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An economic analysis of goat rearing in Kohistan district, Khyber Pakhtunkhwa

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Abstract
This study was conducted in order to assess the financial viability of goats rearing in district Kohistan, Khyber Pakhtunkhwa during the year 2012-13. The average per flock per annum cost incurred for large flock size was Rs. 603883.16 and for small size was Rs. 664920.69. Resultantly, annual net return was estimated Rs. 78477.13 for small group and Rs. 277440.0 for large group. The NPV was observed to be positive (considering interest rate of 14.5 percent as per ZTBL charges for livestock enterprises) for both large and small flock size as Rs.165704.83 and Rs. 34990.09, respectively. B/C-ratio was found greater than one (1.29 in case of small and 1.45 in case of large groups). Finally, the IRR value 29.65 percent in case of small group and 46 percent in case of large group was greater than the required rate of return which supports the financial viability of the enterprise.

Keywords: Internal Rate of Return, Benefit Cost Ratio, Net Present Value, Goat.

1. Introduction

Livestock is an imperative and essential sub-sector of our economy and a significant approach for sustain livelihood. This offers a reasonable economic, agricultural and nutritional assistance for large masses in country. Domestication of livestock is one of the earliest achievements of human beings. It made their lives more fruitful, easy and secure. Hence, in the rural areas it is also source of employment and income generation. Pakistan has made notable stride in livestock population in the world. In the world production of meat was 293 million tons, milk 720 million tons, leather 21591 million sq. feet and wool were 1377 million tons. Pakistan contributed (6.45 percent), (9.46 percent), (12.00 percent) and (0.01 percent) to the global milk, meat, leather and wool production, respectively [1].

An animal also contributes in controlling food security. It is the most effective source which converts plants containing protein into animal one which possess high nutritional value. It provides various essential food constituents in the form of carbohydrates, proteins, fats minerals and vitamins for human dietary usage. During 2012-13 the mutton production in Pakistan was 616 thousand tons which shows its adoptability and interest among the farmers. Contribution of Pakistan to world goat meat production is 19 percent, milk 4.75 percent, wool 13.2 percent and skin 18 percent [2].

It is the common source which provides various raw materials for different kinds of industries. Livestock is a source of high quality food and also an exclusive source of income generation for small farmers. Pakistan has a significant contribution to the world's Livestock population. The total livestock population of Pakistan amounts to 4890 million and Pakistan is placed at second in buffalo population (32.7 million), third in Goat (63.1 million), ninth in cattle (36.9 million), sheep (28.4 million) and tenth in chickens (273 million) [2].

Livestock is a significant sub-sector of agriculture and contributes 11.6 percent of the total gross domestic (GDP) product. Its share in agriculture is 55.1 percent. The value of minor and major crops is less than the total value of livestock which is 6.1 percent and also contributes about 8 percent to total exports. More than half of the population of our homeland is living in rural areas mostly engaged in agriculture sector for their livelihood purpose. This situation has created great burdens on land, resulting in an unfavorable land man ratio. Agriculture is not alone more effective. Therefore, rearing animal husbandry improves income and generates gainful employment which increases our national wealth and uplifts the living standard of the farmers.

Afzal and Naqvi (2004) revealed that Pakistan is gifted with various livestock resources and has good image in animal domestication in the world. Population trends from 1955- 2000 are studied which shows that the population of goat, buffalo, sheep and cattle increased by 650%, 392 %, 299 %, and 219 % respectively in last 45 years. Some genetic improvement programs for livestock are limited and feeble. They suggested proper research work in this sector, otherwise decline in overall economy of the country might be occur [3]. Goat breeds found in Khyber Pakhtunkhwa include Damani, Gaddi and Kaghani. Goat demand exceeds due to their wide adoptability, high potential of reproduction, high nutritional value, and cheap maintainability [3].

