

International Journal of Social Science and Humanities Research-MIYR

ISSN(print): 2788-9092 ISSN(Online): 2788-9106

Volume 5. Issue 2. 2025.06

Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity

**Purevdolgor Dagviikhorol • Batsukh Tovuudorj • Sainchuluu
Amarsanaa • Beisen Bayar**



Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity

Purevdolgor Dagviikhorol¹, Batsukh Tovvudorj^{2*},
Sainchuluu Amarsanaa^{3**}, Beisen Bayar⁴

¹Mongolian University of Life Sciences, School of Animal Science and Biotechnology,
Dagviipurev@gmail.com,

^{2*}Animal Science Sector, Research Institute of Animal Husbandry, Ulaanbaatar, Mongolia
Batsukh7494@gmail.com

^{3**}Mongolian University of Life Sciences, School of Agroecology, ecology department,
Ulaanbaatar, Mongolia
Sainchuluu@mul.s.edu.mn

⁴Animal Science Sector, Research Institute of Animal Husbandry, Ulaanbaatar, Mongolia
beisenbayar@gmail.com

Abstract- This study aimed to develop feed norms and rations suitable for Alpine dairy goats under Mongolian conditions and to evaluate their effects on feed chemical composition, feed intake, live weight change, and milk yield. The experiment was conducted under stall-feeding conditions at a goat farm in Uvurkhangai Province, Mongolia, from June to September 2021. A total of 30 Alpine dairy goats were included in the study and randomly assigned to one control group and four experimental groups, each receiving different feed rations. During the experimental period, the chemical composition and nutritive value of the feed rations, feed intake, live weight changes, and milk yield were determined using standard analytical methods. The results showed that goats fed the experimental rations exhibited higher feed intake by 2.5–3.6% compared to the control group. In addition, live weight increased by 3.6–4.1%, and milk yield improved by 1.6–1.9 times. These findings indicate that feed ration composition and feeding management play a crucial role in improving milk productivity of Alpine goats under Mongolian conditions. Therefore, the implementation of the developed feeding strategies in production practice could significantly enhance the productivity of dairy goats, promote domestic milk and dairy product production, and contribute to supplying the population with environmentally friendly and safe food products.

Keywords – Dairy goat, Live weight, Feed intake, Milk yield, Feed ration, Composition

Received: 2025.04.21

Reviewed: 2025.04.23

Accepted: 2025.06.04

*Corresponding author: Batsukh Tovvudorj

**Corresponding author: Sainchuluu Amarsanaa

Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity

1. INTRODUCTION

Originating in the Alpine mountain area near the France-Switzerland border, the Alpine dairy goat breed High milk output, excellent reproductive performance, environmental stress resistance, and prolificacy define this very successful dairy breed. Usually weighing between 60 and 65 kg, mature Alpine cows may produce an average of 900–1000 liters of milk yearly throughout their 280–295 day lactation cycle [1]. The typical milk composition comprises roughly 3.7% fat and 3.2% protein [2].

Items ranging from infant formula to yogurt, cheese, ice cream, and cream are made from Alpine goat milk; recently, it has also been included in cosmetic items [3]. Rich in calcium, phosphorous, cobalt, vitamins A, B, C, and D, as well as vital amino acids including tryptophan and cysteine, is goat milk. Goat milk is especially fit for small children and the elderly because of its composition, which is somewhat similar to human breast milk [4], [5]. Goat milk's small fat globule size helps it to be antioxidant and immune-supportive as well as fast-digested [6]. Moreover, goat milk is a safe and health-promoting substitute for those allergic to cow's milk [7], which is one of the main causes of its growing popularity in many developed nations.

Often by crossbreeding with local breeds to increase milk yield, international studies have demonstrated that Alpine and Saanen goats have been effectively brought into hot, dry, or humid areas. In India, Alpine goats demonstrated greater heat tolerance than Saanen goats, even though their milk output was only moderate. Although Saanen goats produced more milk, they were more vulnerable to environmental stress [8]. Crossbreeding Alpine and Toggenburg goats with local breeds has produced a 2–3 times boost in milk output in several African nations [9]. Over the past two decades, Alpine goats have been extensively brought to China, producing new genotypes of hybrid populations [10]. Brazil has successfully undertaken bioeconomic studies of small-scale farms cultivating Alpine hybrids [11].

