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Research Article

Challenges and opportunities of indigenous dairy production and management: The case of selected rural villages in Bambasi District, Benishangul Gumuz Regional State, Western Ethiopia

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Abstract

The data sources were both primary and secondary data. To enable an analysis of data collected through questionnaire, Statistical Package for Social Sciences (SPSS) software (version 20) was used. The mean family size of the respondents was 6.04. The mean and SDs of cattle holding per household was (8.38±4.91). The total (67.9%) of respondents were having not have owned grazing land for their dairy cows. Tryponomiasis disease (Gendi) ranked first, Pasteurellosis disease second, and external parasites were third. (98.2%) respondents rear indigenous breeds. The mean daily milk production per cow was 1.4 liters. More than half of the milk was used for family consumption. Milk is sold in the area through an informal market directly to the retailer. Technical strategies to support smallholder cattle production should focus on improving technical and institutional constraints by providing adequate veterinary services, improving fodder cultivation, proper crop residue management, and improvement, supplying medical equipment and medicines, adequate extension service, improved water availability, and improving breeding systems. To ensure a reliable feed supply throughout the year, fodder conservation practices, especially hay and crop residues, should be encouraged.

Introduction

Ethiopia is believed to have the largest livestock population in Africa. Livestock production is one of the most important means to achieve better living standards in many regions of the developing world. The national economies and the livelihood of rural communities in sub-Saharan African countries largely depend on livestock production *[1]*. Agriculture creates job opportunities for more than 85% of the Ethiopian population and serves as a major source of export, revenue, and raw materials for local industries. Improvement in the livestock production system is a key element to improving the productivity of the agricultural sector and consequently the livelihood of the individual farm households.

The Ethiopian dairy production and marketing system face severe constraints; the average production per cow is 1.5 liters per day, well below international benchmarks. Poor genetic insufficient access to proper animal feed and poor management practices all contribute to the low productivity levels Regarding dairying, the national milk production remains among the lowest in the world, even by African standards **[2]**; different reasons are contributing for low productivity. These include high human and livestock populations, land shortage, animal disease prevalence, feed scarcity, and poor genetic potential of indigenous cattle breeds [3,4].

Despite its potential for dairy development, the productivity of indigenous livestock genetic resources, in general, is low, and the direct contribution it makes to the national economy

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is limited. This livestock sector has been contributing a considerable portion to the economy of the country and still promising to rally around the economic development of the country. In Ethiopia, livestock contributes 30-40% of Agricultural Growth Domestic Product (GDP), 16-20% of national GDP, and 14-16% of foreign exchanges [5].

Inadequate quality and quantity of feed, disease and parasites occurrence, poorly management of dairy animals like housing, feeding, and absence of good marketing practice are affecting the productive and reproductive performance of dairy cows *[6]*. Although in Benishangul Gumuze region and elsewhere play an important role in smallholder dairy farming; there is no information available on gender roles in dairy farming practice and management, access to information and technologies, and access and control over resources. This sometimes leads to problems in planning since official data are essential for policy makers.

Materials and methods

Description of the study area

Benishangul Gumuz is one of the nine regional states of Ethiopia. It is located in the western part of the country between 09.170 - 12.060 North latitude and 34.100 - 37.040 East longitude (Kinde, 2012). Bambasi is among the seven districts in the Assosa zone of the region. It is located at a distance of 610 Km from Addis Ababa. According to the CSA (2013), the total population of the district is projected to be 66,306, of which 33,578 were males and 32,728 were females. Out of the total population, 18,563 were urban residents, which comprises 9,448 males, and 9,115 were females and the number of rural dwellers was 47,743, out of which 24,130 males 23,613 were females. Different ethnic groups including Berta, Amhara, Oromo, Tigre, and Gurage live in the district. Muslim and Orthodox are the major religion of large followers in the district (BDAO, 2016) Figures 1,2.

Research design

The research design was a Cross-sectional survey to employ and obtain the required information to meet the objectives of the study. Different data collection techniques were used at a time. These techniques were household surveys, focus group discussions, questionnaire interviews of key informants, and personal observation. Purposively sampling techniques we're employing to select the district and the sample village *kebeles*. Random sampling techniques were used to select respondents of sample household survey, participants of focus group discussion, and attendants of key informant interviews respectively. This study followed both qualitative and quantitative methods of data collection approaches were combined. They focus on collecting, analyzing, and mixing both quantitative and qualitative data in a single study.

Sampling methods and procedures

A mixture of purposive sampling techniques and simple random sampling techniques was used in the analysis. The

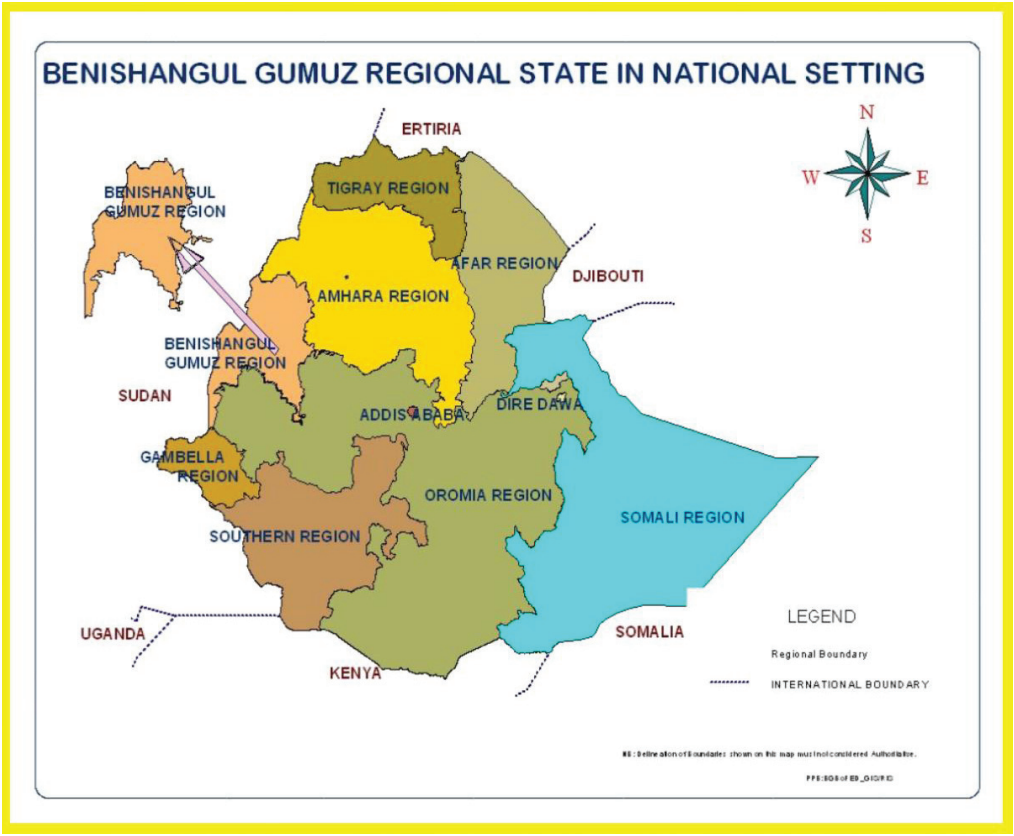

Figure 1: Benishangul-Gumuz Regional State area description.

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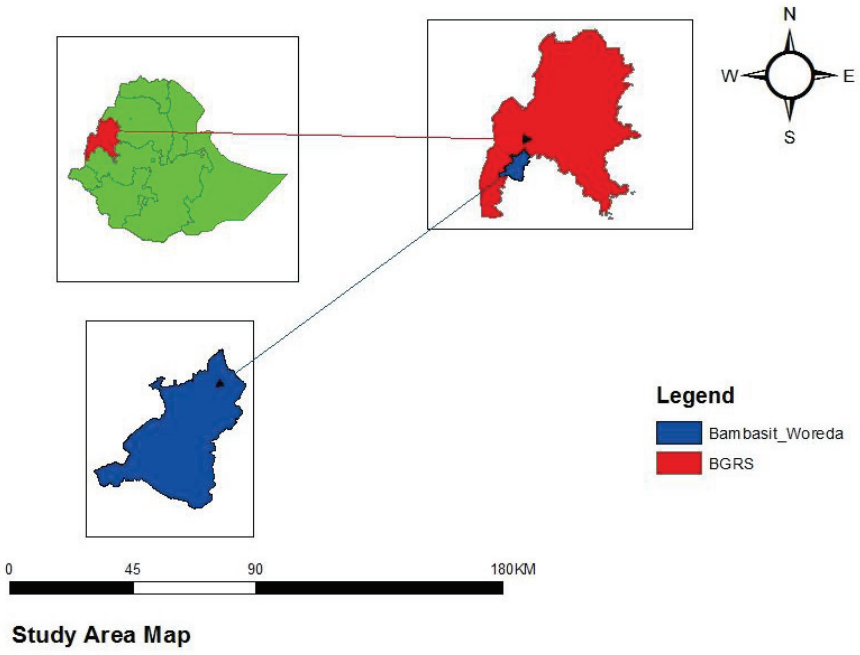

Figure 2: Geographical location of the study area, 2021.

district and the two rural local villages were selected based on market advantages accessibility, livestock population, farming activities, and milk production, and the closest to town. Therefore, to assess the issues of the practice of indigenous dairy production management, challenge, and opportunities in the study area. Respondents were selected from the two rural local villages with the aid of simple random sampling. After determining the sample size proportional to the size of each rural local village, a different number of samples was taken from both study areas.

