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ORIGINAL RESEARCH ARTICLE



Features of small holder goat farming from Chitwan district of Bagmati province in Nepal

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ABSTRACT

An assessment was done to analyze the status of small scale goat production system in Chitwan, Nepal. A semi-structured questionnaire having both open ended and close ended questions were interviewed to 147 farmers (69 males, 78 females). The average goat holding was 5.48 ± 0.15 head with female: male ratio of 6: 5. Mainly women folks in the household were involved in husbandry of the raised goats. In this research, we realized that goats were a valuable commodity for the community in the survey area. Grazing in public forest, fallow lands, tree leaves, shrubs and bushes were the main sources of feed for goats throughout the year. When inquired about vaccination, 92.51% of the farmers did not vaccinate their goats and were not aware about its importance. The high index obtained was for health care constraints, followed by feeding constraints, breeding constraints, miscellaneous and marketing constraints. The findings of this survey are not very encouraging as even from one of the developed parts of the country, small scale farmers raising goats seem to be struggling both in terms of technical and logistic inputs. There is need of awareness on improved care and management practices of goat.

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INTRODUCTION

Livestock raising is a vital part of the agricultural system and in developing countries they mainly focus on small scale farms and farmers (McDermott *et al.*, 2010). Rearing small ruminants contributes to the way of living of the farmers even under challenging environmental circumstances such as high temperature, scarce rainfall, poor soil fertility, rough and remote terrains where crop cultivation is challenging (Akinmoladun *et al.*, 2019). Being multi-utility animals, sheep (*Ovis aries*) and goats (*Capra hircus*) are preferred choices as they play the main role in the economy and nutrition of landless, small and marginal farmers. Raising small ruminants like goat and sheep for backyard farming or for commercial scale is cheaper and easier to manage than other livestock animals (JICA, 2020). No wonder, goats are called the "poor man's cow" and dairy goats are also becoming popular.

Nepal located in the central Himalayas and surrounding foothills have always had a healthy population of goats. In 2018/19, it was estimated to have over 12.28 million heads (MOAD, 2020). In spite of the numbers, Nepal relies heavily on all year round supply of meat purpose goat from India and seasonal imports from Tibet. Their broad feeding habits, small size, capacity to adapt under unfavourable environment, low maintenance cost, diverse utility, short gestation period and multiple offsprings at a time makes goat have comparative advantage over another animals (Degen, 2007; Misra and Singh, 2002; Silanikove, 2000; Neupane *et al.*, 2018). Goats can convert household, industrial waste, crop- residues and other by-products from farms (spoiled grains and vegetables) into high value protein (Lebbie, 2004). They contribute to nutritional security as their meat is highly preferred by the majority of the people (Poudel, 2018). In Nepal, goats are generally reared for their meat, hide,

fibre and manure while milking is not abundantly practiced. Goat meat contributes the second most preferred meat holding (20.69%) following buffalo meat (52.80%) in national meat production (MOAD, 2020). Farmers generally face the problem of poor performance of the goat in small scale production. According to Devkota *et al.* (2000), the poor performance might be due to inbreeding and negative selection. In addition to this, farmers are not able to gain optimum profit due to low nutritional feed, poor husbandry practice and disease control (Bhatta *et al.*, 2018). Some development organizations have continuously pursued supporting economically, socially and gender marginalized communities by providing goats through various schemes.

The prime objective of this study was to assess the status of goat farming in Chitwan as it plays a vital role to their economy and nutrition. This study will be helpful assets to make a suitable strategy for goat rearing farmers to overcome challenges faced by them as this research provides synthesized and comprehensive information of the small scale goat production.

MATERIALS AND METHODS

Study area

Chitwan District is one of 77 districts located in the southwestern part of Bagmati Province being Bharatpur as its headquarter. It borders with six other districts (Nawalparasi, Tanahun, Gorkha, Dhading, Makwanpur & Parsa) of Nepal along with India in the

Southern border and covers an area of 2,238.39 km². Chitwan is rich in various flora and fauna. Chitwan National park which is the first national park of Nepal together with the adjacent Parsa National Park, have a number of diverse species (Wikipedia, 2020). It is characterized by a tropical monsoon climate with high humidity. Here, the monsoon starts in mid-June and ceases off in late September. The average annual rainfall in Chitwan is 1700 mm. It has an average maximum temperature of 27°C to 30°C and minimum of 10°C to 15°C (CBS, 2018). This study was done in various places of Chitwan district having similar climatic conditions. The map of Nepal showing Chitwan District (study area) and table showing coordinates of study area are shown in Figure 1 and Table 1, respectively.

