LIVESTOCK FEED DRY MATTER AVAILABILITY AND UTILIZATION IN BURIE ZURIA DISTRICT, NORTH WESTERN ETHIOPIA†

[DISPONIBILIDAD DE MATERIA SECA DE ALIMENTO PARA GANADO Y SU UTILIZACIÓN EN EL DISTRITO DE ZURIA DE BURIE, ETIOPÍA OCCIDENTAL DEL NORTE]

Getahun Belay[1] and Tegene Negesse[2,*]

[1] Department of Animal Science, Alage ATVET College, Ethiopia. Email: getahunbelay2015pmeas@gmail.com
[2] School of Animal and Range Sciences, Hawassa University, Ethiopia. Email:tegenengss38@gmail.com
**Corresponding author*

SUMMARY

Availability of feed resources, their utilization and balance between supply and demand in Burie Zuria district, north western Ethiopia, were assessedusing focus group discussion, individual interview, key informant interview and secondary data. Data was collected from February to April 2017 on 90, 30 and 30 households (HH)Hs selected from mid, high and low altitudes,respectively, using multi-stage sampling techniques. Data was analysed using FEAST version 2.21 and SPSS version 20.0. Mean land holding, livestock holding and family size were 1.8 ha, 9.03Tropical livestock unit (TLU) and 6.82 persons/HH, respectively. Crop residues, stubble grazing and natural pasture were major feed resources. Maize stover, finger millet and teff straws were the main crop residues produced in all agroecosystems ($p<0.05$). Inappropriate collection, conservation and feed processing practices reduced efficiency of utilization. Utilizable dry matter (DM) supply was 12.87±0.41 t/HH/yr; and 7.2±0.69, 14.6±0.47 and 15.38±0.66 were from high, mid and low altitudes, respectively; crop residues contributed major part (9.76±0.76 t)($p<0.05$). Annual livestock maintenance DM requirement was 20.37±4.14 t/HH/yr with a deficit of 7.5±3.73 t, with DM requirement of 18.25±4.49, 26.78±4.14 and 16.09±3.83t/HH/yr ($p<0.05$) for high, mid and low altitudes, respectively. Available DM satisfies 63.18 % of DM requirements, where 39.45, 54.51 and 95.58 % ($p<0.05$) were for high, mid and low altitudes, respectively ($p<0.05$), indicating more feed shortage at high altitude. In conclusion, the main feed resource is crop residue with low DM contribution. Thus apropriate crop residues management should be used.

Keywords: Agro-ecology; feed availability; feed balance; nutrient utilization.

RESUMEN

La disponibilidad de recursos alimentarios, su utilización y el equilibrio entre la oferta y la demanda en el distrito de Burie Zuria, al norte occidental de Etiopía, fueron evaluados mediante la discusión de grupo, entrevista individual, entrevista del informante clave y datos secundarios. Los datos se recolectaron desde febrero a abril de 2017 en 90, 30 y 30 unidades de producción (HHs) seleccionados de media, alta y baja altitud, respectivamente, utilizando técnicas de muestreo de etapas múltiples. Los datos se analizaron mediante FEAST versión 2.21 y SPSS versión 20.0. Significa tierra tenencia, explotación ganadera y el tamaño de la familia fueron 1,8 ha, 9,03 unidades ganaderas tropicales (UGT) y 6.82 personas/HH, respectivamente. Los residuos de cultivos, pastoreo de rastrojos y pastos naturales fueron los principales recursos alimentarios. Rastrojo de maíz, mijo y paja de teff fueron los residuos de cultivo producidos en los agroecosistemas ($p<0.05$). La recolección inadecuada, conservación y prácticas de procesamiento de los alimentos reducen la eficiencia de utilización. La oferta de materia seca utilizable (MS) fue de 12.87±0.41 t/HH/año; y 7.2±0.69, 14.6±0.47 y 15.38±0.66 para alta, media y baja altitud, respectivamente. Los residuos de cultivos contribuyeron la mayor parte (9.76±0.76 t) ($p<0.05$). Las necesidades anuales para mantenimiento del ganado (MS) fueron de 20.37±4.14 HH/t/año con un déficit de 7.5±3.73 t, con una necesidad de MS de 18.25±4.49, 26.78±4.14 y 16.09±3.83 t/HH/yr ($p<0.05$) para alta, media y baja altitud, respectivamente. La MS disponible satisface el 63.18 % de requerimientos de MS, donde 39.45, 54.51 y 95.58 % ($p<0.05$) fueron para, altitudes medias y bajas, respectivamente ($p<0.05$), indicando un mayor déficit de alimento en altitud alta. En conclusión, el principal recurso de alimentación son los residuos de la cosecha pero con baja contribución de MS. Por lo tanto deben utilizarse una apropiada gestión de residuos de cultivos.

