DOI: https://doi.org/10.20372/afnr.v3i3. 1888
ISSN: 2520-7687 (Print) and 3005-7515 (Online)
Journal of Agriculture, Food and Natural Resources
J. Agric. Food Nat. Resour. Sep-Dec 2025, 3(3):26-33
Journal Home page: https://journals.wgu.edu.et

Original Research

Dairy Production Potential, Opportunities and Challenges in Nedjo District, West Oromia, Ethiopia

Demissu Hundie[1*], Etefa Abreham,[2] Rohotash Kumar[1]

1 Department of Animal Sciences, Shambu Campus, Wollega University, P. O. Box 38, Shambu, Ethiopia
2 Nejo District agriculture office, West Wollega zone, Oromia Agriculture Bureau, Nejo, Ethiopia

Abstract

Ethiopia has substantial potential to improve household nutrition, generate income, and create employment through the dairy sector. This study assessed the opportunities, challenges, and productivity potential of dairy production in the Nedjo District, West Oromia, Ethiopia. The district was purposively selected, and 180 dairy-producing households were sampled using a systematic random sampling technique. Data were collected through a semi-structured questionnaires, key informant interviews, and focus group discussions, and analyzed using SPSS (Version 20). The predominant livestock production system was a mixed crop–livestock. The mean household cattle holdings were 10.07 ± 6.27 in the midland and 10.31 ± 3.1 in the lowland, while average dairy cow holdings per household were 3.78 ± 2.32 and 3.69 ± 1.06 in the midland and lowland, respectively. The mean daily milk yield of local cows differed significantly (P < 0.001) between agro-ecologies. Crossbred cows produced 6.5 ± 0.5L and 7.25 ± 0.36L per day in the midland and lowland, respectively, with an overall mean of 6.8 ± 0.57L. Major constraints to dairy production included poor-quality and insufficient feed, limited grazing land, restricted access to and high cost of formulated feeds, inadequate extension services, suboptimal animal management, and lack of market-oriented production. Addressing these challenges could enhance dairy productivity and contribute to livelihoods in the study area.

Article Information

Article History:
Received: 29-11- 2025
Revised: 21-12-2025
Accepted: 22-12-2025

Keywords:
Agro-ecology
Dairy production
Indigenous cow
Production potential

***Corresponding Author:**
E-mail:
dhundie@yahoo.com

INTRODUCTION

Ethiopia possesses one of the largest livestock populations in the world, ranking fifth globally and first in Africa (CSA, 2022). The livestock sector, particularly dairy production, is strategically important due to several enabling factors, including diverse and suitable agro-ecological conditions, proximity to international markets such as the Middle East, expanding domestic demand for milk and dairy products, and a large and diverse pool of animal genetic resources. Agriculture remains the backbone of the Ethiopian economy, contributing 35–49% of GDP and providing employment for about 80–85% of the population. Within this sector, livestock contributes about 16–19% of the national GDP, 45% of the agricultural GDP, and 16–19% of foreign exchange earnings (Statista, 2022).

Livestock production plays a crucial role in improving livelihoods and reducing poverty in both rural and urban areas. A significant proportion of the population depends on the livestock sub-sector for income and food security. Beyond supplying animal-source foods such as milk, meat, eggs, and honey, livestock provides essential non-food services, including draught power, manure for soil fertility, transportation, fuel, and inputs for agro-processing industries (FAO, 2018). Dairy production, in particular, serves as a key source of income, nutrition, and employment, especially for smallholder farmers.

Ethiopia's dairy sector predominantly relies on indigenous cattle, camels, and goats, with limited contribution from sheep in some regions. Cattle and camels account for the largest share of national milk production (CSA, 2021). Growing population size, urbanization, and improvements in living standards have led to increased demand for milk and dairy products. Although earlier reports indicated that about 85% of the population resided in rural areas and depended heavily on livestock for their livelihoods (ILRI, 2011), more recent estimates show that approximately 77% of Ethiopians are living in rural areas in 2022 (World Bank, 2024), highlighting gradual demographic shifts that may further influence dairy market dynamics.

At the local level, Nejo Woreda, located in the West Wollega Zone, is characterized by integrated crop–livestock production systems that support high-value livestock commodities. The 'woreda' has considerable potential for dairy production due to its farming practices and livestock resources according to Nejo Woreda Livestock and Fishery Development Office (NWLFDO), (2020), (unpublished report). Small-scale mixed farming, where crop production is complemented by animal rearing and dairy activities, predominates in the area. However, dairy producers face several constraints, notably shortages of animal feed in both quality and quantity, and limited access to improved dairy cattle breeds (NWLFDO, 2020), (unpublished report). Therefore, this

study was undertaken to assess the dairy production potential, identify key challenges, and explore opportunities to support sustainable dairy development in Nejo Woreda.