The sample frames for selected villages were prepared, the desired sample size numbers were determined, and the sample was systematically selected using the methods of sampling proportional method. Based on this 112 farmers were selected from a selected rural village.

Data types and source

The data sources were both primary and secondary data. Using a pre-tested standardized interview schedule, KI, observations, and group discussions, the primary information was on the practice of indigenous dairy cow production, management, challenges, and opportunities from respondents and the district livestock office. Secondary information was collected from various documents and publications. During the collection of primary data, triangulations of different methods were used to ensure the reliability and validity of the collected data.

Methods of data collection

The data collection process starts with the concept of a research issue and the marking out of the research design. The researcher should keep in mind two types of data, primary and secondary while deciding on the method of data collection used for the study. The primary information is those that were collected for the first time and are therefore original. On the other hand, secondary data are those already collected by someone else and passed through the statistical process. The methods for gathering primary and secondary data vary because primary data is collected initially, whereas, in the case of secondary data, the purpose of data collection functions is just collecting.

Methods of data analysis

Both quantitative and qualitative, data methods were used to achieve the stated specific objectives of this study. Based on the objectives of the study, appropriate methods of data analysis such as descriptive statistics were used. Descriptive statistics such as frequency, percentage, mean, standard deviation, chi-square, and t-test were used and the result of the study was summarized by tables, figures, and charts to conclude.

Collected quantitative data were analyzed and interpreted using descriptive statistics (percentage, frequencies, mean, and standard deviation chi-square and t-test). Accordingly, data obtained from respondents relating to demographic and socio-economic characteristics, dairy production management & practices, data were analyzed by using descriptive statistics like frequency, percentage, mean, and standard deviation by using SPSS version 20, utilized and the data were summarized and presented in tables and chart. The other collected data was qualitative data were analyzed by using thematic analysis to triangulate the qualitative data to achieve the stated specific objectives of this study. The summary of the analyzed qualitative data was present in a pair-wise matrix ranking chart (Issues in dairy production and management practices) and tables.

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Result and discussion

Characteristics of respondents

Demographic characteristics: The demographic characteristic of the respondents in percentage is presented in Table 1, the study also indicated that the statistical value of all variables (sex, marital status, education, ethnicity, religion) of the demographic characteristic of the respondents was put in the results below.

Sex of households and marital status: Accordingly, from 122 samples of households interviewed (62.5%) were male head and 37.5% (42) were female. This indicated that the male head was dominantly found in the study area.

In the study area, (1.8%) of respondents were single, (9.8%) were widows, and (14.3%) of respondents were divorced, while (74.1%) of households were married. This difference is due to the nature of the household structure, which is similar to most parts of the country, especially in the study rural area was marriage early due to people give low attention for education, believes that girls wealth creation, harsh climate condition, access, and control resources, these more reflected indigenous people in Sonka *kebele*. According to the respondents, in the male household headed male represents the household, while women represent their household in the case when their husband dies or when they are divorced.

When comparing studies kebeles selected from the population as a sample from the keshmando kebele, the findings indicate that more male respondents (73.9%) were interested. In Sonka kebele, female respondents dominated male respondents (55.8%). Women's comments during the FGD discussion in the Keshmando kebele were very similar to the results because women in the kebele are not involved in any community-related issue in the area. In addition, male households dominated women. Furthermore, their women are not invited to issues related to developments, training, and meeting. The other points were that women had more workloads in the area than men.

Table 1: Demographic Profile of Respondent.

variables	Categories	Respondents	
		N	%
Sex	Male	70	62.5
	Female	42	37.5
Marital Status	Single	2	1.8
	Married	83	74.1
	Windowed	11	9.8
	Divorced	16	14.3
Education	Elementary	34	30.4
	High school	8	7.1
	Diploma	1	0.9
	Non-formal	25	22.3
	No education	44	39.3
Ethnicity	Amhara	62	55.4
	Oromo	1	0.9
	Berta	43	38.4

(Source field data, 2021).

Education level of households

Regarding educational status among the sample respondents (30.4%) were in elementary school, (7.1%) high school, (0.9%) had a diploma, (22.3%) were in a non-formal school, and (39.3%) were not educated in the sample area. Generally, the educational level attained by the majority of the household heads was low, which falls between elementary, and illiteracy. As reported **[7]** the low level of education in the household can harm the development of dairy sectors. This is evidenced by the low-level use of dairy innovations such as artificial insemination, cultivation of improved forages and access to manage cattle health, and practice of record-keeping in the current study area.

These low education levels or illiteracy of the society are the challenges in modernizing dairy products and sustaining or commercializing dairy products that require continuous training, experience sharing, and demonstration to enable the dairy products to improve and move forward in the dairy sector. Because educated households improve at least some of the livestock-related routine management and are aware of accepting new technologies.

The majority of the respondents were Amhara ethnic group (55.4%), while the remaining *Berta* ethnic were (38.4%), Tigre (5.4%), and (0.9%) were Oromo ethnic group. The majority of the respondents from the selected *kebele* of Sonka were Muslim (58%) and Orthodox (42%). In the study, an area the religions of sample respondents were, Orthodox (42%) and Muslims (58%).

Respondents family size

The mean family size of the respondents was 6.04 which is in agreement with the finding of (Belay *et al.* 2012) which is reported a mean family size per household to be six, (6 persons/HH) and [8] who reported average family size of 6 (six). The large family size is an opportunity to increase or improves the product and productivity of dairy production concerning labor provision in dairy cows herding, feeding, and watering; overall management of dairy product milking processing, and marketing. Having many children or family size has been thought of as an asset for farming activities and being large in number in the household has social prestige showing the strength of the family. In the study area, a Male married to more than one wife is one of the wealth indicators and it is taken as a culture and interims of religion, especially in the *Berta* ethnic group of *Sonka kebele* of the study area. Similarly, a study by [9] in the *Essera* district indicates that having many wives is one of the indicators and commonly practiced types of marriage Table 2.

The Sonka kebele is showing more familiar than Keshmando and the number of children in the Sonka community has increased since there are two women in one household. The community still believes that having a large family is important. For the intermission of women's cultures and religions, contraceptives are still not allowable. Since children are seen as a valuable resource.

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Age of households

The mean age of the respondent in the study district was 46.5, the maximum is 78, and the minimum is 25. The majority of the respondents were young and middle age. These are people who are energetic and in their prime age and if well supported can contribute to the economy of the household and the country.

Socio-economic characteristics

Land size of households: The overall mean land size of respondents was 3.0383 hectares and the minimum was 0.25 hectares and the maximum was 11.5 hectares. The mean grazing land size of respondents in the study area was 0.6597 hectares, with a minimum of 0.25, a maximum of 1.50, and the mean for cropland were 2.8288 hectares, minimum of 0.25, and a maximum 10 of hectares. Depending on the results majority of the respondents have no owned grazing land for their cows due to a shortage of land and priority for crop production.

According to the respondent during the survey, the majority of grazing use communal grazing lands for their dairy cows this practice was their disadvantage on disease transmission and there is no grazing system (grazing rotation methods) a huge number of cattle were grazing. The other challenges raised by respondents during the survey were communal grazing lands were decreased in size and grass species due to increment in population, expansion of residence, and illegal land grabbing for crop production Table 3.

When the total land areas of both *kebeles* were compared, the results show that Keshmando *kebele* has more grazing and agricultural land than Sonka *kebele*. The explanation for this is that the Sonka is a pre-existing ethnic group with existing land holdings, and no additional land is available. Keshmendo *Kebele*has recently relocated to the area. Farmers can extend their lands around forest and bush areas by clearing open land because of this keshmando were greater than Sonka in size of lands. On the other hand during the FGD the indigenous Sonka *kebele* was raised in the community the male boy and female girls were getting married soon, and they distributed their land to their children, So, the family land was reduced.

Dairy cattle held by households

Cattle are the most important species of livestock in the study area for instance cattle are used for milking, meat, breeding, fattening for sale (cash income), farming activities, and manure production in the district. The mean and SDs of cattle holding per household was (8.38±4.91), with a minimum of 2, and a maximum of 20.

The report was lower than that of [10] in the Horro district and (Shiferaw,2007) in the Fentale district of the Oromia region, which was 14.7 + 0.55 and 12.2, respectively. In the study area, due to the area were harsh environment, high disease infestation especially, Tryponomiasis and pasteurellosis disease, shortage of grazing land, increase population the land were shared for residences and agricultural purpose, variation in family size, the economy of the household for those reasons number of dairy cattle reduce. Therefore, due to those factors, the number of cattle was reduced when compared to others in the study area.

Out of this (1.8%) were crossbreed and (98.2%) were pure local breed. The majority of the respondents in the study area were rearing pure local breeds the reason is due to, the low accessibility of improved breeds and lack of awareness of the improved breeds, and lack of artificial insemination service. This result indicates that in the study area, the local breed was dominant; it indicates that dairy products and productivity were low. Therefore, in the study area dairy improved technology as if(AI) artificial insemination service accessibility will need to focus and improve dairy extension service. This is much lower than the 17.0 average cattle head /households reported by [11] for the Guduru district respectively, in Western Ethiopia. On the contrary, the per-household cattle holding of the current study was higher than the report from the Shashemene-Dilla area of Southern Ethiopia which reported in crop mixed system average herd size of household was 3.8±0.42 [12]. The variation in cattle herd size per household in different parts of the country at different districts might be due to the difference in per household land holding, variation in family size, population, the economy of the household, variation in function of cattle, both grazing lands and accessibility of dairy sector extension service Figure 3.

