



Determinants of market value of goats in Afghanistan

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ABSTRACT

An attempt was made to identify factors influencing goat production and marketing which is at subsistence level in crop-livestock production system and to scale it up to commercial level in Nangarhar and Baghlan provinces of Afghanistan. Data were collected from 240 goat producers that were randomly selected in equal proportions for rainfed and irrigated systems from 24 villages in 4 districts of target provinces. Results from the double-log linear regression model used for both meat and dairy goats indicated that age of goat and production system were significantly influencing meat goats while in case of dairy goats, these factors were non-significant but positive. However, some common determinants were live weight of goat, place of marketing, source of market information and location of goat producers. The study enables goat producers to plan their goat sales with higher incomes and reinforce their motivation to scale up production.

Key words: Afghanistan, Determinants, Goat production, Market prices

With a national herd of 7.3 million goats and an average holding size of 2.4 animals (FAO Livestock census 2003), goats are an essential element in the farming systems and the livelihoods (income from live meat and dairy goat sales) of rural communities in Afghanistan (Srinivas *et al.* 2013, 2014). The price agreed by producers and buyers depends on the goat producers knowledge of factors of market supply and demand, skills in assessing animal condition and weight, as goats are not weighed before purchase (Bett *et al.* 2011); and knowledge of different attributes of goats preferred by different buyers (Francis 1990). Knowledge of bio-economic traits of goats and its relationship with pricing of live goats is the main pre requisite for designing an efficient pricing policy (Pati and Rao 2006). It is necessary to understand factors influencing market price of goats that can be used by goat producers in formulating better strategies for production and marketing of goats especially in countries like Afghanistan with poorly developed market intelligence system.

This study was conducted to evaluate the factors that determine market price of goats in Baghlan and Nangarhar provinces having 3.28 and 3.24% of total goats in the country with 1.75 and 2.2 goats/family, respectively. This information provides important insights into how producers' can better tailor their goat sales to increase profitability. The hypothesis of this study was that market value of goats

is influenced by different attributes of goats and by farmer access to information networks. The specific objective was to identify different factors influencing goat market price.

MATERIALS AND METHODS

Goat producers (240) were randomly selected in equal proportions for rainfed and irrigated systems from 24 villages in 4 districts in Baghlan (Baghlan-e-Sannhati and Pul-I-Kumiri) and Nangarhar (Dar-e-Noor and Achin) provinces. The districts were purposively selected in order to represent areas where development activities such as improving the skills and knowledge of rural women in raising dairy goats, processing and marketing surplus products and improving the use of natural resources and their access to technologies under the "Goats for Women Project". The International Centre for Agricultural Research in the Dry Areas (ICARDA) has been implementing International Fund for Agricultural Development (IFAD)-co-funded research programme "Rehabilitation of Agricultural Livelihoods of Women in Marginal and Post-conflict Areas of Afghanistan" in Nangarhar and Baghlan provinces of Afghanistan.¹ were implemented and to include others without project activities (Achin district). Six villages from each district and 10 households from each village were selected randomly.

Data on biological and economic traits of goats (live weight, sex, age, breed), their market price, time of marketing (to capture demand during festival season), location of market place of the latest live goat transactions, and access to market network of the goat producer in different production system during 2009 were collected

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from goat producers using a structured questionnaire. In the absence of any records on goat transactions, producers were asked to give prices they received for their goats during their latest goat transactions. It was observed from the data recorded that there were 192 goat producers who sold only meat goats, 30 goat producers who sold only dairy goats and 18 goat producers who sold both meat and dairy goats. Thus, there were 210 meat goats and 48 dairy goats sold in the market by the goat producers. Therefore, two models were developed to identify the determinants of market value of meat goats and dairy goats separately.