Palabras clave: Agroecología; disponibilidad de alimentos; equilibrio de la alimentación; utilización de nutrientes.

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Feed Resource Availability and their Nutrient Contribution for livestock Evaluated Using Feed Assessment Tool (FEAST) in Burie Zuria District, North Western Ethiopia

Getahun Belay[1] and Tegene Negesse[2]*

[1]*Department of Animal Science, Alage ATVET College, Ethiopia*

[2]*School of Animal and Range Sciences, Hawassa University, Ethiopia*

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***Corresponding author:** Tegene Negesse, Hawassa University, College Agriculture, School of Animal and Range Sciences, P. O. Box, 05, Hawassa, Ethiopia, Tel: +251916827711; Email: tegenengss38@gmail.com

Abstract

Constraints of livestock production, major livestock feed resources and their nutrient contribution (% of respondents) and intervention options in three agro-ecologies of Burie Zuria district, north western Ethiopia, were assessed from data collected between January 2017 and February 2018. Agro-ecologies, kebeles and households (HHs) were selected using multi-stage sampling techniques. A single-visit multi subject formal survey was conducted. The district was stratified in to high, mid and low altitudes and data were collected from February to April 2017 on 90, 30 and 30 HHs, respectively using focus group discussion, individual interview, key informant interview, secondary sources and personal observation. Feed assessment tool (FEAST version 2.21), SPSS version 20.0 and general linear model procedure were used to analyze data. Feed shortage, limited knowledge of farmers in livestock production, poor genetic potential of indigenous cattle breeds, disease and land shortage were the main constraints affecting livestock production in all agro-ecologies in decreasing order of importance. Dry matter (DM) contribution of purchased feeds is lower but of crop residues higher than that of other feed resources. DM contribution of purchased feed in high altitude (11.22±1.4) is higher ($p<0.01$) than in mid (2.46±0.85) and low altitudes (7.45±1.48) and that of crop residues was higher in low and mid altitude ($p<0.01$) than in high altitude. Highest ($p<0.001$) crude protein (CP) contribution was from crop residues in low (49.75±3.03) and mid altitudes (42.33±1.75) than in high altitude (28.47±3.03) and lowest was from purchased feeds with highest CP contribution in high (10.78±0.75, $p<0.001$) than in mid (2.44±0.43) and low altitudes (4.93±0.75). Highest ($p<0.001$) metabolisable energy (ME) contribution was from crop residues in low (52.91±1.23) and mid altitudes (51.12±0.71) than in high altitude (31.67±1.23) and lowest was found from purchased feeds with highest ($P<0.001$) ME in high altitude (11.55±0.88) than in mid (2.15±0.46) and low altitudes (6.78±0.88). In conclusion, the main feed resource is crop residue which is of low nutritional quality. Chemical and biological treatments of crop residues and concentrate supplementation and training farmers on feeding and grazing management would improve nutritional value total diet.

Keywords: Agro-ecology; Crude protein; Dry matter; Metabolisable energy

Abbreviations: FEAST: Feed assessment tool; CP: Crude Protein; HHs: Households; DM: Dry matter; ME: Metabolisable Energy; SPSS: Statistical Package for Social Science; LSD: Least Significant Difference

Introduction

Livestock feed resources available in the study area are natural pasture, crop residues, improved forage, hay, industrial by products [1]. In Ethiopia natural pasture is the primary feed resource throughout the wet season while crop residues play a substantial role during dry season [2]. The current report revealed that 54.59, 31.06, 6.81, 1.53, 0.31 and 5.11% of the total livestock feed supply of the country is derived from natural pasture, crop residues, hay, agro-industrial by-products, improved forage and other types of feeds, respectively [1]. Natural pasture accounts about 25% of total land mass of the country [3]. However, its productivity in most parts of Ethiopia is extremely low [3] due to seasonal fluctuation of rainfall and poor grazing land management and conversion of grazing land in to crop lands as a result of increased human population [4,5].

