

## The Challenge of Provision of Feed in the Semi Arid Areas, the Case of Chare and Yellen Villages of Shoa Robit, Ethiopia

Aschalew Tsegahun<sup>1</sup>, Lemma H/Yohanes<sup>1</sup>, Tefera Mekonen<sup>1</sup>, Nake Ziku<sup>1</sup>, Getachew Gebru<sup>2</sup> and H. Dana<sup>3</sup>

Debre Birhan Research center P. O. Box 112, Debre Birhan, Ethiopia, MARIL, Ethiopia, Colorado State University

E-mail: [aschalewtsega@yahoo.com](mailto:aschalewtsega@yahoo.com)

### Abstract

*A survey was conducted at Chare and Yellen villages in the semi arid area of Kwet District, North Shoa, Amhara regional State, Ethiopia. These villages represented the peri-urban and rural part of the district, thus enabling the assessment of the feed situation in two different agricultural production systems. Participant farmers were randomly selected in both villages. From the village household listing, ten percent from each village households were randomly selected to represent both male and female headed households. Sorghum, tef and maize are the dominant crops, and horticultural crops are also produced. Cattle, goats, sheep and camels are the dominant livestock species and grazing land is owned communally. Farm plots owned by households range between 0.5 and 2 ha, signifying the limitations to allocated land for forage cropping because the farmers prefer to grow food and/or cash crops. About 10% of the male respondents in Chare are landless, and rely on livestock for their livelihood, and access to market is not a limitation. None of the respondents cultivate improved forage crops nor allocate land as pasture in any of the cropping months. Very few farmers in Yellen plant maize as feed. Regardless of crop type, all crop residues are conserved as a dry season feed in a loose form, and no respondent stacks sorghum stalks under shade. Lack of awareness and resource were mentioned as main reason for not constructing shade for crop residues. Provision of adequate feed, especially in the dry season, remains a challenge to farmers in the villages of Chare and Yellen.*

**Key words:** livestock, crop residues, feed

## Introduction

Agriculture is a risky business particularly in areas with semi-arid type of climate. The irregularity and uncertainty of the rainfall that begins late and withdraws early is one of the main factors contributing to the low agricultural production in such areas. The low agricultural productivity makes subsistence farmers economically weak to withstand any food/feed deficit at any period of the year. Due to its specific niche adaptability, sorghum dominates other crops in terms of area coverage (128,240.06 ha) and total production (2,258,878.73 quintals) in the lowlands of North Shoa (CSA, 2013). Hence, sorghum stalk is used widely in semi-arid areas as dry season fodder.

Despite the fact that the country owns the largest cattle population in Africa 53.4 million (CSA, 2013), Ethiopia still imports milk and milk-related products. Annual per capita milk consumption in Ethiopia was recorded as 17kg per annum (Zealelem, 2013) making it one of the lowest in Africa and by far low from FAO's (1990) recommendations of 62.5 liters. The demand for milk is high in major towns of the country though the supply is too low to satisfy the demand. A shortfall in milk supplies of Shoa Robit, (one of main cities of North Shoa) is often met through milk coming from the nearby towns of Debre Birhan and Kemesse. In order to improve the milk supply and increase the income of subsistence farmers who keep a few milking cows, it is prudent first to tackle the feed shortage.

Inconsistent feed supply continues to challenge the industry. According to ELDMPS (2007) report, feed deficit of 35% occurs in normal years while the deficit rises to 70% in drought years. In Ethiopia, the major feed source comes from grazing (82%), followed by crop residues and agro-industrial by-products. The use of agro-industrial by-products at smallholder farmers' level is minimal as it depends mainly on farmers' wealth status and availability (Zinash and Seyoum, 1991). Proper utilization of crop residues as sources of feed during the dry season was reported to have brought significant change in production (Alemu *et al.*; 1991). Conserving and feeding of sorghum stalk plays a pivotal role as dry season feed in the semi-arid areas of Kewet district (Aschalew *et al.*, 2014). Therefore this study was initiated and conducted to assess the feed situation of the semi arid of Kewet District by taking two distinct villages representing two different production scenarios (peri-urban and rural villages).

