–0.3021	50.81
Proportion of male household heads	0.0524	0.3711	0.93
Proportion of literate households (read and write)	0.0550	0.3795	0.23
Proportion of poor households	0.2435	1.6386	0.56
Proportion of medium and rich households	0.2289**	1.9316	0.43
Proportion of households in humid areas	0.0750 **	3.3495	0.23
Livestock holding/household (TLU)	0.9456	1.3770	27.99

*, ** *indicate significance levels at 10% and 5% respectively.*

Determinants to Adoption

Results of the Tobit regression analysis on the major variables determining agro-pastoralists decision to adopt the grass and forage technologies resulted in the findings shown in Table 3. According to the Tobit regression results, the most significant socio-economic, agro-ecological, and institutional variables determining the adoption of forage or grass technologies were related to: total land holding size of the household, total cash income per year of the household, wealth status of (medium or rich) households, distance to nearest market or town (closer households were adopting more than distant ones), relative agro-ecology of the area/village (households in relatively humid areas were adopting more than in drier lowlands), experience in forage cultivation or crop farming (longer years of cropping experience higher probability of adoption), and adult equivalent labor size of the household (higher household labor size between 14–60 years old; higher adoption rate). On the other hand, gender of the household head, education level, and livestock holding size of the household as well as age of the respondent were found to be non-significant—implying that these variables have little influence on the agro pastoralist household's decision to adopt the improved grass and forage technologies.

Figure 2. Reasons for non-adoption/adoption constraints



Conclusions

In summary, this research project has shown that the Borana agro-pastoralists do plant and utilize some grass and forage legumes into their private rangeland enclosures or crop farms to supplement their livestock feed from natural pasture. However, the level of adoption of these forage and grass species is still low at an average of 21.67% of adopters. The major factors found influencing the adoption of the grass and forage technologies by studied households were mainly related to: economic conditions, size and availability of active labor, agro-ecology and farming experience of the household. On other hand, the major constraints and challenges facing Borana agro-pastoralists to adopt improved grass and forage technologies are mostly related to: shortage of land, shortage of labor and crop cultivation culture, dry agro-ecological conditions that often result in the failure of the species to grow under water stress, little awareness or technical know-how and little support from governmental and non-governmental organizations on what these technologies are, how to cultivate the plants and where to find the planting materials.

Grasses in the Borana plateau. (Photo credit: Etalemahu Haile)

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TIRI, Targeted Investment for Research Impact, identifies early-career researchers who are interested in tackling livestock production problems through innovative approaches and fresh perspectives. This small-grant program is open to early-career researchers (five or fewer years into research career) in any discipline, from student to professor, and from any organization that is engaged in applied research on livestock production in South Asia and East Africa — colleges and universities, government research centers or laboratories, or non-profit organizations.

Proposals are selected based on their potential to make livestock production systems more resilient to increasing climate variability and severity. At the end of one year, TIRI scholars are expected to demonstrate concrete outcomes and real potential for future impact. The 10 selected East Africa TIRI scholars and the 18 selected Nepal TIRI scholars are addressing research problems on various livestock and climate research themes.

Feed the Future Innovation Lab for Collaborative Research on Adapting Livestock Systems to Climate Change is dedicated to catalyzing and coordinating research that improves the livelihoods of livestock producers affected by climate change by reducing vulnerability and increasing adaptive capacity.

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