Data collection

In order to obtain primary data two sets of interview schedules were prepared for collection of necessary information from small scale goat farmers and another set to collect information from key informants. Different variables of goat farming were identified. A total of 147 small scale goat farmers, 52 from Bharatpur Metropolitan city, 25 from Ratnanagar Municipality, 40 from Khairahani Municipality and 30 from Madi Municipality were selected. Selection of the farmer was biased with the requirement of raising a minimum of 3 goats and rearing experience of at least 3 years. The sample size was different due to imposed lockdown to combat risk of COVID- 19. The study was done from July to August, 2020 to the farmers in the study area.

Table 1. Area of the current study and their coordinates.

S.N.	Name of place	Coordinates	Area of study
1	Bharatpur Metropolitan City	27° 40'59"N 84° 25'59"E	Meghauri, Jitpur, Rampur, Kalyanpur and Bharatpur
2	Ratnanagar Municipality	27° 37'8"N 84° 30'58"E	Pidauria Village and Sauraha
3	Khairahani Municipality	27° 34'16"N 84° 34'16"E	Khairahani Ward no. 1,2,4,9
4	Madi Municipality	27° 27'19"N 84° 19'06"E	Kirtanpur, Devendrapur, Jaganathpur and Shitalpur

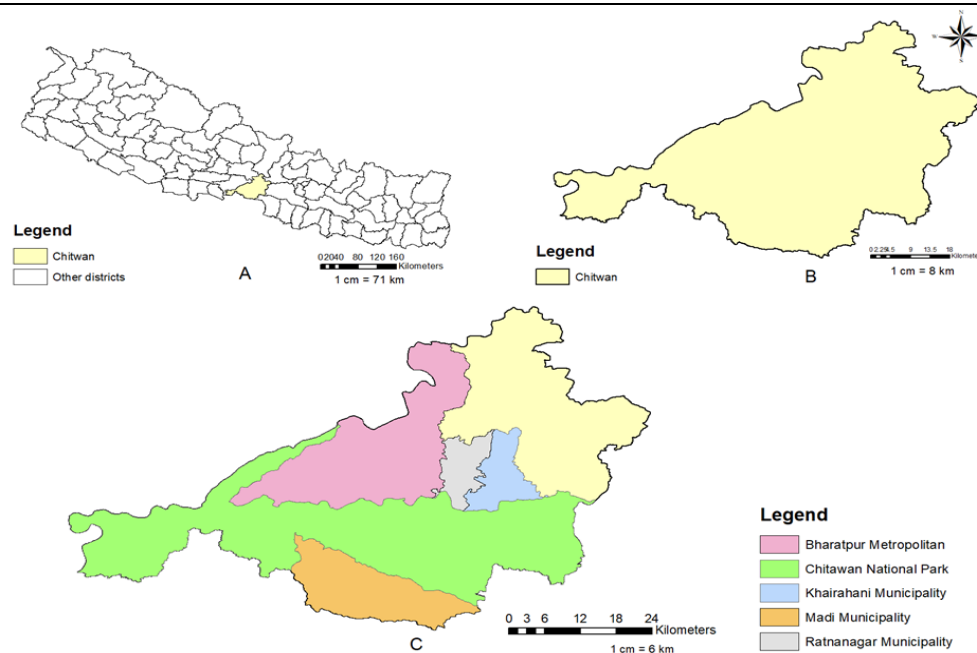


Figure 1. The recently updated map of Nepal showing Chitwan district with yellow colour. Figure 1(B): Map of Chitwan District; Figure 1(C): Different coloured region (Pink, Blue, Orange and Grey) represents the study area.

A semi-structured questionnaire having both open ended and close ended questions consisting of various aspects of goat farming were used. The questionnaires were pre-tested to 15 respondents before the survey to make necessary changes in questionnaires. Focus group discussion was also conducted to verify the data obtained and also to gather small holder's perception regarding goat farming in Chitwan. In order to make the paper more informative and comprehensive, secondary data were also used which were extracted from different journal articles, proceedings, conference papers, reports, and websites.