District Kohistan is located in the middle of mountainous range of Himalayas in between (34.40° to 30.35°) altitudes and (75.30° to 50.72°) longitude, comprises of 7492 km of area. Kohistan district has a population of 472, 504 and the whole district consists of rural population according to 1998 census report. The share of cultivable land is 68137 hectares, irrigated cultivable land is 14372 hectares and followed by forest area about 200000 hectares. Livestock is one of the major source of income and livelihood. Due to dependency on livestock they mostly migrate to alpine and sub-alpine pastures and also into nearby adjacent areas. People mostly grow one single crop (maize) in high altitudes and more than one in the lower areas. Due to this weak agricultural background they are facing economic problems. As most of the people are engaged in goat rearing. Hence, district Kohistan was purposively selected as a research area.

Based on these facts the present study was initiated with the objective to estimate the cost and net returns involved in goat rearing in the study area and to assess the financial feasibility of goat rearing business.

2. Materials and Methods
2.1. Sampling Procedure
This study was conducted during April through August in the year 2012. For the study purpose, respondents were selected by employing multistage sampling technique [4]. Selection of tehsils was the second stage. All the three tehsils were selected from the entire district i.e. Dassu, Pattan and Palas.

2.2. Source of Data
The primary was collected through comprehensive and pre-tested interview schedule. The sampled respondents (120 in number) were interviewed through face to face interview method.

2.3. Analytical Techniques
Following analytical techniques were used for the analysis of the data.

2.4. Financial Analysis
In terms of economic viability, to evaluate the investment in goat business the discounted cash flow technique was used [5]. The discounted cash flow measures are discussed below in detail.

2.5. Net Present Value (NPV)
This is the measures of the discounted value of net cash flows of a project. Difference value of benefit streams, discounted at the rate of 14.5 per cent was taken to calculate the net present value [6].

The equation is as under:

$$NPV = \sum_{n-1}^{N} Yn(1+r)^{-n} - I$$

Where:
Yn= is net cash flows per annum.
r= is the discount factor (14.5 per cent)
I = is initial investment.
N = is number of years.

To prove that the Enterprise is economically feasible, the NPV value must be positive.

2.6. Cost Benefit Ratio
BCR is the ratios of discounted cash in-flows and out-flows, which must be equal to one or greater than one. The minimum ratio should be 1:1. This means that cost incurred is equal to the benefit gained. If the benefits increase that of the cost, it should be more than unity [7].
Mathematically it can be written as:

$$BC - ratio = \left[\frac{\sum_{n=1}^{N} \frac{Bn}{(1+d)^2}}{\sum_{n=1}^{N} \frac{Cn}{(1+d)^2}} \right]$$

Where:
Bn= is benefits per annum.
Cn = is cost per annum.
N= is the number of years.
d = is the discount rate.

2.7. Internal Rate of Return
The IRR stated that the present value of returns must be equals to the present value of cost. IRR represents the average earning power of projects. It can be written as:

$$IRR = \sum_{n=1}^{N} \left(\frac{Bn - Cn}{(1+d)^2} \right)$$

Where:
Bn = is returns per annum.
Cn = is costs per annum.
N = is number of years.
d = is discount rate.

Net present value is essential for interpolation which can be obtained by selecting high discount rate of cost and benefits.

$$IRR = \left(\begin{array}{c} lover \\ discount \\ rate \end{array} \right) + \left[\begin{array}{c} difference \\ between\ two \\ discount\ rates \end{array} \right] \times \left[\frac{\begin{array}{c} NPV\ the\ lower \\ discount\ rate \end{array}}{\begin{array}{c} absolute\ difference \\ between\ the\ NPV\ of \\ two\ discount\ rates \end{array}} \right]$$

The IRR should be more than the discounted rate.

3. Results
3.1. Investment in Goat Rearing
Table 1 shows the investments on goat, goat shed, dotties, ropes and others. The total investment share of these components was Rs.14455.71 and Rs. 403769.56 for both categories i.e small and large rearers and the overall it was accounted to Rs. 274152.64. The purchase value of goat was noticed to be the major investment components which accounted to 75.59 percent and 74.54 percent of the whole investment for the small and large rearers. The expenditure on goat shed accounted for Rs. 40,0000 (20.92 percent) and Rs. 1,15000 (21.23 percent) for the small and large rearers respectively. The expenditure made on other Dotties, Ropes and others was estimated to 3.49 percent for small goat rearers and 4.23 percent was for large rearers.