Source of dairy cow and experience on dairy

The findings revealed that the majority of (94.6%) dairy keepers respondents started the rearing dairy cows by purchasing by themselves and (5.4%) started dairy production by giving from family or relatives. According to the survey result, and FGDs, the majority of the respondents start rearing through its efforts, this indicates that there is no donation from governments and NGOs. However, some respondents earn money from credit and saving institutions after establishing the farm for the expansion of dairy cows for production; oxen for farm activity, and for fattening purposes for additional income. The respondent's experiences in dairy farming ranged from 2 to 45 years with the mean SD experience of 21+ 10 years.

Income source of the respondents

The main income of the sample households in the study area was indicated in the ranking index below (Table 4). The

Table 2: Comparison of Family size between Sonka and Keshmando kebele.

Variables	Kebeles	N	Mean	SD	Min	Max	sig.
Family size of the respondent	Nebar Keshmando	69	5.38	1.628	3	9	.001
	Sonka	43	7.12	3.500	3	19	
	Total	112	6.04	2.642	3	19	

Table 3: Land size in the study area.

Variables	N	Minimum	Maximum	Mean	SD
Grazing Land-hectares	36	.25	1.50	.6597	.27486
Crop Land-hectares	112	.25	10.00	2.8288	1.84729
Total Farm Size/land holding	112	.25	11.5	3.0383	1.90191

Source field data, 2021

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majority of the respondent's income ranked first from crop production, second from animal production, third from labor work and fourth from trade, and fourth from labor work Figure 4.

Purposes of keeping dairy cattle

Farmers keep cattle for multiple purposes like milk, meat, and hide as a source of income [13] and [14]. Socio-cultural functions of cattle include their use as bride price or given to new husband and wife as a gift and payment of fines in settling disputes in communal [15]. They are also reserved for special ceremonial gatherings such as marriage feasts, weddings, and funerals. Cattles are given as gifts to relatives and guests, and as starting capital for youth and newly married men. The result of individual interviews with respondents in the study shows that cattle have multipurpose functions. However, the major functions of the dairy cattle in the study areas are milk production as a source of income and for consumption at the home for the family.

As shown in Table 5: from the total numbers of respondents in the study area was ranked as a primary purpose keeping dairy for milk production purpose, the second-ranked dairy for traction or farming activities to assist the crop production by providing draught power and the third rank was for trade purpose keeping dairy cattle. According to the respondents, farmers use dairy to get additional income as assurance when the agricultural productivity decreased in different factors and when the market fluctuation has occurred and farmers' income from dairy is used for agricultural inputs and immediate incomes for home foods.

Practices of indigenous dairy production and management

Dairy cattle feeds and feeding practices: Feed shortage was the most common problem for dairy production, which is

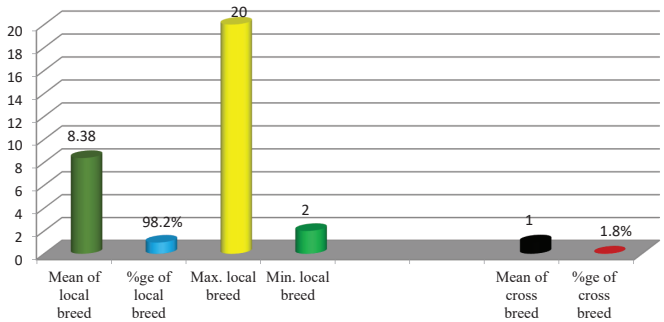

Figure 3: Number and types of dairy cattle in the study area. Source field data, 2021

Table 4: Major purpose of keeping dairy cows (Ranking index analysis).

Variables	Rank1	Rank2	Rank3	Total	index value	Rank
Milk purpose	70	41	1	112	0.391608392	1
Trade	1	0	68	69	0.241258741	3
Traction	41	65	0	106	0.370629371	2
Total	112	106	68	286	1	

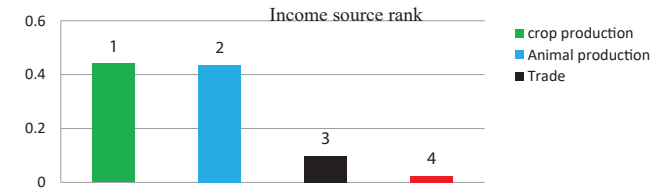

Figure 4: Income source of respondents (in Chart).

Table 5: Grazing land owned by respondents

Variables		Freq	%	Min.	Max.	mean	SD
Do you have your own grazing land	Yes	36	32.1	0.25	1.5	0.669	.2802
	No	76	67.9				
	Total	112	100.0				

Source, field data, 2021

(86.6%), of respondents were saying there is a feed shortage in the area. Only (13.4%) of respondents said feed availability in the area. The result agrees with 82% reported by (Kedija, 2008) [16] in the Oromia region and (84.7%) reported by [17] in East Wollega respectively.

Respondents mentioned that free grazing on natural grazing land is the most dominating feeding system for their cattle in the study area. According to results and FGDs, more than half of respondents mentioned that there was a feed shortage during the dry season and cropping season in the area, which was similar to the finding of [18]. Feed shortage is prevalent throughout the year both in the dry and wet seasons. This is due to more land giving priority to crop production, agroecology, and seasons' effects on feed shortage in the districts.

As discussed with respondents, the feed was the first that affects the performance problem that accounts for a large proportion of dairy production. From the fact points of view, quantitative and qualitative shortages of feed affect milk production negatively. The cause for the shortage of feed may be because most farmers had small grazing land for animals; this was also true for most natural pasture areas are converting to crop production. Moreover, the population number becoming increased over time, overgrazing is common due to inadequate use of natural pasture, scarcity of improved forages, poor extension service relating to feeding management, the most serious problem during the dry season is because of most farmers are poor experience in hay and silage making problem in the area. The present finding is similar to the current study (Daniel,2000) was also reported in North Gonder, Ethiopia, which stated that the shortage of feeds for dairy cattle production is a major problem due to the shifting of natural pasture grazing land to cropland.

Grazing land

As shown in Table 6; of the total respondents (32.1%) respondents have their grazing land utilized individually, with a minimum of 0.25, a maximum of 1.5 with a mean of 0.669 hectares owned by the household. However, (67.9%) of respondents were having not own grazing land for their dairy cows.

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Table 6: Type cows provide extra supplement feed.

	Types of cows	Frequency	Percent
Which types of cows provide extra feed supplements	Oxen	2	1.8
	Milk cow	98	87.5
	Calves	2	1.8

Source field data, 2021

Picture of types of grazing land around waterlogging and on the cropland after harvest (during the survey)

Based on FGD and personal observation, even if the same farmers have their grazing land, the grazing system in the area was extensive grazing methods was a common feeding practice with an average length of grazing time of 10:00 hours per day in the study area. The major livestock feed resource identified in the study area were natural grazing, crop residue, weeds, hay, green grass, and leaf. Natural grazing /communal/ was the main feed resource that support livestock in the study area during the cropping season, whereas crop residue is the major feed in the dry season in the district because crop production is high in the farming community.

In the study area, all respondents were use communal land/natural grazing land for dairy cattle for grazing purposes. Farmers indicate that communal land grazing was the first important source of feed for their cattle in both dry and wet seasons in the area. Grazing on communal land was the most dominant feeding practice for cattle. Dairy cattle were rear on natural grazing land under a continuous grazing system. Natural pasture is when dairy cattle's use in lowland areas is poor in grass species and quality as well as quantity, especially in the dry season. This is due to the factors of agroecology and the management of grazing practices was poor. According to the field, observation in the area cattle are utilizing feeds on communal land, private land, roadside, and around homestead supplementary feeds.

Crop residues

Based on the respondent's survey results, (86.6%) of the respondents were prepared crop residue and feed their dairy cows, while (13.4%) of respondents were not prepared and did not use crop residues for their cows in the study area. The availability of feed for cattle in the study area shows seasonality according to the respondents and from focus group discussion. Crop residues from crops are a more important feed source especially in the dry season when grazing land is less covered or decreased; farmers collect during crop harvesting season. According to the respondents, field observation, and focus group discussion, types of crop residue in the study area were materials that farmers collect and prepare residues maize Stover, *teff* straw, finger millet straw, sorghum Stover and groundnut straw were the major source of residue in the study area. *Teff* and finger millet straw contribute more to livestock feed when compared to any other crop residues. This is because *teff* and finger straw is essential for dairy and draught oxen during cultivation in the study area. On the other hand, dairy cattle use crop field lands such as maize, sorghum, *teff*, and finger millet were used for stubble grazing after crop harvesting.

Based on information from group discussion and field observation indigenous grasses and crop residues were difficult to consume or have low intake and low digestibility for cattle because those feed are categorized as low-quality roughages that may limitations animal performance related to feeding intake and digestibility. Based on this indicated in (Figure 5): (26.8%) of respondents offered this roughage and crop residues feed or provide the whole stalk without treatment and (54.5%) of respondents was offers crop residues by chopping the stalk and (6.3%) was offered the roughages and crop residues by mixing with other like salt and by soaking with water.

During the discussion, more respondents used the roughages feed and crop residues feed for cattle by chopping means by reducing the size of those types of feeds to increase the intake and improve the digestibility of animals during the dry season by assisting with extension service in the study area. These methods of treatment were very important when the shortage of feed occurs in the dry season in the study area due to low land agroecology feeds of livestock are affected by season and agroecology so, the researcher advised such kind of methods will be expanded to other farmers in the districts Figure 5.