Statistical analysis

Data entry and data analysis were performed using Statistical Package for Social Sciences (SPSS Ver. 23). For bar diagrams, MS Excel Ver. 2016 was used. Index formula was used to know the priority of different variables. It was used by Kosgey (2004) and followed by Getachew (2008).

$$\text{Index formula} = \frac{\text{sum of (3 for rank 1 + 2 for rank 2 + 1 for rank 3) for i variable}}{\text{sum of (3 for rank 1 + 2 for rank 2 + 1 for rank 3) for all variables}}$$

The map of Nepal showing the study area was prepared using Arc GIS Desktop Ver. 10.8.

Flock structure

The flock structure is divided into various divisions like potential breeding female (those which have given birth and are fertile); rearing female (those which have not given birth); suckling female (newly born female); potential breeding male (those capable of using in mating); rearing male (those which are not capable of using in breeding); castrated male (one which is castrated) and suckling male (newly born male).

RESULTS AND DISCUSSION

Demographics characteristics

Among the sampled farmers, 53.1% were male and 46.9% were female. On an average, the respondent age was 45.69 ± 0.89 year which ranged from 24 to 75 year. Aadibashi and Janajati (45.6%) were found to be dominant over Brahmin (38.1%), Chhetri (8.2%) and Dalit (8.1%). The literacy rate was found to be 70.7% and 29.3% were illiterate. Primary source of income for families was agriculture (51%) followed by remittance (27.9%), business (7.5%), government service (6.8%) and 6.8% people involved in other types of work like labour, driving and so on. From the survey it was found that 67.3% were a patriarchal family and 32.7% were a matriarchal family. The average family size was found to be 5.56 ± 0.16 . The details of demographic characteristics of respondents are shown in Table 2.

Livestock distribution

The importance of livestock to the production system is indicated in our study. Livestock was the important source of farm incomes to support the livelihood of farmers. The majority (83%) of the households surveyed kept any livestock like buffalo, cow, poultry, duck with goats as they provide multiple socio-economic benefits such as milk, manure, meat, draught power, sale and cultural needs. The number of households and their number of domestic animals in the study area is shown in Table 3. There were 98 (66.66%) households having a total of 148 buffaloes, 35 (23.81%) households having a total of 61 cows, 57 (38.77%) households kept a total of 661 poultry and 11 (7.48%) households kept 125 ducks. Dawadi (2016) found 57.8% households reared buffalos, while 35% households used to have cows, 57% families had chicken in their home and only 15% families had duck in their home in Chitwan.

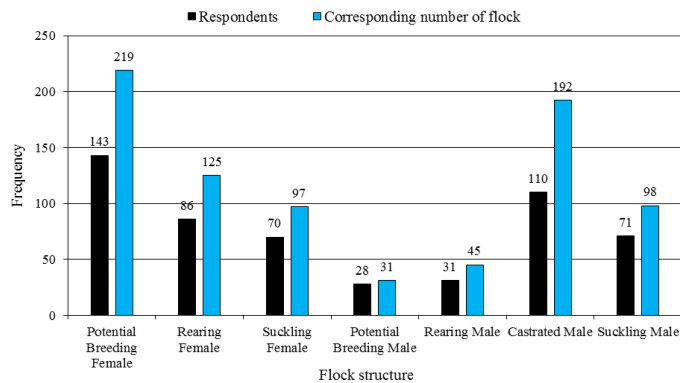
Table 2. Demographic characteristics of respondents in Chitwan, Nepal.

Descriptions		Percentage
Gender	Male	53.1%
	Female	46.9%
Age group	Up to 40 years	36.05%
	41-50 years	36.73%
	>50 years	27.22%
Ethnicity	Brahmin	38.1%
	Chhetri	8.2%
	Aadibashi and Janajati	45.6%
	Dalit	8.1%
Education	Illiterate	29.3%
	Read and write	56.5%
	Secondary	10.2%
	Higher secondary and above	4.0%
Family head	Male	67.3%
	Female	32.7%
Primary occupation	Agriculture	51%
	Business	7.5%
	Government service	6.8%
	Remittance	27.9%
	Others	6.8%
Average family size	Mean \pm SEM	5.56 ± 0.16 number of individual

Source: Field survey, 2020.

