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Economic and Management Evaluation of Mutton Production in District Quetta, Pakistan

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Authors' contributions

This work was carried out in collaboration between both authors. Author KBA designed the study, performed the statistical analysis, wrote the protocol and first draft of the manuscript. Author MAS managed the analyses and literature searches. Both authors read and approved the final manuscript.

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ABSTRACT

Background: Animal rearing has been an indivisible part of human civilization and culture from the very ancient periods. From centuries it is emphasized that livestock possession is a symbol of prosperity that not only enhances income but also diversifies the farming risks and stabilizes the farmer's income, thus resulting in an improvement in the living standards of our rural farmers.

Aims: To explore and assess the present scenario of mutton production in terms of economics and prevailing farming practices in Quetta, a northwestern district of Balochistan province of Pakistan.

Place and Duration of the Study: Study was conducted in three sub-tehsils (Quetta, Khuchlak and Panjpai) of District Quetta from July to October, 2016.

Methodology: A survey of eighty-one mutton farmers / producers was conducted through personal interviews that were randomly selected from three tehsils of District Quetta to evaluate the economics and management of their production system.

Results: Results revealed that majority (51.85%) of respondents were above 41 years of age having literacy rate 81.48%, their major ethnical group was Pashtoon (62%) and most of them belong to agriculture and livestock related occupation (50%). Average farm land, covered area and covered space per animal were 1295, 479 and 5.52 square feet (sq. ft.), respectively. Maximum

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number (62.96%) of farm sheds was kacha. Average flock size was 80 and majority (66.12%) flocks comprised of sheep with relatively lesser number (33.87%) of goats. Shinwari sheep (52.02%) and Khurrasani goat (44.65%) breeds were the most preferred and prevailing breeds being reared in the study area. Commonly adopted feeding method by the farmers was a combination of natural grazing with supplementation (43.42%), while ground wheat was the main feed supplement. Most of the farmers got their animals through purchase only. Capital cost incurred in PKRs. were 313418/-, 4520/-, 6615/-, 548/-, 1591/-, 1996/- and 14994/- on feed & fodder, veterinary services, hired labour, marketing, transportation, miscellaneous and on building & equipment depreciation charges, respectively. Average gross revenue / income earned from mutton production in PKRs. was average 21092/-, 17.79/- and 27.79/- from sale of animal, wool/hair, empty bags and manure etc. Net return obtained by mutton farmers in District Quetta per animal in three months was Rs. 7045/-; while cost-benefit ratio observed was 1:1.32, 1:1.34 and 1:1.33 for Quetta, Khuchlak and Panjpai tehsils, respectively with an average of 1:1.33.

Conclusions: This study shows that the overall mean economic efficiency need to be improved by efficient utilization of resources.

Keywords: *Small ruminants; mutton production; economic evaluation; Quetta.*

1. INTRODUCTION

Sheep and goats are important animal species due to their ability to convert low quality forages, crop and household residues into meat, milk, fiber and skin. Their importance in socio-economic well being of farmers cannot be overlooked. These animals have role in food security, income generation and other intangible benefits such as savings, insurance against emergencies, cultural and ceremonial purposes etc. Sheep and goat meat enjoys wide acceptability amongst different cultural groups because there is no taboo against them; while goats reproduce very fast with tropical breeds producing twins and sometimes even the triplets as well. Consequently in a reasonable time period, a small flock can quickly multiply and forms a major part of the family capital asset [1].

In world's developing countries the daily animal protein intake is below the standard of 35 gm/capita/day [2]; due to low production of livestock and rapidly increasing human population. For an improved animal protein intake, there is a need for an overall improvement in the production of meat and other sources of animal protein from livestock industry. Small ruminants offer a great opportunity in this perspective due to their relative ease of breeding, management, ability to survive on low quality forages, hardiness and wide range adaptation to different ecological zones. In recent times, their production is becoming popular even among urban dwellers due to aforementioned merits. Urban livestock production is a feature of urban agriculture that has the benefit of major food producing activities.