Picture of crop residue in the study area (during the survey, 2021)

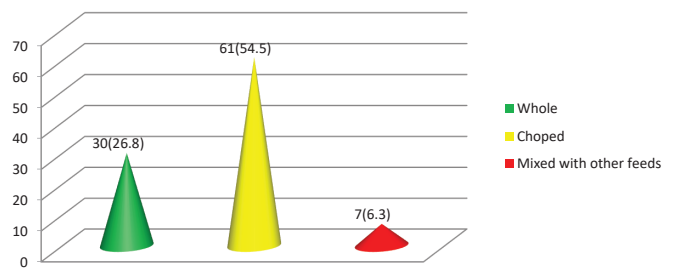

Figure 5: Methods of respondents feed crop residues for cows.
Source, field data, 2021

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Hay making practices

In households in the study area about (63.4%) were practicing hay making for animals collect in the wet season store and conserved for their animals in the dry season, while (36.6%) of respondents were not practicing or preparing hay making for dairy cows in the area. According to the respondents and field observation, the most common materials for hay making in the area were different grass species from improved forages like Rhodes grass and local grasses.

During this study, the researcher observe a sample of model households, those model farmers were selected from each *kebeles* of the district, then take training on hay making and utilization systems by using improved and locally available grasses by assisting extension workers. However, during observation, some farmers conserving or storing systems and utilization systems have technical problems was observed those are, how to conserve, places, materials used, and way of feeding the hay. Those farmers explain the reason, due to the problem of lobar shortage and low gender participation within the family in hay collection, storing, and shortage of place, scarcity of conserved grasses in the study area.

Pictures of improved grass and local grass hay-making in the study area. (During the survey, 2021)

Supplementary feeds practices

During the dry season, there is shortage of green feeds, which were widely used as the farmers provide supplement feeds for dairy cattle. The low availability and quality of feeds in the dry season tends to affect the productive and reproductive performance of dairy cows unless adequately supplemented. Poor nutrition increases the susceptibility of dairy cows to health problems and physiological stress which results in lower production, much longer calving interval, as well as problems with infertility.

Of the total (91.1%) of the respondents were providing additional /supplementary feeds for dairy cows only from green feeds and 8.9% were not providing supplementary feeds for their dairy cows. In the study, area there is no concentrate feed or agro-industrial byproducts. Overall the majority of farmers offered green feeds from grasses and leaves from improved or locally available materials, especially in the dry period. Based on the economic importance of the class of cattle green feed is offered as supplementation for different cattle at different times.

As shown in (Figure 5): (37.5%) offered in the morning before the cattle grazing, (6.3%) during the afternoon time, and (47.3%) during the evening time after back from the grazing field. This is due to a shortage of feeds in grazing area farmers provides additional or supplementary green feeds at the home at different time.

Farmers climb up trees to lop down leaves and branches of various trees and shrubs and feed them to their cattle during the dry season except when they face critical problems. They also collect herbaceous wild plants, legumes, and grasses as feed for cattle. In the study area, the respondents supplement the animals during feed scarcity periods were a Bamboo tree, which is a major tree grown widely in the area. Similar findings with [19] were reported in Wolayita Soddo. The majority of the respondents use animals *Bambusa vulgaris (Bamboo tree) Figure 6.*

Table 6: Show that the frequency of respondent farmers was allocating supplementary feed to their cattle. The majority of respondents collect and provide a supplementary feed from green leaves and different grass species and legumes from the area of forest and around the rivers in the study area. According to the respondents on the economic importance of the class of cattle, supplementation feeds varied among classes of cattle kept. Overall, the majority of the farmers (87.5%) offered green supplement feed mainly for milk cows, Oxen (1.8%) and calves(1.8%) offered additional feed supplementation for dairy cattle in the study area. The main reason for supplementing mostly milking cows was to maximize milk production to increase their profit from milk production and to develop their born calves to replace heifers to attain early age at puberty and first calving; the other reason was to build body condition of lactating cows. The result of this study was in line with the finding of (Sintayehu *et al*, 2008), who reported that the majority of (58%) of the farmers provide supplement feeds mainly to lactating cows.

The practice of improved forage production

Improved forages play an important role in the different livestock production systems. Production of cultivated improved forage depends on the availability of species that are adapted to the agroecology of the area. Cultivated forages are important for haymaking, as cut and carry the source of feeds. Based on the respondent's results only (31.3%) of farmers were practicing or cultivating improved forage production. The majority of (68.8%) of respondents were not practicing

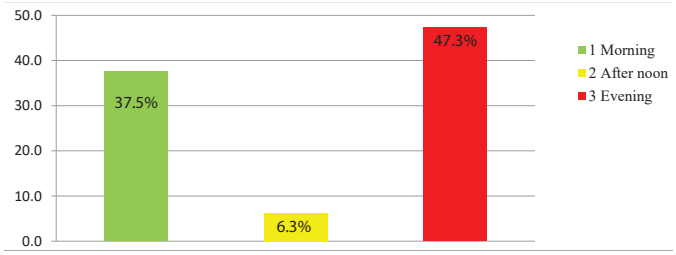

Figure 6: Time of respondents provide extra supplementary feed for cows. Source field data, 2021

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or not cultivating improved forages for dairy production. In the current study, the major limitations for not growing improved forages raised by farmers were due to land scarcity, lack of knowledge, forage seed shortage, labor shortage, lack of information, and low extension service linkage.

Based on group discussion and personal observation shows that dairy farmers in the surveyed area could grow different grass species such as Rhodes grass, Elephant grass, and multipurpose legumes trees such as; *Sesbania*, *Pegeonpea*, and *Macharanta* as a live fence. The feeds are a good source of protein for dairy cows. Those improved forages were distributed to farmers from Assosa agricultural research center, the district agricultural office, and the nongovernmental office by cutting and seedling.

Rhodes grasses have good potential productivity and are good for milk-produced cows, are well adapted to the agroecology of the area, give high yield and require a small area. However, during FGDs with development agents and farmers the extension service of improved forage technology and farmer's linkages, the scarcity of seed, expansion of demonstration, training related to improved feeds technology farmers land scarcity, labor shortage are the main factor to widely adapt in the study area.

Season of feed shortage and feed availability

Grazing of natural pasture constitutes the main source of animal feed throughout the year with maximum availability during crop growing season (June to December) in the study area. Nevertheless, high crop residues were available from (January to May) at the beginning of the dry season following the harvest and threshing of different cereal and pulse crops Tables 7,8.

Sonka kebeles were significantly different from Keshmando kebele in terms of making or preparing different feed products for their dairy cattle in the study area, according to the chi-square results from the two study areas. This result was similar to the FGD and KII results in that both communities were ethnically different, that is, Sonka was a *Berta* indigenous community and Keshmando was a settler community. As a result, in the indigenous community Sonke kebele, there was a shortage of feed in the area due to this the farmers prepare or made different feed items for their dairy, and because the community was close to the roads access to technology, the community leaders also gave priority and extension service more focused in the area.

Water source and watering practice in study area

Water is a determining factor for all activities of animals, water problems in amount and quality can cause a problem like dry abdominal parts, dry digestive tract, and reduced metabolic activities with emaciated body condition [20]. In the study area, all respondents have the source of water for dairy cattle. According to the results, most of the (63.4%) respondents used rivers as a major water source for their cattle even though their quality and availability depend on the season. As observed during the survey, households that use river water for their animals were not clean or contained impurities, (1.8%) tape

Table 7: Feed resource availability across the different months of the year in the study area.

Feed resources	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Natural Grazing	A	A	A	L	Un	Un	Un	L	L	A	A	A
Straw	Un	Un	L	A	A	A	A	A	Un	Un	Un	Un
Stover	Un	Un	L	A	A	A	A	A	Un	Un	Un	Un
Hay	Un	Un	Un	Un	A	A	A	A	Un	Un	Un	Un
Cut & carry	A	A	A	A	A	A	A	A	A	A	A	A

Source field data, 2021
Note; A - available, L - limited, Un– unavailable

Table 8: Comparisons of dairy cattle feeds and feeding practices in both indigenous community and settler's community.

Variables	Response	Keshmando kebele		Sonka kebele		Total		X^2
		N	%	N	%	total N	total %	
Crop residue	Yes	54	78.3	43	100	97	86.6	.000
	No	15	21.7	0	0	15	13.4	
	Total	69	100	43	100	112	100	
Supplementary feeds	Yes	59	85.5	43	100	102	91.1	.006
	No	10	14.5	25	58.1	10	8.9	
	Total	69	100	43	100	112	100	
Hay making	Yes	28	40.6	10	23.3	71	63.4	.000
	No	41	59.4	33	76.6	41	36.6	
	Total	69	100	43	100	112	100	
Improved forage	Yes	6	8.7	29	67.4	35	31.2	.000
	No	63	91.3	14	32.6	77	68.8	
	Total	69	100	43	100	112	100	

Source: field data 2021
$X^{2=}$ chi-square test

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water, (20.5%) hand wale, and (14.3%) used pond. The result was lined with the present study [21] had reported a similar result from the Ilu Aba Bora Zone of Oromia Regional State, South Western Ethiopia; the main source of water for cattle are rivers, ponds, and pipeline.

According to the respondents during survey discussion and field observation majority of the respondents were in the study area there is no sufficient water for their dairy cattle mainly, during the dry season. The major water-related problems in the study area were hygiene problems due to the number of cattle and amount of water is not equal and scarcity due to deforestation of different bushes and forests around the water source.