Table 1: Investment in goat rearing

S. No	Particulars	Small Rearers		Large Rearers		Overall	
		No / Quantity	Value (Rupees)	No / Quantity	Value (Rupees)	No / Quantity	Value (Rupees)
1	Goat Cost	14.64	144535.71 (75.59)	45.79	403769.56 (74.54)	30.21	274152.64 (75.06)
2	Shed/Pen cost	- -	40000 (20.92)	- -	115000 (21.23)	- -	48500 (21.07)
3	Equipment's						
	Dottie's	- -	2350 (1.22)	- -	11000 (2.14)	- -	6676 (1.68)
	Rope	- -	800 (0.41)	- -	2400 (0.46)	- -	1250 (0.43)
	Other	- -	3500 (1.83)	- -	9500 (1.75)	- -	5750 (1.79)
	Sub total	- -	6650	- -	12200	- -	9425
	Total	- -	191185.71	- -	541669.50	- -	366427.61

Note: Figures in parentheses are percentages.

3.2. Cost Incurred In Goat Rearing
Table 2 reveals the expenditure incurred in goat rearing business. Those are divided into two categories i.e. fixed and variable costs.

3.3. Fixed Costs
The fixed cost, include amortization cost made on the purchase value of goat. The Table 2 shows that, the amortization cost was less for small enterprise i.e. Rs. 144535.71 (54.55 percent), when compared to large enterprise which accounted to Rs.403769.56 (66.75 percent) and Rs.274152.64 (60.65 percent) was accounted for overall fixed cost.

3.4. Variable Costs
The costs on fodder, feed, medicine and labor were included in variable cost of goat rearing enterprises. Thus table narrates that labor cost were (Rs. 109500 per flock per year) accounted for small rearers followed by large (Rs. 152347.82 per herd per annum). For small enterprise labor cost is more i.e. (41.33 percent) when compared to large rearers enterprises i.e. (25.20 percent). The mentioned table also revealed that the fodder and feed cost for both groups accounted to Rs. 41150.35 and Rs.10685.70 respectively. Medicine cost were accounted in case of small enterprise is Rs. 199.28 and Rs.7615.43 in case of large rearers. In both categories the most important was labour cost that is accounted to Rs.152347.81 and Rs.109500 per annum per herd for large and small rearers respectively. The total costs of labour were 33.26 percent of the total cost. So that the total cost in case of small rearers were Rs.264920.69 and Rs. 604883.16 for large goat rearers.

Table 2: Cost Incurred in goat rearing

S. No	Particulars	Small rearers		Large rearers		Overall	
		No/Quantity	Value (Rupees)	No/Quantity	Value (Rupees)	No/Quantity	Value (Rupees)
I				Fixed Cost			
01	Amortization Cost	14.64	144535.71 (54.55)	45.79	403769.56 (66.75)	- -	274152.64 (60.65)
II				Variable Cost			
01	Fodder cost	- -	4392.85 (1.65)	- -	18253.62 (3.00)	- -	11323.23 (2.32)
02	Feed Cost	- -	6292.85 (2.40)	- -	22896.73 (3.80)	- -	14594.79 (3.10)
03	Medicine Cost	- -	199.28 (0.075)	- -	7615.43 (1.25)	- -	3907.35 (0.66)
04	Labor Cost	- -	109500 (41.33)	- -	152347.82 (25.20)	- -	130923.91 (33.26)
	Total	- -	120384.98	- -	201113.60	- -	160749.29
	Grand Total		264920.69		604883.16		434901.93

Note: Figure in parentheses are percentage.

