

Assessment of Available Feed Resources, Feed Management and Utilization Systems in SNNPRS of Ethiopia

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Abstract

The study was undertaken in selected central zones of SNNPRS including Wolaita zone, Kembata Tambaro zone, Dawuro zone, Gamo Gofa zone basket special Woreda and Yem special Woreda. The intention of the study was investigating the major feed resources locally available and sorting out major feed utilization system in the region and there by characterize nutritional characteristics of some locally available feeds. As it was identified in the study district highly nutritious and medicinal locally available feeds in the area comprised of Dawuro Dama in Dawuro zone and Konta special woreda, girawa in kemabta Tambaro zone, Eteryiwonjya, Danbursa and Girawa in Wolaita and Gamo Gofa zone. If these locally available feed categories identified botanically in collaboration with respective institute, given due attention and scientifically characterized and multiplied in large proportion, play vita; role for number one problem of agriculture the feed shortage-they could substitute all the other imported improved forage species. The reason for this was that they were adoptability, preferably in faming society, marketability and tolerance of dry season water scarcity. The climate change by its own and its consequences on availability, quality and quantity of feed resources, increasing demand of livestock products due to increased population and related factors force not only the regional authorities and federal authorizes but also the world leaders to give due attention for promotion of locally available feed resources to tackle the feed scarcity problem in the region. In addition to these it was best if diversified feed resource assessment undertaken for whole locally available feeds and their by characterize in nutritional bases.

Keywords: Assessment; Feed; Locally available; Shortage; Utilization

Introduction

Southern Nations, Nationalities, and Peoples' Region (SNNPR) is one of the nine ethnic divisions (kililoch) of Ethiopia. The SNNPR borders Kenya to the south (including a small part of Lake Turkana), the Ilemi Triangle (a region claimed by Kenya and South Sudan) to the southwest, South Sudan to the west, the Ethiopian region of Gambela to the northwest, and the Ethiopian region of Oromia to the north and east. Besides Awasa, the region's major cities and towns include Arba Minch, Bonga, Chencha, Dila, Irgalem, Mizan Teferi, Soddo, Wendo, and Worabe.

The SNNPR Water Resources Bureau announced that as of the fiscal year ending in 2006, they had increased the area of the Region that had access to drinkable water to 54% from 10-15% 15 years ago. In August 2008, the head of public relations for the Bureau, Abdulkirim Nesru, announced that 94 million Birr had been spent to further increase the availability of drinkable water in the Region from 58% in the previous year to 63.6%. Priority was given to certain Zones, such as Sidama, Welayta and Gurage, as well as the Alaba special woreda and several resettlement areas.

Use of improved forages would reduce pressure on natural pasture, improve soil fertility and erosion of marginal lands, improve carbon sequestration to mitigate climate change, support system substantially and enhance natural assets and system reliance [1].

Inadequate nutrition and feeding are major constraints to livestock production in sub-Saharan Africa (SSA). Feeds (usually based on fodder and grass) are either unavailable in sufficient quantities due to fluctuating weather conditions or are available but in a poor quality that they do not provide adequate nutrition. These constraints result in low milk and meat yields, high mortality of young stock, longer inter calving intervals and low animal weights [1].

Improved nutrition through adoption of sown forage and better crop residue management could substantially increase livestock productivity. International research agencies, including the International Livestock Research Institute (ILRI), National and Regional Research institutes

with their corresponding Research centers have developed several feed production and utilization technologies and strategies to address the problems of inadequate supply and poor quality of feeds. To date, adoption of these technologies has been slow, despite evidence of high returns where the technologies have been extended by extension and development agencies. These include fodder banks in West Africa, alley farming in West Africa and Kenya, the Napier grass and leguminous tree combination for dairy animal production in coastal and central Kenya and oats-vetch (*Avena sativa* and *Vicia villosa* ssp. *Dasycarpa*, respectively) intercrop in the highlands of Ethiopia. In the east African highlands, forage crops are not grown widely despite high animal stocking rates that should result in demand for fodder. Nevertheless, evidence is available showing that forage technologies display desirable agronomic characteristics such as high yields, contribute to improving soil condition and fertility, in the case of legumes, and increase milk yields of cows [2].

Agriculture is back bone of Ethiopian Economy, accounts for 46% of Gross Domestic product and livestock sector contributes 30% to 35% and more than 85% of cash income. The subsector also accounts for 19% export earnings.

Ethiopia's livestock resources are huge. Estimated numbers of meat-producing livestock are: 43.1 million cattle, 30.6 million sheep, 26.8 million goats, 2.5 million camels and in excess of 32 million poultry. Cattle contribute 71.5% to the livestock biomass, sheep 7.3%, goats 6.4%, and camels 5.8%.

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The predominant livestock production systems are (a) in the lowlands (<1500 masl) pastoral and agro-pastoral which together contain some 30% of all livestock, all camels, the majority of goats and provide some 90% of livestock for export, and (b) in the highlands (>1500 masl) highland mixed crop-livestock, per-urban milk production, small-medium scale fattening and dairy production, and large commercial farms. Sheep are kept for sale and meat and in the lowlands, milk. Reproductive performance is poor and below potential. Off take is estimated as 35% and mortality as 11-16%.

Livestock Feed resources are classified as natural pasture, crop residue, improved pasture and forages, agro industrial by products, other byproducts and vegetable refusal, of which the first two contributes the largest feed type.

Animals mainly depends on natural pasture for their feed requirement, natural pastures, which provide more than 90% of livestock feed are generally are very poor managed. In the mixed farming in mid altitude areas better soils used for cropping and the main permanent natural pasturelands are found on upper slopes of hills and seasonally water logged areas. Due to poor management and overgrazing, natural pastures are highly overgrazed resulting in sever land degradation, loss of valuable species and dominance by unpalatable species [3].