MATERIALS AND METHODS

Description of the Study Area

Nejo Town, the administrative center of Nejo Woreda, is located along the main road connecting Addis Ababa and Assosa, approximately 515km West of Addis Ababa. The area lies at an altitude ranging from 1,600 to 2,250 meters above sea level (masl). The Woreda has a total of 35 'Kebeles' (the smallest administrative structure in Ethiopia) majority of which were classified under midland agro-ecology while few were in the lowland. Among the entire 'kebeles' in the woreda, 4 'kebeles' were urban, 3 were peri-urban while the remaining 28 'kebeles' were rural (Nedjo Woreda Agricultural office (NWAO), 2020), (unpublished report).

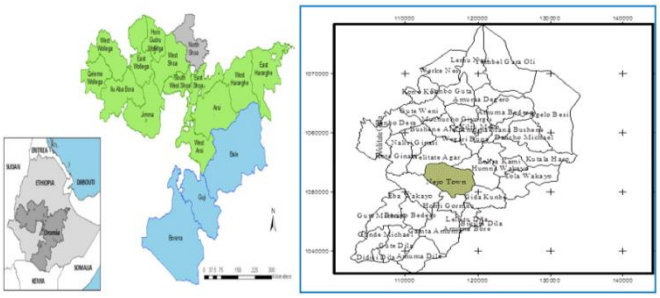

Figure 1: Map of the study area

Data Sources and Collection Methods

Both qualitative and quantitative data were collected from primary and secondary sources. Primary data were gathered using a semi-structured questionnaire, key informant interviews, and focus group discussions. Secondary data were collected from reports of the Central Statistical Agency (CSA), NWAO, NWLFDO, and other relevant institutions.

Sampling Techniques

The district was traditionally stratified into midland (mid altitude) and lowland based on Agro-ecologic locations. For the present study, two midland and two lowland *kebeles* were purposively selected based on their potential for dairy cow production and marketing, from each agro-ecological zone. A preliminary listing identified 325 households owning at least two lactating dairy cows, from which 180 dairy cow–owning households were targeted for the study. Accordingly, 45 respondents from each 'kebele' were randomly selected using Yamane's (1967) formula.

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

Where: - n= is the sample size,

N =stands for total number of targeted population

1=stands for the probability of the event occurring

e =stands for maximum variability 5% (0.05)

Data Analysis

For data processing, the collected data were coded and entered into Microsoft Excel. Both qualitative and quantitative data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 20 (2019). The level of significance for variation among the study results were declared at 5% precision.

Ranking for feed resources, and dairy production, and the challenges and opportunities were computed using index formula executed by Gelila, (2016) as; (5x proportion of respondents ranked first,+4x proportion of respondents ranked second, +3x proportion of respondents ranked as fourth,+2x proportion of respondents that ranked third, +1x proportion of respondents ranked fifth for particular attributes)/sum of (5x proportion of respondents ranked first +4x proportion of respondents that second +3x proportion of respondents that ranked fourth +2x proportion of respondents that ranked third +1x proportion of respondents that ranked fifth for all variables in question). The indices for feed and water resources were also calculated as; (4x proportion of respondents that ranked first+3x proportion of respondents that ranked second +2x proportion of respondents that ranked third+1x proportion of respondents that ranked fourth for each particular variable)/sum of (4x proportion of respondents that ranked first +3x proportion of respondents that ranked second +2x proportion of respondents that ranked third+1x proportion of respondents that ranked fourth for all variables in question).

RESULTS AND DISCUSSION

Socio-Economic Characteristics

The general characteristics of dairy producers in the study area are presented in Table 1. The results indicated that the majority of households were male-headed, accounting for 92.2% and 90% in the midland and lowland agro-ecologies, respectively, while female-headed households represented only 7.8% in the midland and 10% in the lowland. This pattern is consistent with findings from other parts of Ethiopia, where most households were male-headed as reported by Demissu *et al*. (2015).

Regarding the age of household heads, the majority in both the midland and lowland agro-ecologies, as well as overall-mean in the entire study area were between 25 and 45 years of age, accounting for 73.3%, 65.5%, and 69.4%, respectively. In total, the majority of the agricultural labor force in the study area consisted of dairy farmers within this working-age group. Approximately 20.6% of household heads were between 46 and 55 years, while about 10.0% were in the range, 56 to 75 years. Regarding literacy level, the majority of respondents (60.5%) in the study area attended primary education, with 64.4% in the midland areas and 56.6% in the lowland areas, which might indicate midland dwellers more access to education.