Regarding on frequency of watering of dairy animals varies from one agroecology to another, which might be affected by different factors, among which season, accessibility (getting easily), water performance, number and breed of the animals, and type of predominantly animal consume feed (in dry season crop residues). Based on the result in Table 9: (4.5%) of respondents were providing water once per day, (and 5.4%) three times per day, Most of the respondents (90.2%) respondents were given water for their cattle twice a day in the morning and afternoon. Because of the heat effect on the environment, the feed type is utilized by animals. According to the respondents, this was especially more sound in summer (dry period) from December, January, February, March, and April when this period a high scarcity of water for animals. According to the farmers during water scarcity, farmers use more hand-wale water and sometimes pond water (by digging around the water logging area) for animals. Thus, more water is needed by animals similar results have been reported by [20] from Alaba district, Ethiopia.

Among the distance of water sources in the study area was (72.3%)of the respondents indicated that cattle have traveled to get water for a distance of less than 1 KM, respectively. As researcher concludes shorter distance travel could have a probability of animals drinking water two or more and due to less distance traveled there is no weight loss,(17.0%)were traveled the distance between 1 to 2 KM, (8.9%) between 2 to 3 KM, and(1.8%) were greater than three KM. show Figure 7.

Dairy house and housing types

Dairy cattle house is very important to provide an appropriate condition for the rearing of dairy cattle by minimizing the extreme effect of harsh climate like heat, and rain by protecting different enemies. The appropriate design of dairy housing reduces stress and clean improves productivity. Dairy cattle's control from environmental factors improves productivity by reducing disease, and insects and is easy to manage.

Picture of a sample water source during the dry period in the study area (during the survey, 2021)

Table 9: Water and watering system

		Frequency	Percent
Types of water sources in the area	Tape	2	1.8
	River	71	63.4
	Hand wale	23	20.5
	Pond	16	14.3
The frequency of water provide for cows	Once	5	4.5
	Twice	101	90.2
	Three times	6	5.4

Source field data, 2021

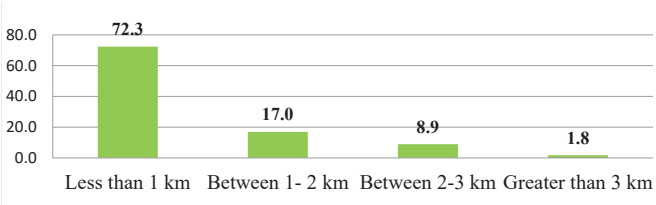

Figure 7: Distance of water source from the homestead of the respondents. Source field data, 2021

Table 10: Types of House and Frequency of Cleaning

Variables		Frequency	Percent
Types of house	Permanent enclosure/house	49	43.8
	Semi-permanent (temporary)	13	10.7
	Open the fence in the backyard	50	45.5
Frequency cleaning of dairy barns/house	Once a day	74	66.1
	Once a week	38	33.9

Source field data, 2021

The result of the current study indicates that there are three types of dairy cows' housing systems were respondents use for their cattle in the area. In the rural study area, (43.8%) permanent enclosure house types. Semi-permanent or temporary types of housing systems were(10.7%) and open fences in the backyard (45.5%). Among, permanent enclosure house types were suitable to protect cattle from extreme temperature, rain, thieves, and insects. Farmers use the fence-type house in the backyard due to scarcity of land, and lack of building materials. As a result, farmers adapted widely use of the fence-type house in the backyard this is more reflected in the Sonka *kebele* study area.

However, according to FGDs, farmers use a house in the fence in the backyard, and the animals are exposed to high temperatures and rain. Some farmers use plastic as shade only during high rain occurs for dairy cows according to the respondent dairy cattle has exposed to different diseases and are affected by the insect-like tsetse fly. However, overall the researcher observed in the study area, that the house quality of constructing or building, size of a house, shade quality, sanitation relating to clearing urination drainage, and wall building were problems. The other observed by a researcher in the area all dairy cattle type of house was not far from

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the main family house. The other observation was types of houses were constructed from locally available materials from different woods, grasses, and corrugated iron. The majority of farmers who use houses for their dairy cattle in the study area were tethered by rope to each animal in the open fence in the backyard with no roofing and wall-only fence type.

In the study area, about (66.1%) of the respondent cleaned dung and urine from the dairy cattle house once a day in the morning time; those farmers use a permanent type of dairy house in the study area. While (33.9%) were, clean only once a week in the morning time, this indicates that those farmers use dairy open in the fence at the back yard type of house (Table 10).

Pictures of types of dairy house in Keshmando, 2021 Pictures of types of dairy house in Sonka,(in the Fence) 2021

Dairy cattle health management, practice

Disease: Health care is one of the management aspects of dairy cattle production. The disease has numerous negative impacts on dairy products and the productivity of herds, which means the death of animals, loss of weight, slow down of growth, poor fertility performance, and decrease in physical power was reported to be among the major factors affecting cattle in the study area. In the study area, respondents confirm that disease is one of the main constraints of their livestock production.

Major animal diseases and parasites were identified through group discussion and key informant farmers, Development agents, and veterinary technicians. As reported economic losses due to feed and water shortage, poor management practices and environmental factors are the main sources in the study area. Drought and feed shortage are considered the major factors that predisposed the cattle to a variety of different diseases in the area. According to FGD, most of the diseases are reported to occur in the dry season while the prevalence of parasite increase during the wet season. Dairy cattle disease reported in the studied district was common but the amount of occurrence for a disease type was different.

About eight common dairy cattle diseases that were known locally by farmers were assessed during the survey the local name of the disease listed was translated into a scientific name with the help of the nearby animal veterinary technician in the study *kebele's* and finally ranked. Accordingly (Tryponomiasis disease (*Gendi beshita*), FMD (*aftermath*), Lumpy skin disease (*Koda beshita*), Pasteurellosis(*samba beshita*), Bloating (*hod minefa beshita*), Mastite(*git beshita*) Reproductive disease or Abbortion(*asweraj beshita*), the occurrence of that disease occurred yearly. From the external parasite (tick and lice) and tsetse fly (*Gendi zinb*)wereidentified. The sign of disease raised during the discussion include loss of appetite, reduce milk, high respiratory rate, open mouth breathing /abnormal breathing system, blood through the nose, no movements, wounded on mouth and feet, smooth skin, diarrhea, mucus discharge in the nose Figure 8.

As indicated by the respondents, the effect is more severe during winter during the rainy season because, in these periods, the environment might be conducive for microbes, parasites, and tsetse fly reproduction.

Based on the results Tryponomiasis disease was ranked first in the study area, This disease prevalence was mainly in adult dairy cattle attacked because this group of animals infected in field of grazing in the forest by tsetse fly vectors. Tryponomiasis disease of livestock, known as *Gendi* in the region, is one of the major diseases of livestock. This disease is found throughout the district of the region.

During the discussion respondents Tryponomiasis disease is one of the major constraints of dairy cattle production as well as agricultural productivity in the study area of Bambasi districts, due to cattle affected by this disease were reduced milk yield, loss of body condition, and problem on draught power. The controlling mechanisms respondents raise before a year different research was done by Assosa agricultural research center by using chemicals to prevent biting tsetse flies but the chemicals are not sufficient in the study area and the cost of chemical also high.

As observed by the researcher during survey data, the majority of farmers' dairy cattle housing systems were poor hygiene, overall the housing management and cleaning system were observed as the major reasons for the high prevalence of disease in the farmers of dairy farms. In the study area, the farmers had used different prevention, control, and treatment method; few (0.9%) used only traditional medicine methods (indigenous knowledge), and (0.9%) farmers were purchasing drugs or medicine from markets and treated their dairy cattle's. The majority 98.2% of respondents use to take the diseased dairy cattle to nearby veterinary services in the study

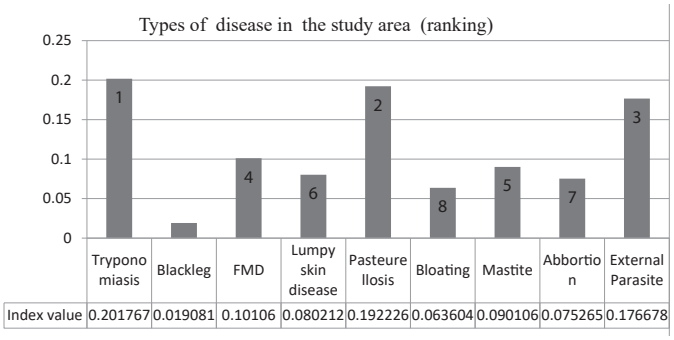

Figure 8: Types of disease in the study area by ranking.

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area (Table 11). This result indicates the majority of farmers in the study area had aware of basic knowledge's treatment of dairy cattle to government veterinary clinic service in the study area. According to the veterinary workers, vaccination is given to dairy cattle two to three times per year.

As observed by researchers and animal veterinary clinics discussed in the study area had a shortage of medical supplies, shortage of human power, high disease occurrence, no light for examination, no types of equipment, and no storage for drugs or medicine were raised by technicians. During focus group discussion, the occurrence of disease in the study area was raised by farmers due to different factors such as limited access to veterinary service, low extension service, high cost of medicine, harsh climate conditions, hygiene problems, lack of awareness of dairy managements practices, inadequate feed and water resource, and parasite incidences in the study area.

Pictures of veterinary services in the study area. (During the survey), 2021.

External parasite

External parasite tick (*meager*) and lice (*kukicha*), "*Kimazhir*" and flies are the most problem in dairy cow's in the area the prevention mechanisms used only drugs nearby veterinary clinics.

Breeding practice

Dairy cattle breed and breeding system: Almost all dairy cattle owned by the respondents (98.2%) in the study area were indigenous breeds that have not been characterized and non-described. Farmers purchase the cattle from surrounding market areas based on his criteria. In addition, ([22] reported that the cattle kept in *Ilu Abba Bora* Zone were 100% non-descriptive indigenous cattle. Correspondingly, in Ethiopia according to (CSA 2003), 99.4% of the total cattle, populations in the country are local breeds and the remaining are the hybrid and the exotic breeds that accounted for about 0.5% and 0.1%, respectively.