Feed scarcity in both quantitative and qualitative dimensions is the major impediments for the promotion of the livestock sub-sector in the country. Much of the available feed resources are utilised to support maintenance requirement of the animals with little surplus left for production. There are marked seasonality in quantity and quality of available feed resources due to various environmental determinants (drought, frost etc.). Appropriate technologies that can optimise utilisation of available feed resources and alternative technologies to replace traditional practices are not yet fully developed and database required for the generation of technologies are grossly lacking both at feed and animal level. Although research has identified high yielding and better quality forages adaptable to various agro-ecologies and production systems, improved forages are not yet adopted and developed by the farming community due to inadequate knowledge, poor extension service, and shortage of land and policy issues.

Mixed crop-livestock production system is a dominant mode of production especially in the highlands of the country. This area accounts for more than 90% of cultivable land, and encompasses 75-80% of human and livestock population. It is characterized by high human (120 person/km²) and livestock population (130 TLU/km²). Livestock has so many functions like provision of food, income source, fuel and fertilizer. Because of its ecological niche, conversion of fibrous materials in to high quality products, ruminant production is closely linked with crop production. Draught animals are the main source of power for cultivation, and income from livestock sales heavily dictates purchasing power of input (fertilizer, herbicide, etc) for crop production. Livestock production in turn depends on crop residues for feed and the quantity and quality of the crop residues have substantial impact on livestock productivity. The mixed crop-livestock production system basically involves a lot of complementary and competitive features of the two sub-systems and improvement of the system at large requires a thorough understanding. The challenge in attaining food self-sufficiency in areas dominated with this production system is immense and technological interventions are the only way out. Optimizing productivity per unit of land, and per head of animal while maintaining the environment are the ultimate goals to make the production system sustainable. One of the key challenges and linkages

in the crop-livestock production system is feed resource availability and feeding system responsive to the needs of the farming community [2].

Feed shortage and poor quality of available feeds are the major constraints to increased livestock productivity in Sub Saharan Africa. Sowing a new pasture or improving an existing natural pasture requires a reliable source of seed or vegetative material or species recommended and adopted for the area [4].

Executive summary

Studies have indicated that the total feed DM obtained from crop residues including inset and banana in SNNPRS was estimated at 2,446,174 tones DM in 1992/93 production years. Other feed resources come from grazing and browsing, aftermath grazing, fallow land grazing, forest woodland, bush land and shrub land contribute about 7,274,126 tones of DM/yr. The livestock population of the region is estimated at 6,190,875 TLU. The available DM was calculated to be 9,720,300 tons per year for 1992/93-production year. This is equal to 4.30 Kg DM/TLU/day. The maintenance DM requirement of 1 TLU is estimated at 1.679 tones of DM/yr or 4.6 kg DM/day. Thus the available feed supply satisfies only 93.5% of the maintenance requirement and is not enough for the maintenance and production requirement of the livestock population in the region. The deficit is 0.3 kg DM/TLU/day or 110 kg DM/TLU/yr. Feed shortages and nutrient deficiencies become more acute in the dry season in both the highlands and lowlands. To feed the increasing human population by continuous cereal growing, available grazing is on the decline. For various reasons, crop residues and agro-industrial by-products are not adequately utilized. Cultivation of forage is not widely adopted and commercial feed production is not developed.

The major animal feed problems are stemmed from lack of comprehensive information on regional feed resources, natural pastures and range lands, indigenous forage species and feeding systems. Pastoral and agro-pastoral production systems were not given due attention with respect to feed research and development interventions. Treatment options to achieve optimum utilization or strategic supplementation of crop residues and non-conventional feed resources was not adequately studied and promoted. Feeding guidelines for the different classes of animals and production systems based on available feed resources were scanty. Information on nutritional quality of major feed resources is limited. Improved forages required for on-farm production and research interventions are not adequately available.

Generating information on the regional available feed resources and their nutritional characteristics, identification of botanicals in range and grazing lands, current status and condition of grazing and range lands, smallholder feed management and feeding practices, factors affecting demand and adoption of improved forage materials, qualitative aspects of available feed resources could provide baseline data to understand the existing situation of animal feed and basis for planning improved feeding and feed management interventions for specific locations, agro-ecologies and farming systems of the region. Further, improved technologies and methodologies mitigating the identified problems and will be developed and demonstrated to smallholder farmers and pastoralists of the region.

Animal agriculture plays a considerable role in the livelihood of farmers and pastoralist and national economy of Ethiopia. The country holds a largest livestock population in Africa. The diverse agro-ecology, varying farming systems, vast geographic area and the long tradition

of rearing livestock contributed to the current huge resource base. The Southern Nation, Nationalities and People's Regional State is the third largest reservoir of national animal resource base followed by Oromiya and Amhara Regional States. According to the recent report of CSA, SNNPR Regional State has about 8.5 million cattle (20% of the total national population), 4 million sheep (17%), 2.5 million goats (14%), 0.7 million equines (10%), 6.5 chicken (19%) and 72 different fish species.

In SNNPR State, livestock is the backbone of agriculture and livelihood of the rural community. Livestock provide draft power for crop cultivation, food (meat, milk and egg) for family consumption, source of income through sale of animal and animal products, saving and asset, and plays vital role in the social and cultural settings of the farmers and pastoral communities in the region. Livestock are also source of a considerable foreign currency from export and trade of live animals, their products and by-products. High population growth, high rate of urbanization, growing incomes and need for high quality animal-source food fuelled high demand of animal and animal products, which made *Livestock Revolution*. The possibility of benefiting producers from this potential global opportunity is largely determined by the competitive and efficient production and marketing of animal and animal products.

The huge resource bases, versatile functions of animal agriculture to the livelihood of smallholder farmers and pastoralists and national and regional economy highlights the potential role of livestock in attaining food security, poverty reduction and sustainable natural resource management of the region. However, production and productivity of the regional livestock sector is significantly below its potential. Various technical and socio-economic factors are responsible for the low performance and contribution.