In industrialized nations, including those in the European Union, the United States, Australia, and New Zealand, goat milk consumption has been rising gradually. Producers extensively use it to produce probiotic milk, yogurt, and baby formula [12], among other specialty items. Furthermore, influencing new trends in the cosmetics business is the special composition of goat milk and its advantages for skin care. Reflecting customer enthusiasm and a new degree of inventiveness in cosmetic production, an increasing variety of natural, vitamin-rich skincare products, including goat milk, have hit the market [13].

The growing urban concentration of the population in Mongolia has resulted in higher demand for milk and dairy products. But a big problem is domestic manufacture unable to satisfy this demand. Urban areas have an average yearly per capita milk consumption of over 80 kg; rural inhabitants consume only roughly 20 kg, suggesting a clear discrepancy [15]. Although Mongolians' suggested annual intake of milk and dairy products for sustaining optimal health is assessed at 137.8 kg, actual consumption is 40% less; rural consumption is especially low [16]. Furthermore, domestic goat milk production is still underdeveloped, which causes dependency on imports and maybe compromises food security.

Compared to high-yielding dairy breeds, Mongolian native goats yield just 0.3–0.5 liters daily and provide milk with quite low protein and fat content, which limits their market competitiveness. Therefore, enhancing public health, food security, and economic resilience

depends on introducing and adjusting high-yield dairy goats that are robust against Mongolia's natural and climatic conditions—while optimizing their feeding and management techniques. The aim of this project is to improve, under Mongolian conditions, the feeding and housing methods for Alpine dairy goats. This study explores the impacts of customized feed formulations—considering nutrient composition, palatability, intake, changes in live weight, and milk yield—through the development and experimental testing of specific nutritional rations suited to local conditions for the first time.

2. LITERATURE REVIEW

Comparative research by Ts. Davaasuren (1975) in Erdene soum, Gobi-Altai province, assessed the milk output of local Mongolian goats as well as the Tulman Khokht breed. Over the first month postpartum, Mongolian goats produced an average of 343 g of milk daily; in the fourth month, 438 g; and in the last month of lactation, 48 g. Tulman Khokht goats yielded around 1.6 times more milk than Mongolian goats under the same conditions: 579 g, 828 g, and 112 g, correspondingly.

Haenlein (2008) claims that highlighting the vital importance of goat farming in food security in developing nations, most of the worldwide increase in goat numbers and milk production is driven by these countries. Genetic elements, management techniques, and environmental surroundings all affect the milk yield of dairy goat breeds.

Reviewing many dairy goat breeds reveals the following average annual milk production and butterfat contents: Saanen goats produce 1,134–1,360 liters with 3.5–4.0% butterfat; Alpine goats yield 946–1,360 liters with 3.0–4.0% butterfat [17]; Toggenburg goats average 959 liters with 3.2% butterfat; Nubian goats yield 681–1,134 liters with 4.0–5.0% butterfat; and LaMancha goats produce 1,000–1,134 liters with the highest butterfat content ranging from 3.9–8.0% [18].

One clear benefit of goats is their effective eating behavior, which calls for less input than that of other livestock. Goats may choose to graze on the nutritious sections of plants, such as seeds, leaves, and buds, avoiding stems and prickly parts by means of their very flexible lips and necks [19]. Their diet consists of a broad range of shrubs, legumes, and browsing species [20]. They are nimble and capable of standing on their hind legs to access higher plants.

Feed formulations for dairy goats have to be enhanced with both micro- and macronutrients as well as vitamins [21]. Especially balanced concentrate feed enhanced with minerals, vitamins, and bioactive compounds is crucial [22]. Recommended reasonably priced feed materials include maize, straw-grass silage, brewer's grains, sunflower meal, and fodder beets [23]. Ideal feeding management calls for the combined use of concentrated foods [24] and green grass. While the highest nutritional needs arise during early to mid-lactation and late pregnancy [25], goats in early gestation take rather little feed.

To satisfy the large energy requirement during peak lactation, feed intake capacity and the metabolic conversion of body tissues into energy rise [26]. While fat reserves are hardly used throughout early pregnancy and peak breastfeeding, appetite usually falls during late gestation and early lactation [27]. To completely satisfy dietary needs, thus, it is best to offer premium fodder and either supplemental feeding or use of lush pastures. Maintaining moderate to good body condition for dairy goats would help to guarantee good milk output [28].

Gerlach (2017) advises feed rules to be catered to physiological phases, including live weight, production level, pregnancy, and lactation. Adult goats should get high-quality silage at daily rates

Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity

of 3.0 kg; growing goats should get 1.5 kg. The best delivery for concentrates is compound or mixed feed. Giving nursing goats premium hay and luscious feeding results in higher milk output [29].

