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Availability and Nutritional Potential of Major Feed Resources at Wayutuka District, East Wollega, Ethiopia

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Abstract: This study was conducted to evaluate the availability, feeding management and nutrient content of major feed resources used at Wayutuka district, western Ethiopia. A total of five main crop residues, six improved forages, five indigenous browse species and native pasture were collected involving 90 households in three PAs of the district. Group discussion was also made with key informants. Chemical analysis of forages samples was made following standard procedures. The survey showed that the major feed resources in the study area were crop residues and natural pastures. Among the residues, maize and sorghum stovers were the main ones. Crop residues produced in the district were also used for other purposes other than feeds such as home construction. All the crop residue types (Maize, sorghum, wheat, teff and millets) contained nutrient ranges: DM (93-95%); CP (3-6.6%), NDF (58.-67.3%); ADF (43.9-59%) and ADL (10.2-15.5%). The native pasture contained DM (92.5%); CP (7.4%); NDF (59.5%), ADF (47.9%) and ADL (12.8%). The composition of crop residues and native pasture indicates low CP and high fiber. The improved grasses such as Rhodes, Elephant grass and Desho grasses had CP (4.3-6.4%); NDF (51-70.8%) and lignin (10-13.2%) while that of *S. sesban* as a multipurpose trees contained CP (19.4%), NDF (39%) and ADF (27%) and lignin (5.7). The nutrient content of indigenous browse species such as *F. tonigie*, *F. indica*, *F. vasta*, *C. Africana* and *V. amygdalina* had CP (12.8-18.6%), NDF (42.3-69.7%); ADF (35.2-58.9%) and lignin (7.5-15%). This shows that indigenous browse species contained CP values nearest to *S. sesban* and may be important as protein supplement for poor quality crop residues and native pasture in the district.

Key words: Availability, Chemical Composition, Feed Resources, Wayutuka

INTRODUCTION

Ethiopia is believed to have the largest livestock population in Africa. According to CSA [1] the sector has been contributing considerable portion to the economic development of the country. It is eminent that livestock products in the form of meat, milk, honey, eggs, cheese and butter etc. provide the needed animal source nutrients that contribute to the improvement of the nutritional status of the people. Livestock also plays an important role in providing export commodities, such as live animals, meats, hides and skins to earn foreign exchanges to the country. On the other hand, draught animals provide power for the cultivation of the food crops and for crop threshing virtually all over the country and are also essential modes of transport to take holders and their families long-distances, to convey their agricultural products to the market places and bring back their domestic necessities [2].

In contrary to their multi advantages to the society, there are many factors which limit productivity of livestock in the tropics in general and in Ethiopia in particular. Livestock feed resources in Ethiopia are mainly natural pasture and crop residues [3, 4]. These types of feed resources are usually inadequate to support optimum livestock production and productivity both quantitatively and qualitatively. The contribution of these feed resources for livestock, however, depends up on the agro ecology, the types of crop produced and also production systems. Most grazing lands were encroached due to wider cultivation for food crop production [5]. Such narrow grazing land in almost all

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regional states of Ethiopia created a status in which the same land was frequently grazed without the chance for resting. In addition crop residues are not only used for feeding livestock but also used as construction materials being sold most frequently taking to urban areas. In some crop-livestock areas including the study site, stovers are being burned for ease of tillage. The rest crop straws are burnt on the field for ease of land preparation for crop production. In addition these crop residues are highly fibrous, low intake. These and other factors contributed to limited availability and feed values of feed resources in Ethiopian conditions.

The availability of feed resources, feeding managements and their nutritional quality are the most important factors that determine the productivity of livestock [6]. However, there is scanty of information regarding feed resources availability, feeding management and nutritive values in the Wayutuka district.