Livestock is distributed in varying horizons of agro-ecology, farming practices, socio-cultural settings, resource endowment and management systems in the region. Diverse people of this region varying preferences to the different types of livestock species and also different custom of using livestock and livestock products. However, benefits producers obtain from their livestock are very low and below the potential. Following the reengineering of regional agricultural research sub-process, agricultural research issues needs to be identified and prioritized by producers of the sector so that technology generation, adaptation and demonstration interventions focuses on the needs and requirements of the customers and stakeholders. The Technology Generation and Extension Sub-processes under Technology Generation and Extension Process of Bureau of Agriculture and Rural Development have undertaken a region-wide problem identification and technology need assessment.

Accordingly, a team of multidisciplinary researchers were established to identify and prioritize problems and assess needs of improved technologies and methodologies that could overcome the major bottlenecks of agricultural production in the region. The assessment has been conducted in selected Woredas/Special Woredas and Kebeles of the region representing all types of agricultural production systems and agro-ecological zones. The problem identification and technology need assessment were conducted through focused group discussion with group of selected farmers and pastoralists and key informants interview [5].

Farmers and pastoralists of the region have identified and prioritized constraints of agricultural production. Respective Zonal and Woreda/Special Woreda experts and development agents were involved during the survey. The problems identified and technological needs were

collected and compiled at regional level. The regional agricultural research institute (SARI) and the regional Bureau of Agriculture and Rural development (BOARD) made a final refinement on aggregate ranking of the regional agricultural production constraints across production system and agro-ecological zones of the region.

The problem identification and technological need assessment exercise has come up with a unique outputs and implication relevant for the development of regional livestock sector. The top three aggregate problems were all issues of livestock. Inadequate supply and poor quality of animal feeds and nutrition is the leading constraint of regional agricultural production. Inadequate feeding and poor nutrition of livestock stemmed from many interrelated factors.

Major source of the regional livestock feed resources includes grazing on natural forages (rangelands, communal and private grazing lands), crop residues and indigenous browse. The use of improved forages and agro-industrial products is seldom practiced in smallholder feeding systems. The availability of feeds is largely depends of the seasonality of the year. Surplus feed are available during wet seasons followed by aftermath grazing after crop harvest. Dry season represents severe shortage of animal feed. The practice of managing surplus feed resources available during wet season for use during severe dry periods of the year is almost not common in the region. Large parts of the region have high population density, contributed to fragmented and small landholdings. Thus, communal and private grazing lands are allotted for crop cultivation, expansion of perennial vegetation and human settlement. As a result, lands available for livestock grazing are shrinking gradually. The large number of livestock grazing in the available lands led to overgrazing, low forage biomass production, degradation of soils and loss of forage biodiversity. Improved feeding practice using farm produced (improved forage) or purchased feedstuffs (agro-industrial products and supplements) is not common in smallholder livestock systems of the region.

The Summary and objectives of the study

Better understanding of existing situation of livestock feed resources utilization and management options in the region and demonstrating technological options overcoming the constraints and enhancing animal feeding and feed management were some of major areas of intervention in this project.

Farmers, Pastoralists and concerned stakeholders of the SNNPR identified feed shortage as an overriding constraint of animal production and rated first among all livestock-related and general agricultural constraints. Assessment and estimation of the currently available feed resources enables to understand the amount of production and supply of feed biomass and nutrients. This together with the maintenance and production requirement of total animal resources in the region helps to design strategies fulfilling the dietary requirement of the animals and proper feed production and management systems. Assessment of available livestock feed resources including indigenous forages, feeding systems, feed management practices and quantification of biomass (DM) and nutrients available for livestock will be carried out in selected areas of the region. Primary and secondary information will be gathered in the study. Primary information will be gathered through key informant interview, focused group discussion and selected individual households in the selected sites of the region. Multistage sampling techniques were employed to select the study sites and households. Data were managed and analyzed using SPSS software. For important feedstuffs including indigenous in the region with no information, samples will be collected for analysis of chemical composition and nutritive value. Analysis was done in Debrezeit Agricultural Research Center.

Materials and Methods

The study locations

The livestock feed resource utilization and management system survey was carried out in different zones, zonal Woreda and Special Woreda of Central zones of Southern Nations Nationalities and Regional State. The study zones and Special Woreda comprised of Wolaita, Kembata, GamoGofa, Dauro and Gurage Zones, Yem Special Woreda, Konta Special Woreda and Basketo Special Woreda. The zonal woreda covered in investigation duration were Angetcha Woreda from Kembata Tambaro Zone, KindoKoisha Woreda and Humbo Woreda from Wolaita Zone., Tocha Woreda from Dawuro zone and Zala Woreda from Gamogofa zone. To sum up, the listed peasant association where the assesment under taaken were Abala Sipa from Humbo Wored, Sorto, Mundena and Zabato from kindoKoisha, Sheno punamura, Messesnaand Gerba pandide from Angetcha Woreda, Horbitezezu, Geshaude andKochire from Enemurina Ener Woreda, Gayle, Melakeisha and Genda from Zala Woreda, Motikessa Erzeka, Tona Bosa and Delkensa from Basketo Special Woreda, and Bitetty Tsanga, Genja Genet and Chaka Bucha from Konta Special Woreda. In addition to these the study covered Yem Special woreda for commonly used feed sample collection and analyses.

The household characteristics of the study area

The three peasant association where the household survey undertaken in Basketo Special Woreda were Debsa Delkensa, Motikessa Arzeka and Bona Bossa. The education level of the respondent, primary for 47.7% households, secondary high school for 8.7% households, illiterate for 37% households and read and write 6.5% households interviewed respectively. As to the age of household head interviewed concerned, it was 29 for 15.2, 34 for 21.8% households, 39 for 6.7% households, 42 for 19.6% households interviewed, 47 for 28.3% households, 60 for 8.8% households interviewed accordingly.

The peasant associations included in Tocha Woreda were Medhanealm and Wara Wori peasant. From these two peasant associations considered medhanialem was high land while Wara Wori was low land. The education level of household respondents in Medhanlem and wara wore peasant association characterized as primary for 33.3% households, secondary for 13.3% households, illiterate for 40% respondents and read and write for 13.3% households interviewed.