Religious, cultural and social events in a year have marked impact on the marketing of these animals and must be given due weight while planning livestock development programs for enhancing the production and marketing of meat and its relative products [3]. At present mutton animals are being reared at a subsistence level in rural areas of Balochistan, where these animals are raised and contribute as a whole / partial source of income in a small rural and peri-urban set up. It is currently being realized that this system needs transformation from existing subsistence level to commercial enterprise, thus offering more opportunities for economic uplift of associated farming community.

It is therefore needed to have more concrete and empirical information on prevailing economic and management systems of mutton farming in urban and peri-urban centres of the province. This information will assist policy makers to devise strategies to improve mutton production and its marketing among these urban and peri-urban livestock producers / famers. This would result in an increase in animal protein production, its consumption and consequently better health conditions of the relative population. Thus in order to plan better production methodology, it is imperative to explore and assess the present scenario of mutton production in District Quetta keeping in view the following objectives:

- To examine the socio-economic characteristics of mutton farmers.
- To observe the production and management systems of small ruminants.
- To identify the potentials of mutton farming in the study areas, and

- To evaluate the economics of mutton production.

2. METHODOLOGY

In order to obtain data regarding socio-economic profile, production and management practices adopted by small ruminant farmers of rural and urban areas of District Quetta; a survey was carried out from July to October, 2016, where a significant proportion of rural population is engaged in small ruminant production activities for domestic and supplementary commercial benefits.

2.1 Study Area

The study area was randomly selected from three sub-units (Tehsil) of district Quetta, Pakistan namely Quetta, Khuchlak and Panjrai. District Quetta itself is located in South East of Pakistan on 30.20 latitudes with 67.10 longitudes and its elevation from sea level is 1682 meters above. It has a semi-arid climate with an average annual precipitation of 261 mm [4]. The study area was selected because it is the capital of Balochistan province and also one of the biggest small ruminants market in the whole province. Enormous potential for raising livestock is present in this district that provides livelihood to many poor and marginalized families. Livestock farming is a traditional activity that comprises mostly small ruminants rearing, while sheep constitutes the major proportion of livestock population in the district. Livestock raising has a vital role in the living of these farmers and often it is the only source of income for rural and the most marginal people of the area [5]. Sheep belong to fat tailed breeds i.e. Balochi / Mengali, Bivrigh, Rakhshani and Shinwari; while goats belong to long hair breeds i.e. Khurasani, Pahari, Lehri and their crosses.

2.2 Sampling Procedure

Multi-stage random sampling technique was applied for this study. First, list of the district sub-units (tehsils) and their villages was collected from the district administration; from each of these tehsils, five villages were randomly selected out of twenty five villages on the map of the study area. Five to six farmers were interviewed per village giving a total number of twenty seven respondents from each tehsil and a total sample size of eighty one farmers were used for this study.

2.3 Data Collection and Analysis

Eighty one respondents from Quetta, Khuchlak and Panjrai tehsils (Table 1) of District Quetta were interviewed for present study; mostly belonged to settled and semi nomadic type of farming group. Primary data were collected with the use of validated and structured questionnaire to obtain information on main inputs (feeding, medication, vaccination, labour, marketing and transportation charges etc.), outputs (sale of animals, wool / hair, manure and empty feed bags etc.) with costs & returns on keeping these animals. Descriptive statistics such as frequency distribution and percentages were used to evaluate the raw data. For the economic analysis, gross margin analysis was applied as a proxy for profit. Microsoft excel 2007 [6] was used to build a spreadsheet model of mutton production systems.