According to the information obtained from the respondents when farmers purchase dairy cattle from markets apply their indigenous knowledge as criteria such as present and equal and large teats, large body size, full teeth, large ear, healthy, large tail, interims of color only black color not preferable because black colored cows affected by tsetse fly insects.

Table 11: Treatment of sick dairy cows in the study area.

Variables		Frequency	Percent
Where the farmers treat sick dairy cows	Treat using traditional methods	1	0.9
	Take to a nearby veterinary service	110	98.2
	Purchase drug /medicine	1	0.9
	Total	112	100.0

Source field data, 2021

Table 12: Amount of milk in liters /cow/day.

Variables		Mean	SD	Min.	Max
Milk production from both breed in liters /day/cows	Local cows	1.442	0.478	.5	2
	Crossbreed	3		3	3

Source field data, 2021

Based on the results, the majority of respondents (96.4%) were using natural mating, and (3.6%) respondents used both natural mating and artificial insemination, respectively. In the study area, using the natural mating system was the unplanned and uncontrolled mating system. Farmers in the area did not keep breeding bulls only formatting rather they use both for breeding and draught power purpose. Similarly, smallholder farmers in the Danno district [23] did not practice the keeping of sire or bull only for breeding. However, a different result was reported in the Fentale district that keeping breeding bull in a herd is a common practice in both pastoral and agro-pastoral systems [24]. According to the discussion with farmers, communal grazing land is the main source of breeding bulls, the majority of the farmers did not know the bull of their home breed animals. However, sometimes they guess bull of animals based on coat color and body conformation of the born calf.

In general, artificial insemination (AI) is improve breeding efficiency in dairy farm development with semen collected from genetically superior sires is the most efficient and economical method for the genetic improvement of economically important traits in dairy farming. It also depends on the sanitary of the equipment so contaminated equipment can be caused a low fertility rate, and could spread venereal diseases if the bull is not evaluated accurately. In the study area, artificial insemination was provided by governmental service from the district of the animal production office. Based on the results artificial insemination was not effective in the study area due to different factors. These are environmental factors, disease, and parasites, technician knowledge, inadequate semen, distance from the source of semen, farmers' knowledge, size of farmer's cows, lack of time to manage an inseminated cow, low supervision from extension service were raised by farmers and animal health technician in the district.

Record keeping practices

About (96.4%) of the interviewed dairy producers did not have any record-keeping practice. Only 3.6% of the respondent's dairy producers practiced recording some reproduction parameters regarding breeding/access to artificial insemination services using informal sheets given by development agents. Record keeping in modern dairying is a precondition for any decision and control over certain

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production and reproduction performance such as purchasing data, mating date, birth date, health-related recording of dairy cattle on the farm, and to measure the profitability of any market-oriented farm. However, record-keeping in the study area is not practiced since the households do not have adequate experience and are not aware of the benefit.

Milk and milk product marketing

Milk practicing and production performance: Small dairy herd holding as a part of an integrated crop-livestock production system can characterize the study area. In the current study area, the mean daily milk productions per cow were 1.4 liters of milk per day. While the mean milk from crossbreed was given 3 liters per day (Table 12). The farmers in the study area were milking two times per day their dairy cows at the morning and in the evening and all respondents use milking practices by hand milking. In almost all cases, household wives or women predominantly handled all dairy cows milking.

However, in some areas, there are some expectations such as in the Fogera area of the Amhara region where milking is entirely performed by males (Anteneh, 2006) [26], and in the Shashemene-Dilla area household adult males milk cows (Yigerem *et al*, 2008). Cattle productivity interims of milk yield are generally low in Ethiopia under smallholder management conditions due to lack of proper breed improvement, supplementary feed, the poor nutritive value of pasture and forage offered to dairy. Moreover, the majority of the farmers keep indigenous animals that are generally low producers of milk [26,27].

Milk and milk product marketing

The rural milk and milk product system is non-market-based, and the majority of milk is produced for home consumption. The level of milk excess is determined by the household's and its neighbors' demand for milk, the ability to produce milk in terms of herd size and production season, and access to a nearby market. When milk is excess is often processed using traditional methods, and processed milk items like butter, ghee, and *paying* for household consumption.

According to the result, from the total samples, only (40.2%) of was sell milk and (59.8%)of them said that milk is used only for family consumption. According to the findings, more amount of milk is consumed without advanced value addition processes. These findings were related to the findings of [28] who state that the Ethiopian milk market is dominated by the informal market, and milk is sold fresh without further processing for family consumption of the total sample, respondents only (45.5%) of respondents was selling butter at the local and main markets in the study area.

In the study area, respondents have reported that there is no formal channel for milk marketing. The result is an informal milk marketing system used by dairy farm owners. Milk producers were informally selling products to milk collectors or retailers in the area[29] and (Lemma, *et al.*,2005) came to the same conclusion that both rural and urban milk is

Table 13: Milk and milking marketing system.

Variables		Frequency	Percent
Do you sell milk?	Yes	45	40.2
	No	67	59.8
Do you sell butter	Yes	51	45.5
	No	61	54.5
Place of milk selling?	To milk collectors	44	39.3
	To cafeteria	1	0.9
Transportation system for milk selling	By Vehicle	2	1.8
	By loading	43	38.4

Source field data, 2021

Table 14: The distance to milk collectors (minutes) and income from milk and milk products in Birr.

Variables	Mean	Max.	Min.	SD
Distance travel on foot to milk collectors points	8 min.	20 min.	2min.	4.850
Distance by vehicle to milk selling points	30 min.	30 min.	30 min.	.000
Income from milk in a month	630 b.	1060 b.	300 b.	217.64
Income from butter in a month	248 b.	600 b.	100 b.	123.18

Source field data, 2021

distributed from producers to consumers through the informal (traditional) means. The authors also added that a dependable system is not developing to market milk and milk products in Ethiopia.

Milk is marketed in the study area through an informal market that sells directly from producer to retailer, from the respondents about (39.3%) of respondents were selling the milk to retailers or collectors in the area. Only (0.9%) of respondents were provided milk in the cafeteria and the majority of the milk was consumed at home.

The price of milk varies depending on the season and the demand for milk in the districts. The key price fluctuation in the study area was due to low milk production during the dry season; however, according to the focus group discussion, the interims of religious fasting does not have a significant impact on price fluctuation in the district.

Farmers, mostly women, take the product to market weekly or sell them at farm gates to traders/retailers, who collect it and sell it in bulk to licensed butter traders who transport it to more far-away markets, mostly the main market. Traders often buy butter with a longer shelf life from farmers at farm gates or market places to resell at relatively high prices in urban and rural markets.

However, there were no formal milk collection enterprises, cooperatives, or farmers in the study area, so farmers sold their milk to local or informal retailers in the village for 11 to 12 birr per liter and those retailers sold it to different cafeterias and hotels in the city for 20 to 22 birr. According to the findings and personal observations, farmers or producers did not profit from milk production; however, the study areas lack a structured milk marketing system, cooperatives, and milk collection centers.

The milk marketing method in the study area was

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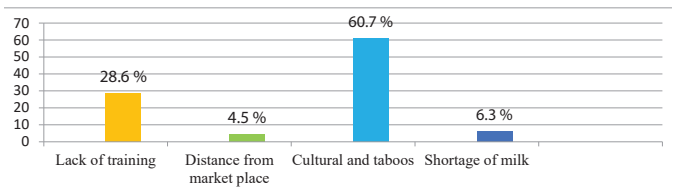

Figure 9: Major milk marketing related constraints.
Source: field data, 2021

Table 15: Comparing the mean of major milk marketing constraints in both selected PA's.

Variables		Kebele		Total
		Keshmando	Sonka	
Lack training	N	1	31	32
	%	1.4%	72.1%	28.6%
Distance frommarket	N	0	5	5
	%	0.0%	11.6%	4.5%
Cultural and taboos	N	68	0	68
	%	98.6%	0.0%	60.7%
Shortage of milk	N	0	7	7
	%	0.0%	16.3%	6.3%
Total	N	69	43	112
	%	100.0%	100.0%	100.0%

(X^2 = .000 significant difference)

Producer - Retailer/collectors - Consumer: Retailers served as intermediaries between producers and consumers in this channel. Retailers' position in this channel is to purchase milk from the producer and deliver it to the customer. Retailers affect farmers' and producers' potential benefits. According to the researcher, milk producers in the study area did not profit from dairy products, and farmers in the rural areas had little information or knowledge about the demand and market in the study area.

Researchers' advice concerning milk marketing in the field, farmers or youth organized as cooperatives, therefore, receiving milk at fair prices and delivering the milk across the channels is beneficiary of income for all producers, co-operatives or collectors.

The results of the mode of transport and distance of farmer's farm gate from milk collection point were indicated in (Table 13) from the total, milk selling respondents' majority of (38.4%) way of milk transportation to milk collector point by loading. While only (1.8%) were used by vehicles.

The money earned from the sale of dairy products is critical in covering the daily expenses of households. Women handled and transported the milk to collection points the majority of the time. According to the focus group discussion, wives in MHHs and women in FHHs were responsible for taking milk to collection points and selling it, and MHHs and daughters in both male and female-headed households were sometimes responsible for taking milk to collection points and selling it.

Women were generally more responsible than men in all aspects of dairy production management, including milking, handling, processing, and marketing. Previous research reports conducted in *Ada'a* district of Ethiopia by [30,31] also indicated that the majority of activities related to dairy production were performed by women.