The total annual production of crop residues at global and national level is estimated to be about 1.14 billion [6] and 30 million [7] tons of DM, respectively of which 70% is utilized as livestock feed. Moreover, crop residues are providing a considerable quantity of dry season feed in most farming areas of the country [8-11], and contributed up to 30-80% of the total feed DM available for animals in the highlands of Ethiopia [12]. However, crop residues are fibrous by products and their feeding values are limited by their poor voluntary intake and digestibility and low nitrogen, energy, mineral and vitamin contents [13].

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Climate Smart Livestock Feed Improvement Promising and Prioritized Technologies and Intervention Options: A review

Getahun Belay*

Department of Animal Science, Alage ATVET College, Ethiopia

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***Corresponding author:** Getahun Belay, Department of Animal Science, Alage ATVET College, Ethiopia

Abstract

The global livestock sector contributes a significant share to anthropogenic green-house gas (GHG) emissions. With emissions estimated at 7.1 gigatonnes CO2-eq per annum, representing 14.5 per- cent of human-induced GHG emissions, the livestock sector plays an important role in climate change. Recent analysis suggests that developing world regions contribute about two thirds of the global emissions from ruminants, with sub-Saharan Africa a global hotspot for emissions intensities, largely due to low animal productivity, poor animal health and low-quality feeds. Feed and nutrition directly affect an animal's productivity and health status and can strongly influence GHG emissions per unit of product. Low digestible feeds affect nutrient uptake and result in low animal productivity. For ruminants, a large fraction of GHG emissions is caused by enteric methane production in the rumen. While total enteric emissions might be lower with low digestible feed, so is overall production; as a result, emissions intensity tends to be much higher. There are multiple ways in which feed quality and digestibility can be improved in all production systems. Feed substitutes and supplements are highly effective ways to increase resource efficiency and change fermentation processes in the animal to decrease GHG emissions intensity. In conclusion, incorporating low greenhouse gas traits in to forage plants, identification and synthesis of compounds from plants that can reduce methane and nitrous oxide, low methane feeds, low nitrogen feeds, forage crops with improved energy values and lower nitrogen content, precision feeding, feeding management, nuclear and isotopic techniques and improved forage quality would improve livestock productivity and reduces green-house gas emission intensity..

Keywords: Livestock; Green-house gas; Feed improvement; Methane; Silage

Abbrevations: GHG: Green-House Gases; GDP: Gross Domestic Product; UMMB: Urea Molasses Multi-Nutrient Blocks: LWG: Live weight gain; IAEA: International Atomic Energy Agency

Introduction

Projections based on population growth and food consumption patterns indicate that by 2050 agricultural production will need to increase by at least 60-70 percent to meet demand [1,2]. The livestock sector supports over 1 billion people accounts for 40% of global agricultural gross domestic product (GDP) and provides over 33% of the world's protein intake [1]. Livestock's contribution goes beyond the production of meat, milk and eggs and a number of factors determine their overall impact on food security [3]. Livestock production must deal with the increased competition between human food and animal feed and the greater demand for animal products globally and the resulting environmental impacts as human populations increase, and their dietary preferences change [4].

Livestock production globally contributes about 9% of total anthropogenic carbon dioxide (CO_2), 37% of methane (CH_4) and 65% of nitrous oxide (N_2O) emissions [5]. Globally, enteric fermentation from all major ruminant species is responsible for 2.7 Gt CO_2 eq. (almost 40% of total greenhouse gas emissions from the livestock sector) in 2005 [4,6]. In aggregate, the large number of domestic ruminants, particularly beef cattle and dairy cattle - combined with the high level of methane emissions per head and the high global warming potential of methane - makes enteric fermentation a significant contributor to global greenhouse gases from agriculture, with around 30% of GHGs in the agriculture sector coming from enteric fermentation. Dietary factors are known to affect the community of microorganisms in the digestive tract and thus affect the quantity of methane produced. This has resulted in an increasingly large body of literature which suggests that we can manipulate CH_4 production using diet [4,7-9].

Crop residues can be used for feeding dairy cattle but cannot supply adequate nutrients without supplementation. Because of their low digestibility they remain in the rumen for a long time,