3.5. Returns from Goat Rearing
The table 3 reveals that the returns from goats comprises of sale of milk and offspring. The total income was Rs. 78477.13 for small enterprise and for large it was Rs. 277440.10 per flock per year. The table declares milk as the major component of income for both enterprises which made Rs. 295861.30 (33.60 percent) Rs. 131451.42 (38.30 percent) for large and small goat rearers respectively and overall it is accounted 35.95 percent of the total income. The income from offspring accounted to Rs.61935.71 for small and for large it was Rs.163616.30 million. The net returns obtained from large rearers were more Rs. 277440.10 when compared to small rearers Rs. 78477.13 per flock per year.

Table 3: Returns from goat rearing (per year per flock)

S. No	Particulars	Small Rearers		Large Rearers		Overall		
		No /Quantity	Value (Rupees)	No /Quantity	Value (Rupees)	No /Quantity		Value (Rupees)
01	Present Value of Goat	14.64	150010.71 (43.70)	45.79	422845.65 (47.90)	30.21 (30.21)		286428.18 (45.80)
02	Value of Offspring	10.90	61935.71 (18.00)	33.80	163616.30 (18.50)	22.35		112776.01 (18.25)
03	Sale of Milk (lit/yr)	1825.70	131451.42 (38.30)	4109.20	295861.30 (33.60)	2967.44		213656.36 (35.95)
	Total Gross Return	--	343397.84	--	882323.25	--		612860.55
	Net Return	--	78477.13	--	277440.10	--		177958.62

Note: Figures in parentheses are percentages.

Table 4 describes the cost, benefits and revenue occurred in five years of duration in goats rearing. The benefits at first year were counted as zero in both small and large rearing enterprises, while the revenue found to be negative in the same

year. Further, the benefits and revenue were increased every year as with the increasing of herd size for both the enterprises. This increase in revenue indicates that both the enterprises are economically viable, but the large rearing enterprise is more profitable as compared to smaller one in long term plan.

Table 4: Perceived cost, benefits and revenue.

S. No		Small Goat Rearers		
1	Year	Cost (Rupees)	Benefits (Rupees)	Net Revenue (Rupees)
	1	264920.69	0	-264921
	2	169534.13	429247.30	259713.20
	3	222513.55	563387.09	340873.50
	4	292049.04	739445.55	447396.50
	5	383314.36	970522.29	587207.90
2		Large Goat Rearers		
	1	604882.04	0	-604882
	2	263960.86	1102904.06	838943.20
	3	346448.64	1447561.58	1101113.00
	4	454713.84	1899924.58	1445211.00
	5	596811.91	2493651.010	1896839.00
3		Overall		
	1	537465.27	0	-537465
	2	254865.98	756574.00	501708.00
	3	334511.59	1279180.27	944668.70
	4	439046.47	1678924.10	1239878.00
	5	576248.49	2203587.88	1627339.00

Table 5: Five Years horizon at different interest rates in Rupees

S. No	Small Rearers	5 Years Horizon		
		r=10%	r=14.5%	r=20%
1	Present value of benefits	985607.06	873605.64	762155.70
	Present value of costs	1885700.15	1626086.41	1370753.65
	Net present value	1110487.38	981975.4545	850702.52
	Benefit cost ratio	1.91	2.04	1.80
	Internal rate of return	204.75 %		
2	Large Rearers	5 Years Horizon		
		r =10%	r =14.5%	r =20%
	Present value of benefits	4845100.55	6905590.77	3522001.76
	Present value of costs	975357.70	822951.70	674049.79
	Net present value	3650292.17	3235164.20	2811117.41
	Benefit cost ratio	4.97	8.39	5.23
	Internal rate of return	234.07 %		
	Overall	5 Years Horizon		
		r =10%	r =14.5%	r =20%
3	Present value of benefits	4101317.30	3525745.44	2960903.85
	Present value of costs	984092.49	835273.64	689637.84
	Net present value	3623130.888	3274773.81	2919702.80
	Benefit cost ratio	2.55%	2.45%	2.35%
	Internal rate of return	134.11 %		