The study showed that the mean household family sizes in the midland and lowland regions were 5.47 ± 2.1 and 5.94 ± 1.8, respectively. No significant difference was observed in family size between the midland and lowland areas ($P > 0.05$). Likewise, for the male-headed households, the mean family size did not differ significantly between the two agro-ecologies ($P > 0.05$). In contrary, among female-headed households, the variation in family size across the studied agro-ecologies was statistically significant ($P < 0.05$) (Table 1). The study also revealed that the gender difference in family heads (female headed family size was smaller) had brought about the variation in family size.

Table: 1. General characteristics of dairy producers in the study area

Variables	Parameter	Agro ecology of the study area					
		Midland (N=90)		Lowland (N=90)		Overall(N=180)	
		N	%	N	%	N	%
Sex:	Male	83	92.2	81	90.0	164	91.1
	Female	7	7.8	9	10.0	16	8.9
Age of respondents	25-35	24	26.7	20	22.2	44	24.4
	36-45	42	46.6	39	43.3	81	45.0
	46-55	16	17.8	21	23.3	37	20.6
	56-65	6	6.7	9	10	15	8.3
	66 and above	2	2.2	1	1.2	3	1.7
Marital status of household heads	Married	82	91.1	84	93.2	166	92.2
	Single	1	1.1	-	-	1	0.6
	Widow	7	7.8	5	5.6	12	6.6
	Divorced	-	-	1	1.2	1	0.6
Education Level of household heads	Illiterates	23	25.6	35	38.8	58	32.2
	Primary education	58	64.4	51	56.6	103	60.5
	Secondary education	5	5.6	3	3.4	8	4.5
	Tertiary education	4	4.4	1	1.2	5	2.8
Family size per household		Mean± SD		Mean± SD		Mean± SD	P-value
	Total Family size	5.47±2.084		5.94±1.763		5.71±1.94	0.099
	Male	2.69±1.002		2.97±1.116		2. 83±1.116	0.081
	Female	2.83±1.36		3.21±0.99		3.02±1.20	0.034

N=Numbers of household, SD=Standard division, ED. Education, chart. = Characterization and HH =Household

Occupational status of dairy producers in the study area is presented in Table 2. Out of the overall household heads of the study area, about 90.6% of dairy cow owners were farmers while 5.5% and 3.9% of the interviewed households were traders and government employees, respectively. Traders had relatively larger average dairy cows compared to farmers and other employees. This might be because farmers are producing dairy cows mainly as a herd replacer (plowing bulls and heifers) whereas traders produce dairy cows for commercial purpose that most or all of cattle in the herd could be dairy cows. On the other hand, the results in the current study indicated that the major source of income for the overall (90.6%) of households in the study area were crop-livestock production. While some (5.6%, 2.8% and 1.1%) of them were relying on other businesses, followed by crop production and livestock keeping (Table 2).

Table 2. Occupational status of dairy producers

Variables	Labels	Agro ecology of the study area					
		Midland(N=90)		Lowland (N=90)		Over all (N=180)	
Occupation of HH heads in the study area		N	%	N	%	N	%
	Traders	8	8.9	2	2.2	10	5.5
	Farmers	77	85.6	86	95.6	163	90.6
	Others	5	5.5	2	2.2	7	3.9
Main Source of income	Crop production only	2	2.2	3	3.3	5	2.8
	Livestock keeping only	2	2.2	0	0.0	2	1.1
	Crop and Livestock production	78	86.7	85	94.5	163	90.6
	Others activities	8	8.9	2	2.2	10	5.6

HH = household, N= Numbers of household, %= percentage, other = Govt. employee, daily laborer, and pension.

Household's Livestock and Landholding

Table 3 presents the landholdings and livestock ownership in the study area. Nejo Woreda is characterized by a mixed crop–livestock farming system, in which livestock play a central role in supporting crop production. Among the livestock species in Ethiopia, cattle were the most commonly reared beast, followed by sheep and poultry (Table 3). The average cattle herd sizes were 10.07 ± 6.27 in the midland, 10.31 ± 3.10 in the lowland, and 10.19 ± 4.90 overall.

Concerning household landholding, the majority (53.3%) and (65.4%) of household heads in the midland and lowland households respectively, holds 3 to 4.5ha land. About 37.8% and 4.4% household heads in the midland and lowland hold a land in the range of 1.5-2.75ha (Table 3). The study indicated that the average landholding of farmers in the study area exceeds the national average of 1.77ha reported by CSA (2013) and is also higher than values reported for the Horro-Guduru Zone in the same region according to Demissu et al. (2015).