Table 3. Number of households with their domestic animals in the study area.

Livestock	Number of respondents	Total number of livestock
Buffalo	98	148
Cow	35	61
Poultry	57	661
Duck	11	125
Goat	147	807

**Figure 2.** Goat flock structure in Chitwan district, Nepal.

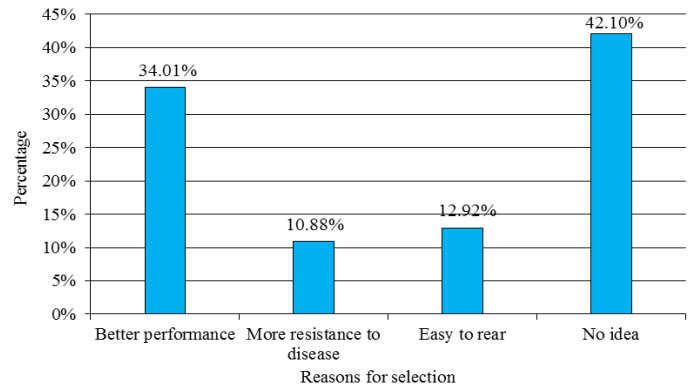
Flock characteristics

The flock structure directly influences the management practices. Only 17% of respondents kept goats exclusively. The female: male ratio was 6: 5. The average flock size was found to be 5.48 ± 0.15 (Mean \pm SE) goats per household with a maximum of 15. The average flock size was similar to findings in Kaski District by Redding *et al.* (2012) whereas Nepali *et al.* (2010) reported that farmers raised an average of 4 goats in Syangja district. Details on goat flock structure is shown in Figure 2.

Figure 2 shows the goat flock structure in Chitwan district. The black and blue color depicts the number of households and their total number of rearing particular flock types, respectively. During the study we found that 143 families were rearing 219 potential breeding female goats. Similarly, 86 families have 125 rearing females, 70 families have 97 suckling females, 28 families have 31 potential breeding males, 31 families have 45 rearing male, 110 families have 192 castrated males and 71 families have 98 suckling males (Figure 2). The percentage distributions of reasons for selecting reared breeds by the farmer are shown in Figure 3. Majority of the respondents were unknown about the breed of goat they were rearing. The figure shows that 42.10% of the people did not have any idea why they were raising that breed whereas 34.01% of respondents reared the breed because of its better performance. Similarly, 12.92% of respondents thought they were easy to rear and 10.88% found it to be more resistant to disease.

Purposes of keeping goats

The purpose of keeping goats by farmers with its index and their ranking accordingly is presented in Table 4. The reasons for keeping goats were rational and also associated with the

**Figure 3.** Reason behind selection of reared goat breed in Chitwan, Nepal.

farmer's needs in the short term or long term. The results indicated that the relative importance related to income earning was indexed high followed by a sense of emergency financial security with an index of 0.295 and 0.233, respectively. Similarly, they were followed by the purpose of ceremonies, household meat and other purposes (manure, sacrifice, companionship etc.), respectively (Table 4).

Status of goat milk consumption

Hygienically produced goat milk is believed to have medicinal and nutritional value (Kebede *et al.*, 2012) but no evidence of milking goats was reported in the study area. This might be due to non-availability of suitable milking breeds. Also, the majority of respondents didn't like the taste of goat milk and its products as it was not a part of their traditional diet. Few respondents carried out milking only when the kids of the doe died or the milk was excess for the kids. Shrestha *et al.* (2020) found that only few respondents consume goat milk infrequently as a part of the family diet in eastern Chitwan.

Housing practices

Goat rearing is a dynamic farming, for which significant care is needed from housing, feeding to breeding practices. Stall-feeding and partly grazing the goat for some time was found in the study area which is also reported by HVAP (2017). Mainly women folks were involved in the roles like care of sick animals, carrying fodder, taking animals for grazing and cleaning the barn similar to the findings in Dhading district (Sapkota *et al.*, 2017). Fencing was practiced for the purposes of easy handling and protecting them from predators like jackals, dogs, etc. by using locally available materials. The use of locally available materials helps in reduction of cost of production (Acharya *et al.*, 2017).

Table 4. Purposes of keeping goats by small scale goat raisers of Chitwan valley. The priority ranking being universal is to support family by making best use of limited resources and time.