3. MATERIALS AND METHODS

Conducted under limited housing conditions at a farm in Arvaikheer soum, Uvurkhangai province, where Alpine dairy goats are raised, the experimental study took place in 2021. The experiment involved a total of 25 healthy, well-conditioned adult female goats free from structural flaws and comparable in live weight and milk output. With five goats in each group, the goats were split into four groups: one control group and three experimental groups. Three distinct feed rations were created and evaluated.

Table 1. Composition of the Feed Rations

Group	Feed Composition
Control	Hay + Bran
Ration 1	Hay + Bran + Beet
Ration 2	Hay + Bran + Carrot
Ration 3	Hay + Bran + Cabbage

Aiming for a daily milk yield of 3.0 liters, calculations were done depending on the daily nutritional needs of a goat with an average live weight of 40 kg, guiding the development of the feed rations. The Feed Evaluation Laboratory of the Animal Husbandry Research Institute examined the chemical composition of the feed components. Moisture content was found per MNS 6548:2015; total protein was measured with MNS 6549:2015; total fat content followed MNS 6554:2015; total fiber was evaluated using MNS 6551:2015; and total ash content was computed with MNS 6548:2015 [24] [25]. Calculation techniques [12] were used to evaluate the digestibility of organic matter and general nutritional value. At the start and finish of the experiment, the goats' live weight was recorded; milk yield was tracked by gathering milk samples from the control group. SPSS 25 software was used for data analysis. The average live weight of the dairy goats was calculated to be 40 kg, and based on this, the daily requirements for 14.5 MJ of metabolizable energy, 1650 g of dry matter, and 120 g of digestible protein were used to develop the feed rations and formulas [26], [27].

Table 2. Feed Rations

Specification	Feed (kg)	Ration Composition (%)	Metabolizable Energy (MJ)	Dry Matter (g)	Digestible Protein (g)	Calcium (g)	Phosphorus (g)
Norm		100	14.5	1650	120	3.8	3.6
Control	Hay	1.3	50.8	7.1	1040	53	2.8
	Bran	1.1	49.2	8.8	880	106.9	2.2
Ration 1	Hay	0.6	29.2	4.3	546	25	1.3

	Bran	1.3	13.3	1.9	195	11.7	0.8
	Beet	0.9	57.5	8.5	893	87.5	1.8
Ration 2	Hay	0.7	35.1	5.0	637	29	1.47
	Bran	1.2	12.3	1.7	180	9.6	1.1
	Carrot	0.8	52.6	7.5	704	77.8	1.6
Ration 3	Hay	0.7	35.1	5.0	630	29	1.5
	Bran	1.2	12.1	7.5	180	20.4	4.1
	Cabbage	0.8	52.7	1.8	706	77.8	1.6

4. RESULT

The feed's nutritional value is mostly indicated by its chemical composition; the rations' chemical composition was assessed, and the findings are shown in Table 3.

Table 3. Chemical Composition of the Rations (on an air-dry basis)

Specification, %	Control	Ration 1	Ration 2	Ration 3
Organic Matter	95.3	96.5	94.1	94.3
Total Protein	13.6	9.2	10.8	8.9
Total Fat	3.5	2.6	2.4	2.1
Total Fiber	22.7	17.2	17.9	17.6
Total Ash	4.7	3.5	5.9	5.7
Nutritional Value	15.4	14.7	14.2	14.3

The rations' overall protein level varies from 8.9% to 13.6%, total fat from 2.1% to 3.5%, total fiber from 17.2% to 22.7%, and total ash from 3.5% to 5.9%, according to Table 3. The control group (with grass + bran) has a total protein content of 13.6%, the grass + bran + carrot group has 9.2%, the grass + bran + carrot group has 10.8%, and the grass + bran + cabbage group has 8.9%. Rations guided the feeding of control and experimental group goats; feed efficiency was calculated using the approach shown in Table 4.

Table 4. Feed Intake

Group	n	M±m
Control	5	92.4±1.11b
Ration 1	5	96.0±2.12a
Ration 2	5	94.9±1.42a
Ration 3	5	95.6±1.56a

Different superscripts (a, b) indicate significant differences (P<0.05)

The control group's feed efficiency was 2.5-3.6% lower than the other three rations (P<0.05). The three experimental rations' feed efficiency, ranging from 95.7% to 96.4%, showed no notable variation. Groups with silage were 2.1-3.6% more efficient than the control group when silage was included in the proper proportion in the feed, probably because of better feed digestibility

Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity

and higher appetite. Improving milk yield and quality as well as preserving consistent body weight depends on the right mix of silage in the feed [28].