The result of this study will help in identifying the existing feed resources, feeding practices and ways and means of improving these practices. It will also help in defining prospects for future interventions in developing livestock feeding systems to enhance productivity and viable integration of the crop and livestock sectors. This study, therefore, is initiated to assess the availability and nutritional potential of major feed resources at Wayutuka district, East Wollega, Ethiopia

MATERIALS AND METHODS

Study Area: The study was conducted in Wayutuka District which is found in East Wollega Zone Oromiya Regional state, Ethiopia. It is one of seventeen districts of East Wollega zone, Oromiya, Ethiopia. The land size of the Wayutuka is 45, 895 ha and comprises 12 kebeles (Smallest administrative unit) belonging to ten rural areas and two urban centers namely 'Boneyamolo', 'Garahudha', 'Gutebadya', 'Kichi', 'Komto', 'Migna Kura', 'Harochalchis', 'Gidaabalo', 'Gidabasaka', 'WaraBaboMigna', 'GabaJimata' and 'Gute'. It is located 320 km from the capital city Addis Ababa toward the west of the country and 10 km away from Nekemte, which is the East Wollega zonal town. The District is bounded by GutoGida and Sibu Sire Districts in the north, by GutoGida and LeqaDulacha Districts in the west and East by Sibu Sire District and WamaHagalo in the south and NunuQumba District in the east. The District is classified in to three agro Climatic zones: Dega covers about 37.66 percent, Woina Dega 49.23 percent and Kolla 13.11 percent, with min and max temperatures of 12°C and 32°C respectively. The altitude range of the District is 750 masl to 3180 masl and the min and max Rainfall of 1400mm & 2400mm respectively. The district has a human population of about 78, 871 out of which 40, 350 (51.16%) and 38, 521 (48.84%) are males and females respectively. The household size of the Wayutuka District rural PAs is estimated at 11, 947. Of these, the male and female headed households are estimated to be 10, 577 (88.53%) and 1370 (11.47%), respectively. Agriculture (mainly rain fed and characterized by low productivity) is the economic base of the Wayutuka District. Major crops such as cereals, pulse and oil crops are cultivated annually in their descending order of area coverage [2].

Sampling Approaches: Two kinds of samples were taken here. One is sampling of the study population for collecting data through questionnaire, interviews and focus group discussions (FGD). The second sample type was representative feed samples which are collected from the different and major types of feeds available in the district for nutritive value analysis.

The Wayutuka District was purposely selected due to transport accessibility and matters related to research costs. Three kebeles in the district were selected randomly for the study. However, sampling for Kebeles and households were done randomly therefore multistage sampling approach were employed in this regard. Out of each kebeles, 30 farmer's households were taken based on the following formula [7].

$$n = \frac{N}{1+N}(e)2$$

where:
n = Sample size
N = Sample frame
e = marginal error

Accordingly ninety (90) households including female households (HH) were selected randomly from the district for the study. The survey were conducted using semi-structured questionnaire which focused on animal feed availabilityand feeding management; group discussions and key informants interview were used to generate necessary data on feed resources availability and utilization in the wet and dry season. The group discussions were made using check list, focusing on available feed resources, feeding system, grazing system, seasonality of feed availability and type of fodder plants.

Feed Sample Preparation for Laboratory Analysis

Sampling from Native Pasture: Representative samples of available grazing feed resources were taken during the data collection. Sample sites were grouped for grazing site using 0.5mx0.5m quadrants thrown randomly. The native pasture covered within the quadrant was carefully mowed, sun dried for a day after which it was taken to laboratory for drying at 65°C for 48 hours. Then was ground in Willey mill to pass through 1mm sieve and allowed to equilibrate at room temperature for 24h. The samples were then put in air tight plastic bags and sealed for further chemical analysis.

Sampling from Crop Residues: Crop residues were sampled purposely for major types of crops used in each Kebeles, from crop fields. The parts to be included in the sample were those which can be used or consumed by animals. Most crop residues were obtained at threshing areas. Such samples of residues were randomly taken from bulk of each crop type. The same procedure was followed to take samples of aftermaths in the field, immediately after harvesting.

Sampling from Browse Species: Leaves, twigs and other edible parts of different indigenous/local and multi-purpose trees (MPTs) browse plants was sampled during the dry season, a critical time when these plants serve as the alternative feed source. Thereafter, sub-samples were taken after thorough mixing for laboratory analysis. Feed samples were sun-dried before being transported to the laboratory, then dried at 65°C for 48h to constant weight and ground in Willey mill to pass through 1mm sieve and allowed to equilibrate at room temperature for 24h. The samples were then put in air tight plastic bags and sealed for further chemical analysis.