The peasant association interviewed in Enemurina Ener Woreda were Gasawude and Horbete Zizo. The education level of small scale farmers in Gasawude and Herbetu zezu characterized as primary, secondary, illiterate and Read and write for 63.2%, 2.6%, 23.7% and 10.5 respectively. The age distribution of farmers in the area looked 28 for 7.9%, 33 for 23.75%, 40 for 26.4%, 48 for 34.4% and 58 for 7.9% of respondents.

The study was undertaken in Gamo Gofa zone at Zale Woreda in the three peasant associations. These three peasant association includes Genda, Gayla and Mela Keysha. The selected Woreda peasant association falls on low land agro-ecology. The education level small scale farmers interviewed in zala Woreda primary for 52.5%. Secondary school attended were 10% and illiterate 37.5% household. The household size for interviewed farmers was 3 for 20%, 37 for 17.5%, 48 for 37.5%, 62 for 25% respondents accordingly.

The education level of small scale farmers in Konta Special Woreda keble interviewed were illiterate for 40%, primary for 52.1%, and secondary for 7.9% respectively. The family size was 5 for 24.5%, 7 for

40%, 9 for 20%, and 10 for 15.4% respondents respectively. The family size for household interviewed in humbo woreda was 4 for 15.4%, 6 for 30.8%, 8 for 46.2%, and 11 for 7.7% respondents. The age distribution of farmers in the study area characterized as 33 for 38.5%, 39 for 15.45%, 47 for 30.8%, 64 for 15.4% accordingly.

Results and Discussions

The samples of feeds for laboratory analyses were collected from different zones and special Woreda of SNNPRS. Feed categories collected for laboratory analysis were commonly used as livestock feeds in specific study districts. These above sample feeds dried over sunlight and analyzed at Debaerezeit Agricultural Research Center Nutrition Laboratory. The climate change and its consequences on availability and quality of livestock feeds and feeding system forced the livestock to consume almost all naturally existing feed categories; hence, the analyses of nutritional contents, their feeding system (Tables 1-3).

Major livestock feed resources in the study area

Some of major feed categories identified in the study district at Wolaita and Kembata Tambaro zone in local name comprised of Girawa, woshua, talsakia, bodena, etriwongia, maize stalk, natural pastures, sugarcane, crop residue, leaf of kerkha, leaves of avocado, leaf of heva, shenbeko leaves, kortch, wusha, dagusa, Enset, root, leaves and pseudostem, kortch, Gulban and other unspecified natural grasses. Some of improved forage species introduced in the area were Desho grass, elephant grasses, sesebainia sesban, rhodes, oatsr, cow pea and others.

As to daily livestock feed contribution composition for livestock in the Kembata Tambaro and Wolaita zones concerned Enset and natural pasture in 15.5% households, crop residues, leaf of heva, shenbeko, kortch, Enset, Gulban in 10.5% households, natural pasture, enset, sugarcane, crop residue, leaf of kerkha, avocado in 7.9% households, crop, residue, naturalgrass, ensetparts, potato in 18.4% households, enset parts, barley wheat bea residues, natural, pasture, maize stalk in 10.5% households, enset, serdo, sodonakala, humba, laluncha in 5.3% households, enset, kerkeha, kortch and shenbeko, desho grass, enset leaf and steam, napiergrass, maize stalk in 10.5% households, crop residue, grass, maize stalk, enset, banana tuber, sesbania seban, serdo, enset, merga in 5.2% households inerved, kerkeha, muja, ensetparts, worirebo, sensel, grasses, crop residue in 10.5% households respondents interviewed.

Some of major livestock feeds in Konta special Woreda listed were Teff residue, natural grasses, and maize stalk, bamboo tree leaves, girawa, chachwa and Dawuro dama. Some of major dry season feeds in the study district were crop residue of maize, teff and haricoat bean for 25% respondents, leafs of trees and browse species specifically chachwa, girawa, bamboo treess leaves for 35% respondents households and crop residues and enset parts (leafes, pseudosteam and tuber) for about 40% respondents. In the household survey from the study had identified as highly nutritious and medicinal livestock feed resources were girawa as to 5% household confirmation, some enset parts for 30%, Dawuro dama for 35% housholds, chachwa, and girawa for 35% respondents farmers interviewed accordingly.

The small scale farmer in kindo koisha and Humbo Woreda the area characterized and listed some medicinally known livestock feeds. These feeds used as medicinal and highly nutritious valuable feeds given for livestock when they were weakened, diseased and when fed improve their body condition; among these the so called **Danbursa** very well-known feeds used for various purposes; as medicinal plant, for broken legs and fattening purposes as well. It mostly found in highland