Cattle, sheep, goats, horses, and poultry were the most important livestock species in the study area, based on their role in agricultural production. Honeybees also contribute significantly to the livelihoods of farming households. These findings are consistent with those reported by Demissu *et al*. (2015) for the Horro-Guduru Zone, in the North-western Ethiopia.

The mean population size of cattle in the current study area was lower than the average holdings reported (17.0 ±11.67) by Demissu et al., (2015) in Horro Guduru Wollega zone. The proportion of female to male cattle in the study district was 73: 27. This result is in agreement with the reported ratio of female to male (71:29) by Coppock, (1994) and is also in line with the ratio (72: 28) in Horro Guduru reported by Demissu et al., (2015).

Conversely, the mean population size for other livestock species such as sheep was 6.11 ±1.04, 5.95 ± 1.3 and 6.02 ± 1.18 in midland, lowland and overall mean of the study area that the flock size was in the ranges of 4-9. For goats the mean population size of 4.40 ±1.23 was recorded in the midland, it was 5.85±2.02 in the lowland and 5.38 ± 1.92 overall mean for the entire study area, where the flock size was in the ranges between 3 to11. The current study revealed that goat keeping was significantly (P <0.05) influenced by agro ecology

Table: 3. Livestock and Land holding characterization of dairy producers

Variables	Livestock Species	Agro ecology of the study area				*P*-value
		Midland (N=90)	Lowland (N=90)	Overall(N=180)		
		Mean± SD	Mean± SD	Mean± SD	Range	
Livestock Holding	Cattle	10.07±6.27	10.31±3.1	10.19±4.9	5-62	0.740
	Sheep	3.12±3.158	3.63±3.085	3.38±3.123	0-9	0.274
	Goat	0.98±1.925	2.67±3.229	1.82±2.783	0-11	0.000
	Poultry	7.58±4.135	8±3.754	7.79±3.944	0-18	0.474
	Donkey	0.79±0.918	0.94±0.693	0.87±0.815	0-4	0.201
	Mule	0.07±0.251	0.08±0.269	0.07±0.260	0-1	0.775
	Horse	0.07±0.251	0.04±0.207	0.06±0.23	0-1	0.518
	Honey bee colonies	3.49±6.62	6.72±10.97	5.11±9.18	0-58	0.018
Land holding	Total Land holding (ha.)	2.927±1.925	4.373±1.147	3.650±1.738	1.125-18.5	0.000
	Crop land (ha.)	1.416±0.632	2.178±0.705	1.796±0.769	0.5-4.00	0.000
	Pasture (ha.)	0.711±1.225	1.009±0.359	0.860±0.913	0.25-12.00	0.000
	Other Agric. land (ha.)	0.812±0.625	1.194±0.485	1.002±0.589	0.063-3.00	0.000

NB: N= numbers of household, SD= standard deviation, ha = hectare, Agric. = Agricultural

Dairy Cow herd composition

Table 4 below presents the herd composition and breed distribution of dairy cows in the study area. The overall per household mean (±Std) holding was (3.73 ±1.8) for both Local and Crossbred dairy cow. The proportion of Crossbred dairy cow holding in midland and lowland 'kebeles' was 2.6 to1 ratios respectively, that indicates from the total crossbred dairy cow found in the study area majority of which were kept in midland 'kebeles'. While in case of local breed dairy cow holding, the mean (± std.) in lowland 'kebeles' was slightly greater than those kept at midland kebeles, which was (3.63 ±1.04), (3.47±1.19), respectively and the overall average mean for midland and lowland 'kebeles' was (3.55±1.12). This result is higher than the number of dairy cattle holding 3.06 ± 0.27 reported by Hailemichael and Hailay, (2018) in Easter Zone of Tigray, Northern Ethiopia. However the number of lactating cow in this study was below the number of dairy cow holding by the household reported above. Similarly the overall average mean numbers of lactating cow in the current study area is higher than the number of lactating cow 1.89 ± 0.14 reported by Hailemichael and Hailay, (2018) in Eastern Zone of Tigray, Northern Ethiopia. In addition, the average (mean + Std.) for both cross and local breed of heifer holding of the producers in this study was (1.57± 1.11) and from the overall householders, 75.6% of them had heifer.