Sampling of Improved Forages: Improved forage stands such as elephant grass and other perennials was taken fresh. About 300g sample were taken for lab analysis following normal procedure. To take sample of hay made by farmers, first a single lot of hay was identified and a good sharp coring device was chosen. Sample was taken at random with enough cores and a good care was used to handle the samples correctly. The sample was weighed about 300 grams taken to the lab to dry it at 60°C for chemical analysis.

Chemical Analysis: Dry matter and ash were determined according to AOAC [8]. Dry matter content of the samples was determined by oven drying for 24 hours at 105°C to constant weight. The crude protein was determined by using the Kjeldahl procedure. NDF, ADF and ADL were determined using [9] analytical procedures. Hemicelluloses and cellulose can be calculated by difference from NDF and ADF and ADF and ADL, respectively.

Statistical Analysis: Both quantitative and qualitative data were collected during the survey. Descriptive statistics such as means, percentages, standard error of mean (at $\alpha = 0.05$) and frequency distributions were computed using Statistical Procedures for Social Sciences (SPSS) software. The graphs and charts were drawn using Microsoft excel computer program.

RESULTS AND DISCUSSION

Land Usage and Feeding Management in Wayutuka District

Land Use in the Study Area: Land use per households was highest for crop production in all the three kebeles and the mean for district level was 1.8ha/HH followed by grazing land with the mean value 0.45ha/HH. The least land size was (0.14ha/HH) occupied by forest. From this it is evident that crop residues and grazing lands were the major sources of feed for livestock at Wayutuka district. This is in line with the report of CSA [1] in that crop residues and grazing are the main feed resources for livestock in Ethiopia. This is common for most Ethiopian farmers in rural areas. However, small variations were common for average landholding per households between different farmers in rural Ethiopia based on population densities.

The average land holding in this study was 1.74ha per household and it was higher than the reported by Shenkute *et al*. [10] who showed that the overall land holding was 0.93 for Goma District and lower than 2.55ha per household reported by Yeshitila Admassu [11] for Alaba District and also 3.28 ha per household in the North Gondar [12].

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 [13] as well as for the possibility of incorporating them in the general farming activity. The chemical composition of Fodder trees are shown in Table 9.

Table 1: Land use in hectares in Wayutuka district

	Kebeles in Wayutuka							
	Wara Babo		Mignakura		Gute Badya		Average land use	
Land use (ha)/HH	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Food crops	2.0	0.87	1.86	0.75	1.6	1.0	1.8	0.91
Hay (native)	0.2	0.2	0.3	0.27	0.4	0.26	0.3	0.27
Grazing	0.60	0.33	0.27	0.27	0.47	0.22	0.45	0.31
Forest land	0.09	0.2	0.16	0.28	0.17	0.27	0.14	0.25

Remark: HH=household Std =standard deviation

Table 2: Major crop residues types and yield (t/ha) per household in Wayutuka district

	Kebeles in Wayutuka						
	Wara Babo		Migna kura		Gute Badya		
Main crop							District
Residues	Mean	Std	Mean	Std	Mean	Std	Average
Maize	35.83	72.18	42.00	54.61	41.70	51.66	39.84
Sorghum	41.73	50.91	48.00	56.23	13.63	18.44	34.45
Teff	20.50	38.15	29.83	49.77	10.73	17.63	20.35
Millet	31.83	53.99	9.67	27.48	20.77	46.71	20.76
Wheat	18.00	30.07	11.50	38.93	4.00	13.03	11.17
Total yield	120.83	80.190	137.67	79.38	90.50	76.675	126.57

Std = standard deviation

Table 3: Estimated crop residues and native pasture yield in Wayutuka district

	Crops residues (Tons/ha)					
						Native
Kebeles	Maize	Sorghum	Wheat	Teff	Millet	Pasture
Wara Babo	28608	4240	2, 532	11628	3295.6	-
Migna kura	47712	50, 8635	84	31218	12628	-
Gute Badya	39730	3340	125.6	3654	6349	-
Total	116050	58442.5	2741.62	46500	22272.8	1656.27
Overall total						247, 663