Table 5. Changes in the Body Weight of the Experimental and Control Groups of Goats

Group	Body Weight, kg	Difference, kg
Control	38.8±1.5 (Start)	39.0±1.2 (End)
Ration 1	41.5±1.4 (Start)	43.2±1.1 (End)
Ration 2	38±1.3 (Start)	39.5±1.3 (End)
Ration 3	39.2±0.7 (Start)	40.6±1.2 (End)

When measuring the live weight of the goats at the beginning and end of the experiment, the goats in the control group gained 0.2 kg (0.5%) by the end of the trial. However, goats fed with the grass + bran + carrot mix gained 1.7 kg (4.1%), those fed with the grass + bran + carrot mix gained 1.5 kg (3.9%), and goats fed with the grass + bran + cabbage mix gained 1.4 kg (3.5%). In the control group, where goats were fed with the grass + bran mixture, the milk yield decreased by the end of the experiment. However, the goats fed with the grass + bran + carrot mixture showed a 1.9-fold increase in milk yield, those fed with grass + bran + carrot had a 1.6-fold increase, and those fed with grass + bran + cabbage had a 1.7-fold increase in milk yield (Figure 1).

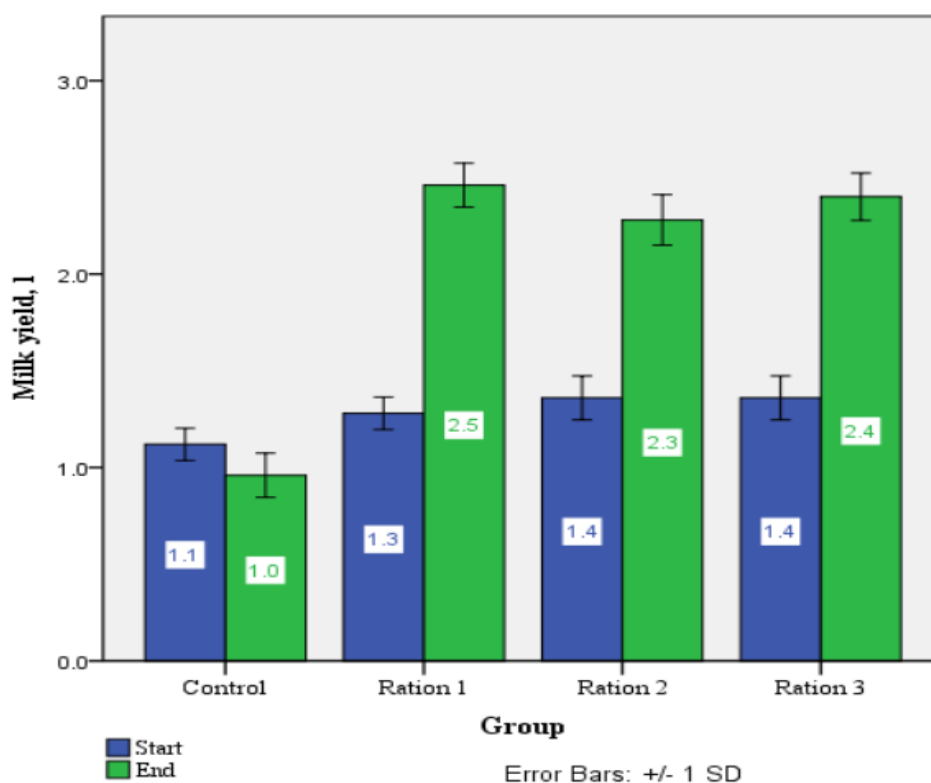


Figure 1. Milk yield of Alpine goats

5. DISCUSSION

We ran the first-ever trial study on the nutritional norm of Alpine breed goats being brought into Mongolia. Goats' milk output and quality are directly affected by the kind, composition, and nutritional value of the feed they consume [29]. Researchers have looked at how various feed combinations—including typical hay, cabbage, carrots, and other mixed feeds—affect the milk yield and quality of Anglo-Nubian, German White, and Alpine breeds. The Alpine breed's milk output tripled and the German White breed's yield rose 2.5 times when goats were milked twice a day with an electric milking machine [30]. Though our findings were lower than in the prior study, it shows a good rise in milk yield given it is the first study done under Mongolia's severe climate conditions.

Milk production rose by 10% at the end of the trial in a study on one-year-old Canary Majorana breed goats fed a mixed diet of 33% corn seeds, 26.5% dried alfalfa, 24% dried sugar beet pulp, 10% wheat bran, and 6.5% soybean meal. Though our study's outcomes contrast with these results, it obviously shows that the best mix of wet feeds in the nutritional norm is quite important for raising milk yield.

