



## Assessment of consumers' preference and willingness to pay for Boer cross goat Chevon in Nepal

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### ABSTRACT

Domestic production of chevon does not yet meet the national demand. Efforts are being carried out since last decade to increase the goat production or so to introduce and adopt a high chevon yielding Boer goat in farming practices in Nepal. Recent research findings have demonstrated that farming practices of Boer goat is well adoptable along with the marketing potentiality of Boer goat in Nepal. A total of 120 respondents selected randomly for the sensory analysis experiment and were interviewed. Two male goats, Boer cross (50% Boer blood) and Khari (100% local goat), of the same age were slaughtered. Shredded chevon from the goat's shoulder after cooking was used for organoleptic taste. As per consumer's response, Boer goat chevon was found to have higher tenderness and juiciness than Khari, while Khari was found to have a better flavor than Boer. Two thirds of the consumers preferred Boer goat chevon in terms of overall satisfaction compared to Khari. The rank-ordered logit regression revealed that tenderness has a positive and significant influence ( $p < 0.01$ ) in contrast, flavor has a negative ( $p < 0.01$ ) on consumers' decision to choose Boer goat chevon. Flavor of the Khari goat chevon was found to be an important taste attribute in favor of the Khari goat. The increasing demand of goat meat in Nepal showed the opportunity for the farmers to obtain higher Chevon production by rearing Boer goat, which has a faster growth rate and higher body weight than Khari.

**Keywords:** Boer, demand, goat meat, organoleptic taste, willingness to pay

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### INTRODUCTION

The goat (*Capra hircus*) is a small ruminant that has been closely associated with human livelihoods. Goats are generally referred to as poor men's cows and play a significant role in the livelihood of agro-pastoralists and pastoralists. In Nepal, the goat population has been reported as 1,39,90,703 in the year 2021/22, while goat meat (Chevon) consumption has been reported to be 74,241 mt. Moreover, the number of live goats imported in Nepal in the year 2021/22 has been reported to be 50,787, with an import value of NRs.45,47,38,000. In terms of consumption, chevon is the second most consumed meat in Nepal after buffalo meat and constitutes for a quarter of all meat consumed despite the highest cost per unit weight.

Domestic production of chevon in Nepal does not meet this demand, and the country imports goats from neighboring countries (MOALD 2023).

Khari is a popular and dominant indigenous breed existing across mid hill of Nepal sharing about 56% of the total goat population. This breed is one of the well-adopted in Nepal with higher prolificacy, multiple kidding abilities and carcass quality (Bhattarai et al 2019). Boer goat, which is popular for its fast growth rate as well as meat quality, has been introduced by private sector and several agencies such as in 2012 by Agriculture Food Security Project (AFSP 2016) for research in Nepal Agricultural Research Council premises and to cross with local goats protecting the pure indigenous goat breeds.

Boer goats are known worldwide for their fast weight gain and meat quality is a native breed of South Africa and is developed and reared worldwide for meat purposes which possesses strong disease resistance and is adaptable to environments, prevailing in Nepalese mid hills and others (NGRP 2021). Weaning weights are high (13.5 kg) and sexually active at 7–8 months of age, with an average weight of 20 kg. Mature bucks weigh approximately 34 kg for crossbreeds (Bowman 1999). Thus, comparing to other goat breeds available in Nepal at present Boer goat has higher potential with carcasses of acceptable quality.

The adoption of the Boer goat among the farmers is substantially increasing in Nepal. It is likely that the Chevon of Boer cross goats are reaching consumers in the market soon. In such circumstances, identification of consumers' preferences and WTP is very important for the sustainability of this goat enterprise. No study has been conducted on the sensory characteristics of goat meat and the WTP for Boer cross goat meat in Nepal. Therefore, we aimed to perform empirical research and explore the marketing potentials of Boer goats in Nepal through assessment of consumer satisfaction and WTP.

## **MATERIALS AND METHODS**

### **Study sites**

Sensory analysis experiment on goat meat was conducted in three locations: Bandipur, Rampur, and Khumaltar cities, belonging to Tanahu, Chitwan, and Lalitpur Districts, respectively.

### **Data collection and sampling technique**

The respondents selected for the organoleptic taste were from the different categories (strata): service holders, business owners, university students, and the daily wage laborers. All total 120 respondents (31, 33, and 56 from Bandipur, Rampur, and Khumaltar respectively) were selected using stratified random sampling (selected 10% from the sapling frame of the respective strata). A semi-structured questionnaire was used to collect the primary information.