Table 4: Order of importance and rank for feed resources used in Wayutuka district

	Kebeles in Wayutuka			
	Wara Babo	Migna Kura	Gute Badya	Rank
NP-CR-hay-FT-SG-others	22	12	26	1
CR-NP- hay-FT-SG-others	4	11	4	2
Hay-CR-NP-FT-SG-others	4	7	0	3
Total	30	30	90	-

NP=Natural pasture, CR=crop residues; FT=fodder trees; SG=stubble grazing

Major Crop Residues Used as Feed in Wayutuka District: Estimated mean yield (t/ha) of crop residues at household level and at district level were shown in Tables 2 and 3, respectively. For household level straw production, the least yield from the five main crops, was recorded for wheat residues (4 t/ha) at Gute Badya kebele whereas the highest residue yield was for sorghum (48 t/ha) at Migna Kura kebele. The district level average straw yield was highest for maize stover (39.84 t/ha). This was followed by sorghum straw (34.45t/ha) whereas the least residues yield was for wheat straw (11.17). This shows that at Wayutuka district, maize is widely produced and the stover is used as animals feed and given only during feed scarcity. This finding is in agreement with Teshager [14] who reported maize and sorghum residues are the main crop residues produced in Ilu Abba Bora zone of Southwest Ethiopia, which is immediate to east Wollega zone in which Wayutuka district is located.

Table 5: Main feed resources available in dry and wet periods in Wayutuka district

		Kebeles in Wayutuka				
Seasons	Feed types	Wara Babo	Migna Kura	Gute Badya	Total	Percent
Dry period	Crop residues	20	14	22	56`	62
	Hay	6	9	4	19	21
	Fodder trees	0	0	1	1	1.1
	Stubble grazing	3	8	1	12	13.3
Wet (rainy) period	Natural pasture	21	10	24	55	61.1
	Fodder trees	4	6	0	10	11.1
	Natural pasture & fodder trees	2	6	5	13	14.4
Total	30	30	30	90	100	

As indicated in Table 2, the overall crop residues production for the three kebeles Wara Babomiya, Migna kura and Gute Badya was calculated from their respective grain yield using conversion factors [15] as indicated under literature review.In similar way as in the case of household level crop residue yield trends, the highest total straw yield was for maize stover (116, 050 t/ha) while the result for sorghum stover (58, 442.5t/ha) indicating that sorghum straw yield was the second, next to maize. The least was for wheat straw (2741.62 t/ha). These all confirmed that the regions from lower part of West Shewa to almost all East Wollega are maize belt as they all receive hot humid climate. On the other hands the total crop residue produced in the district was not solely used for animal feeding purpose. However, there is high competition between crop residue for livestock feed, for fuel and construction purpose. The competing use of crop residues for livestock feed, fuel and construction activities may be managed through various efforts, such as through planting multipurpose trees [16] around homesteads, riversides and field boarders to reduce use of crop residues for fuel and construction materials. Multipurpose trees can be used for livestock feed, they can fix atmospheric nitrogen and are also fuel sources.

Quantitative Estimationof Feeds Availability in the District: The total estimated feed produced in the district excluding improved forage, indigenous browse species and multipurpose trees, is about 247, 663 tons (Table 3). The total amount that livestock in the district require was 232, 667.83 tons. This shows about 15, 000.27 tons positive balance is there. Such result is not common in most rural farming communities of Ethiopia. One of the reasons for such quantitative positive balance; however, might by due to high off take of livestock due to road accessibility and short distance of the Wayutuka district from Nekemte town where livestock market is available.

The reason for excluding improved forage, indigenous browse species and multipurpose trees was that improved forage was nil in; indigenous browse species were large trees like *F.vasta* and these are less accessed by animals. Concerning multipurpose trees, utilization as fodder was negligible since most farmers were using as live fence at their homestead. In reality, the positive balance observed in above calculation might not be practical because remarkable size of teff straw was taken to market for home construction purpose, maize stover for temporary fence making by farmers, use as fire wood and also burning on the farm for ease of land preparation. The same utilization principle works for sorghum stover that it is also not utilized only for feeding animals. Since maize and sorghum stovers are woody in nature, livestock consume less of it, except by large ruminants like cattle during early harvesting time when dried leaves are available on the stalk. In addition, it is uncommon with farmers to chop and provide (Physical treatment) to their animals to improve intake. Thus all residues produced on the farm were not utilized as feed for the animals.