No	Feed samples nam	%DM	%ASh	%NDF	%ADF	%ADL	%CP
1	Koha-zala	94.3	18	63.2	40.7	2.7	16.6
2	Gulbana-Angetch	93.8	16.5	35.8	17.9	2.6	27.4
3	Usupa-zala	94.4	34.9	66.8	51.1	3.6	5.6
4	Togo/tura-konta	93.2	14.8	54.3	45.8	8.8	16.5
5	Woshiranga-zzala	93.4	19.4	72	49	3.5	7.6
6	Lidisa-yem	94.1	49	50.4	50.8	5.3	9.8
7	Bazobulo-Zala	94.2	24.5	56	48.5	6.2	10.9
8	Unspe.grass, enclosure 1;Enemur	93.6	9.5	72	37.2	5.6	7.7
9	Zaregoina- zala	93.2	19.2	65.8	43.8	4.1	7.3
10	Betafarmlok-enemurand ener	92.3	14.3	43.4	37.5	9.3	16.1
11	Jejeba-yem	93.1	14.2	71.2	46.6	7.3	5.1
12	Muriya-konta	94.6	15.8	65.3	44.5	5.9	10.2
13	Gishisha-Enemurand Ener	93.6	8.5	73.9	39.9	4.9	9.2
14	Likiya-kindokoisha	94.2	17	70.6	46.2	2.8	9.3
15	Koshombo-zala	94.5	18	67.4	44.9	3.2	5.6
16	Shalshatwa-konta	93.4	19.4	67.1	44.8	3	9.5
17	Woshwua-kkonta	95.7	50	79	65.8	6.3	4.1
18	Heda-yem	93.7	14.2	56	42.5	7.5	14.6
19	Gotineta-zala	94.6	25.5	43.8	34.1	9.2	15.5
20	Papa-zala	93.3	16.5	67.6	49.9	9.4	5.6
21	Unspecified grass, enclosure 2;Angetcha	93.7	20	66.2	44	4.7	5.9
22	Tura-zala	93.3	11.4	47.7	29.6	5.9	18.8
23	CheCha-kindokoisha	94.8	13.5	67.6	43.5	4.9	10.6
24	Hargaza-zala	92.1	19.1	71.6	49.7	3.4	7.5
25	Jebir-Zala	94.1	15.8	69	43	2	4.9
26	Dasusa-yem	89.7	21.6	74	45.6	5.3	4.6
No	Feed samples na	%DM	%ASh	%NDF	%ADF	%ADL	%CP
27	Sogu-yem	93.8	13	39.7	33.12	6.2	14.2
28	Habachiya-konta	93.2	19.8	62.4	42.1	4.95	13
29	Dawuro dama –Dawuro	93	10.9	53.4	45.02	26.4	15.7
30	Unspesiedbrwse-yem	92.9	10.2	40.8	28.44	4.73	15.8
31	Wolkika	94.1	11.7	61.7	45.7	13.5	14.7
32	Shotsoriya-yem	93.2	17.1	66.4	44.6	5.4	4.4
33	Hasso-zala	92.1	7.8	52.8	34.9	12.7	13.1
34	Lumucha-enemurand Ener	93.5	13.4	36.5	27.9	5.6	18.1
35	Gallelelo-yem	92.3	9.7	43.8	35.1	6.1	11
36	Aliba-zala	93.8	14.7	68.8	44.3	4.5	9.2
37	Danbursa-kindokosha	92.3	15	50.6	39.2	17.1	11.8
38	Enclosure three.Enemurand ener	93.8	27.8	64.2	37.7	8.4	6.8
39	Mushecha-enemurand Ener	92.8	18.4	62.4	49.7	7.8	9.9
40	Unspec.grass enclosure II, Enemur	94.2	14.5	64.8	35.2	6.6	11.3
41	Taro tuber-Boloso I	97.2	3.62	48.8	6.81	0.2	12.6

Table 1: Nutrient content of locally available feed Resources in SNNPRS of Ethiopia.

Woreda	Humbo	Kindo koisha	Angetch	Tocha	Enemurand Ener	Zala	Konta Special Woreda
Variables	Mean, St.Dv. Ran.	Mean, St.Dv.	Mean, St.Dv.	Mean, St.Dv.	Mean, St.Dv.	Mean, St.Dv.	Mean, St.Dv.
Total land/ha	2.8, 1.8 and 0.5-6	1.7, 1.4, 0.3-6	1.3, 0.75, 0.25-3	2.2,1.2, 1-7	1.1, 1.32, 0.25-8	6.6, 2.1	6.5, 1.9, 3-11
Private grazing land	0.11, 0.12, 0-0.25	0.3, 0.36, 0-1	0.1, 0.08, 0-0.25	0.18, 0.23, 0-11	0.08, 0.15, 0-0.9	0.4, 0.36, 0.1-0.9	0.3, 0.36, 0-1
Local cattle	3.6, 2.7, 0-10	4.4, 2.5, 1-10	4.7, 3.2, 1-6	5.5, 2.8, 2-14	5.5, 2.8, 2-14	5.2, 2.6, 2-16	5.6, 3.8, 2-15
Improved cattle	0.07, 0.3, 0-1	0.02, 0.14, 0-1	0.2, 0.8, 0-4	0, 0, 0	0	0.05, 0.32, 0-2	0, 0.1, 0.6
Local shot	1.9, 1.38, 0-4	1.6, 1.6, 0-6	2.5, 3.9, 0-20	2.4, 1.7, 0-6	0.4, 0.76, 0-2	2.2, 1.6, 0-5	2, 1.5, 2.5
Local poultry	2.9, 1.2, 1-5	5.4, 5.8, 0-30	4.4, 3, 0-15	4.5, 3, 0-15	1, 1.7, 1-3	7.1, 12.9, 2-15	3, 6, 3.3
Improved poultry	0.07, 0.28, 0-1	0.04, 0.2, 0-1	0.6, 2.3, 0-12	0.06, 0.36, 0-2	0	0.15, 0.65, 0-3	0.18, 0.78, 0-2

Table 2: Livestock and Land hold characteristics per household in SNNPRS of Ethiopia.

parts of kindokoisha Woreda and surrounding Woreda, Damot sore. In addition to these some enset variety/Red/girawa, zinbanuwa, etriwonja, chaldidya, tura, goddare uta and other unspecified grasses, browses and tree species used as medicinal plant in kindokosha Woreda small scale farmers. Similar to Kindokoisha Woreda the

small scale farmer in Humbo wored used various trees, weeds, grasses, browses, and shrubs for their livestock as medicinal, valuable, highly nutritious and body promoting plants. To list some of them from interviewed farmers the corresponding percentage and its respective percentage in using as medicinal plant seems giziawy and lenda/local

Grazing area	Woreda and its respondents percentage of using the grazing land							
	K/Koisha	Humbo	Angetch	E/Ener	Zala	Konta	Tocha	Basketo
Main Road	14.9	11.1	7.9	7.9	7.5	4.8	4.5	26.3
Homestead	21.3	11.1	2.6	34.2	7.5	9.5	9.1	34.2
Main road and homestead	33.2	11.1	15.8	13.2	15	14.4	13.6	18.5
Own land	4.3	11.1	2.6	2.6	10	9.5	13.5	2.6
Communal grazing land	21.2	55.6	23.7	23.7	50	52.3	40.9	5.3
Crop land	4.3	11.1	47.4	10.5	10	9.5	18.2	13.2

Table 3: Feed availability and feeding around Kindokoisha and Humbo Woreda of Wolaita zone.

name 18.2%, girawa and esso 18.2% leaf of shiferawu 9.1% etriwonjia in 54.5%. In addition to these Desho grass, serdo/Bermuda grass, maize stalk fresh, sirety, dalesha and bisana leaf considered as most nutritious and medicinal feeds for the livestock in Humbo Woreda.