## Materials and Methods

A survey was conducted at Kewet District of North Shoa. The district is located at longitude of 39.90°E and 10.00°N latitude. The major crops grown in the district include sorghum, tef, maize and different horticultural crops. Cattle, goats, sheep and camels are the dominant animals in the locality. The two villages were selected after collecting information from Development Agents and extension officers at Kewet District's Office of Agriculture. Chare village is situated 2 km away from Shoa Robit town while Yellen is located at a distance of 17 km from Shoa Robit.

Chare was selected to represent the peri-urban animal production system where milk sale and small ruminant fattening are practiced to support family income. Yellen represent rural villages where crop and livestock production are integrated and cropping system is more intensified with irrigated vegetable crops. The number of respondents was set based on the population's number of each village, where about 10 percent of the inhabitants were selected randomly and interviewed individually on a pre-set questionnaire with the help of Enumerators. Female headed households were well represented and accounted for 20 percent of the interviewed farmers. The collected data were entered in Excel data sheet and analyzed using SPSS for range and percentile values.

## Results and Discussion

Of the total respondents, 19% of Chare and 18% of Yellen were female-headed households and the balance was male-headed families. Respondents' educational status varies from the illiterate at the lowest level to those with high school education, a sizeable number of the respondents were able to read and write i.e. 90% in Chare and 82% in Yellen. This indicates that Chare dwellers have better access to education than Yellen. This might be related with school distance and people awareness about the value of education (Chare dwellers live near the main city of Shoa Robit). Although all female respondents can read and write as opposed to males, the males have more chance to continue formal education through the system. Based on the study the proportion of females in Chare and Yellen that attended elementary and high school educations (Table 1) were 19 and 6 percent respectively. Cultural factors contributed much to the big difference observed, as girls are forced most of the time to marry at earlier age than boys. Overall formal education attendance reached 62% in Chare and 54% in Yellen. None of the respondents had college level education.

**Table 1. Educational level** of respondents of Chare and Yellen farmers in percentage

Education level	Villages					
	Chare			Yellen		
	Male	Female	Total	Male	Female	Total
Illiterate	10	0	10	18	0	18
Read and write	29	19	48	24	18	42
Grade 1- 8	29	19	48	29	0	29
Grade 9-12	14	0	14	18	6	24
>12	0	0	0	0	0	0

Twenty four percent of the respondents of Chare were under the age of 30 years, while none of Yellen respondents were in this age category (Table 2) indicating the inclination of the youth to participate in peri-urban agricultural activities compared to those living in deep rural villages of the country. With regard to age, only 19% of Chare were above the age of 51 whereas in Yellen they constitute 24%, indicating rural farmers have less chance to move out of their birth places

and change work type. 80% Chare and 76% Yellen respondents were within the productive age of less than 50 years.

Table 2. Demographic characteristics of respondents

Age category	Villages					
	Chare			Yellen		
	Male	Female	Total	Male	Female	Total
< 30	24	0	24	0	0	0
31 -40	24	5	29	47	6	53
41 – 50	19	10	29	18	6	24
51 – 60	10	5	15	18	5	23
➤ 61	5	0	5	0	0	0
Total %	81	19	100	83	17	100

