Utilization of feeds, livestock unit versus dry matter requirement in Alaba, Sothern Ethiopia

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Abstract

This study was undertaken in Alaba, Southern Ethiopia with the objective of evaluating the efficiency of utilizations of livestock feed resources. General linear model was fitted for utilization efficiency of livestock feed resources and it was significant. This was achieved by using dummy variables of yes or no at each farm household for parameters of feed preservation technique, use of storage house, feed quality improvement systems of grazing and feeding calendar. Seasonal variation of feed is high and efficient utilizations of what is produced is still quite less than 65% because of non-storage of crop residues during crop harvest, wastage by trampling and lack of improvement of the quality of the feed. Plots of, private grazing lands in front of homestead are usually the main sources of feeds for livestock, during cultivation and hence is over grazed. High production of crop residues dry matter, locally available sodic soil of the area called bole in addition to better livestock market out let is an existing opportunity. Interventions to utilize locally available potential feeds, better access to forage and fodder development, water development and quality improvement of straws are optioned as a way out to profit from the livestock sector in the study areas. Nevertheless, these are not only enough unless backed up institutionally as a strategy for consistent and persistent monitoring.

Key words*: Farming systems, Livestock unit, Dry matter, Utilization Efficiency and Feed balance.*

Introduction

The basal feed resources for ruminants available in most developing countries in the tropics are crop residues, pasture from fertile land, for example communal land or agro-industrial by-products. These are low in protein and of low digestibility. Practical strategies for improving production of animals on these diets depend on supplementation to optimise both fermentive digestion in the rumen and the efficiency of metabolism of absorbed nutrients. Specific strategies employ molasses ureas multi-nutrient blocks to optimise digestion in the rumen. The smallholders of developing countries have limited available for feeding to their ruminant livestock. They often do not have the luxury of being able to select the basal diet, they use whatever is available and at no or low cost. The available resources are essentially low digestibility forages such as tropical pastures (both green and manure), straws and other crop residues and agricultural by-products which are generally low in protein. The major criteria for improvement in production are to optimise the efficiency of utilization of the available fodder resource and not to attempt to maximise animal production (Flavey L. and Chantalakhana C, 1999). Economic considerations of feed resources abundantly available in the tropics should therefore pay particular attentions to proper systems of grazing to the grazing land, use of feeding calendar to optimise efficient animal conversion, timely and proper storages of crop residues with good techniques quality improvement, minimise alternative uses of these feeds and their supplementation with appropriate fodder tree.

Material and methods

Description of Alaba Woreda, its farming systems, stratification and sampling methods

Please refer to the preceding paper because the procedures are same.

Study design and types of data collection

Questionnaire and time of data collection are same as the previous however; in this case qualitative data of dummy variables were collected for farm households that use the parameters of utilisation efficiency so that delineation was between users and non-user farm households.

Feed Utilization Efficiency, Estimation of Nutrient Supply and Requirement

Dry matter production from all feed resources was used to evaluate utilization efficiency of the feed resources at household level. Total production of each feed resource per annum was computed using the designed methodologies. Then after, values were set for increasing or decreasing utilization efficiency in each feed resource. These values had also literature supported and computed after consistent monitoring for a month at each household and season. Households were delineated as users and non-users to final multiply them with the percent upgrade or reduction of efficiency. Then the totals were summed for users and non-users to evaluate the utilization efficiency of feed resources. General Linear model was fitted based on parameters that affect utilization of livestock feed resources of grazing land and others. Grazing systems, feeding calendar and storage of crop residues, quality upgrading were the efficiency measuring parameters.

Statistical Models used for Data Analysis

$W_{ijlkm} = \mu + F_{i} + c_{j} + O_{k} + v_{l} + Z_{m} + e_{ijlkm,}$ This evaluates utilization efficiency, Where.
W_{ijlkm} is dry matter production of the households all
F_{i} is the effect of I th Preservation technique employed; hay making, i = 1 or 2
C_{j} is the effect of j th storage house constructed, j = 1 or 2
O_{k} is the k th quality improvement employed k = 1 or 2
V_{l} is the effect of l th Proper system of grazing employed l = 1 or 2
Z_{m} is the effect of proper feeding calendar employed on a grazing land z = 1 or 2
e_{ijlkm} is the random error

Data Analysis and Interpretation

Data of the survey results and relevant secondary data were organized, summarized and analyzed using SAS, 1987 (Version 8.2) statistical package. Descriptive and percentage values of various parameters were computed. The general linear model of univariate and multivariate was used to fit models, observe their significances and estimate the effect of covariates on a single dependent variable and the effect on many dependent variables, respectively. The model estimated the possible change values that might come because of one unit change of the covariates clearly.