Table 1. Sample size of the study for mutton production in District Quetta

S. no.	Study areas	Sample size
1.	Quetta Tehsil	27
2.	Khuchlak Tehsil	27
3.	Panjrai Tehsil	27
Total		81

Data also included information on farmers socio-economic status, animal breeds kept, land holdings, farm size, farm structure, housing type, flock composition and size, capital investment, recurring cost and sale value of products. Formula used to analyze the Cost-benefit ratio was:

$$\text{Cost-benefit ratio (Cbr)} = \frac{\text{Net return (Nr)}}{\text{Total cost (Tc)}} [7]$$

3. RESULTS AND DISCUSSION

3.1 Respondent Characteristics

Data regarding age and education of responding farmers are given in Table 2. Based on the gathered information from eighty one livestock farmers, it was found that 63% of farmers fall in an average age group ranging from 31 to 50 years; whereas young age farmers were found in Quetta tehsil (41%) and old age farmers were found in Panjrai (26%) and Khuchlak (22%), respectively. Hence, it can be assumed that this enterprise is an adult aged business in the area. Study results agree with previous findings on age of small ruminant livestock farmers in rural

settings of South-western Nigeria, where most of the farmers were reportedly adults with an average age of 45 years [8].

Data regarding formal education level (Table 2) of mutton producers show that 81.48% of them had attended the educational institutes from primary to graduation level with maximum numbers in Quetta (88.89%) and minimum (74.07%) in Panjrai tehsils; while small but a sizeable (18.52%) of them were found illiterate. Data regarding formal education level in this study are agreeable to those reported by [9,10,11,12] among livestock farmers. High literacy rate can offer a better opportunity for any technical intervention and technological adaptation between these farmers. However, our study findings did not agree with findings of [13, 14,15,16] who reported a higher percentage of illiterate farmers in their respective studies.

Data related to ethnical background of respondents are depicted in Table 2, these data reveal that majority (62%) belonged to Pashtoon tribes and minimum (5%) belonged to Baloch tribes involved in this activity.

Study results show that maximum number (90%) of respondents is directly involved in livestock farming while a small number (10%) is indirectly

involved in this enterprise. Our findings relates with earlier findings [17,18,19], who reported that about 66% goat keepers were dependent on agriculture and animal husbandry for their livelihood and remaining (16.74%) goat farmers were landless labour (Table 2).

3.2 Farm Area, Area Covered and Housing Type for Mutton Animals

Results given in Table 3 indicated that average mutton farm area in District Quetta was about 1295 sq. ft. with covered area of 479 sq. ft.; while space available per animal was 5.52 sq. ft. The study results further revealed that three farm structure categories were used for animal housing by the mutton producer / farmers of the studied area; out of total 81 farms majority 64.20% had kacha, 30.86% semi-pacca while only 4.94% of the farm had pacca structures. Study findings are in line with previous studies of [17,20,21,22].

3.3 Flock Structure and Size

Results regarding flock structure are depicted in Table 4, these data reveal that sheep flock constituted male 28.20%, female 48.12% and young stock 23.68%; and in goat flock male 34.98%, female 37.00% and young stock

Table 2. Respondents distributions according to their socio economic status

Particular	Quetta (%)	Khuchlak (%)	Panjrai (%)	Overall (%)	Mean (%)
Age					
21-40 years	59.26	44.44	40.74	144.44	48.15
41and above years	40.74	55.55	59.26	155.56	51.85
Total	100	100	100	300	100
Education					
Illiterate	11.11	18.52	25.93	55.56	18.52
Primary to Matriculation	55.56	70.37	66.67	192.60	64.20
Intermediate to Graduation	33.33	11.11	7.40	51.84	17.28
Total	100	100	100	300	100
Ethnicity					
Pashtoon	56	78	52	186	62.00
Brahvi	29	10	39	78	26.00
Balochi	6	5	4	15	5.00
Others	9	7	5	21	7.00
Total	100	100	100	300	100
Occupation					
Agriculture& livestock farmer	45	56	49	150	50.00
Livestock trader & farmer	33	29	40	102	34.00
Butcher & livestock farmer	8	6	4	18	6.00
Others*	14	9	7	30	10.00
Total	100	100	100	300	100