Double-log linear regression model: Market price of goats depends on the purpose for which goat was transacted. Determinants of the market value of meat goat and that of dairy goat are likely to be different. Biological (breed, sex, kidding rate) and economic traits of goats (live weight, age, milk productivity), socio-economic factors (experience in goat husbandry, source of market information) and entrepreneurial skills of goat producers (sales timing corresponding to festival demand, physical location of sales transaction such as village, district and provinces) in different production systems in different provinces, are expected to influence the market value of a live goat. Dummy variables were introduced for qualitative factors such as breed, sex, market information source, sales timing, physical location of sales transaction, production system and provinces of goat producers in both the models (Gujarati 2007). The following functional form was used for meat goat:

$$\ln Y_{mi} = \beta_0 + \beta_1 \ln Lwt_{mi} + \beta_2 \ln A_{mi} + \beta_3 \ln Exp_{mi} + \beta_4 \ln Gbd_{mi} + \beta_5 \ln Gsd_{mi} + \beta_6 \ln Misd_{mi} + \beta_7 \ln Std_{mi} + \beta_8 \ln Mpd_{mi} + \beta_9 \ln Psd_{mi} + \beta_{10} \ln Gpp_{mi} + U_{mi}$$

equ.....(1)

The following functional form was used for dairy goat:

$$\ln Y_{di} = \beta_0 + \beta_1 \ln Lwt_{di} + \beta_2 \ln A_{di} + \beta_3 \ln Exp_{di} + \beta_4 \ln Amp_{di} + \beta_5 \ln Kr_{di} + \beta_6 \ln Gbd_{di} + \beta_7 \ln Misd_{di} + \beta_8 \ln Std_{di} + \beta_9 \ln Mpd_{di} + \beta_{10} \ln Psd_{di} + \beta_{11} \ln Gpp_{di} + U_{di}$$

equ(2)

Equation 1 corresponds to meat goat model while equation 2 is for dairy goat. Y_{mi} and Y_{di} are market value of meat and dairy goat in Afs of the i^{th} goat producer respectively. Independent variables in the equation 1 and 2 are denoted with subscripts m and d for meat and dairy goats respectively. Lwt is the live weight of goat; A is age of live goat at the time of transaction, Exp is the experience of goat producer in goat husbandry, Amp is the annual milk produced, Kr is the kidding rate during last season, Gbd is the goat breed dummy (for meat goat, the values are 1 for Gujiri goat and 0 otherwise; for dairy goat the values are 1 for Asmary, Chily and Watani goats and 0 otherwise), Gsd is the goat sex dummy (Male goat, 1 and 0 otherwise), Misd is the market information source dummy (Neighbors as market source of information, 1 and 0 otherwise), Std is the sales timing dummy (sales time corresponds to Eid-ul-Fitr and Eid-ul-Zuha, 1 and 0 otherwise), Mpd is the market place dummy (Goat transactions in district market, 1 and 0 otherwise), Psd is the production system dummy (goat producer from irrigated production system and 0 otherwise),

Gpp is the goat producer province (Goat producer from Nangarhar, 1 and 0 otherwise) and U is the disturbance term.

Summary statistics of the variables used in the models such as mean, minimum, maximum and standard deviation were estimated.

RESULTS AND DISCUSSION

Meat goats

Descriptive statistics: Summary statistics for all the variables in the equation 1 (Table 1) showed lot of variability as evident from their high standard deviation. It also gives an indication on the extent of differences in the market value and live weight of meat goats and the age and experience of goat producers in goat husbandry among sample farmers.

Table 1. Descriptive statistics for meat goat sales

Variable	Minimum	Maximum	Mean	Std. deviation
Goat sales price in Afs	1000	6500	3407	1212.296
Live weight of goat sold in kg	7	43	24	8.093
Age of goat sold in years	0.1	4	1.5	0.654
Goat rearing experience in years	1	48	10.9	8.666

Parameter estimates together with their corresponding standard errors and t-ratios from the regression analysis of meat goat (Equation 1) are presented in Table 2. R^2 value indicated that 74% variation in the market value of meat goats was explained by the variables included in the model. Significant F value indicated that the model fit was good. Among different determinants of market value of meat goats included in the model, live weight, age of the meat goat, goat sex, market place, source of neighbours as market information to goat producers and provincial location of goat producers have positive and significant influence on the market value of meat goat.