Ranking Order of Major Feed Resources Utilization in Wayutuka: The major feed resources which dominate in the three kebeles were used in the order Natural pasture-crop residues-hay- fodder trees-stubble grazing-others (73.3%) followed by the order CR-NP- hay-FT-SG-others (13.3%) and Hay-CR-NP-FT-SG-others (13.3%) for Wara Babomigna. This trend of order of feed utilization was similar for both Mignakura and Gute Badya kebeles (Pas). In general term, the dominant feed type in the district was from natural pasture followed by crop residue. Crop residue is known as one of dominant feed resource in all livestock production systems in Ethiopia [17]. The nature of crop residues produced depends on the amount and type of crops grown in the area [12]. As the presence of different agro-ecologies in the study area, farmers practice mixed crop production and usually produce a mixture of cropsand hence the residues were produced on the way, which can be used as feed for their livestock. Hay production is widely practiced in the district and used as feed next to crop residues based on their availability.

According to Firew and Getnet [18] though hay utilization is among the lowest but now days there is growing trend of hay making from natural pasture, especially from school compounds, church yards and other public places. Hay is made during October to January and commonly very late, therefore of poor quality. Part of the pasture could be protected and left for standing hay for grazing. Native hay is also used during the dry season.

Feed Resources in Dry and Wet Period in the District: Feed resource in dry period, crop residue and stubble grazing, was more used in all three kebeles (62%) but in wet period natural pasture is used (61.1%). Animals are undernourished because of fluctuating supply of nutrients, insufficient intake of available feeds or from inherent deficiencies in the available feeds. In this relation, however, in the study areas, more than half of the feed resources in dry period are obtained from crop residues.

Because of high competition of grazing land with cropping, the interaction between land and livestock is high in smallholder farming. Two main seasons are exhibited in Wayutuka district. Recent reports for most parts of Ethiopia indicated that there is increasing importance of crop residues as a livestock feed [19, 20]. According to Tsegaye *et al*. [20] shortage of grazing lands and the absence of alternative feed resources leads to the increased dependence on crop residues in the central highlands of Ethiopia. Similarly, the practice of feeding livestock with crop residues in the mornings and evenings around homesteads has been reported to increase in the recent years in the Bale highlands of Ethiopia due to the reduction of the herbage obtained from natural pasture because communal grazing areas are overgrazed [19]. The feed availability situations in Wayutuka district also confirm these reports.

Status and Type of Communal Grazing Land in the Study Area: The majority of the respondents (80%) witnessed that the status of communal grazing land was in diminishing (93.3%) trend and only few households included in the study reflected that the communal grazing land has shown “No change”. These few groups might had reflected their ideas “No change” in view of the government ban against plowing communal grazing lands. Except this, if the crop production was virtually expanding, the communal grazing land was encroached. This result is in line withFAO [21] and this confirms that the response of the majority of households involved in the current study is acceptable that the communal grazing land was at a diminishing trend.

The type of communal land in Wayutuka district was open grassland (60%) tree covered grassland (21.1%), bush land (16.7%) and was swampy (2.2%). According to the respondents, the communal grazing land has no adequate feed to meet the required amount in terms of quality and quantity.

In addition, intensive grazing affects the amount of plant litter at the soil surface and exerts indirect pressures on the germination and seedling establishment patterns [22]. The productivity of most communal lands has been reduced by human and livestock pressures and natural hazards. Because vegetation integrates all environmental factors acting on a site, knowledge of its types may be used to make inference about prevailing environmental patterns [23].