The distance from the milk producer's home to the milk collection point is shown in (Table 14). The average distance traveled by foot to milk collector's points was 8 minutes, with a maximum of 20 minutes and a minimum of 2 minutes, while the average distance traveled by vehicle to milk selling points to deliver milk to their marketing location was 30 minutes. A study conducted in the Ada'a and Lume districts of Ethiopia by [32] reported that it took an average of 30 minutes to deliver milk from the farm gate to the marketing place. The distance traveled and time is taken to deliver milk without cool transport and the purity of milk and storage equipment is one of the major reasons for spoilage and rejection of milk upon quality checking on collection points.

According to the farmers' information, the average monthly income from milk was 630 ETH, Birr, with a maximum of 1060 ETH, Birr and a minimum of 300 ETH Birr, while the average butter income was 248 ETH. Birr, with a maximum of 600 ETH, Birr and a minimum of 100 ETH Birr

Milk marketing constraints

As indicated in Figure 9: the major milk marketing constraints as cited by producers in study areas include lack of training (28.6%), distance from the marketplace (4.5%), culture and taboos (60.7%), and shortage of milk (6.3%).

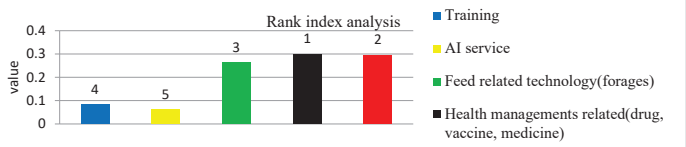

Figure 10: Chart of Types of extension services provided by Development agents.
Source field data, 2021

Table 16: Types of Extension services provided by respondents (Rank index analysis).

Type of Extension service	R1	R2	R3	R4	R5	Total	Result of an index value	Rank
Training/Demonstration	15	0	3	4	8	100	0.081566069	4
AI service	0	4	2	21	10	74	0.060358891	5
Feed related technology	12	25	51	2	6	323	0.263458401	3
Health managements	20	53	13	8	0	367	0.299347471	1
Advisory on dairy milk production	49	13	18	5	1	362	0.295269168	2
Total	96	95	87	40	25	1226	1	

*Index = sum of [5 * respondents in rank 1 + 4 *respondents in rank 2 +3 * respondents in rank 3+2 * respondents in rank 4+ 1 * respondents in rank 5]*

Table 17: Comparisons of access to training and demonstration related in both study kebeles.

Variables	Keshmando *PA's*			Sonka *PA's*		
	Response	F	%	by gender	F	%	by gender
Training and demo.	Yes	14	20.3	Male = 14	8	18.6	Male = 2
	No	55	79.7	Female = 0	35	81.4	Female = 6
	Total	69	100		43	100	

Source survey data, 2021
F=frequency, %= percent

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Culture and the taboos restriction were the main constraints raised by farmers.

This shows that in the study area, these farmers do not adapt to milk selling and renting for newly born babies, and do not offer milk to other people because they believe that the study area has such perceptions of the loss of cows and witchcraft. Lack of training was the most frequently mentioned milk marketing constraint by respondents in the study area, this indicates that quality milk management, price, market information, methods of preserving fresh milk, transportation system, milk storage equipment, and cooperation to supply milk at a fair price to consumers for the benefit of producers in the study area Figures 9, Table 15.

Access to different services

Extension service of dairy production: Development agents employees those who provide the extension service designated by the Bambasi district of the Bureau of Rural Agricultural office. The study's results showed that development agents communicated with livestock production on a regular and frequent basis.

According to the survey results,(89.3%) of respondents was access to extension services from the *PA's* development agents(DA) and while (10.7%) of respondents were no access to any extension service in the area. Among that 62 males and 38 females was participate in different extension services about the dairy products in the study area.

Based on the personal observation in the area the linkage between farmers and extension service was medium. However, extension service provides different knowledge, information, and experiences. During the focus group discussion, the respondents and development agents explained that farmers were providing services in both informal and formal ways in various practices or activities.

However, the degree of farmers' acceptance varied depending on age, education, economy, household income, sex, distance from the development agent's office, farmers' interest, land access, and technology accessibility. Based on this majority of development agents advise farmers in an informal way of setting, such as in a meeting area, church area, campaign/development area, an animal treatment area, an input purchasing area, home to home service where development agents provided services.

From the result and FGDs, the majority of respondents received dairy health management services in the area, because of in the area high disease and parasites occurrences how farmers can protect and monitor livestock, how to use drugs and chemicals for animals. The second one was an advisory service on dairy milk production related to the quality of milk, to increase income through the selling of milk, for consumption and calf feeding Figure 10, Tables 16,17.

Training and demonstration related to dairy production

Among the total respondents only (19.7%) of the total respondent's access to training and demonstrations, with 16 males and 6 females being a participant. Producers have received much information about the dairy farming practice, including how to treat milk cows properly, breeding methods, improved feeding and preparation, and health care, from extension agents.

According to the focus group discussions result, accessibility of training and demonstration was inadequate, due to the low priority of livestock production, low extension services, low technical access, low budgets allocation for livestock sectors, weak linkages between development agents and technologies, priority for crop production and scarcity of land for livestock technologies and low linkage between research and other stakeholders (Figure 11): indicates that the frequency of farmer's participants in the training and demonstration by development agents and district experts among this, 15.2% of the respondents were participants one time, 3.6% participants two times, and 0.9% were three times in the study area.

According to personal observations and the findings of the report, the involvement of the government and other stakeholders in providing training and technical support for interim dairy is weak; as a result, dairy producers have few opportunities to use different livestock technologies and be important in their dairy farm to be more efficient. However, even though extension service was limited in the study areas Figure 11.

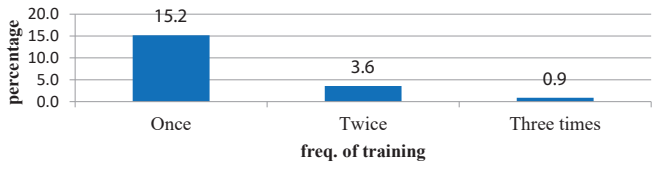

Figure 11: Chart of Types of extension services provided by Development agents. Source field data, 2021

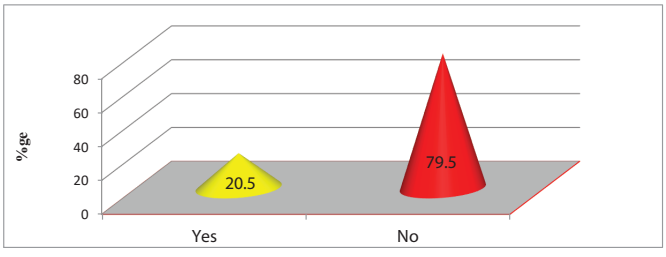

Figure 12: Access to credit service. Source field data, 2021

Access to credit service

Access to credit for financing investment and expanding dairy farm operations is essential to the commercialization of smallholder dairy farming [33]. However, the survey results revealed that producers' awareness of dairy production credit issues was low on the milk farm. Of the total respondents, only (20.5%) of respondents were dairy producers who had access to credit and savings services in the study area.

Farmers discussed, based on the results, the reason they cannot provide from credit institutions, the principal of the credit institution was difficult, moreover; the credit systems

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Table 18: Major challenges of the practice of indigenous dairy production and management in the study area (Pair-wise matrix ranking).

Challenges	Diseases and parasite	Feed shortage	lack of AI (artificial insemination) service	Water shortage	Shortage of extension services/ training/ improved technology	Shortage of veterinary service/ medicine/drugs /Vaccination	Market-related problems with milk, milk product, and live animals	Lack of credit for dairy developments	Shortages of land	High cost of cattle medicine/ drugs	Scores	Ranks
Diseases and parasite (D & P)	0	D& P	D & P	D & P	D & P	D & P	D & P	D & P	D & P	D & P	9	1
Feed shortage (F Sh)		0	F Sh	W Sh	F Sh	F Sh	F Sh	F Sh	F Sh	F Sh	7	3
lack of AI (artificial insemination) service (L AI)			0	W Sh	Sh Extn	Vet	M Prob.	LC	Sh L	H C	0	10
Water shortage (W Sh)				0	W Sh	W Sh	W Sh	W Sh	W Sh	W Sh	8	2
Shortage of extension services/training/improved technology (Sh Extn)					0	Vet	Sh Extn	LC	Sh L	HC	2	8
Shortage of veterinary service/medicine/drugs/Vaccination (Sh Vet)						0	Sh Vet	Vet	Sh L	Vet	5	5
Market-related problems with milk, milk product, and live animals. (M Prob.)							0	LC	Sh L	H C	1	9
Lack of credit for dairy development(LC)								0	Sh L	HC	3	7
Shortage of land(Sh L)									0	Sh L	6	4
High cost of cattle medicine/drugs(HC)										0	4	6

Source field data, 2021

Table 19: Major opportunities for dairy production (rank index analysis).

Variables	R1	R2	R3	R4	R5	R6	Total	index value	Rank
Market accessibility	42	12	19	19	12	8	477	0.208479021	2
Grazing land/access to feeds	20	25	20	12	15	9	400	0.174825175	3
Infrastructure/FTC	4	8	25	29	24	11	310	0.13548951	5
Access Extension service / training	8	31	15	25	26	4	394	0.172202797	4
Access of new improved technology	0	8	12	12	17	52	210	0.091783217	6
Access of Veterinary service/drug	38	28	21	8	5	11	497	0.21722028	1
Total	112	112	112	105	99	95	2288	1	

Source; survey data, 2021
R= rank

were not well developed, the money was not given individually, and the interest was high. Another issue rise when they purchased livestock, which did not survive due to disease and an increase in the interest rate. The institutions that serve credit services in the study area were microfinance Figure 12.