Table: 4. Dairy cows breed composition and herd structure

Dairy cow holding	Breed	Agro-Ecology of the study area			P-value
		Midland (N=90)	Lowland (N=90)	Overall(N=180)	
		Mean ± SD	Mean ± SD	Mean ± SD	
Total dairy cow holding:	Total	3.78±2.321	3.69±1.056	3.73±1.799	0.741
	Local breed	3.47±1.192	3.63±1.043	3.55±1.120	0.320
	Cross bred	0.34±2.204	0.07±0.536	0.21±1.605	0.247
Current Lactating Cow:	Total	2.53±1.40	2.40±0.684	2.47±1.101	0.418
	Local Breed	2.17±0.566	2.34±0.656	2.26±0.617	0.053
	Cross Bred	0.16±0.733	0.06±0.378	0.11±0.584	0.252
Heifers	Total	1.26±1.442	1.11±0.827	1.18±1.175	0.411
	Indigenous	1.01±0.800	1.08 ± 0.810	1.04±0.804	0.579
	Cross bred	0.26±1.294	0.03±0.181	0.14±0.928	0.109
Calves	Total	2.53±1.400	2.38±0.646	2.46±1.090	0.340
	Indigenous	2.25±0.528	2.26±0.510	2.25±0.518	0.914
	Cross bred	0.31±1.363	0.09±0.286	0.20±0.988	0.132

N= numbers of respondent, SD =standard deviation

The Purpose of dairy cow and milk production

Table 5 depicted purpose of dairy cow keeping and milk production in the study area. In the study area, dairy cows were primarily reared for household consumption and income generation, reflecting the pattern observed in most rural dairy production systems across Ethiopia. Of the households surveyed, approximately 1.1%, 3.9%, and 95.0% kept dairy cows for home consumption, as a source of income, and for both purposes, respectively. Additionally, other uses of dairy cattle in the area included use of manure for homestead crop production, generating income through the sale of live animals, and serving as collateral or guarantees for various purposes. The majority (75.0%) of dairy farmers produce milk primarily for the preparation of byproducts, such as traditional-table-butter, for both home consumption and sale. A smaller (23.9%) proportion of farmers in the current study area produce milk for home consumption in the form of table butter, cheese, and yogurt, while only 1.1% of dairy farmers produce milk solely for direct sale.

In contrast to the findings by Sintayehu *et al*. (2008), who reported that approximately 74.2% of dairy producers in urban areas of Hawassa milk produced primarily for sale, and Yitaye *et al*. (2009), who documented

that around 68% of milk produced in the urban-dairy-system of northwest Ethiopia. Approximately 30.6% of producers had three to five years of experience with dairy farming, while 4.4% had only one to three years of experience. The majority of producers (65%) had more than five years of experience. The high proportion of households engaged in dairying over an extended period that may indicate the relative success and sustainability of dairy farming in the study area compared to other livestock enterprises.

Table: 5. Purpose of dairy cow keeping and milk production

Variables	Purpose of Production	Agro ecology of the study area					
		Midland (N=90)		Lowland (N=90)		Over all (N=180)	
Purpose of dairy cow keeping		N	%	N	%	N	%
	Income Generation	2	2.2	-	-	2	1.1
	Home Consumption	-	-	7	7.8	7	3.9
	Income Generation and Home use	88	97.8	83	92.2	171	95.0
Purpose of milk production	For sale	2	2.2	-	-	2	1.1
	For Home Use and milk by Product	14	15.6	29	32.2	43	23.9
	For production of milk by Product	74	82.2	61	67.8	135	75.0
Experience in Dairy Cow keeping	1-3 years	8	8.9	-	-	8	4.4
	3-5 Years	38	42.2	17	18.8	55	30.6
	>5 years	44	48.9	73	81.2	117	65.0

N=numbers of respondent in the study area and **(-)** = No response of the household in that activity, other products = Butter and cheese

Milk Production Potential of Dairy Cows

Table 6 presents the average milk productivity of dairy cows in the study area. Local and crossbred dairy cows had mean (±SD) daily milk yields of 1.61 ± 0.28 liters and 6.8 ± 0.57 liters, respectively, with corresponding average lactation durations of 9.4 ± 1.18 and 10.25 ± 0.50 months. The average daily milk yield of local cows observed in this study was higher than the national average of 1.371 liters reported by CSA (2018) but lower than the 4 liters reported by ILDP (2004).