Tolba [24] reported that the major causes of changes in rangelands are excessive grazing by domestic and/or wildlife animals, cultivating for cropping and intensive collection of resources like firewood, foods and building materials. To alleviate these problems peoples recommend use of crop residues (37.8%), use of purchased forages and concentrate (37.8%), preserve any feed during high abundance (22.2%) and exclude areas from stock (2.2%) for better re-growth. Purchase of forage and concentrate feeds, however, was not affordable by rural households except for intensive animal fattening and related activities for commercial (profit) purposes.

Availability of Improved Forages in Wayutuka District: The most common types of improved forages planted in Wayutuka district were given in Table 8. Households who did not have planted improved forages were only 22.2%. About 77.8% of the respondents practice improved forage plantation on their own private land. Among the improved forages planted in the district, Rhodes, alfalfa elephant grass and multi-purpose trees (MPTs) like *S. sesban* were the most common ones. As the respondents indicated they use the MPTs as a live fence around their homestead. They have also disclosed the reason for lower percentage of backyard forage development practice was mainly due to the fact that their land was occupied with coffee. The rare practice on developing improved forage was supported by other reports [12]. Establishment and utilization of improved forages as livestock feed in the area was hardly known. The least size of improved forage produced in the study area is not uncommon practice. It was rare to produce such improved forages as reports from different places in the country showed similar facts [25].

Table 6: The status and type of private and communal grazing land in Wayutuka district

Descriptions		Kebeles in Wayutuka			
		Wara Babomigna	Migna Kura	Gute Badya	Total
Communal grazing land	Decreasing	27	30	27	84
	No change	3	0	3	6
	Total	30	30	30	90
Type of communal grazing land	Open grassland	25	4	25	54
	Tree covered grass land	3	11	5	19
	Bush land grassland	1	14	0	15
	Swampy	1	1	0	2
	Total	30	30	30	90
Adequacy of grazing	Yes	1	2	5	8
	No	29	28	25	82
	Total	30	30	30	90
Measures taken to alleviate feed shortage	Purchase concentrates	5	8	4	17
	Purchase forages	13	3	1	17
	Use crop residues	8	8	18	34
	Preserve during abundance	3	7	7	17
	Exclude areas from stock	1	4	0	5
Total		30	30	30	90

Table 7: Type of improved forage cultivated in Wayutuka district

Type of improved forage	Kebeles in Wayutuka			
	Wara Babo Miya	Migna Kura	Gute Badya	Total
No improved forage	9	7	4	20
Rhodes	8	2	6	16
Elephant grass	1	1	2	4
Alfalfa	1	0	1	2
Desho	0	0	1	1
MPTS	0	2	3	5
Rhodes+elephant grass+ alfalfa	5	7	7	19
Elephant grass+desmodium	0	5	0	5
Desho+MPTs	2	3	0	5
Rhodes & Desho	4	3	0	13
Total	30	30	30	90

Chemical Composition of Major Feed Resources in Wayutuka District: Beside feed evaluation in terms of biomass yield, determination of the potential of forages is important in estimating its nutritive values. Chemical composition is one of the approaches used by researchers to determine nutritive values of feeds. Table 9 shows nutrient content of different herbaceous, browse and crop residues in Wayutuka district. Maize and sorghum stover, wheat, teff and millet straws were the main crop residues used in the district. Accordingly the CP content ranged from the minimum 3% for maize stover and maximum 6.56 for sorghum. In all cases, it is below the minimum level required for normal rumen microbial physiology [9]. The CP for natural pasture averaged 7.44%. [26] report was for Wheat straw 2.98%, Teff straw 4.34%, Maize stover 4.56%.

The NDF content of both the crop residues and native pasture was within short range (58.7-67.3%). Numerically, the highest NDF value was for wheat straw followed by maize stover and the least was for sorghum stover. The highest value in the former feeds shows that these feed types need treatment to facilitate feed intake of animals which was highly influenced by NDF levels. The ADF and ADL contents of the straws and natural pasture followed nearly similar trends with their NDF. This implies that the high fiber containing diets were also more lignified and that their digestibility was expected to be low. These all affects overall utilization efficiency of the feeds.