Reason for rearing goat	Index	Ranking
Regular cash income	0.295	I
Emergency financial security	0.233	II
Ceremonies	0.21	III
Household meat	0.16	IV
Others (manure, sacrifice, etc.)	0.102	V

Table 5. Selection criteria for breeding bucks with rank, the basis being experience sharing, information extended by government agencies, veterinarians and large scale farmers.

Characters	Index	Ranking
Body Size	0.323	I
Pedigree	0.264	II
Growth rate	0.259	III
Colour	0.154	IV

Table 6. Selection criteria for does with their rank.

Characters	Index	Ranking
Twinning ability/ Multiple birth	0.338	I
Pedigree	0.251	II
Kidding interval	0.238	III
Colour	0.173	IV

Kids and its management practices

61.90% of HH kept new born kids separately in family houses during night for the first month separating them from does and the rest of the flock, until they became able to graze properly so as to reduce risk of injury and death. Kids are at high risk of death and injury if they are not separated from adult animals due to contamination of the environment of neonates and accidents (Sharif et al., 2005).

Feed and feeding management practices

The farmers are attracted towards the goat production as the goat has the ability to thrive even in the inadequate food supply and better performance (Abraham, 2015). It was reported that the natural vegetation including the tree leaves, bushes, shrubs, crop residue and forage available in the public areas were the chief source of feed for the goat. All the households were found using their own land for forage whereas 38.09% of respondents also got forage from nearby public forest. There was a shortage of natural feed during the dry season of the year in the study area. Commercial concentrate feed was regularly adopted by 65.30% of respondents whereas 31.97% of respondents did not continue using it due to its high price. Some of the respondents infrequently used it. Occasionally different household's left over and grains were provided to goats. Farmers did not have any idea about feed formulation at local level. They had no special knowledge and had not followed any practices to feed according to age and need. Common salt was normally given to all types of goats both in dry and wet seasons by mixing with commercial concentrate feed and water. Regular grazing of goats was also reported among 48.29% respondents in the study. The average grazing hour per day was 4.60 ± 1.27 hour with a maximum of 7 hours and minimum of 2 hours. The findings were similar with

the findings of Ghimire (2013). Ghimire (1992) reported that lack of enough area for grazing and condensed cropping intensity were major reasons for shorter grazing time.

Breeding practices of goats

In the study area, it was found only 19.05% of respondents have their own buck in the flock whereas the remaining 80.95% of the respondents used the breeding buck of neighbours or other nearby available bucks. The average litter size was found to be 1.48 ± 0.05 whereas the average number of breeding attempts was found to be 1.32 ± 0.04 with a maximum of 3 times by natural mating. Natural mating was carried randomly in the field or in a herd. Idea of artificial insemination in goats was not known to 93.19% of respondents.

The selection criteria for breeding bucks with their index and ranking are shown in Table 5. Body size and pedigree were frequently used characters for selection of breeding bucks with index scores of 0.323 and 0.264, respectively. Whereas, they were followed by character like growth rate and colour. The selection criteria for breeding does with their index and their ranking is shown in Table 6. Does giving multiple births were more favoured with a high index 0.338 by farmers as it also contributes more income to farmers in return. Similarly, other characters like pedigree, kidding interval and colour were also criteria for selection of doe with index of 0.251, 0.238 and 0.173, respectively.

Castration and hoof trimming

Castration was not new to the farmers and was practiced by almost all respondents (100%) when a newly born male was less than 3 months. Majority of them did it for improved meat. Only 4.76% of respondents stated that they carried out hoof trimming.

Table 7. Ranking of potential production constraints of goats in study area.

Constraints	Index	Ranking
Health care constraints	0.337	I
Feeding constraints	0.315	II
Breeding constraints	0.277	III
Miscellaneous constraints	0.066	IV
Marketing constraints	0.005	V

Deworming, ectoparasite management and culling of goats

Deworming was one of the routine management practices for the majority of respondents. Hand dressing (87.07%) was a commonly used method of application of anti-tick medicine while the rest of respondents used sprayer. Farmers only used it after intense tick infestation. 92.51% of respondents did culling of unproductive animals after fertility failure of doe whereas 7.49% respondent stated that they reared doe till it passed away.