Apart from milk yield, taking the rise in body weight into account, the body weight of goats in the experimental group rose by 3.6-4.1%, which implies that more energy could be needed to boost milk output. This is in line with earlier research, including El-Kholodny et al. (2018), which indicated that a mix of moist feeds including turnips and cabbage enhances the general nutritional state of goats [32], so helping to maintain stable body weight.

Herders generate income, create jobs, and ensure food security through dairy goat farming [18]. In terms of feed formulation, mixing 15% dried leaves with wheat bran in the feed has been shown to increase milk yield and be more cost-effective compared to other types of supplementary feed [33].

Satik (2015) claims that a study on Sarabi breed goats aged 5–6 months and weighing 20 kg involved splitting them into three groups and changing the protein sources in their feed. The most economically efficient choice was Group G1, which had the greatest feed digestibility (73.82%) and daily weight gain (90.8 g) from a combination of Kochia silage (50%) and concentrate feed (50%). This is consistent with our results, which show that adding silage to the feed formulation for dairy goats raises milk output and is financially advantageous [34].

Gerlach's (2013) research indicated a linear correlation and a tendency for greater preference in the dry matter intake of Saanen breed goats as the proportion of fermented sugar beet (SBS and TBS with chemical additives) rose. Goats had 4–5 times greater digestibility in high sugar feed on sugar beet silage with chemical additives that preserved sugar better. The sweet flavor and increased energy content could be related to this since they might influence the metabolism of the goats by supplying more energy for their requirements [21].

According to Monzón-Gil et al. (2010), goats fed with supplemented mixed feed showed a 10% increase in milk yield and a 5% increase in protein content. The results of our study are consistent with these findings, particularly highlighting that the optimal inclusion of silage feed in the nutritional norm is an important factor for increasing milk yield [36].

In our study, the group fed with a diet of grass + bran + turnip showed the highest milk protein content, which may be related to the combination of natural sugars and minerals found in turnips.

Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity

This aligns with the theoretical premise that the type of feed and its chemical composition directly influence milk quality [37], [38].

In our country, to sustainably increase the milk yield of dairy goats, it is necessary to continue research in the following areas: testing and experimenting with natural protein sources that are high in amino acids, supplementing diets with biologically active additives such as probiotics, enzymes, and organic minerals, and aligning pasture management with optimal feed allocation strategies.

6. CONCLUSIONS

Under Mongolia's climate, a preliminary study was carried out to assess how succulent feed affected the chemical makeup, palatability, nutrient digestibility, and production of Alpine dairy goats. With crude protein varying from 8.9% to 13.6%, crude fat from 2.1% to 3.5%, fiber content from 17.2% to 22.7%, and ash content from 3.5% to 5.9%, the nutritional makeup of the experimental feed compositions differed. The protein content of the control group—fed hay and bran—was the greatest.

The groups fed succulent feeds—beets, carrots, and cabbage—showed 2.5–3.6% higher feed intake than the control group ($P < 0.05$), therefore indicating improved palatability and enhanced nutrient absorption. Whereas the control group showed only a 0.2 kg or 0.5% rise, live weight gain in the succulent-fed groups ranged between 1.4–1.7 kg, comparable to a 3.5–4.1% increase during the study period. This proves the better nutritional value of the formulations of succulent feed.

Whereas the control group showed a drop in output, milk yield in the succulent-fed groups rose 1.6 to 1.9 times ($P < 0.05$). These findings imply that mixing succulent diets with hay and bran can greatly increase feed intake, live weight gain, and milk supply, thereby providing financial advantages.

This study is the first of its kind to show, under Mongolia's severe environment, the need to create appropriate feed diets for high-yielding dairy goat breeds. It also emphasizes the need to add easily accessible succulent foods like cabbage and root vegetables to boost dietary protein in the next feed development projects.

For Mongolia's animal industry, using this knowledge offers social as well as financial value. By increasing the supply of wholesome milk and dairy products, successfully adjusting high-yielding Alpine dairy goats to Mongolian conditions can improve not only the income of herders and farmers but also national food security. In areas with limited milk supply and vulnerable populations including children with nutritional deficits—this is especially important. In such places, raising dairy goats and using balanced feeding methods can help solve public health issues.