According to the dairy producers in this study, the most critical strategy for improving milk productivity of indigenous cattle is the selection of animals based on milk-yield traits, in addition to providing improved nutrition and management. The indigenous cows in the study area exhibited longer lactation periods than the national average of 7 months reported by CSA (2005). In comparison, Zelalem *et al*. (2001) reported that crossbred cows in the central highlands of Ethiopia had an average lactation length of 11.7 months, which is longer than that observed for crossbred cows in the present study. Overall, the lower average daily milk yield per cow and the observed variability in lactation length in this study might be attributed to feed scarcity and the limited genetic potential of local cattle. However, addressing the production constraints identified by the dairy producers particularly through improvements in breed, nutrition**,** and animal health could significantly enhance the productive potential of dairy cows in the study area.

Table: 6. The Mean milk productivity of dairy cows

Attribute	Breed of cows	Agro-Ecology of the study area			P-value
		Mid-land (N=90)	Lowland (N=90)	Overall(N=180)	
		Mean± SD	Mean± SD	Mean± SD	
Milk productivity of cow Lit/da	local breed	1.54±0.28	1.68±0.27	1.61± 0.28	0.001
	Cross bred	6.5±0.5	7.25±0.36	6.8± 0.57	0.170
Lactation length	Local breed	9.53±1.55	9.27±0.59	9.40±1.18	0.128
	Cross bred	10.5±0.70	10.0±0.00	10.25±0.50	0.423

Lit= liter, SD= standard deviation, N= numbers of respondents,

Feed and water sources, feeding and watering system

Table 7 presents the main sources of water and feed for livestock in the study area. Natural pasture (grazing land) was identified as the primary source of feed for livestock. Crop residues, conserved feeds such as hay and cereal straws, and, to a lesser extent, cultivated improved forages were ranked subsequently in order of importance (Table 7). In addition to these non-conventional feed such as 'Atala' (homemade brewery and alcohol residue), and kitchen and food table leftover) were also used as a feed supplements. In general, natural pasture which was used as the major feed source for livestock in this study area includes any feed resources in the range land such as Grass, Sharps and edible parts of different tree leaves which are commonly used as animal feed. While crop residue includes teff straw, millet straw, and maize and sorghum stover are the common crop residues used as conserved animal feed. Similarly conserved feeds especially grass-hay (Elephant grass, Rhodes grass and local grasses) and leaves of maize were commonly used for conservation of feed as a hay. All livestock species were allowed to graze on communal pasture fields during the daytime and offer crop residues before foraging, pregnant and lactating cows and draught animals were the premiums which were offered special supplements. The result is in agreement with the report by Demissu *et al*. (2015) who documented that all livestock species were allowed to forage on communal pasture fields during the daytime and offer crop residues on their return to barn in the evening around Horro Guduru Zone, Oromia Region, Western Ethiopia.

Except for certain lands unsuitable for agricultural production and riverbanks that retained some green forage during the dry season, communal grazing areas were generally dry and free from swamps. Cattle preferred these areas during the dry season due to the relative availability of green fodder and water. It was reported that from midland areas some classes of animals were taken to pastureland at lowlands in search of feed during shortage of feed during dry season (locally known as 'Daraba' in Afan Oromo) and they return to midland following rainy season. Only majority of lactating cows with their calves and a few drought animals were left behind the householder in midland during dry season and during this time dairy cow owners receive the milk

byproducts such as table butter only from the person who is keeping their lactating cows. This type of seasonal movement of cattle to the lowland areas was enabling animals escape the problem of dry season feed insufficiency, and reduces the overstocking. Crop residues were also the most important feed sources in both midland and lowland areas during the dry season when grass for grazing is scarce.

Regarding the Water Supply for Livestock in the study area, almost all of producers were depending on rivers as the source of water for their livestock (Table 7); whereas wells and pond water were used for especial purposes and/or time (if the animals were sick to take rivers and for new born calves).

Table: 7. Major Sources of Animal feed and Water

Variables	Agro ecology of the study area															Rank
	Midland					Lowland					Overall					
Feed Sources :	1	2	3	4	In.	1	2	3	4	In.	1	2	3	4	Index.	
Natural pasture	53	21	12	4	0.36	77	13	0	0	0.43	130	34	12	4	0.39	1st
Crop residue	39	48	3	0	0.31	13	54	21	2	0.28	52	102	24	2	0.29	2nd
Conserved feed	0	11	30	49	0.2	0	4	17	69	0.17	0	15	47	118	0.19	3rd
Cultivated forage	0	4	7	79	0.13	0	0	3	87	0.12	0	4	10	166	0.13	4th
Water Sources:																
River	88	2	0	0	0.44	73	17	0	0	0.41	161	19	0	0	0.42	1st
River and Wells	0	52	22	16	0.23	0	47	19	24	0.22	0	99	41	40	0.22	2nd
Wells	0	0	33	57	0.19	0	5	41	44	0.23	0	5	74	101	0.21	3rd
Pond	0	0	11	79	0.14	0	0	12	78	0.14	0	0	23	157	0.15	4th

N=numbers of respondent, SD=standard division

Note: In. =Index R1, R2, R3 and R4= rank 1, 2, 3 and 4 respectively.