Occurrence of disease and health care practices

Health care practices are an indispensable part for successful goat production. Almost all respondents had access to veterinary services from government extension officers or private veterinary practitioners. The common problems as reported by respondents were parasitic disease, digestive disorders, general debility, urogenital disease whereas PPR was seen only at some places in the past. Digestive disorder might be due to overfeeding of feedstuff, helminthes, coccidian parasites, and use of unclean water (Khakural, 2003). Unlike our study, PPR was the major disease of Khari goats in Dhading district (Sapkota *et al.*, 2016). Many diseases are not reported unless there is a serious epidemic. So, Community-based animal health camps can be one way forward that can be carried out (Njoro, 2001). Majority (92.51%) of the farmers did not vaccinate their goats and were not aware about vaccines that a goat should be vaccinated with. Acharya *et al.* (2017) reported that a massive vaccination program against PPR and foot rot has been organized by the government twice a year but the majority of respondents didn't get this free service from the government. There was a wide application of the ethno veterinary practice to flock for minor ailments detected before taking to a veterinarian which was also similar to findings of Dhakal *et al.* (2021). After the death of animals, the majority of smallholder farmers disposed of the dead body by digging graves in their backyard. Few of them were disposed of to nearby forest.

Constraints

The major factors that hinder the success of goat production is reported in Table 7. Disease of small ruminants was the major production constraint with an index of 0.337. Health is a key factor limiting productivity of goats. This was followed by feed and breeding constraints with index of 0.315 and 0.277, respectively. The non-availability of good breeding stock, high price of feed and fodder are major ones. The Government of Nepal is

trying to address these constraints through various schemes but small scale farmers rarely get to reap the benefit. Nepali *et al.* (2007) reported that feeding and health facilities related constraints were major ones which were similar to our study. Inbreeding was found to be the major problem for goats in Kaski district (Redding *et al.*, 2012). Repeated breeding might be due to lack of knowledge regarding goat seasonal poly-oestrous characteristics. Miscellaneous constraints such as theft, predators, road injuries, etc. were also reported. Goats were attacked by wild animals and street dogs. Nepali *et al.* (2007) also reported a similar case of attack of wild animals in Arghakhachi, Lamjung and Myagdi district. Market constraints was ranked last indicating less market problem for goat selling of smallholder goat farmers.

Marketing system

A newly born kid becomes ready to be sold with an attainment of average weight of 20-25 kg and they were marketed through different channels. The majority of farmers sold it to the local meat sellers whereas other dimensions are household consumption, community kitchen, middle-man or religious offerings. It was similar with findings of Nepali *et al.* (2007) in Western Nepal. It was found that people try to make their goat ready at the time of festivals like Dashain, Tihar, Maghe Sankranti, etc. as there is huge demand for meat at this time so as to get maximum profit. Moreover, goats are exported to nearby big cities like Bharatpur, Hetauda and to big markets of capital Kathmandu with the help of middle-people. The marketing pattern was similar to the findings of Dawadi (2016). Unproductive does with reproductive failure were sold to the butcher. According to Nepali *et al.* (2014), farmers were heavily dependent on middlemen to sell their goats in western hills of Nepal but there was not any problem of marketing in our study due to the increment in the demand of goat meat, ease of transportation facilities and access to good roads.

Conclusion

The findings of this survey are not very encouraging as raising goats seem to be struggling both in terms of technical and logistic inputs. There is a clear indication that the major constraint in our study area is health care constraints. Only few are acquainted with the knowledge of zoonotic disease in goats. So, there is a great need to aware and improvise about the improved care and management practices of the goat. Strategic

plans and policies should be executed from the government level as the majority of farmers are liable to extend their goat rearing if they are provided with the incentives. If we are to achieve the sustainable development goals (SDGs) by 2030, there is an urgent need to focus on all spectrum of farming practices by the majority Nepalese who associate their livelihood in farming activities. Thus, based on the findings of present study, the government should work together with farmers for improvement of the traditional production system by introducing new breeds of goats.

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Conflict of interest

All the authors declare no conflict of interest.