The average size of arable land per household was less than 2 ha and the range is from 0 – 4 ha. Forty eight percent of Chare and 53% of Yellen respondents possess land between 1 and 2 ha per household (Table 3). Ten percent of Chare's male respondents do not own arable land at all (Table 3); as they were below the age of 18 at the time of the 1997 Land Redistribution Program of Amhara Regional State. The land less residents of Chare rely on livestock for their livelihood as they do have better access to markets for animal products. Yellen respondents mainly depend on rain-fed sorghum production and vegetables as they do have reliable irrigation facilities throughout a year. In both villages, no much difference was observed with regard to land ownership between female and male headed households, indicating the absence of biasness in land possession. In the highly populated zone of North Shoa land is the main factor that determines the wealth status of a family. Only 5 and 6% of Chare and Yellen respondents respectively own more than 2 hectares of land (Table 3). All cultivable land in the villages is allocated to crop production and none of the respondents' allot a piece of land as a pasture land in any of the cropping months. Farmers of both villages recognized the value of crop residue as dry season feed, and all respondents (100%) conserve crop residues regardless of crop type. None of the respondents bale crop residues; rather they conserve it in a loose form without shade and no farmer stacks sorghum under the shade. As a result, the nutritional value of this valuable feed resource is declining as times goes due to weathering. Lack of awareness and resource were mentioned as main reason for not constructing shade to conserve crop residues for longer period.

Table 3. Land holdings of Chare and Yellen respondents by sex

Land holding	Villages					
	Chare			Yellen		
	Male	Female	Total	Male	Female	Total
No land	10	0	10	0	0	0
< 1 ha	29	10	38	35	6	41
1 – 2 ha	37	10	47	41	12	53
➤ 2	5	0	5	6	0	6

Fallowing is not practiced at all in the villages and no land is allocated for hay productions during the cropping season as well no farmer allocate a piece of land for improved forage crops production. Few stands of *Leucaena* and *Sesbania* shrubs are observed around homesteads and are used to feed to preferred animals in the dry season. Similar crops are found to be grown in both villages. Sorghum is the main crop produced in the villages covering 57% at Chare and 71% in Yellen; followed by tef and onion 48 and 59 percent respectively. The region is well known with its sorghum production 14,898,156,740 quintals (CSA, 2013) next to Oromia Regional State. Respondents of Yellen produce Tef (18%) and Onion (12%) as a primary crop (Table 4). Only five percent of Chare respondents produce Mungbean and Papaya as primary crops. Five percent of Chare respondents produce tobacco as secondary crop as the village is close to Shoa Robit Tobacco Processing Plant. Using the available irrigation facility Chare and Yellen farmers produce different crops in the year. Onion at Yellen and tobacco at Chare are cash crops produced under irrigation. Though farmers were not able to quantify the exact amount, they indicated that availability of sorghum residue is high among all residues as land allocated to sorghum is proportionally high (Table 4). The stalk is fed mainly to draught oxen and milking cows in the dry period which lasts for 5 to 7 months. Any part not used for feed is used for fuel and/or construction purpose. According to CSA (2013), among the zones of the region North Shoa is the highest producer of sorghum per hectare (23.79 quintal/ha), indicating a magnificent stalk is produced as feed as the correlation between grain to stalk is high in sorghum is 1:3 respectively.

Table 4. Relative importance of crops grown in the two villages

Crop type	Chare			Yellen		
	Primary	Secondary	Tertiary	Primary	Secondary	Tertiary
Tef	14	48	10	18	24	29
Onion	-	-	19	12	59	6
Maize	-	5	2	-	6	12
Sorghum	57	19	-	71	12	-
Tobacco	-	5	-	-	-	=
Mungbean	5	5	-	-	-	-
Papaya	5	-	-	-	-	-
Vegetables	-	5	-	-	-	-
Total	81	86	31	100	100	47

In all villages animals are raised and kept under traditional management using the low input and low output system. Cattle, goats, donkey, camel and chicken are important species found in the study area. All animals in the villages ranging from chicken to cattle are owned by small holder farmers (Table 5). In crop-livestock based system cattle are the dominant tropical livestock unit (TLU) and are kept mainly to produce replacement ox and milk. This finding is in agreement with that of Fekede *et al.*, (2013) in the central highlands of Ethiopia. The higher number of oxen at Yellen primarily indicates that oxen play significant role and are used frequently for land preparation and threshing. A pair of oxen enables the farmer to manage all land preparation activities on time. Households with no or one ox may be in difficult position to timely accomplish land preparation. Twenty-four percent of both villages' respondents own one ox, while 10% of Chare farmers did not own ox at all. The majority of the respondents in both Chare 62% and Yellen 47% own a pair of oxen. Only 5 and 12% of Chare and Yellen respondents respectively own two pairs of oxen, as higher number of oxen usually corresponds to large acreage of cultivable land.