Furthermore, this work helps to create semi-intensive agricultural methods combining current dairy technologies with ancient pastoralism. It can help organic farming, raise women's involvement in agriculture, support small and medium sized businesses, and generate rural jobs. The creation of ideal feed formulations also presents a strategic way to better use local feed resources and lower winter feed shortages. This work fits really nicely with national development projects and agriculture plans.

Thus, this kind of research is not only crucial for raising the output of a particular livestock breed but also has wider consequences for enhancing food supply, feed production, rural development, and sustainable livestock systems in Mongolia.

REFERENCES

- [1] Jerry Belanger. "Raising Milk Goats the Modern Way". Revised edition. Storey Publishing, (1990):21-33
- [2] McNally Jackson, "Alpine Goats". Paperback, Independently Published, (2024):45-60
- [3] Gail Luttmann. "Raising Milk Goats Successfully", (2010): 25-42
- [4] Young W Park. "Goat Milk-Chemistry and Nutrition". Academic Press (Elsevier), (2017): 95-110
- [5] Rinchin Indra. "Milk and Dairy Products". (2000):60-71
- [6] Tserenkhand Zorigbaatar, Tumurtogtokh Erdenetsogt, Damdinsuren Dorjoo, Erkigul Bukyei, Enkhjargal Buyandelger. "Results of studying the fatty acid composition of yak meat of Mongolia". International Journal of Social Science and Humanities Research-MIYR, 3.3 (2023):1-12. <https://doi.org/10.53468/mifyr.2023.03.03.1>
- [7] Gulzar Ahmad Nayik, Yash D Jagdale, Sailee A Gaikwad, Anupama Devkate, Aamir Hussain Dar, Daniel Severus Dezmiorean, Otilia Bobis, Muhammad Modassar A N Ranjha, Mohammad Javed Ansari, Hassan A Hemeg. "Recent Insights into Processing Approaches and Potential Health Benefits of Goat Milk and Its Products: A Review". 6.7 (2021) DOI: <https://doi.org/10.3389/fnut.2021.789117>
- [8] Manoj Kumar Singh. "Performance of Saanen and Alpine goats under tropical Indian conditions". Indian Journal of Animal Sciences, 3.85 (2015):305-310. DOI: <http://dx.doi.org/10.1007/s11250-012-0246-6>
- [9] Christie Peacock. "Small Ruminant Research", Goat production and development in Africa, 60(1-2) (2005):179-186. <http://dx.doi.org/10.1016/j.smallrumres.2003.08.015>
- [10] Yong Zhang, Xiao Zhao, Wei LiY. "Crossbreeding between local goats and exotic dairy breeds in China", A review. Livestock Science. (2013):157-164.
- [11] Concepta McManus, Giane Regina Paludo, Helder Louvandini, Rosilene Gugel, Luiz Cláudio Bastos Sasaki, Samuel Rezende Paiva. "Heat tolerance in Brazilian sheep: Physiological and blood parameters" Trop Anim Health, 41.1 (2009):95-101. <https://link.springer.com/article/10.1007/s11250-008-9162-1>
- [12] G.F.W.Haenlein, "Goat milk in human nutrition". Small Ruminant Research, 51.2 (2024):155-163. <https://doi.org/10.1016/j.smallrumres.2003.08.010>
- [13] Keabetswe Tebogo Ncube, Mamokoma Cathrine Modiba, Takalani J Mpofo, Bohani Mtileni, Khathutshelo A Nephawe. "Genomic Tools for Medicinal Properties of Goats Milk for Cosmetic and Health Benefits. A Review" [Animal Science](https://www.preprints.org/manuscript/202404.1662/v1), (2024). <https://www.preprints.org/manuscript/202404.1662/v1>
- [14] Željka Klir Šalavardić, Klemen Potočnik, Antunović Zvonko, Josip Novoselec. "Milk production traits from alpine breed of goats in Croatia and Slovenia Possibilities of economic valuation of the wool in Croatia View project Organic and conventional goats for milk production". Bulgarian Journal of Agricultural Science, 21.5 (2015):1064-1068.
- [15] www.mofa.gov.mn.
- [16] www.1212.mn.
- [17] Purevdolgor Dagviikhorol, Khaliunaa. Tumenbayr, "Milk yield study of alpine goats". Mongolian Journal of Agricultural Sciences, 32.1 (2021):21-24. <https://doi.org/10.5564/mjas.v32i1.1598>.
- [18] Bivatac Ltd., "Goat breeds and milk productivity. Bivatac Publications." (2005).

Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity


- [19] Nadmid N. "Goat Husbandry". (2006):102-108
- [20] Gendaram Khuder. "Animal Feeding Science", (2009):45-66
- [21] Thiivi Kahiya Mutunga, Lavar Musalia, Bernard Mukiri Gichimu, Salome Atieno Migose. "Dairy goat production in Kenya". African Journal of Food, Agriculture, Nutrition and Development. 23.7 (2023). https://ideas.repec.org/a/ags/ajfand/340733.html?utm_source=chatgpt.com#:~:text=DOI%3A%2010.22004/ag.econ.340733
- [22] Hart Sudagar, "Goat Nutrition". (2008)
- [23] Muhammad Ezz Ahmed, Ehab Saeed Soliman. "Cultivation and evaluation of some green forage mixture and its utilization in feeding of lactating Zaraibi goats", Egyptian J. Nutrition and feeds, 11.329 (2008). <http://dx.doi.org/10.21608/jappmu.2014.68600>
- [24] Katrin Gerlach, Yihan Liao, Karl-Heinz Südekum. "Aerobic exposure of lucerne silages and its impact on preference and dry matter intake by goats" Small Rumin Res. (2014):308–313. <https://doi.org/10.1016/j.smallrumres.2014.07.022>
- [25] Gamal A. Maged, Walid M. A. Sadik, Gamal I. El-Emam, Mohamed E. El-Kholany, Talaat H. El-Sawah. "Milk production and feed utilization of zaraibi goats fed some forage protein sources such as berseem or kochia silage and their mixture with fodder beet". Animal and Poultry Prod. Mansoura Univ. 5 (2014):815-826. <https://doi.org/10.21608/jappmu.2014.70914>
- [26] Camillus O. Ahuya, Julie M. K. Ojango, Reuben O. Mosi, Christie P. Peacock . "Performance of Toggenburg dairy goats in smallholder production systems of the eastern highlands of Kenya". Small Ruminant Research. (2009):7–13. <https://doi.org/10.1016/j.smallrumres.2008.11.012>
- [27] Tesfaye Sahlu, Arthur Goetsch. "Feeding the pregnant and milking doe". Langston University, Oklahoma. (1998):4-20
- [28] Fathy A. El-Sayed, Walid M. A. SadikEl-Sayed. "Effect of feeding different types of silage (berseem or kochia and their mixture with fodder beet) on growth performance of growing male goats". J. Animal and Poultry Prod., Mansoura Univ, 8 (2015):567. <https://doi.org/10.21608/jappmu.2015.52918>
- [29] Katrin Gerlach, Anke Reimink, Ulrike Messerschmidt, Karl-Heinz Südekum. "Ensiled sugar beets as dietary component and their effect on preference and dry matter intake by goats". Arch Anim Nutr, 71.4 (2017):297–310. <https://pubmed.ncbi.nlm.nih.gov/28541752/>
- [30] Gendaram Khuder, Togtokhbayar Norovsambuu. "Methodology for chemical analysis of feed and meat". (2009):33-40.
- [31] Tserendulam Rentsen. "Nutritional Value Chart of Feeds". (1990):44-76
- [32] Richard O. "Feed and Nutrition of Livestock". (2017)
- [33] Julicelly Gomes Barbosa, Roberto German Costa, Ariosvaldo Nunes de Medeiros, Rita de Cássia Ramos do Egypto Queiroga, Ângela Maria Vieira Batista, Geovergue Rodrigues de Medeiros, Edvaldo Mesquita Beltrão Filho. "Use of different urea levels in the feeding of Alpine goats". Revista Brasileira de Zootecnia, 41.7 (2012), <https://doi.org/10.1590/S1516-35982012000700022>
- [34] Michele N. Hempstead, Thomas M. Lindquist, James K. Shearer, Lisa C. Shearer, Paul J. Plummer. "Health and welfare survey of 30 dairy goat farms in the midwestern united states" Animals. 11.7 (2021), <https://doi.org/10.3390/ani11072007>
- [35] Katrin Gerlach, Frank Roß, Kathrin Weiß, Wolfgang Büscher, Karl-Heinz Südekum. "Changes in maize silage fermentation products during aerobic deterioration and effects on dry matter intake by goats". AgricFood Science. 22 (2013):168–181. <https://doi.org/10.23986/afsci.6515>
- [36] Nataliya Zazharska, Oksana Boyko, Volodymyr Brygadyrenko. "Influence of diet on the productivity and characteristics of goat milk". Indian Journal of Animal Research, 52.2 (2018):711–717. <http://dx.doi.org/10.18805/ijar.v0iOF.6826>
- [37] Arthur L. Goetsch. "Recent advances in the feeding and nutrition of dairy goats". Asian-Australas Anim Science. 32. 8(2019):1296–1305. <https://pmc.ncbi.nlm.nih.gov/articles/PMC6668859/>