The feed marketing system in the study area

The small scale farmers in the Kembta Tambaro confirmed that there were livestock feed marketing system in their vicinity to some extent. From the respondents' farmers' 22.2% small scale farmers confirmed that there were used to taken part in feed marketing and the remaining 77.8% did not. Mostly marketed livestock feeds types were concentrates and sugarcane tops in kembata and Tambaro zone. In opposition to these, the small scale farmers in Wolaita zone of Humbo Woreda and Kindo koisha Woreda were used to take part in various sorts of feed marketing. The farmers in the specific area marketed grasses, crop residue, browses, medicinal feeds, weeds and concentrates. From all the study area, it was the Wolayita surrounding where all feed categories marketed. There were the small scale farmers in Wolayita zone that used to obtained daily subsistent income for their households by livestock feed marketing. The price and value of marketed feed high in dry season and it was low in wet season. The medicinal plants /Danbursa/and other unspecified weed, grasses and browses that played prominent role in increasing milk and butter yield in quality together with quantity aspect, they set price in estimated gram bases and it was too costs to purchase and collect from field these medicinal and nutritious feeds than any other feed types such as concentrates. These feeds named as milk fields in the study district and have direct impact on milk quality and taste after consumption (Figure 1).

There were no livestock feed marketing trend observed in Konta special Woreda. All the farmers in the area undertake livestock fattening activities. Major feed s and feeding system vares in different households of the farmer.

The livestock feeding system in Kindo koisha, zala and Humbo Woreda

The farming system in Wolaita Woreda was mixed and every farmer in the study area engaged in mixed farming. In order to keep their livestock farmers use various way of management options. From respondents farmers 83% feed their livestock by free grazing, tethering and by cut carry system and the remaining respondents 17% feed by cut carry system with free grazing in kindokoisha woreda. In the Humbo Woreda about 38.5%, 61.5% confirms that the perform to keep their livestock free grazing, cut carry system and restrain by rope and cut carry system and free grazing way respectively.

The small scale farmers in zala, humbo and kindo koisha farmers fed their livestock through cut and carry system, free grazing and tethering as well. As the land possessed per household in zala Woreda was larger as compared to that of wolaita zone and the area known by possessing vast of natural forest and communal grazing land, most



Figure 1: Feed Marketing in Wolayita Area 2.

of the farmer used to graze in communal grazing land rarely used cut carry system. By cutting and carrying system the 37.5% farmers collect from own land, 12.5% farmers fed by purchasing from nearby farmers, 12.5% farmers fed by harvesting beneath crop, 37% farmers fed from own land, beneath crop and purchasing from governmental land. The amount of livestock feed collected was different across various seasons of the months of the year. It was the wet season in which the farmers collect fed large quantity and quality of feeds for their livestock. Lack of access, drying of locally available grasses and the weather condition variation compels the farmers to collect and fed various quantities of livestock feeds across various farming seasons. The livestock category that consume the grasses collected by cut and carry system mostly were dairy cow and ploughing oxen in 50% of respondents, fattening cattle and shot in 17.5% households and dairy cow, ploughing cow and fattened cattle in about 32.5% respondents interviewed. the livestock category that consume grasses in a little quantity at home at night that collected by cut and carry system were equine in 28.9% household, sheep and goat in 42.1% respondents and shot and equine in 28.9% respondents accordingly.

Major grazing areas of livestock in the study district

As to on-farm investigation undertaken, there was variation in availability, access, quality, quantity and feed types in the study area across various seasons. Some of livestock feed scarcity seasons in kind Koisha Woreda were: January February, March, April, may and December. For these feed scarcity seasons the small scale farmers in Kindo Kasha Woreda conserve feeds in form of hay under heavy tree canopy or under enset and inform of crop residue. As to interviewed farmers, the small farmers conserved feeds inform of hay by harvesting at maturation stage and storing bellow trees, storing left over feeds after consumption and conserving excess and by preparing house

and restraining in a good way. The respondents farmers confirms that majority of the them didn't accomplish silage for conserving feed during surplus seasons for their dearth period. These feed scarcity coping mechanisms followed consists of feed purchase, collecting browses of shola and bodena leaves, feeding leaves of trees such as, kortch, ugugya, tishita, shola, banana, grasses such as woshua, senbelete, serdo, sugarcane tops, enset parts and crop residues. In opposite to these there were also seasons in which the livestock access vast quality, quantity, variety of feed and surplus feed availability. The major months of the year in which livestock do have vast, excellent quantity and quality of feeds includes; June, July, August, September, October, November and December as to 43.5% household confirmation, April, may, June July, August and September as to 19.6% respondents report, June, July, August and September as to 26.1% household statement, July, august and march as to 10.9% respondent's response. Major seasons/ months of the year in which livestock suffer in feed shortage in Humbo Woreda are January, February, March, May and April as to 46.2% HH response, jenuary, february and march as to 30.8% on farm survey respondents, and march, april and February as to 23.1% as to on farm survey respondents in the area. For these feed scarcity season the small scale famers in study district accomplish various traditional copying mechanism including purchasing feeds, collecting bodona and shola leaves, taking to other locate, feeding crop residues and browse and tree leaves, feeding tree leaves and crop residues, feeding crop residues, and feeding leaves of chachwa and other trees, Enset leaves, natural grasses. In other way to these there were also the seasons in which livestock do have vast quantity, quality and better access to better feed resources. Some of these seasons includes: June, July, august and September, June, July, August, September, October, November and December and July, august and march. From these surplus feed periods the small scale farmers conserve feed resources for their dearth periods. None of the small scale farmer in Humbo Woreda undertake silage formulation in order to conserve livestock feed the major forage crops used for silage making in Humbo woreda peasant association comprises natural grasses, haricoat bean leave, maize stalk and teff residue, natural grasses and crop residues and maize stalk. The right duration for making hay at farmer condition were grasses blooming stage, crops harvesting season, and pre flowering periods of grasses. The formulated from various forage crops given as feed for mainly, cattle: oxen, heifer, bull, cow and equine: donkey, horse and mule.