Camels and donkeys are used to transport farm products to home and market places. Though number of chickens is too small at Chare and Yellen, 0.65 and 0.06 TLU respectively they cover most of the daily/weekly expenses required by the family (Table 5). Fresh milk is either marketed/used at home or converted to butter and cheese for sale. Sheep and goats are raised to cover immediate cash needs of the household such as medicament, school fee, clothing, taxation, etc. All livestock in the locality have access to the communal grazing lands from morning to dawn regardless of sex, age and physiological stages. As per the response recorded from the farmers no management practice is employed to improve the productivity of the communal grazing land. This was due to the communal ownership that doesn't attach any responsibility to individual uses.

Table 5. Livestock types and species owned by the sample population in TLU by village and sex

Animal species	Villages					
	Chare			Yellen		
	Male	Female	Total	Male	Female	Total
Oxen	31.0	4.0	35.0	34.0	3.0	37.0
Cow	11.0	5.0	16.0	17.0	2.0	19.0
Heifer	6.75	3.75	10.5	6.75	0.75	7.50
Steer	6.75	0.75	7.5	8.25	0.75	9.0
Calf	3.0	2.25	5.25	6.75	0	6.75
Sheep	0	0	0	3.77	0.26	4.03
Goats	1.17	1.04	2.21	39.75	0.13	7.02
Donkey	2.8	1.4	1.4	4.2	0	4.2
Camel	2.2	0	6.6	2.2	1.1	3.3
Poultry	0.46	0.33	0.65	0.05	0.013	0.06

Note: One TLU is equal to 250 kg live weight. 1 TLU = 0.25 weaned calf, 0.75 heifer and steer, 1.00 oxen and cow, 1.10 horse, 0.70 donkey, 0.13 sheep and goat, 0.013 chickens.

All respondents unanimously reported that they require additional labor to accomplish agricultural activities on time. In the vicinities labor comes usually from three sources (hired, family and shared) or a combination of them. Female-headed families in both villages required more hired labor than the male-headed families. Male-headed families of Yellen use more hired labor 47% than in Chare 33% (Table 6). This indicates that seasonality of cropping requires more labor within a given time frame and Yellen farmers are economically stronger than Chare farmers to pay wages. Labor shortage and lack of sufficient time were reasons given for delaying collection and stacking of crop residues at the right time in both villages. This delay has its own impact on crop residues' quality, which in turn affects animal performance and farm productivity in general.

Table 6. Labor sources employed by male-and-female headed households in the two villages

Village	Sex	Labor source					
		Family	Hired	Shared	Family+ shared	Family + hired	Total
Yellen	Male	-	47	-	12	24	82
	Female	6				12	18
Chare	Male	10	33	14	-	19	76
	Female	5	-	-	5	10	19

Livestock serve as an asset and farmers are well aware of their economic importance. Animals provide immediate cash income that is required for household expenditure. Male-headed families of both villages have better chance either to own or have information about improved breeds. Respondent farmers of both villages are well aware of the value of improved breeds of cattle

(24%), sheep (6%), cattle and sheep (17%), cattle and chicken (11) and chicken only (12%). None of the respondents did not own any improved breeds at the interview time (Table 7). Consequently, the respondents clearly stated that inaccessibility to AI or bull service and improved breeds in general impedes their income.

Table 7. Percentage of respondents who previously owned improved animal breeds or have information.