### **Experimental procedure**

Male goats of two different breeds, Boer cross (50% Boer blood) and Khari (100% local goat blood) of the same age (9 months) which weigh approximately 32 kg and 26 kg, respectively were slaughtered at National Goat Research Program (NGRP), Nepal Agricultural Research Council (NARC), Government of Nepal, located at Bandipur, Tanahu District of Nepal. The chevon from the slaughtered breeds were made available to the National Agricultural Policy Research Center for sensory analysis experiments. Although chevon from the entire carcass was cooked, however, only shredded chevon from the shoulder of the goat was used in the sensory analysis. The chevon was then cooked in the same cooker using same duration of cooking and identical ingredients and spices.

Respondents were allowed to taste the two cooked chevon without any identities to measure the true experience attributes: tenderness, flavor, and juiciness. This was accomplished by placing cooked chevon into two different individual bowls, labeled as squares and triangles. Cooked chevon associated with each shape were randomized across the respondents. Additionally, the participants were provided with water and unsalted crackers to cleanse their palates before tasting. Similar arrangements were performed at two experimental sites: Rampur and Khumaltar.

### **Socio-economic and demographic variables**

The survey asked several questions related to respondents' demographic and socioeconomic information. Moreover, questions relating to the choice, chevon and consumption interval, type of meat consumed, and other variables were collected and analyzed using descriptive statistics (frequency/percentage, mean, and standard deviation) in the Statistical Package for Social Sciences (SPSS).

### **Hedonics and Ranking**

Hedonics were used to measure consumer acceptability and preference for food products. It was asked to indicate the extent to which they liked the tenderness, flavor and juiciness of each chevon with rating the acceptability on a scale of 1 to 9 points, ranging from "1= dislike extremely" to "9= like extremely".

### **Rank ordered logit regression**

To test whether the Boer cross and Khari chevon rankings were statistically different, the ranking data were also analyzed using rank-ordered logit regression in the STATA program. This model assumes that the overall utility or satisfaction from any one meat can be described by the random utility model in (1), where each respondent "i" has a certain utility,  $U_{ij}$ , for every choice, "j", where  $j = 1, 2$ , and  $V_{ij}$  represents the systematic component. The random component,  $\epsilon_{ij}$ , is assumed to follow a type-II extreme value distribution.

$$(1) U_{ij} = V_{ij} + \epsilon_{ij} = \beta_0 (\text{Khari}_{ij}) + \beta_1 (\text{Boer cross}_{ij}) + \epsilon_{ij}$$

Boer cross =1, if the meat being evaluated was a Boer cross. Coefficient  $\beta_1$  is estimated using the maximum likelihood. The sign and statistical significance of the coefficient  $\beta_1$  describe the ranking of Boer cross chevon relative to Khari. For example, if  $\beta_1$  is positive and statistically significant, then Boer cross chevon tends to be ranked higher (meaning better) than Khari goat meat, on average. Another advantage of the rank-ordered logit model is that it provides an intuitive way to express rankings in terms of consumer choice.

### **Two-sample Wilcoxon rank-sum (Mann-Whitney) test**

The statistical significance of the difference in ratings (1= dislike extremely to 9= like extremely) given by the consumer respondents for three different taste attributes: tenderness, flavor, and juiciness of Boer cross and Khari chevon were tested using the Two-sample Wilcoxon rank-sum (Mann-Whitney) test in the STATA software.

### **Willingness to Pay**

The willingness to pay for boar cross chevon was estimated using a direct referendum question. A direct question was asked to the respondents "What premium price are you willing to pay for Boer cross goat meat"?

## RESULTS

### Description of the socio-economic and demographic variables

Descriptive statistics such as mean and standard deviation were estimated for continuous variables (Table 1), while frequency and percentage were estimated for categorical variables (Table 2). More than two-thirds of the respondents answered chicken as the mostly consumed meat, while nearly one-fourth answered Chevon (goat meat). More than three-quarters of the consumers were found to prefer freshly slaughtered Chevons over frozen ones. Moreover, majority of consumers were willing to pay premium prices for Boer cross goat meat. In addition, two-thirds of the respondents chose Boer cross goat meat as their favorite in terms of overall satisfaction (Table 2).