For each feed resource, the index is equal to the sum of (4 X number of households ranked first + 3 X number of households ranked second + 2 X number of households ranked third + 1 x number of households ranked fourth) divided by the sum of (4 X number of households ranked first + 3 X number of households ranked second + 2 X number of households ranked third + 1 x number of households ranked fourth) for all feed and water source.

Oat and Elephant grass cultivated for dairy in the study area "Waltate Agar" Kebele

Fig. 2a. Rhodes with Elephant grass cultivated and Millet Residue stored for use during feed shortage

Over Fig. 2b. Over-sowed and protected natural pasture used for animal feed in the study

Fig. 2c. Natural unprotected all season pasture land in ''Gidda-Kumbi'' kebele during spring season

Figure 2: Major Livestock feed source in the study area

Challenges in Dairy Cattle Production

Table 8 presents the major challenges associated with dairy production in the study area. Dairy production and productivity are constrained by several critical factors, including the limited availability of improved breeds, prevalence of diseases and parasites, shortage of grazing land, restricted access to markets and extension services, and inadequate feed supply. Among these, feed scarcity both in quality and quantity was identified as the most significant constraint affecting dairy production in the study area.

Table: 8. Challenges of Dairy production

Variables	Ranks of constraints in (%) of respondent Agro ecology of the study area																		Rank
	Midland						Lowland						Over all						
	1st	2nd	3rd	4th	5th	Ind.	1st	2nd	3rd	4th	5th	Ind.	1st	2nd	3rd	4th	5th	Ind.	
Dairy production Constraints																			
Feed shortage	48	26	13	3	-	0.26	33	51	5	1	-	0.25	81	77	18	4	-	0.26	1st
Disease	23	39	22	6	-	0.23	27	45	18	-	-	0.23	50	84	40	6	-	0.23	2nd
Lack of improved breed	16	22	35	12	5	0.19	11	24	37	18	-	0.18	27	46	72	30	5	0.19	3rd
Land shortage	12	11	18	26	23	0.17	6	10	20	38	16	0.17	18	21	38	64	39	0.17	4th
Poor access to different services	10	12	19	15	34	0.15	16	11	22	16	25	0.17	26	23	41	31	59	0.15	5th
Major disease constraints																			
Mastitis	35	32	20	3	-	0.26	38	30	22	-	-	0.26	73	62	42	3	-	0.26	1ST
Trypanosomiasis	21	39	19	11	-	0.24	23	36	15	16	-	0.25	44	75	34	27	-	0.25	2nd
LSD (Lampy skin disease)	7	19	34	14	16	0.18	-	18	36	24	12	0.17	7	37	70	38	28	0.18	3rd
Endo and Ecto-parasites	-	13	23	39	15	0.17	-	20	20	43	7	0.19	-	33	43	82	22	0.17	4th
Foot and mouth disease	-	12	16	28	34	0.15	-	9	13	22	46	0.13	-	21	29	50	80	0.14	5th
Milk and milk product marketing Constraints																			
Small milk quantity	43	28	18	1	-	0.26	38	31	21	-	-	0.25	81	59	39	1	-	0.25	1st
No attractive prices	32	40	14	4	-	0.25	36	39	9	6	-	0.24	68	79	23	10	-	0.24	2nd
Spoilage	16	22	40	9	3	0.19	13	31	38	5	3	0.2	29	53	78	14	6	0.2	3rd
No Collection center	10	12	21	34	13	0.17	7	22	17	33	11	0.17	17	34	38	67	24	0.18	4th
Distance to market	-	-	22	38	30	0.13	3	11	23	21	32	0.14	3	11	45	59	62	0.13	5th

% = percentage, D/T = different and Services = Veterinary services, AI services and credit service

CONCLUSION

This study assessed the performance, challenges, and opportunities of dairy production in Nejo Woreda and Nejo Town, Western Ethiopia. The findings indicate that dairy production in the area relies predominantly on indigenous cattle, resulting in low productivity due to the animals' genetic potential, feed shortages, and reliance on an extensive production system. Key constraints identified include poor-quality and insufficient feed, high feed costs, limited grazing land, genetic limitations of dairy cattle, restricted access to and high cost of formulated feeds and industrial by-products, weak linkages between research and technology users, inadequate extension services, suboptimal animal management, and the absence of market-oriented production systems. Despite these challenges, the study also highlights significant opportunities for enhancing dairy production. These include the extended rainy season that supports green forage availability, increasing demand for milk and dairy products, and the potential for introducing improved genetics through crossbreeding programs. Harnessing these opportunities, alongside targeted interventions to address the identified constraints, could substantially improve dairy productivity and contribute to the livelihoods of farming communities in the study area.