It is imperative from the coefficient of live weight of goat that for every 1 kg increase in the weight of meat goat sold, market value increases by Afs 75. Aged goats with good body weight can command better market price as evident from the significant coefficient for age of goat sold in the market. Shukla *et al.* (1996), Kumar and Singh (1999) and Yogi *et al.* (2015) have reported similar results in their studies conducted in India. Market value for male meat goat is more than female meat goat as evident from the positive significant coefficient for meat goat sex dummy (Kumar and Singh 1999). One % increase in the sale of meat goat in district markets, increases market price by 7% over other markets (village and provincial).

Lack of awareness about market (and price) information leads goat producers to sell goats at lower prices in nearby markets to meet immediate cash needs. Neighbours have been playing major role as goat market and price information source. Information from neighbours enables

Table 2. Coefficients and their standard error for variables in double-log linear regression model for meat goat sales

Variables	Coefficient (β)	Std. error	t-ratio
Constant	5.499*	0.187	29.337
Live weight of goat sold in kg	0.756*	0.065	11.703
Farmers' meat goat rearing experience in years	-0.016	0.019	-0.839
Age of goat sold in years	0.072**	0.036	2.009
Goat sex dummy	0.078**	0.036	2.191
Market place (goat sold in district markets) dummy	0.076**	0.031	2.412
Goat breed dummy (Gujiri)	-0.038	0.043	-0.893
Production system dummy for goat	0.025	0.029	0.860
Major market information source (neighbors) dummy	0.058**	0.029	2.019
Sale season dummy (sold during ramadan and eid-ul-adha)	0.008	0.029	0.281
Location dummy (Provinces)	0.182*	0.045	4.080
R ²	0.743	0.205	
F Change	57.247*		

*significant at 1%; **significant at 5%.

goat producers to bargain for better price as evident from the positive and significant coefficient for the market information source dummy (0.058). This is good indication that goat producers have inherent interest to know about market prices prevailing in different markets. Therefore, it is necessary to improve market intelligence system at least in the identified markets.

Goat producers from Nangarhar province are able to command better market price over Baghlan. Nangarhar markets have advantage of more traders from bordering Pakistan also and hence demand is more than in Baghlan. Goat producers (provinces) location is thus showing positive and significant coefficient.

Dairy goat

Descriptive statistics: Summary statistics for all the variables in the equation 2 (Table 3) also showed lot of variability as evident from their high standard deviation. It also gives an indication on the extent of differences in the market value and live weight of dairy goats, annual milk production and the age and experience of goat producers in goat husbandry among sample farmers.

Parameter estimates together with their corresponding standard errors and t-ratios from the regression analysis of dairy goat (Equation 2) are presented in Table 4. R² value indicated that 68% variation in the market value of dairy goats was explained by the variables included in the model. Significant F value indicated that the model fit was good. Among different determinants of market value of dairy goats included in the model, live weight, market place, and provincial location of goat producers have positive and significant influence on the market value of dairy goat.

Table 3. Descriptive statistics for dairy goat sales

Variable	Minimum (β)	Maximum error	Mean	Std. deviation
Goat market sales price in Afs	1000	5800	3277	1266.800
Goat live weight in kg	7	40	24	7.446
Goat age in years	1.0	4	2	0.727
Goat farmer experience in years	1.5	40	9	8.124
Goat annual milk production in litres	10	2100	316	408.039
Goat kidding rate	1	4	2	0.825

Table 4. Coefficients and their standard error for variables in double-log linear regression model for dairy goat sales