Village	Sex	Animal species							Total
		Cattle	Sheep	Cattle + sheep	+ Chicken	Cattle + chicken	No idea		
Yellen	Male	24	-	6	12	6	35	82	
	Female	-	6	6	-	-	6	18	
Chare	Male	-	-	-	-	5	71	76	
	Female	-	-	5	-	-	14	19	

Chare respondents expend more money on feed purchase, as they do not own enough land to produce crops and use the byproduct (residues) as livestock feed or allot land for hay production. The expenditure for feed ranges from 200 to 500 Birr at Yellen, and from 300 to 1300 Birr at Chare. Prices of crop residues are usually negotiable and farmers with good economic background tend to purchase residues right away after harvest, when it is comparatively cheaper than during the dry season. All respondents complained about the escalating price of crop residues from year to year which challenges the profitability of the small enterprise that they own. This is in agreement with the findings of Binyam *et al.*, (2013) who indicated that soaring feed prices destabilize milk prices in the Central Highlands of Ethiopia. The other factor of high feed expenditure noted by Chare respondents is associated with the annexation of the village with Shoa Robit City Administration that converted a large amount of arable and grazing lands to residential areas which reduces the amount of feed to be produced. As a result 67% of Chare respondents purchased additional feed while only 35% of Yellen respondents purchase feed for their animals (Table 8). In the villages water for livestock comes from rivers and pipe water, only 24% of Yellen respondents use pipe water, while the rest drives their animals to watering points.

Table 8. Percentage of respondents that purchase feed; and water availability and source in the surveyed villages

Village	Sex	Feed bought		Water availability		Drinking method	
		Yes	No	Yes	No	River	Pipe
Yellen	Male	35	67	82	-	59	24
	Female	-	18	18	-	18	-
Chare	Male	52	29	81	-	81	-
	Female	14	5	19	-	19	-



Feed availability both in quality and quantity needs a serious attention in order to fully exploit genetic potential of farm animals. Without adequate feed, productivity of animals will be hampered, and the effect will be reflected on the total farm productivity as the poorly fed oxen cannot generate adequate draught power for land preparation and other farm related operations. The respondents unanimously reported that milk production suffers from seasonal fluctuations as its production is directly related with feed availability. None of the respondents have the experience of silage making, though the technology could solve the seasonal problem of feed shortage both in amount and quality.

Although they don't cultivate them in their plots, the respondent farmers identified elephant grass, *Leucaena*, and *Sesbania* as the most popular cultivated forage crops. These species are among the improved forages reported by Ameha and Aschalew (1998) and Alemayehu (2004). The respondents clearly stated that lack of major inputs (AI or bull service, veterinary services and small farm implements), and lack of appropriate market channel hampered their farm productivity. The Office of Agriculture provides regular veterinary services and disease diagnosis although laboratory support is lacking. Strengthening the veterinary service would minimize morbidity and mortality of animals and improve the total output of the households. Labor and capital shortages are mentioned as serious bottlenecks and needs attention. Supporting private input suppliers and strengthening marketing channel can be an option to address animal related problems in the district.

### **Conclusion and Recommendations**

Animal production is an important activity in the villages and is constrained mainly by shortage of feed, labor, capital and the ever-increasing feed price. The existing grazing lands are too poor to support any sound livestock productivity. Most of the respondents purchase additional feed to overcome the shortages during the dry season. The overall crop residues produced per household is proportional to farm size and is conserved in loose form without shade till it lasts. This practice causes loss of nutrients which is reflected on the performance of the livestock. Therefore, post harvest management of crop residues is crucial to maintain the nutritive value of these immense resources. Proper intervention mechanism in handling of crop residues enables to maintain the nutritive quality of the resources. Sorghum stalk is the main feed resource conserved as dry season feed and special attention need to be given to its conservation and utilization. Technologies like that of ensiling could be introduced and verified to improve the nutritional quality of the stalk, as the technology requires small investment that can be implemented at household level. Supporting private input suppliers and strengthening marketing channel might be an option to address animal related problems in the district.

## Acknowledgements

The activity was conducted through the grant obtained from Colorado University, USA. The first author would like to thank specifically Dr. Dana for all the invaluable assistance he rendered from inception up to completion.