* Government servants i.e. teachers, health workers, security staff etc

Table 3. Farm area and area covered for mutton animals in District Quetta

Particular	Quetta	Khuchlak	Panjpai	Overall	Mean
Total Farm Area (sq. ft.)	1258	1296	1330	3884	1295
Total Covered Area (sq. ft.)	398	515	523	1436	479
Covered Space / Animal (sq. ft.)	5.45	5.92	6.46	17.83	5.52
Construction Cost / sq. ft. (PKRs.)	115	97	86	298	99
Housing type of animals					
* Kacha (%)	40.74	66.67	85.18	192.59	64.20
** Pacca (%)	14.82	0.00	0.00	14.82	4.94
*** Semi-Pacca (%)	44.44	33.33	14.82	92.59	30.86
Total	100	100	100	300	100

* Mud + Thatch; ** Mud + Bricks; *** Mud + Bricks + Paved floor

28.02%, respectively. Maximum number of male animals was found in Quetta tehsil and minimum in Khuchlak tehsil, highest number of female animals in Panjpai and lowest number constituted the flock in Quetta while more number of young-stock was in Khuchlak and lesser in Quetta. Sheep number was dominant in the flock that may be due to their meat preference, relative bigger size and management ease as compared with goats which are harder to handle. These results are in agreement with those reported by [8].

Information regarding flock size reared by mutton farmer / producer in District Quetta shows that average flock size was 87, 81 and 73 animals respectively in Khuchlak, Panjpai and Quetta tehsils. The small herd size characterizes a smallholder production system. (Table 4)

3.4 Breed Wise Flock Composition

Data revealed that overall sheep flock comprised of 6.11%, 21.49%, 20.37% and 52.02% of Bivrigh, Balochi / Mengali, Rakhshani and Shinwari, respectively with highest mean value of Shinwari and lowest for Bivrigh breeds. The higher incidence of Shinwari sheep breed animals relative to others seems to be due to its good meat production both in terms of quality and quantity; while the data regarding goat flock revealed a proportion of 44.65%, 14.20%, 8.17% and 32.97% of Khurrasani, Pahari, Lehri and Khurrasani & Lehri crosses, respectively with maximum number of Khurrasani and minimum number of Lehri breed animals. High proportion of Khurrasani goat breed over the other breeds may be due to its good roaming and low level grass eating habit. (Table 5)

3.5 Feeding Pattern

Findings of the present study regarding feeding practices reportedly adopted by respondents

revealed that maximum number (43.22%) of farmers used grazing along with and supplementation for feeding (Natural grazing + concentrates) their animals as against only natural grazing (30.85%), while minimum number (3.70%) of them practiced Natural grazing + green fodder + concentrates (Table 6). It could be due to lack of grazing and depletion of range areas in urban centers due to overgrazing and climate change. This situation promoted the supplementary feeding practices. Study findings were contrary to the findings of [8], who observed that agro-pastoralists with access to vast rangeland, rarely supplement their animals but depend almost entirely on range fields for feeding their sheep and goats. However, the results are in-line with previous findings of [23], who reported supplementary feeding of cassava peel as major feed supplement contrary to grains which were the least supportive feed supplement used by the respondents due to its relative affordability and availability as compared with grains that were too expensive because of its competition between humans and animal. It was also reported that left over feeds on the farm and home are the cheap feed sources and are readily available to ruminant farmers [24,25].

3.6 Investment by Producer / Farmer in Mutton Production

Economic indicators related to input and productivity costs are based on different variables such as meat, wool / hair production, raising replacement animals along with forage production, purchase of feed, veterinary services (medicines / vaccines) and other miscellaneous items.

3.7 Fixed Investment

Results on fixed investment in mutton production revealed that average cost of animal accounted

(94.86%) of the total fixed investment followed by cost of building (4.71%) and cost of equipment (0.62%), respectively. This shows that mutton production is performed in extensive farming way in the area and less attention is being paid for infra-structure and on equipments as compared with investment on animals. (Table 7)

3.8 Capital / Recurring Cost

Information on recurring costs of small ruminant farms managed for mutton production in District Quetta was worked out in Table 8. Results shows that average cost in (PKRs.) on feeding

was 3,13,418/-, veterinary charges 4,520/-, labour charges 6,625/-, marketing charges 548/-, transportation charges 1,591/- and miscellaneous charges 1,996/-. Maximum recurring cost per animal was 4,772.92/- in Quetta while minimum was 353.28/-. In Panjrai tehsil; whereas the average per animal recurring cost was PKRs. 4,091.72/-. Variation in capital investment might have been associated with the distance of different areas from big cities and the higher variable costs per animal may be due to non-grazing area in the capital city. Consequently this increased need of supplementary feeding.