There were traditional ways of crop residue treatments in study area such as chopping of feeds, mixing with water and supplement such as amole. In the area the farmers were not familiar with practices of giving flour milling by products as livestock feed. The farmers in the area carryout giving supplementary feeding for calve before weaning. These major calves feed that given as supplementary feeding before weaning includes Girawa having been mixed up with water and powdered given by 13.3% respondents, enset root, palatable and soft grasses and elephant grasses by 6.7% interviewers, cutting enset root and flowering parts, sorghum as muke/powder by 13.3% interviewers, feeding palatable and green grasses fed by 26.7% household respondents, and green grasses, Danbursa leaf by cutting and making juice given by 40% household respondents.

The forage crops given as feed for livestock collected and harvested by cut carry system. The livestock feeding as common in most mixed farming location was cut carry system, free grazing and restraining using rope. Location from which livestock feed is collected by cut and carry system were from communal land, from governmental land, from own land, beneath crop, buying from governmental and farmer,

beneath crop, purchasing from governmental land purchasing from neighbor farmer from own land.

The small scale farmers collect large quantities of feed for their livestock at wet season rather than dry season. The feed resources excess availability, good weather condition for feeds had made the respondent farmer to collect at wet season. For restraining and free grazing purpose the livestock category order that taken to field at early were equine first, oxen second, heifer and bull third, cow and calves fourth sheep fifth and goat sixth. The livestock category that consume the grasses collected by cut and carry system mostly were dairy cow and oxen as to 34% respondents, fattening cattle as to 25.5% respondents, dairy cow, fattening cattle and plough ox as to 40.4% household respondents.

The livestock category that consume grasses in a little quantity at home at night that collected by cut and carry system were equine as to 50% household response, shot and equine as to 25% interviewers, heifer and bull as to 25% respondents. The reason of not allocating the grasses harvested equally by cut carry system at night were because of difference in their productivity and service given, age, because of production difference and level of feed eat at day and activities they perform.

Feed availability and coping mechanism for scarcity

As there were livestock feed scarcity in the study area there were some seasons in which the livestock feed available in excess quantity. For feed scarcity seasons in the area, the small scale farmers adopt variety of coping up mechanisms in their respective peasant associations. Some of commonly used coping mechanisms for feed scarcity season in the area includes feeding sugarcane tops, enset leaf ad pseudo steam and crop residue for 14.3% farmers, taking to some distant grazing locality for 23.8% farmers, feeding crop residues, sunbelt grass, woshwua grass and trees and browse leaves for 1s 9% farmers, feeding tree leaves, crop residue and taking to communal grazing land for 28.6% farmers, feeding locally available grasses, enset parts and Chichewa tree leaves for 14.3% small scale farmers interviewed at the kebele. major seasons/months of the year in which livestock suffer in feed shortage were January, February, march, may and April for 47.6% households and January, February and March for 52.4% households interviewed accordingly. In opposition to feed scarcity months of the year in which the study district owned excess feed availability were June, July, august, September, November and December for 50% respondents and July, August and March for the remaining 50% households respondents respectively. The whole small scale farmers conserve livestock feed inform of crop residue and in some amount inform of hay.

The study indicated that the livestock feed availability, access, quality and quantity different in different seasons of the year. In some seasons of the year there were excess feed availability and there were also some seasons in which livestock face dearth feed shortage. As to the study result naturally available feeds used for livestock in wet season includes grasses and weeds. The small scale farmers adopt different techniques of coping mechanism for feed shortage in the area. some of common feed shortage coping mechanisms include feeding leaf of banana, s/potato and enset whole parts in 3.6% households, taking livestock to other locality in 3.6% households, feeding crop residues and browse and tree leaves in 14.3% households, feeding specific feed species such as woshwua and senbelet, wanza and Galaelo in 10.9% respondents, taking livestock to communal grazing land in 21.4% households, feeding trees leaves, Enset, sweet potato vines, crop residues in 42.9% respondents and the remains 23.3% household fed crop residue. The feed scarcity seasons in the study area were January,

February, March and April in 14.8% of households, January, February and March for 77.8% households, December, January and February for 7.4 respondents interviewed accordingly. In other side months of the year in which livestock have excess supply of feed resource were June, July, August, September, October, November and December as to 5% households, April, may, June, July, August and September as to 32.5% households, June, July, August and September as to 20% respondents, October, September, July and June as to 7.5% households, May, June, July, August and September as to 12.5% respondents, July, August and March as to 20% households, December, January, February as to 2.5% respondents interviewed.

Crop residue feeding system

As any livestock feed category the livestock in Enemurina Ener Woreda used to consume crop residues in different quantity and quality across various seasons. The crop residue given for livestock in the study location was usually at dearth periods. In addition to seasonal and constitutional variability of crop residue the livestock category fed it is different too. The small scale farmers mostly give tiff residue for cattle firstly cattle and equine secondly and cattle, equine and sheep and goat thirdly in percent of respondents amounts to 52.6%, 34.2% and 13.2 respectively. Crop residue of cereal crops such as wheat and barley crop residue weren't common in the study area. As the study indicated only 7.1% used as cattle feed and the remaining 92.9% not usually given as livestock feed for their animals. In most of the time the crop residue of fababean and field pea were uncommon as livestock feed in the study area. From respondent farmers, 75.9% households confirms that they do not usually given as livestock feed. But 13, 9%, 3.4% and 6.9% household fed the residue of faba bean, field pea and maize for livestock category cattle, equine, equine, cattle accordingly for their daily livestock need. The feeding calendar of crop residues of maize, faba bean, field pea, and haricot bean was dry season for all interviewed small scale farmers.