## References

- Alemayehu Mengistu. 2004. Pasture and forage resource profile of Ethiopia. Alemayehu Mengistu and Associates. Addis Ababa, Ethiopia. Pp. 52.
- Alemu Yami, Zinash Sileshi and Seyoum Bedye. 1991. The potential of crop residues and agro-industrial by-products as animal feed. Pp. 57-64. In proceedings of the 3<sup>rd</sup> National Livestock Improvement Conference. 24-26 May, 1989. Addis Ababa, Ethiopia.
- Ameha Sebsibe and Aschalew Tsegahun. 1998. Forage and pasture research in Northern Shoa. In Proceedings of the 4<sup>th</sup> Technology Generation Transfer and Gap Analysis Workshop. 18-21 March, 1997. Bahir Dar, Ethiopia.
- Aschalew Tsegahun, Lemma HabteYohanes and Tefera Mekonen. 2014. Effect of harvesting stage and urea-molasses treatment on quality of sorghum silage. Pp. 647-655. In Zeleke Mekuriaw, Getnet Zeleke and Likawent Yeheyis (eds), 2014. Proceedings of the 6<sup>th</sup> and 7<sup>th</sup> Annual Regional Conference on Livestock Completed Research Activities 25-27, January, 2012 and 22-24 January, 2013, Amhara Agricultural Research Institute, Bahir Dar, Ethiopia.
- Binyam Kassa, Firew Kassa, Friew Kelemu, Deresse Teshome, Getahun Kebede, and Addisu Abera. 2013. Improving dairy market through products diversification. Pp. 47 – 58. Getnet Assefa and Firew Kassa (eds). In the proceedings of the national workshop on exploiting market opportunities for the value added milk and meat products in Ethiopia. Holetta Research Center, 2012.
- CSA (Central Statistical Authority). 2013. Agricultural Sample Survey 2012/2013 (2005 EC) (September – December, 2012) Volume III. Report on area and production. Addis Ababa, Ethiopia. June, 2013
- CSA, 2011. Agricultural Sample Survey. Report on crop livestock product utilization. The Federal Democratic Republic of Ethiopia. Central Statistical Authority (CSA), Private Peasant Holdings. Statistical Bulletin 468, Addis Ababa, Ethiopia.

- CSA. 2010. Agricultural Sample Survey. Livestock, Poultry and Beehives Population (Private Peasant holdings). Federal Democratic Republic of Ethiopia Central Statistical Authority (CSA), Addis Ababa, Ethiopia.
- ELDMPS (Ethiopian Livestock Development Master Plan Study). 2007. Livestock Development Master Plan Study, Volume 1- Dairy. Phase 1 Report data collection and analysis. Government of Ethiopia Ministry of Agriculture and rural development. ([www.igaddata.org/index.php](http://www.igaddata.org/index.php)).
- FAO. 2010. Status and prospects for smallholder milk production – A global perspective. In Hemme T. and J. Otte (eds). Rome, Italy.
- FAO. 1990. The technology of traditional milk production in developing countries. FAO Animal Production and Health paper 85. Food and Agricultural Organization of the United Nations.
- Fekede Feyissa, Shiv Prasad, Getnet Assefa, Getu Kitaw and Seyoum Bediye. 2013. The status of production, conservation and utilization of natural pasture hay for feeding dairy cattle in the greater Addis milk shed central highlands of Ethiopia.
- Zealelem Yilma. 2013. Perception of the Ethiopian dairy sector. Pp. 3 – 46. Getnet Assefa and Firew Kassa (eds). In the proceedings of the national workshop on exploiting market opportunities for the value added milk and meat products in Ethiopia. Holetta Research Center, 2012.
- Zinash Sileshi and Seyoum Bediye. 1991. Utilization of feed resources and feeding systems in the central zone of Ethiopia, pp 129 -132. In Proceedings of the 3<sup>rd</sup> National Livestock Improvement conference. 24-26 May 1989. Addis Ababa, Ethiopia.