**Table 1.** Socio-economic and demographic characteristics (continuous variable) of the respondents (N=120)

Continuous variables	Mean	Standard deviation	Minimum	Maximum
Age of the respondent	40.73	9.43	22.00	65.00
Schooling years of the respondent	15.01	4.59	1.00	23.00
Family size of the respondent	4.85	2.02	2.00	12.00
No. of family members involved in income generating employment	2.19	1.23	1.00	8.00
Annual household income (NRs./year)	605170	220095	200000	1200000
Goat meat consumption interval(in days)	14.83	12.78	2.00	90.00
No. of family members consuming goat meat	4.21	1.82	1.00	11.00
Price of local goat meat (NRs./kg)	1236	113.09	900.00	1400.00
WTP additional premium price for Boer cross goat meat (NRs./kg)	99.19	38.61	50.00	200.00

Source: Field survey, 2023

**Table 2.** Socio-economic and demographic characteristics (categorical variables) of the respondents (N=120)

Categorical variables		Frequency	Percentage
Gender of the respondent	Male	87	72.5
	Female	33	27.5
	<b>Total</b>	<b>120</b>	<b>100</b>
Experimental site/Location	Bandipur	31	25.8
	Rampur	33	27.5
	Khumaltar	56	46.7
	<b>Total</b>	<b>120</b>	<b>100.0</b>
Profession of the respondent	Agriculture	9	7.5
	Business	2	1.7
	Daily wages	19	15.8
	Service	84	70.0
	University students	6	5.0
<b>Total</b>	<b>120</b>	<b>100.0</b>	
Major source of Household income	Agriculture	13	10.8
	Business	6	5.0
	Daily wages	9	7.5
	Government Service	1	.8
	Remittance	3	2.5
	Service	88	73.4
<b>Total</b>	<b>120</b>	<b>100.0</b>	

Mostly consumed meat	Buffalo	1	.8
	Chicken	84	70.0
	Fish	3	2.5
	Goat	29	24.2
	Pork	3	2.5
	<b>Total</b>	<b>120</b>	<b>100.0</b>
Preferred meat type	Fresh slaughtered	100	83.3
	Fresh slaughtered and frozen	13	10.8
	both		
	Frozen	7	5.9
	<b>Total</b>	<b>120</b>	<b>100.0</b>
Willing to pay premium price for Boer cross goat meat	Yes	62	51.7
	No	58	48.3
	<b>Total</b>	<b>120</b>	<b>100.0</b>
Most favorite meat	Boer cross	80	66.7
	Khari	40	33.3
	<b>Total</b>	<b>120</b>	<b>100.0</b>

Source: Field survey, 2023

**Table 3.** Categorization of the respondents willing to pay additional premium for Boer cross goat meat.

WTP* (NRs./kg)	Frequency of the respondent
<60	17 (27)
60-138	31 (50)
>138	14 (23)
Total	62 (100)

Figures in parentheses indicate percentages; \*mean 99 and s.d. 39

### Consumer's perception on Boer cross and Khari goat chevon

The Two-sample Wilcoxon rank-sum test (Mann-Whitney test) revealed a significant difference in the ratings of different attributes for Boer cross and Khari goat meat. As per the ratings given by the consumers, Boer cross chevon had significantly higher tenderness ( $p < 0.01$ ) and juiciness ( $p < 0.05$ ) compared to Khari goats, whereas Khari goat chevon reflected to have a high flavor ( $p < 0.01$ ) than Boer cross (Table 4).

**Table 4.** Consumer's rating of Boer cross and Khari goat chevon

Attributes	Observation	Rank sum	z-value	p-value	
Tenderness	Boer cross	120	15922.5		
	Khari	120	12997.5	2.882***	0.0040
	Combined	240	28920		
Flavor	Boer cross	120	13604		
	Khari	120	15316	-1.737*	0.0823
	Combined	240	28920		
Juiciness	Boer cross	120	15587		
	Khari cross	120	13333	2.202**	0.0277
	Combined	240	28920		

\*\*\* 1% level of significance; \*\* 5% level of significance; \* 10% level of significance.

### Rank ordered logit regression (LR)

The highly significant LR  $\chi^2$  value indicated that the model fit well. The rank-ordered logit regression revealed that tenderness has a positive and significant influence ( $p < 0.01$ ) on consumers' decision to choose Boer cross chevon as the favorite, while juiciness has a

positive but non-significant effect. In contrast, flavor has a negative and significant influence ( $p < 0.01$ ) on consumers' decision to choose Boer cross chevon as favorite; flavor of the Khari goat meat was found to be an important taste attribute, making it the most popular among consumers (Table 5).