Data availability

All findings are presented within the article, and the raw data will be made available upon reasonable request to the corresponding author.

Competing interests

The authors declare that they have no conflict of interest.

REFERENCES

CSA (Central Statistical Agency) (2005). Federal Democratic Republic of Ethiopia Agricultural sample survey. Livestock and livestock characteristics bulletin, Volume II. Addis Ababa, Ethiopia

CSA (Central Statistical Agency) (2008). Report on livestock and livestock characteristics; vol. II, Agriculture sample survey 2008/09.

CSA (Central Statistics Authority) (2009). Agricultural sample survey 2008/09. Report on livestock and livestock characteristics. Statistical bulletin 446. Addis Ababa, Ethiopia: CSA.

CSA (Central Statistical Agency) (20013/14). Agricultural sample survey 2013/2014. Vol. II. Report on livestock and livestock characteristics. Statistical Bulletin. Addis Ababa, Ethiopia: CSA.

CSA (Central statistical agency) (2018). Agricultural sample survey 2017/18. Volume II; Report on livestock and livestock characteristics (private peasant holdings). Addis Ababa, Ethiopia april 2018.

CSA (Central Statistical Agency) (2022) Agricultural Sample Survey. The 2021/22 National Statistics. Report on Livestock and Livestock Characteristic with Statistical Bulletin 594, Volume II.

Demissu H., Fekadu B. and Gemeda D. (2015). Productivity of Horro Cattle and their F1 Jersey crosses.*Sci. Technol. Arts Res. J.,* April-June 2015- 4(2): 215-221

ILDP (2004). (Integrated Livestock Development Project). Study report on dairy marketing and mini-dairy in Gonder (Draft Report), North Gonder. 35p.

ILRI (International Livestock Research Institute), (2011). Livestock: A pathway out of poverty. Interim strategy of the International Livestock Research Institute, 2011–2012. Nairobi, Kenya, ILRI.

Legese, G., Gelmesa, U., Jembere, T., Degefa, T., Bediye, S., Teka, T., Temesgen, D., Tesfu, Y., Berhe, A., Gemeda, L., Takele, D., Beyene, G., Belachew, G. Hailu, G. and Chemeda, S. 2023. Ethiopia Na-tional Dairy Development Strategy 2022–2031. Addis Ababa, Ethiopia: Ministry of Agriculture, Federal Democratic Republic of Ethiopia.

Selamawit Debele and Matiwos Habte, (2015). Sheep and goat production practice in agro forestry systems of Gedio zone, Ethiopia. ISSN 2091-2854. International Journal of Environment.

Sintayehu Y., B. Fekadu, T.Azage, and G. Berhanu, (2008). Dairy production, processing and marketing systems of Shashemene–Dilla area, South Ethiopia. IPMS (Improving Productivity and Market Success) of Ethiopian Farmers Project Working Paper 9. Nairobi, Kenya: ILRI (International Livestock Research Institute).

Tesfaye, L., Azage, T., Ranjitha, P. and Hoekstra, D.,(2008). Moving Ethiopian Smallholder dairy along a sustainable commercialization path: Missing links in the innovation systems, IPMS project, ILRI, Addis Ababa, Ethiopia.

Yamane, Taro,(1967). Statistics, An Introductory Analysis, 2nd Ed., New York: Harper and Row.

Yemane G., Melesse A., Taye M., (2020). Evaluation of production systems and husbandry practices of Ethiopian indigenous goats. Online *J. Anim. Feed Res*., 10(6): 268-277. DOI: https://dx.doi.org/10.51227/ojafr.2020.36

Yitaye A., Maria W., Azage T. and Werner Z., (2009). Performance and limitation of two dairy production systems in the Northwestern Ethiopian Highlands. Trop. Anim. Health Prod., 41(7): 1143-1150.

Zelalem Y, Emmanuelle G, Sebsibe A, (2011). A Review of the Ethiopian Dairy Sector. Ed. Rudolf Fombad, Food and Agriculture Organization of the United Nations, Sub Regional Office for Eastern Africa (FAO/SFE), Addis Ababa, Ethiopia, pp 81.

.