Variables	Coefficient (β)	Std. error	t-ratio
Constant	6.204*	0.634	9.783
Goat live weight in kg	0.523**	0.210	2.494
Goat age in years	0.118	0.134	0.886
Goat farmer experience in years	-0.062	0.064	-0.975
Goat annual milk production in litres	-0.011	0.047	-0.233
Goat kidding rate	-0.070	0.204	-0.344
Market place (sold in district markets) dummy	0.200***	0.105	1.903
Goat breed dummy	-0.038	0.122	-0.311
Production system dummy for goat	0.053	0.096	0.557
Major market information source dummy (neighbors)	0.119	0.093	1.283
Sale season dummy (sold during festival season)	-0.013	0.099	-0.131
Goat location dummy (Provinces)	0.482**	0.186	2.586
R ²	0.681	0.288	
F Change	6.981*		

*significant at 1%; **significant at 5%; ***significant at 10%.

It is clear from the coefficient of live weight of goat that for every 1 kg increase in the weight of dairy goat sold, market value increases by Afs 52 (Shukla *et al.* 1996). One % increase in the sale of dairy goat in district markets, increases market price by 20% over other markets (Village and provincial).

Like in case of meat goat, goat producers from Nangarhar province are able to command better market price over Baghlan goat producers. Nangarhar markets have advantage of more traders from bordering Pakistan also and hence demand is more than in Baghlan. Goat producers (provinces) location is thus showing positive and significant coefficient.

Live weights and prices of goats traded: In the meat goat model, live weight of goat, goat sex, market place, location of goat producer and source of market information while in the dairy goat model, live weight, market place and goat producer location have played an important role

among different variables considered. Therefore an attempt was made to explain the goat marketing in Baghlan and Nangarhar provinces taking into account the variations in the live weight and prices of goats with respect to sex, market place, province, etc.

Goat sales by sex and province: Male goats dominated the meat goat sales volume in both provinces. Seventy seven % of goats transacted by goat producers were males and 23% were females among meat goats. Males sold at a higher percentage in Nangarhar province (87%) than in Baghlan (71%).

Ninety percent of Gujry (meat breed) goats transacted were from Nangarhar as it was the dominant breed there. As Gujry is the most preferred breed for meat purpose, males were sold at a later stage after attaining good weight, coinciding with Eid Al Adha, as 50% of them were sold in December. The average live weight of male and female goats sold in Nangarhar province was almost same (29 and 30 kg each) with no significant difference, but female goats (20 kg) were heavier than the male goats (18 kg) of Baghlan province. Thus, male and female goats sold in Nangarhar province were heavier than from those sold in Baghlan province (Table 5).

Overall, males fetched higher prices than females. Price/kg live weight of males was higher in Baghlan while in Nangarhar province it was higher for females. The high prices for females need to be further probed especially in Nangarhar province. As the total number of female Gujry and Tedipk goats sold were only eight and five respectively in the current survey sample in Nangarhar province, this data is not sufficient to test whether the difference in the price/kg live weight between male and female was

significant or not.

The high market price and live weight correlations obtained indicated that prices offered were proportional to live weights. This also suggests that goats were mainly purchased for slaughter and prices were arrived based on live weight of the goat. Similarly high correlation between the price of male goats and the age at the time of sales indicates that male goats are sold after attaining good body weight while female goats were retained for breeding and dairy products.

Weights and prices by production system: Prices and live weights of goats were also analysed by production system (Table 6). There was no significant difference in the weight of goats sold between irrigated (23 kg) and rainfed (24 kg) production systems. It would be interesting to find out the possible reasons as this is contrary to the theoretical expectations. However, this is beyond the scope of this paper as this requires additional data on feeding sources and quantity available of each source and feeding calendar followed in both the production systems. Price/kg live weight was more in irrigated production system (Afs 146) than in rainfed (Afs 141). The high price-live weight correlation coefficient obtained for both production systems indicates that prices offered for animals were proportional to live weights.