**Table 5.** Boer cross chevon taste attributes

Most favourite meat ( Boer =1)	Coefficients	Standard error	Z	P>[z]
Tenderness ratings (9-like extremely, 1-dislike extremely)	.792***	.192	4.12	0.000
Flavor (9-like extremely, 1-dislike extremely)	-.437***	.166	-2.63	0.008
Juiciness (9-like extremely, 1-dislike extremely)	.297	0.192	1.55	0.121
Summary Statistics				
Number of observation(N)	120			
Log likelihood	-47.36372			
LR $\chi^2$ (3)	52.88*** (Prob> $\chi^2$ =0.0000)			

## DISCUSSION

Tenderness of meat is one of the essential attributes for consumer satisfaction (Grunert et al. 2004), while flavour is a fundamental sensory characteristic that influences the taste and influence consumer acceptance (Arshad et al 2018). The major factors influencing meat tenderness and flavour attributed to breed, age, muscle and feed quality on which the animal was fed and cooking method (Goetsch et al 2011).

In the present study we examined only three attributes: tenderness, flavour and juiciness in Boer cross and Khari goat though, there could be several other attributes to determine the consumers' preferences. The Boer cross chevon was found to have higher tenderness and juiciness than Khari while Khari was found to have a better flavor than Boer as per consumers' response (Table 4). Two thirds of the consumers preferred Boer cross chevon as their favorite in terms of overall satisfaction as compared to Khari (Table 2).

Previous research works (Keskin et al 2012; Bakhsh et al 2019; Mandolesi et al 2020; Mazhangara et al 2024) have indicated that consumers' behavior, preference, as well as their acceptability for goat meat are strongly influenced by texture, flavour, ease of cooking, juiciness, colour, and odour. Meat tenderness and flavor are the most important sensory characteristics that determine meat quality (Sanudo et al 1996; Tshabalala et al 2003). Muchenje et al (2008a) suggested that the tender meat rapidly releases the juice on chewing, and only fewer residues remain in the mouth after chewing. Several studies (Campo et al 1999; Marlinez-Cerezo et al 2005; Bureš et al 2006) have showed that goat genotypes have different organoleptic scores. Based on such organoleptic differences of different goat breeds, Esenbuga et al (2009) speculated that consumers may differentiate the goat breed on purchasing Chevons.

These could be the reasons that majority of the farmers were willing to pay an additional 5 to 11 % more price than that of Khari for Boer crossed chevon. The Willingness to Pay (WTP) for Boer cross goat meat among the consumers reflects substantial prospects at present in the slaughtered meat market. Balderjahn et al (2003) reported that WTP estimates are important for developing an optimal pricing strategy. Consumer preferences are influenced by product characteristics such as nutritive value, taste, freshness, appearance, and other sensory characteristics related to product quality of product (Makatouni 2002). Consumers' food consumption habits are seen to be diversified with the awareness of health, food safety, the environment, industrialization, and globalization of agriculture (Senauer 1994). Many

theoretical studies have shown the importance of consumer psychology for meat-related behaviours, including moral psychology, for meat purchase and consumption (De Backer and Hudders 2015). Moral consumerism includes consideration of ethical attributes, whereby consumers are willing to pay for meat products that are produced with concern for ethical attributes, including health-related, environmentally friendly, and animal-friendly attributes (Grunert et al 2018). Consumption of goat chevon also depends on consumer demographics, where factors such as religion, nationality, heritage, geographical region, and gross income (Sans and Combris 2015).

Increased domestic Chevon production would contribute to reducing the import of goats in Nepal. The number of live goats imported in Nepal in the year 2021/22 has been reported to be 50,787, and the import value was of NRs. 45,47,38,000 (MOALD 2023).

## **CONCLUSION**

Based on the present study Boer cross goat chevon had also substantial preferences probably due to higher tenderness and juiciness. Khari goat chevon was found to have a higher flavor than that of Boer cross chevon as per the consumer's response. Based on these results it can be concluded that the prospects of Boer cross goat chevon in the domestic market could be positive, even at a premium price, indicating that in general, goat chevon industry has good market potential for entrepreneurs and investors if they can capitalize on growing market demand.

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## **Authors' Contributions**

SS was the principal investigator who conceptualized the research design and performed data analysis and manuscript preparation tasks. KPT and RK verified the analytical methods, provided critical feedback on the manuscript, and were responsible for the field study along with SS. All authors jointly discussed the results and contributed to the final version of the manuscript.

## **Conflicts of Interest**

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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