On the other hand improved forages such as *C. gayana, P. purpureum, P. pedicellatum and S. sesban* were analyzed for their chemical composition and the

Table 9: Chemical composition of different feeds in Wayutuka district

Types of crop Residues	Chemical composition (%) DM	ASH	CP	NDF	ADF	ADL
Maize	93	5.68	3	63.32	49.89	11.76
Sorghum	93.33	6.44	6.56	58.74	46.41	12.76
Wheat	93	9.79	6	67.33	58.96	15.48
Teff	93.6	6.84	4.64	59.13	43.94	10.19
Millet	95	6.7	5.62	58.8	46	11
Native pasture	92.5	7.36	7.44	59.45	47.87	12.78

Nutrient content of some improved forage and MPTs

Name of the forages/MPTs		Chemical composition (%)					
Common names	Scientific Name	DM	Ash	CP	NDF	ADF	ADL
Rhodes	*Chloris gayana*	93.3	6.33	4.3	65.8	52.9	13.2
Elephant grass	*Pennisetum purpureum*	92.7	8.2	4.9	70.8	54.9	13
Desho	*Pennisetum pedicellatum*	91.3	8.8	6.4	51	40	10.1
Sesbania	*Sesbania sesban*	92.5	8.5	19.4	39	27.6	5.7

Chemical composition of indigenous browse species

Local name	Scientific Name	DM	ASH	CP	NDF	ADF	ADL
Dambi	*Ficus thonigie*	91	9.8	17.6	68.5	57.8	13.9
Akuku	*Flakorpia indica*	92	5.5	18.6	42.3	35.2	7.5
Kiltu	*Ficus vasta*	91	53.4	14.1	69.7	58.9	15
Waddeessa	*Cordia africana*.	92	10.3	12.8	61	55.4	11.3
Girawa	*Vernonia amygdalina*	92.5	10.1	17.6	44	36.8	7.4

DM= dry matter; CP= crude protein, NDF= neutral detergent fiber, ADF= acid detergent fiber; ADL= acid detergent lignin; MPTs= multi-purpose trees

results are given in the same Table 9. The CP content of the grasses, as expected ranged between 4.3 to 6.4% which was poor and nearly similar with those of crop residues. This was because both the grasses and cereal straws were from the family *Gramineae*. As opposed to the CP of the grasses, *S. sesban* contained highest value (19.4%). Among the improved forages and MPTs, *S. sesbania* contained the least NDF value (39%) while highest (70.8%) was for elephant grass. The lowest NDF in the MPTs, *S. sesbania* shows its potential feed intake values. It must be for this reason that some households in the district used these MPTs to mix with straws and provided to their animals. The benefit of ADF and ADL content of the improved grasses over crop residues was invisible because they contained nearly similar levels of these same materials.

The CP content for the browse species ranged from 12.8 to 18.6% for *C. africana* and *F. indica*, respectively. This confirms previous reports that indicated higher CP contents of indigenous browses in Ethiopia [27] and other tropical countries [28] shown that the levels of CP ranged from 18.62 to 24.44% .This shows browse species were the potential sources of protein supplement to livestock kept on poor quality crop residues and native pasture. The NDF, ADF and ADL contents of *V. amygdalina* and *F. indica,* as compared to the rest browse plants, were at promising level in that.

CONCLUSIONS AND RECOMMENDATIONS

The overall availability of the crop residues and native pasture, without considering indigenous browse species, improved forages and multipurpose trees (MPTs), were mainly affected by selling for construction purposes, burning for field preparation and cultivation for crop production. Most of the classes of livestock, especially cattle were not performing well due to use of the existing feeds for other purposes other than feeding animals. Most farmers used to feed crop residues alone whereas few of them exercised mixing with leaves of MPTs and providing to their animals. Generally, their feeding practice was highly influenced with the availability of feeds. During feed scarcity periods in the district, farmers used to practice livestock-feed adjustment strategies mainly through destocking, selling animals, using improved forages or conservation in the form of hay and restocking techniques. Concerning the quality of the feeds, the poor nutrient content of crop residues and native pasture in the district have reduced the value of these feeds to support optimum livestock production and productivity. It needs treatment of such highly fibrous feeds to enhance intake and support performances of the animals. It is also better that farmers advised or trained on how to make use of MPTs as feed than keeping it growing only for live fence.

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