- [38] Michele Hempstead, Thomas Lindquist, James Shearer, Lisa Shearer, Valerie Cave. "Welfare Assessment of 30 Dairy Goat Farms in the Midwestern United States". *Frontiers in Veterinary Science*. 8 (2021) <https://doi.org/10.3389/fvets.2021.646715>
- [39] Hyo-Jin Kim, Jae-Hee Kim, Hye-Jong Lee. "Comparison of Milk Composition between Korean Native Black Goats and Alpine Goats in Korea". *Journal of Animal Science and Technology*. 58.7 (2016):711-717. <https://doi.org/10.5187/JAST.2016.58.7.711>
- [40] Brenda Jemutai Kiptui, Eunice Akello Mewa, and Jackson Kibet Kitilit, "Effect of Supplementation Level of Leucaena Leaves and Wheat Bran to Grass Based Diet on Milk Yield and Cost of Production in Dairy Goats" *International Journal of Scientific Research in Science and Technology*. 12.1 (2025):413–419 <https://ijsrst.com/home/issue/view/archive.php?v=17&i=131&pyear=2025>
- [41] Fathy A. El-Sayed, Walid M. A. Sadik. "Effect of feeding different types of silage (berseem or kochia and their mixture with fodder beet) on growth performance of growing male goats" 6.8 (2015):567-581. <https://doi.org/10.21608/jappmu.2015.52918>
- [42] Mohamed El-Kholany, Gamal A. Maged, Walid M. A. Sadik, Ahmed A. Mehany. "Effect of Using Different Types of Silages Mixtures in Dairy Goat Diets on Milk Production, Feed Conversion, Rumen Fermentation, Nutritional Value and Blood Components". *Journal of Animal and Poultry Production, Mansoura University*, 9.2 (2018):115–121. <https://doi.org/10.21608/jappmu.2018.38935>
- [43] Elena Monzón-Gil, José I. R. Castañón, María R. Ventura, Monzón-Gil. "Effect of low-forage rations on milk production of dairy goats: Separate concentrate-forage versus mixed rations". *Small Ruminant Research*, 94.1–3, (2010):196–200. <https://doi.org/10.1016/j.smallrumres.2010.07.018>
- [44] Ragnhild Arnli Inglingstad, Anine Lovise Næsset, Tormod Randby, Hilde Steinshamn, "Forage quality and feed supplementation effects on goat milk yield and composition". *Journal of Dairy Science*. 10.2 (2019):2345–2354
- [45] El-Ashry, Mohamed A, Fadel, M, Kholif, Ahmed, Salem Abdel fattah. "Effect of replacing protein sources in concentrate feed mixture on performance of lactating goats". *Egyptian Journal of Nutrition and Feeds*. 3 (2018):545-556.


Potential for milk production in Alpine dairy goats in Mongolia: A study on adaptation and productivity

AUTHOR'S INTRODUCTION


1. First Author

	Purevdolgor Dagviikhorol Dagviipurev@gmail.com
	<p>Doctoral student at the School of Animal Science and Biotechnology, Mongolian University of Life Sciences, Ulaanbaatar, Mongolia</p> <p>Work: Animal Science Sector, Research Institute of Animal Husbandry, Ulaanbaatar, Mongolia</p> <p>Work field: Animal nutrition, care, and husbandry, pasture management</p>


2. Corresponding Author

	Sainchuluu Amarsanaa sainchuluu@muls.edu.mn
	<p>2018 Ph.D in Environmental Science</p> <p>Work: Senior lecturer, School of Agroecology, Mongolian University of Life Sciences, Ulaanbaatar, Mongolia</p> <p>Work field: Ecological resoration, rangeland ecology, sustainable land management</p>

3. Corresponding Author

	Batsukh Tovvudorj Batsukh7494@gmail.com
	<p>Ph.D in Animal Science</p> <p>Work: Director, Research Institute of Animal Husbandry, Ulaanbaatar, Mongolia</p> <p>Work field: Animal production, animal nutrition and breeding, selection</p>

4. Co-Author

	Beisen Bayar beisenbayar@gmail.com
	<p>Ph.D in Veterinary Science</p> <p>Work: Scientific secretary, Research Institute of Animal Husbandry, Ulaanbaatar, Mongolia</p> <p>Work field: Animal production, animal nutrition and physiology, biotechnology, animal medicine</p>