Results and Discussion

Uses of grazing land

A total of 1.29 tones of dry matter were produced per household in Alaba which accounts for 11.9% of the total feed resources in the *Woreda* of which in the total surveyed households of 114 nearly 74.5% of the farm households graze the land continuously without control. Assuming 30% loss in efficiency due to not properly grazing this land the total utilization efficiency reduces to 9.21%.

Crop residues utilization

Crop residue is one of the abundantly produced feed resources in Alaba which is 63.8% of the total feed resources and its usage was highly hampered by alternative uses, failure to store properly to use during time of feed scarcity and not improving its quality by different techniques because it has low In Vitro and In Situ degradability values (Melaku *et al*., 2003). Feeds with such nutritional characteristics, which are relatively abundant in tropical farming systems need to be

supplemented with better sources of crude protein (CP) in order to support reasonable animal production. The reduction contribution of all those mentioned above reduces the utilization efficiency to 40.6% for all the surveyed households.

Utilization of indigenous browses

Shrubs are receiving increasing attention as potential livestock forage and valuable re-vegetation species on disturbed lands, especially in arid regions. Management and integration of shrubs require considerably more information than is presently available. Fodder trees and herbaceous legumes offer an opportunity for use as potential feed supplements by smallholder farmers in the tropics due to their high CP content and degradability (Melaku *et al*., 2003). These plant species are potentially available in Alaba and need to be incorporated in the total feed resources of animals after critical evaluation with appropriate use in the long run. In spite of all these incorporation of these feeds into livestock feed by human intervention is infrequent. This fact could reduce the utilization efficiency of these feeds to almost zero according the already set values. Nevertheless, indigenous browse are tremendously available in Alaba.

Utilization Efficiency of Feed Resources

It has been proved that livestock feed resources are obtained in the *Woreda* from grazing lands, after math, crop residues, indigenous browse, fallow land, forest and wood land and from naturally available salt lick called '*bole*' at the rate of 1.29, 1.35, 6.92, 1.14, 0.077, 0.0285 and 0.037 t DM per household, respectively. Therefore, of the total household production of 10.8 which can suffice 1/3 rd of the farmers TLU the percent utilization was 63.4%. What matters is not the production in this regard rather it is the proper utilization of these resources by small holders' livestock that is quite pressing and a point ponder able to the forage-Agronomist, natural resource conservationist (botanist), economist and the extension worker. There is, however, an abundant supply of crop residues; particularly cereal straw during this period because the dry season normally coincides with the harvesting time of cereal crops in addition to the 64% dry matter production being from crop residues at *Woreda* overall and 72% in the two farming systems. This is computed for about nine major commodities of crops where maize, *teff* and potato take the greatest proportion in *teff* / haricot bean /livestock producing system where as maize, wheat and pepper in pepper/wheat/ livestock production system. Efficient utilization of feed resources also has to take into account the combined knowledge packages of storages, preservation, processing and improvement in feed quality and the results of the survey in this regard showed that quite less than 20% of the farm households possess storage houses for storing the crop residues of their farm left over for use during dry period. In fact, these crop residues are not recommended as major feeds for livestock in animal nutrition because they are low in nutritive values; however, the effort of this research is to make use of them in the existing interaction between the crop and livestock. If livestock productivity is to keep pace with demand, the imperative is to enhance productivity per animal and reduce wastage.

Storage houses

The feed value of crop residues could be greatly improved if they were cut soon after harvest and stored. Cutting and storing will minimize wastage from grazing and if done soon after harvest, will retain relatively good quality feed for livestock. Cereal residues would provide mainly energy (TDN) and if mixed with available forage legumes and haulms (which supply protein), the nutritive value of the crop residues would greatly be improved. One of the utilization efficiency of feed resources is storage house. Not storing properly the feed during ample production for use during dry period, especially crop residues which are produced in great proportion was not found to be an adopted technology and based on theoretical survey and practical observation a conclusion was reached that this may reduce efficiency of utilization of dry matter yield of crop residues of a given household by 25% and to this is added alternative uses of crop residues which 20% according to

Zinash and Seyoum bringing down the total crop residues utilization of the *Woreda* to 40.56% of the total crop residues yield and 25.87% of the total feed resources produced.