Table 4. Flock size and structure of animals in mutton farming of District Quetta

Particular	Quetta (%)	Khuchlak (%)	Panjrai (%)	Overall (%)	Mean (%)
Sheep					
Male	32.20	24.69	27.72	84.61	28.20
Female	45.98	46.77	51.60	144.34	48.12
Young stock	21.83	28.54	20.68	71.05	23.68
Total	100	100	100	300	100
Goat					
Male	36.74	32.58	35.62	104.94	34.98
Female	35.17	39.84	36.00	111.01	37.00
Young stock	28.09	27.58	28.38	84.05	28.02
Total	100	100	100	300	100
Grand Total	1975	2349	2187	6511	2170
Mean Flock Size	73	87	81	241	80

Table 5. Breed wise flock structure of animals in mutton farming of District Quetta

Particular	Quetta (%)	Khuchlak (%)	Panjrai (%)	Overall (%)	Mean (%)
Sheep					
Bivrigh	6.34	0.00	11.99	18.33	6.11
Balochi / Mengali	23.12	7.82	33.54	64.48	21.49
Rakhshani	16.10	4.80	40.23	61.12	20.37
Shinwari	54.43	87.39	14.25	156.07	52.02
Total	100	100	100	300	100
Goat					
Khurrasani	46.76	54.09	33.11	133.96	44.65
Pahari	22.99	11.52	8.11	42.61	14.20
Lehri	11.79	6.36	6.37	24.52	8.17
Khurrasani & Lehri cross	18.47	28.03	52.41	98.91	32.97
Total	100	100	100	300	100

Table 6. Feeding patterns of the animals reared for mutton in District Quetta

Particular	Quetta (%)	Khuchlak (%)	Panjrai (%)	Overall (%)	Mean (%)
Natural grazing	25.93	33.33	33.33	30.86	30.85
Natural grazing + Concentrates	51.85	44.44	33.33	43.21	43.22
Concentrates + Roughages	18.52	7.41	11.11	12.35	12.33
Concentrates + Green fodder	3.70	11.11	14.81	9.88	9.88
Nat. grazing + G. fodder + Concentrate	0.00	3.70	7.41	3.70	3.70
Total	100	100	100	100	100

Table 7. Fixed investment (In PKRs.) and its proportion (In %) in mutton production

Particular	Quetta		Khuchlak		Panjpai		Overall		Mean	
	PKRs.	(%)	PKRs.	(%)	PKRs.	(%)	PKRs.	(%)	PKRs.	(%)
Cost of animal	896696	94.54	1007210	94.71	919970	94.73	2823876	94.86	941292	94.66
Cost of building	45770	4.83	49955	4.70	44978	4.63	140703	4.71	46901	4.72
Cost of equipment	6060	0.64	6163	0.60	6249	0.64	18472	0.62	6157	0.63
Total	948526	100	1063328	100	971197	100	2983051	100	994350	100

Table 8. Fixed and variable cost in mutton production (In PKRs)

Particular	Quetta	Khuchlak	Panjpai	Overall
Fixed cost				
Depreciation on building @ 10%	4577	4996	4498	14071
Depreciation on equipment @ 20%	303	308	312	923
Total Fixed Cost	4880	5304	4810	14994
Particular	Quetta	Khuchlak	Panjpai	Mean
Variable cost				
Feeding charges	334034	335421	270800	940255
Veterinary charges	3504	4872	5184	4520
Labour charges	7700	6960	5184	6615
Marketing charges	440	662	542	548
Transport charges	1474	1184	2116	1591
Miscellaneous charges	1272	2428	2288	1996
Total Variable Cost	348424	351527	286114	986065
Average flock size	73	87	81	241
Variable cost / animal	4772.93	4040.54	3532.28	4091.56
				4091.72