The study indicated that live weight of any goat (meat and dairy) is important in getting good market price if sold in district markets especially in Nangarhar markets. Age of the goat, and source of information about market prices are influencing market value of goats sold. Thus goat producers when plan their sale of male goats with an average weight of above 1.5 kg in district markets from irrigated production

Table 5. Live weights, prices/head/kg and correlations between live weight-price and live weight-age for goats in Baghlan and Nangarhar provinces (province and sex wise)

Parameter	Baghlan		Nangarhar		Both	
	Male	Female	Male	Female	Male	Female
Number	76	31	85	13	162	48
% goats transacted	71	29	87	13	77	23
Market value of goat (Afs ^{**})	2588	2610	4203	4494	3446	3277
Live weight of goat (kg)	18	20	29	30	24	24
Average market price per kg live weight (Afs)	148	129	145	149	146	138
Annual milk production (l)	0	332	0	296	0	319
Age of goat (years)	1.41	1.92	1.42	1.74	1.41	1.86
Neighbor as source of market information (1, Neighbor as market source; 0, otherwise) (% [*])	53	45	47	29	49	40
District as market place (1, district; 0, otherwise) (% [*])	76	71	49	59	62	67
Location dummy (1, Nangarhar; 0, otherwise) (% [*])	0	0	101	100	53	35
Goat age 1 (1, <1year; 0, otherwise) (% [*])	14	3	6	0	10	2
Goat age 2 (1, 1–2 years; 0, otherwise) (% [*])	86	97	95	100	90	98
Meat goat dummy (1, meat goat; 0, otherwise) (% [*])	3	6	34	35	19	17
Production system dummy (1, irrigated; 0, otherwise) (% [*])	47	52	52	53	49	52
Time of sale (1, sold during festival season; 0, otherwise) (% [*])	51	35	35	35	43	35
Correlation between market price and live weight	0.78	0.58	0.84	0.81	0.90	0.81
Correlation between market price and goat age	0.58	0.38	0.70	0.59	0.48	0.19

^{**} Afs is the abbreviation for the Afghanistan currency Afghani. One US \$ = Afs 48 in 2012.

^{*} represents % goat producers involved in using the parameter in consideration

Table 6. Live weights, prices per head and per kg and price/live weight correlations for goats (Production system, province and goat sex wise)

Parameter	Baghlan Irrigated		Baghlan Rainfed		Nangarhar Irrigated		Nangarhar Rainfed		All Irrigated		All Rainfed	
	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe	Buck	Doe
Number	36	16	40	15	44	9	42	8	80	25	82	23
Market price of live goat (Afs ^{**})	2450	2613	2713	2607	4261	4344	4143	4663	3446	3236	3445	3330
Live weight (kg)	16	19	19	21	29	30	28	31	23	23	24	25
Goat market price per kg live weight (Afs)	153	136	144	123	145	147	145	152	147	141	145	135
Age of goat (Years)	1.30	1.81	1.50	2.04	1.44	1.78	1.39	1.69	1.38	1.80	1.45	1.92
Experience in rearing goats (years)	10	5	8	11	15	15	12	10	13	8	10	12
Annual milk production (l)	0	338	0	327	0	437	0	137	0	373	0	267
Goat age 1 (1, <1 year age; otherwise, 0) (% [*])	19	0	10	7	5	0	7	0	11	0	9	4
Goat age 2 (1, 1–2 years age; 0, otherwise) (% [*])	81	100	90	93	95	100	93	100	89	100	91	96
District as market place (1, district; 0, otherwise) (% [*])	67	56	85	87	50	56	48	63	58	56	66	78
Market information source (1, Neighbor as source; 0, otherwise) (% [*])	44	38	60	53	50	22	43	38	48	32	51	48
Festival sales (1, sold during festival season; 0, otherwise) (% [*])	58	38	45	33	34	44	36	25	45	40	40	30
Correlation (price and live weight)									0.86	0.89		
Correlation (price and age of goat sold)									0.40	0.32		

^{*}represents % goat producers involved in using the parameter in consideration; ^{**} Afs is the abbreviation for the Afghanistan currency Afghani. One US \$ = Afs 48 in 2012.

system can get better market price and this can motivate them to take up this subsistence goat rearing to commercial level.

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