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REFERENCES

- Abraham, F. (2015). Characteristics of Traditional Small Ruminant Production and Management in Awbare District of Ethiopian Somali Regional State. *Journal of Animal Production Advances*, 5: 697–704, <https://doi.org/10.5455/japa.20150626043822>
- Acharya, R. G., Sapkota, S., Sanjyal, S., & Bhattacharai, N. (2017). Sustainable Goat Farming for Livelihood Improvement in South Asia. *Sustainable Goat Farming for Livelihood Improvement in South Asia*, 69–98.
- Akinmoladun, O. F., Muchenje, V., & Fon, F. N. (2019). Small ruminants: Farmers' hope in a world threatened by water scarcity. *Animals*, 9(7), 456, <https://doi.org/10.3390/ani9070456>
- Bhatta, B., Kaphle, K., & Yadav, K. (2018). Situation of Livestock, Production and its Products in Nepal. *Archives of Veterinary Science and Medicine*, 1(1): 1–8. <https://doi.org/10.26502/avsm.001>
- CBS. (2018). *District Profile of Chitwan*. <https://cbs.gov.np/wp-content/uploads/2018/12/District-Profile-of-Chitwan-2074-Book-1.pdf>
- Dawadi, S. D. (2016). Problems and prospects of small scale commercial goat farming: a study of jagatpur vdc, Chitwan District. Tribhuvan University, Kathmandu.
- Degen, A. A. (2007). Sheep and goat milk in pastoral societies. *Small Ruminant Research*, 68 (1-2): 7–19, <https://doi.org/10.1016/j.smallrumres.2006.09.020>
- Devkota, N. R., Ravnay, G. E., Kolachhapati, M. R., & Timsina, J. (2000). Production problems and potentials of livestock sub-system in the Makalu Barun conservation area of eastern Nepal: A system analysis. 16th Symposium of the International L. Fanning Systems Association and 4th Latin American Farming Systems Research and Extension Symposia. Santiago.
- Dhakal, A., Khanal, S., & Pandey, M. (2021). Ethnoveterinary practice of medicinal plants in Chhatradev Rural Municipality, Arghakhanchi District of Western Nepal. *Nusantara Bioscience*, 13(1): 29-40, <https://doi.org/10.13057/nusbiosci/n130105>
- Getachew, M. T. (2008). Characterization of Menz and Afar Indegenous sheep breeds of smallholders and pastoralists for designing community-based breeding strategies in Ethiopia (Issue October). Haramaya University.
- Ghimire, R. P. (2013). Fodder Management Strategies and their challenges for commercial goat production in Nepal: Potentials and challenges. *National Workshop on Research & Development Strategies for Goat Enterprises in Nepal*, 24–41, <https://doi.org/10.13140/RG.2.1.1024.4006>
- Ghimire, S. (1992). The role of small ruminants. Sustainable Livestock Production in the Mountain Agro-ecosystem of Nepal. Food and Agriculture Organisation of the United Nations. <http://www.fao.org/DOCREP/004/T0706E/T0706E05.htm>
- HVAP. (2011). A Report on Value Chain Analysis of Goat. High Value Agriculture Project in Hill and Mountain Areas (HVAP). <https://ansab.org.np/storage/product/hvap-vca-report-goat-1579684999.pdf>
- JICA. (2020). Goat Farming Technical Manual. District Livestock Service Office, Gorkha https://www.jica.go.jp/nepal/english/office/others/c8h0vm000bjww96-att/tm_7.pdf
- Kebede, T., Haile, A., & Dadi, H. (2012). Smallholder goat breeding and flock management practices in the central rift valley of Ethiopia. *Tropical Animal Health and Production*, 44(5): 999–1006, <https://doi.org/10.1007/s11250-011-0033-9>
- Khakural, G. P. (2003). Surveillance of Goat Diseases in the Western Hills of Nepal. *Nepal Journal of Science and Technology*, 5(1): 37–40, <http://www.nast.org.np/njst/index.php/njst/article/view/125/92>
- Kosgey, I. S. (2004). Breeding objectives and breeding strategies for small ruminants in the tropics. In Ph.D. Thesis. Wageningen University, The Netherlands. Wageningen University.