According to the survey results, when both *PA's* compared in terms of training and demonstration usability, the keshmando *PA's* ranks higher (20.3%). All of the respondents were men. During a focus group discussion about women's, low acceptance of such issues. Similarly, Sonka *PA's* respondents (18.6%) had access to training and demonstration facilities in the area. Females take up a significant proportion of those who participated in training and demonstrations Tables 18,19.

Challenges and opportunities in indigenous dairy production

Challenges of dairy production and management: As presented in Table 15, were major there were various challenges to dairy production and management was: Diseases and parasites, feed shortages, lack of AI (artificial insemination) services, water scarcity, lack of extension services /training improved technology, lack of veterinary services /medicine/ drugs/ vaccination, the market-related issue with milk, milk products, live animals and lack of veterinary services / medicine/drugs /vaccination, there is lack of credit for dairy developments, scarcity of land, cost of cattle medicine/ drugs challenges which affect dairy cattle production and productivity.

The statistical values of pair-wise matrix rank among major challenges were significantly different in the selected area. In the study area, disease and parasites were the first major challenges, which accounted for a large proportion of dairy cattle production.

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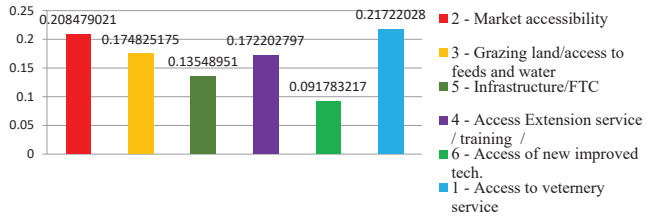

Figure 13: In Chart of major opportunities for dairy production (rank index analysis). Source field data, 2021.

This finding was similar to the finding of [34-39], who found in different areas that shows dairy production was constrained by an insufficient supply of quality feed and its high cost, access to credit, seasonality of demand, particularly in fasting time and lack of processing industry.

From the fact points of view, quantitative and qualitative shortage of feed and fodder affects the performance of milking animals, through underfeeding animals in general; in particular, it affects milk production negatively. The cause for the shortage of feed may be because most farmers had small grazing land for animals; this was also true for most natural pastures areas are converting to crop production.

The other constraints that the respondents ranked were less access to land shortages that can hinder dairy development in the area. Dairy producer households identified small farmland size as a serious problem and as a constraint for expansion of drying. As it is discussed in the above section on landholding of respondents when the number of cows increases the demand for land increment will increase. Besides, the land is important to prepare improved feed by planting different types of grass-like Rhodes grass, and elephant grass, for milk production increment.

Opportunities for dairy production in the study area

Although numerous issues and constraints could hinder the development of the dairy production sector in the study area, there were also favorable conditions for future dairy production and productivity, such as marketing accessibility, access to veterinary and extension services, infrastructure (FTC), grazing land (feed and water), and access to new improved technology (Figure 13). These were required by dairy farmers for them to continue with their daily production operations. The statistical values of rank index analysis among major opportunities are significantly related to dairy production. As indicated in Figure 13, access to veterinary service ranked first, marketing accessibility ranked second, grazing land ranked third, access to extension service ranked fourth, infrastructure (FTC) ranked fifth, and access to new improved technology ranked sixth, respectively.

Veterinary and AI operation expansion and infrastructure are also significant elements for the growth of the dairy industry. Access to veterinary services is essential for having healthy animals for processing, as it allows for the prevention, control, and treatment of various diseases and parasites that can be harmful to animals.

AI is now a key technology for the short-term dissemination of improved breeds to smallholders; the AI service is also important for controlling transmissible illnesses and is economical. This will help to promote the development of various facilities, for example, appropriate land use, organizing inputs (improved breeds, foods, IA, medicines, etc.), and credit, extension, and training. The infrastructure includes a health center, training center, information center, and road. More and more government policy NGOs have been encouraged to use the milk industry in the current situation, even though the area has been adapted to differ in milk production, as it is discussed and observed during the data collection.

While several issues and constraints have been established in the area that can affect the capacity of the dairy sector, the households interviewed and the focus group discussion in the research areas was ready to continue and improve, or invest in future dairy farms. Dairy farming supports society's livelihoods under the low input method, generates income, and creates job opportunities through a market-oriented production system. The Community is a growing demand for milk and milk products as well an increase in prices for these products are other opportunities. Women's participation in dairy growth was also promoted, as the study shows that they play a significant role in dairy production and marketing. Bambasi areas are located in lowland or harsh areas, where disease and parasites are common, a major threat to farmers' livelihoods. This requires the use of drugs and chemicals for dairy cattle. The presence of numerous institutions engaged in dairy research and development across the country provides an opportunity to find a solution to the challenges that limit dairy production and the low acceptance of dairy technology in the country.

Conclusions

The following conclusions were inwards based on the major findings of the study

Accordingly, assess indigenous dairy production management practiced by rural villages of the selected household of the study area. Therefore, as the research result indicated above, Most indigenous dairy production management like housing systems, feed, and water systems, health management, breeding practice, extension services, milk, and milk product marketing system is the main indigenous dairy production and management practices were practiced by selected rural villages were assessed in the results.

Regarding their challenges to indigenous dairy production and management: Diseases and parasites were the biggest obstacles to dairy production in the area ranked first, water shortage was ranked second, feed shortage ranked third, and shortage of lands was ranked fourth.

From the fact points of view, quantitative and qualitative shortage of feed and fodder affects the performance of milking animals, through underfeeding animals in general; in particular, it affects milk production negatively. The cause for the shortage of feed may be because most farmers had small

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grazing land for animals; this was also true for most natural pasture areas are converting to crop production. The other constraints that the respondents ranked were less access to land shortages that can hinder dairy development in the area. Dairy producer households identified small farmland size as a serious problem and as a constraint for expansion of drying.

As it was discussed in the above section on the landholding of respondents when the number of cows increases the demand for land increment will increase. Besides, the land is important to prepare improved feed by planting different types of grass-like Rhodes grass, elephant grass, for milk production increment

Regarding existing opportunities, although numerous challenges could hinder the development of the dairy sector in the study area, there were also suitable conditions to improve dairy production and productivity in the future, such as access to veterinary and extension services, infrastructure (FTC), grazing land (feed and water), and access to new improved technology.

Expanding veterinary and AI services, and infrastructure is also an important aspect of dairy industry development. Veterinary service accessibility is necessary to have a healthy animal for production; as it enables to prevent, control, and treat different diseases, and parasites, which could be destructive to the animal.

Nowadays, AI service is a crucial technology to disseminate improved breeds to smallholders in a short time; AI service is also important to control transmissible diseases, and it is also cost-effective. Infrastructure includes a health center, training center, information, road, etc. these can help to support different services such as adequate land access, organizing input supplies (improved breeds, feeds, AI, and drugs), and provision of credit, extension, and training. More ever, as was discussed with respondents and observed during data collection, government policy NGOs were encouraged for the dairy industry in the current situation, and even if, the area has suitable for dairy production different challenges are there the area.

Recommendations

Recommendation for rural village agricultural extension service:

- ✓ Technical strategies to support rural smallholder cattle producers should focus on improving the farmer's traditional knowledge and providing a new working structure.
- ✓ The development agent first must be improving his skill by reading, learning, and gathering different information.
- ✓ Provide the different technology from the government on time and deliver good and updated information for farmers.
- ✓ To reduce the feed challenges, especially in dry periods farmers should be, informed or trained on how to prepare and make feed conservation practices, especially hay and crop residues.
- ✓ It is critical to provide training to farming communities to develop their knowledge and skills in the management of dairy animals and the production of quality milk.

Recommendations for rural farming households

- ✓ Farmers should use traditional knowledge by mixing it with new technologies.
- ✓ Should be getting information and technology from DA's, In addition, changed into practice and should be to implement any farming activities were planned.
- ✓ Farmers manage all livestock from disease and parasites and provide clear water and feed, using improved forages within small lands.
- ✓ As we know dairy production is challenged by disease and parasites, so, not won by minor problems that occur naturally or manmade.
- ✓ Farmers should be conserving the environment and managing water sources, by the local administration in the village's cultural methods.

Recommendation for governments

- ✓ To encourage dairy producers in the study areas, smallholders should be provided/supported with credit facilities, technology for milk processing and market accessibility, improved market knowledge, and the establishment of youth milk marketing cooperatives. It is necessary to establish and build a marketing connection between the producer and the consumer of milk products.
- ✓ The government should focus on feed processing technologies and provide sufficient space for sustainable dairy expansion. The first major intervention in the study area should be the government's allocation of private or communal land to smallholder dairy farmers for feed production.

Recommendation for researcher

Rapid urbanization, extensive population growth, and changes in the living standards of the communities in the study area provide an opportunity for the production of dairy in the area as a source of income as a highly demanded product and a highly profitable sector with access to animal health, AI, extension, and training centers.

Recommendation for Non-Governments (NGOs)

- ✓ Many stakeholders will therefore be involved in strengthening this sector to maximize the sector's existing potential. In many areas of Ethiopia, the contribution of NGOs supporting was low, because the

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coordinators of the projects were self-supported rather than community.

- ✓ NGOs should have harmonized with research institutes and universities.
- ✓ The implementation must be sustainable or continued and related to the environment or adapted.

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