Feed quality improvement

There are different techniques by which the quality of a feed could be improved to cite some of these physical treatment from a simple soaking with water, chopping, grinding and pelleting up to the high chemical treatment, especially the latter improves the nutritive value of crop residues by 30% there by removing the hard cover of plant cellulose. In this case, crop residues are not exposed to such treatments in the survey areas. Most of the time a feed coping mechanism of like this is the interventions recommended in cereal based high crop residue areas like that of Alaba. There is no doubt that the effect of sodium hydroxide on digestibility and intake of roughage. In general, digestibility increases between 10-20% can be expected with intake increases of 30-50% (Beckman, 1921). The results of analysis of efficiency utilization of feed resources model showed that there is entirely significant difference in efficiency between farmers using store and those not using, thus crop residues produced in higher proportion has to be stored and used properly to mitigate the feed shortage process. How ever, variation was not well observed amongst households in other efficiency parameters like uses of systems of grazing, feeding calendar. This is because the techniques by which the different households use in trying to efficiently utilize the feed resources for almost the available feed resources starting from collection, storage, preservation and improving the feed quality are similar. Therefore, this model is fitted to represent efficient utilization of feed resources in the smallholder systems where grazing lands and crop residues are the main feeds for livestock and has to be recommended for use by farmers.

Summary and conclusion

Improvement of the poor quality roughage feeds that do not meet the requirements of these livestock with available innovated technologies and use of alternative feeds available should be an area of intervention. It has been found by the survey that the *Woreda* is one of the highest livestock population areas where feed availability is less than one-third per se of tropical livestock unit and the efficiency of utilization is less than 65% of what is normally available.

Table 1.Theoretical efficiency of utilization of livestock feed resources

Feed resources	Amount and percent produced per household		Efficiency Problem	N (%)	Users n1 (%)	Non users n2 (%)	Percent feed utilization
	Amount t/hh	%		114 (100%)			
Grazing land	1.29	11.89	1	114 (100%)	29 (25.5)	85 (74.5)	1. 3.03x1+8.85x0.7 = 77.54%x11.89= 9.21%
Aftermath	1.35	12.45	1	114 (100%)	All		2.Perfect = 100%x12.45.0=12.45%
Crop residues Total	6.92	63.8		114 (100%)	21 (18.4)	93 (81.6)	1.27x1+5.64x0.75 = 100%x63.8=63.8
Crop residues minus 20% alternative use	6.92 -1.384= 5.536	63.8 51.05	6	114 (100%)	All		Uses almost 20%x63.8= =51.05
Crop residues	6.92	63.8	2	114 (100%)		All	Not improved and remains as it is
Crop residues utilized	6.92	63.8	3	114 (100%)	21 (18.4)	93 (81.6)	3.1.27x1+5.64x0.75 =79.47%x51.05=40.56%
Indi. browse	1.14	10.5	4	114 (100%)		All	All do not use = 0%x10.500 = 0.00%
Fallow land	0.077	0.71	1	114 (100%)	All		4. Perfect =100%x0.071 = 0.71%
Forest-Wood	0.0285	0.26	1 & 4	114 (100%)			5.Only 50% is used =0.5%x0.26 = 0.13%
Bole	0.037	0.34	5	114 (100%)	All		6. =100%x0.034 = 0.34%
Total	10.842	100					7. Percent total feed utilization =63.4%

Descriptions

1= grazing system and theoretical %ages of reduction that not using causes between any two time intervals is 30%

2= quality improvement: grinding, pelleting, treatment & etc improves utilization rate by 30%.

3= Storage houses: Not using causes 25% reduction

4= No usage at all has a value of 0%

5= No problem

Acknowledgements

I would like to express my sincere gratitude and heartfelt thanks to the Federal MoARD, Alage ATVET and my advisors, Assistant Professor Tessema Zewdu in the Department of Animal Sciences at Haramaya University and Dr. Azage Tegegne, IPMS/ILRI for their meticulous guidance and encouragement throughout the study periods.

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