- Lebbie, S. H. B. (2004). Goats under household conditions. *Small Ruminant Research*, 51(2): 131–136, <https://doi.org/10.1016/j.smallrumres.2003.08.015>
- McDermott, J. J., Staal, S. J., Freeman, H. A., Herrero, M., & Van de Steeg, J. A. (2010). Sustaining intensification of smallholder livestock systems in the tropics. *Livestock Science*, 130: 95–109, <https://doi.org/10.1016/j.livsci.2010.02.014>
- Misra, A. K., & Singh, K. (2002). Effect of water deprivation on dry matter intake, nutrient utilization and metabolic water production in goats under semi-arid zone of India. *Small Ruminant Research*, 46(2-3): 159–165, [https://doi.org/10.1016/S0921-4488\(02\)00187-6](https://doi.org/10.1016/S0921-4488(02)00187-6)
- MOAD. (2020). Statistical information on Nepalese Agriculture 2075/76 (2018/19) http://doanepal.gov.np/downloadfile/Statistical%20information%20on%20Nepalese%20agriculture_1601976502.pdf
- Nepali, Megh B, Gautam, S., Poudel, H. P., & Dhakal, K. (2007). Goat Production and Marketing Constraints to Goats in the Western Hills of Nepal. *Nepal Journal of Science and Technology*, 8(1): 53–61.
- Nepali, Megh B, Sapkota, S., Upreti, S., Pokhrel, B. R., Sharma, B., Devkota, H. P., & Amatya, S. M. (2010). Adoption of Goat Production Technology at the Farm Level: A Case of Krishnagandaki VDC, Shyangja District. *Nepal Journal of Science and Technology*, 11: 79–82, <https://doi.org/10.3126/njst.v11i0.4127>
- Nepali, Megh B., Tiwari, M. R., Sapkota, S., Poudel, H. P., Acharya, B. R., & Gautam, S. (2014). Marketing Constraints to Goats in the Western Hill of Nepal. *Nepal Agriculture Research Journal*, 8: 95–102, <https://doi.org/10.3126/narj.v8i0.11601>
- Neupane, N., Neupane, H., Dhital, B. (2018). A socioeconomic view of status and prospects of goat farming in rural areas of nepal. *Journal of the Institute of Agriculture and Animal Science*, 35(1): 1–8, <https://doi.org/https://doi.org/10.3126/jjaas.v35i1.22508>
- Njoro, J. N. (2001). Community initiatives in livestock improvement: the case of Kathekani Kenya. Community-Based Management of Animal Genetic Resources, 77–84.
- Poudel, D. (2018). Goat Meat Industry in Nepal: Opportunities and Challenges. *Biruwa*. <http://biruwa.net/2018/03/goat-meat-industry-nepal-opportunities-challenges/>
- Redding, L., Chetri, D. K., Lamichhane, D. K., Chay, Y., Aldinger, L., & Ferguson, J. (2012). Animal production systems of small farms in the Kaski district of Nepal. *Tropical Animal Health and Production*, 44(7): 1605–1613, <https://doi.org/10.1007/s11250-012-0114-4>
- Sapkota, S., Kolakshyapati, M., Gairhe, S., Upadhyay, N., & Acharya, Y. (2016). Boer Goat Production Performance, Constraints and Opportunities in Nepal. *Imperial Journal of Interdisciplinary Research*, 2(12): 491–495, <https://doi.org/10.5281/zenodo.1183837>
- Sapkota, S., Gairhe, S., Kolakshyapati, M., Upadhaya, N., Acharya, Y., & Ghimire, Y. (2017). Role of women in goat farming in mid-hills of Nepal. *10th National Workshop on Livestock and Fisheries Research in Nepal*, 351–354.
- Sharif, L., Obeidat, J., & Al-Ani, F. (2005). Risk factors for lamb and kid mortality in sheep and goat farms in Jordan. *Bulgarian Journal of Veterinary Medicine*, 8(2): 99–108.

Shrestha, R., Ghimire, R., & Bhattarai, N. (2020). Study of farmer's attitude and consent towards consumption of goat milk and milk product in eastern Chitwan, Nepal. *International Journal of Veterinary Sciences and Animal Husbandry*, 5(3): 17-20.

Silanikove, N. (2000). The physiological basis of adaptation in goats to harsh environments. *Small Ruminant Research*, 35(3): 181-193, [https://doi.org/10.1016/S0921-4488\(99\)00096-6](https://doi.org/10.1016/S0921-4488(99)00096-6)
Wikipedia. (2020). Chitwan District. https://en.wikipedia.org/wiki/Chitwan_District