3.9 Farmer / Producer Net Return (Gross Revenue) per Animal from Mutton Animals

Economic indicators related to returns are mutton farmer's profit. It is the total farm net cash received from sale of animals, wool / hair, farm yard manure and empty feed bags all are return on investment. The net cash / farm income is obtained after deducting total expenses from total receipts. Study results in Table 9 shows that they earned an average amount of PKRs. 16,87,312/-, 1,423/- and 2,223/- from the sale of animal, wool / hair, empty bag and farm yard manure, respectively. In this way the producer /

farmer obtained a total gross income for different sources to value of PKRs. 21,121/- per animal in three months. Same way a livestock farmer gets three to four crops of mutton animals per annum from his flock.

The results of the present study are in contrast with that of [19], who received PKRs. 3,787/- per animal; it may be due to that in the study area high sale competition and more animals are brought from other areas of the province to fill the demand of large human population residing in this capital city of the province and proximity of metropolitan. Secondly this would be also due to inflation in time period after 2005.

Table 9. Net returns obtained by mutton farmers in District Quetta (In PKRs.)

Particular	Quetta	Khuchlak	Panjpai	Overall	Mean	Per animal
Average flock size	73	87	81	241	80	1
Sale of male animals	1640056	1818780	1603100	5061936	1687312	21092
Sale of wool/hair & empty bags	1360	1470	1440	4270	1423	17.79
Sale of farm yard manure	2500	2200	1970	6670	2223	27.79
Total Net Return	1643916	1822450	1606510	5072876	1689677	21138

Table 10. Cost-benefit ratio earned by mutton farmers in District Quetta (In PKRs)

Particular	Quetta	Khuchlak	Panjpai	Overall	Mean
Total Net Return (Nr)	1643916	1822450	1606510	5072876	1690959
Total Cost (Tc)	1250000	1364041	1210894	3824935	1274978
Per animal revenue	5385.18	5269.07	4884.15	15538	5179
Input Output Ratio (Nr ÷ Tc)	1:1.32	1:1.34	1:1.33	-----	1:1.33

3.10 Cost-benefit Ratio

In order to find out the profit on investment of one rupee, cost benefit ratio earned by mutton farmers / producers in the study areas was calculated; results shows that maximum profit was received by Khuchlak farmers (1:1.34) followed by Panjpai (1:1.33) and Quetta (1:1.32) farmers, respectively. Whereas 1:1.37, 1:1.24 and 1:1.19 was seen in tehsil Mastung, Dasht and Kirdegap of District Mastung Pakistan [26], this might be due to Quetta as one of the big city of the province, availability of feeding resources and marketing facilities (Table 10).

4. CONCLUSION

Small ruminant production system is an important contributor in the economics of rural farmers of district Quetta. Sheep and goat rearing is being practiced as a sole enterprise by majority of the farmers, whereas the rest of farmers have adopted a more diversified system of living with sheep and goat farming combined with livestock trading and holdings of butcheries etc.

This enterprise appeared to be a male dominant enterprise. A considerable proportion of farmer laying in an age group of 21–40 years and an overall high proportion of literate farmers suggests that interventions from different organizations for the improvement of the enterprise can be a useful tool in terms of adaptability. The prevailing structural conditions of the farm and existing feeding strategies suggested enough room for improvement. It was realized that any intervention to improve financial / management capacity of farmers may turn these small mutton production units to a more viable commercial entities.

In recent years, mutton farming is increasingly seen as a lucrative business option for smallholder farmers in District Quetta; results of the study showed that investment by small farmers in this enterprise are financially feasible and also socially acceptable. With good technical support, coordination and partnership between

farmers, government bodies, private sector and financial institutions this enterprise could turn into a commercially viable entity. However, in order to be operated profitably, the current orientation of production has to be changed from extensive traditional systems to agribusiness-oriented intensive farming systems with adaptation of new technologies and cost effective feeding systems.

CONSENT

As per international standard or university standard written participants' consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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