Livestock fattening system in Angetcha Woreda

As all the small scale farmers were confirmed that they had experience in ruminant fattening. The feeding system of locally available feeds for fattening cattle seemed as giving milked maize, Oats, Enset parts, beverage, sweet potato and feeding milked maize, oats beverage resid, zole. The Major feeds used for cattle fattening comprised of Enset corn, concentrates, milking maize seed oats, sweet potato and local beverage residue. Improved forages or feeds used for cattle/shot fattening in the area were Napier grass, Desho grass and oats. These improved forages were oats and elephant grass fed as a sole feed and as supplement feeds in the study area. From respondent farmers 28.6% fattened by supplement feeding of milking maize, cooked haricot bean, pumpkin, local mineral, girawa and sweet Sweat potato; for 28.6% households interviewed, feeding milked maize, oats Enset root beverage residue and feed fermented maize, sorghum and flowered teff, cassava sweet potato for 33.4% households interviewed, boiled maize, Enset, cassava; flowered corn, sorghum, flowered teff, common bean and natural pasture grasses, maize, boiled cassavas/potato for 23.8% households interview respondents accordingly. Major feeds and their feeding system for small ruminant seems feeding pea, bea, palatable grasses, powdered for 5.6% households, feeding local beverage residue, coffee residue, Enset root for 22.2% households and feeding maize and natural grasses with coffee residue for 72.2% households respondents interview.

Livestock fattening system in Wolaita

As to on farm survey almost all farmers in the area had experience

in cattle fattening and this activity employed by them so as to change their livestock, obtain daily income and benefits and hence, the livestock fattening operation was one of the small scale business activity in the area. In order to undertake these business activity the small scale farmers follow different sorts of fattening methods adopted traditionally by feed feeding milky maize, haricot bean, cooked maize, pumpkin, local mineral, girawa, sweat potato tuber and leaves, milked oats, local beverage (coffee residue), Enset roots and leaves, sorghum flowered teff in kindo koisha Woreda peasant association. At the time fattening the feed categories given as basal feed and supplement were different in different agro ecologies, zones and Woreda of the study area. As the farmers witness, all natural pastures were given in majority concentration during starting phase of fattening period and natural pasture in combination with supplement feeds at mid stage of fattening period and supplement feeds at final finishing phase of fattening operation in the study districts.

The livestock feeding system Kindokoisha and Humbo Woreda

The farming system in Wolaita Woreda was mixed and every farmer in the study area engaged in mixed farming. In order to keep their livestock farmers use various way of management options. From respondents farmers 83% feed their livestock by free grazing, tethering and by cut carry system and the remaining respondents 17% feed by cut carry system with free grazing in kindokoisha woreda. in the Humbo Woreda about 38.5%, 61.5% confirms that the perform to keep their livestock free grazing, cut carry system and restrain by rope and cut carry system and free grazing way respectively.

Livestock feed conservation and preservation strategy adopted

There were no farmers respondents that conserved feed resource inform of silage at the area. The farmers hadn't obtained any sorts of training on improved feed conservation and preservation mechanisms. From the whole interviewed respondents 57.1% conserved feeds for dry season inform of hay and 42.9% didn't conserved inform of hay. Majorly used feed types for hay making were: natural grasses, haricot bean leave, and maize stalk and teff residue for 47.6% farmers, natural pasture and crop residues for 23.8% households, natural grasses, and maize stalk for 28.6% interviewed farmers in the area. Even if there were the trend of using crop residue as livestock feed, there were no way of treatment of crop residue for better utilization and improvement of intake of residues. None of the farmers in the area used flour milling by products as livestock feed in the study area. The livestock keepers in the area practiced supplementary feeding of calves before weaning. The feed categories that used as supplementary feeds for calves were enset tuber cutting, flowerings sorghum and barley, powdered sorghum and barley, palatable and greenery grasses.

The livestock category that consume harvest grasses at home cattle for 14.% households, dairy cow and plough oxen for 23.8% households, fattened oxen and small ruminants in 9.5%, dairy cow plough oxen and fattened cattle for about 52.4% households interviewed. in other side the farmers give harvested feed by carry and cut system in little or no quantity were equine for 20% households, small ruminants for 20% household respondents bull, heifer and small ruminants for 13.3% households, small ruminant and equine foe 46.7% household respondents interview at the location.

Conclusions and Recommendations

As the on farm survey the majority of the small scale farmers

weren't obtained awareness creating training. In the study area of Kembata Tembaro zone only few small scale farmers obtained training on improved utilization, feed improvement and feed management options by agricultural officers and development agents and subject matter specialist.

Some major comments given by small scale farmers to improve feeds, feeding system and management option comprised of:

- ✓ Adopting of improved feed conservation techniques
- ✓ Introduction of improved forages, feeding system and management options
- ✓ Pre-scaling up of improved feed establishment, improved forage and utilization system
- ✓ Giving training on livestock feed management and improved utilization of feeds
- ✓ Developing improved forages and allocating lands for forage development

There were no vast as such known improved forages in study area. The interviewed farmers assure that they didn't take any feed management, feeding system improvement and knowledge upgrading and brainstorming training. They hadn't taken any training on feed conservation, Management and feeding system for all. The farmer in the study district had commented the improvement way of livestock

feed management system. In summing up general comment improving feed, feed management and feeding system suggested by small scale famers and respected bodies include.

As to the study result the, it is better to further collect all additional feed categories that used as basal for livestock in dry season and wet season, recollection of the analyzed and non-analyzed feed categories so as make full nutrition analysis that enable to understand the carbohydrate, protein, vitamin, mineral and other nutritional aspect of locally available feed stuffs. In order to improved the feeding system of livestock in the area, introduction of improved feed conservation techniques, introduction of improved forage.

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