Table 5, summarizes the Benefit Cost analysis for small and large groups at study area. The table indicates that for all values of discount rates (r) present value of benefits exceeds present value of costs. It is also noted that the Benefit-Cost Ratio (B/C ratio) is greater than 1 for all given values of "*r*" which implies that the scheme is viable and has contributed to the net economic welfare of the sample farmers. The table further reveals that when this enterprise is extended to five years the B/C ratio increased for all values of discount rates taken into account. The Internal Rate of Return which is an indicator of robustness of the results for the investment initiative and calculates the discount rate at which the present value of benefits equates the present value of costs ranges from 204% to 234% for the 5 years horizon respectively.

3.6. Financial Feasibility in Goat Rearing
In this study the NPV, BCR and IRR are used to study the investments in goat rearing business. Table 6 reveals that the NPV for small rearers were Rs. 34990.09 and Rs. 165704.83 for large rearers, while Rs.107847.46 for aggregate sample as whole. Further net present value was reasonably high in large rearers as compare to small units but for both size units it was found positive which reflects that the investment in goat rearing is economically feasible.

The discount benefit cost ratio is also mentioned in the table which indicates the returns for per rupee of investment and also assigned priority among alternative choice of investment. In the present study benefit-cost ratio at 14.5 percent of discount rate was 1.29 for small units and for large units it was 1.45. Both ratios were greater than unity but for large units it ranks over the small units. Hence, the investments in both small and large units are economically feasible.

Hence, internal rate of return was also used to explain the mentioned aspect. The result for internal rate of return in small units was 29.65 and 46 for large units which are greater than the discount rate (14.5 percent) considered in the analysis. While the IRR for aggregate sample was 37.65. Again the priority is given to large rearers.

The results from different tools employed in the research study clearly indicated that the investments in the goat enterprises are economically feasible and financially sound. Besides if there is only one option of investment.

Table 6: Financial feasibility in goat rearing

S. No	Particulars	NPV (Million)	BCR	IRR
01	Small Rearers	34990.09	1.29	29.65
02	Large Rearers	165704.83	1.45	46
03	Overall	107847.46	1.37	37.65

4. Discussion
Sheep and Goat farming activity is the most important activity in animal production sector, which provides employment to about 300,000 families and contributes 45 percent of the gross values to overall animal production in the country (Greece). It is concluded that this sector will boost up the rural economy and increase socio-economic status of the farmers (Hadjigeorgiou *et al*. 1998). The findings of this study are in close agreement with the previous researchers who demonstrated that Small-livestock-enterprises are of great economic importance and small-ruminant-enterprise is economically viable and a profitable venture [8].

Aslaam and Khaushak (2004) carried out work on the economic of buffalo-dairy-farms in Sindh province, Pakistan. They evaluated the overall cost of small-dairy-farm as Rs. 264938, medium Rs. 1094658 and for large Rs. 2791760. The

average net return for small, medium and large farms were found to be as Rs. 67134, Rs.390482 and Rs.1346580 per year respectively. They concluded that buffalo dairy farm enterprises are a profitable venture in the area of research. They also observed some problems during the study which affects the production of dairy-farms such as low quality feed and fodder, high-mortality, less- genetic-potential, high-input-cost and shortage of marketing-facilities [9].

In a study conducted on small livestock holders in rural mountainous areas of KPK (Pakistan), it was found that most of the animals were found to be under fed due to self-growing grasses for grazing except milking animals were offered cottonseed cake and wheat bran. It was found that gross profit per annum per buffalo was Rs. 32475, per sheep Rs. 3320 and per goat Rs. 5314. Production environment was found poor but the overall performance of animals was satisfactory [10]. Jitender *et al*. (2005) worked out the return and cost involved in goat and sheep farming in Mahender Garh and Gurgaon in 2001. They revealed that the average annual return from goat was Rs. 16605 and for sheep Rs. 4983 while the cost for one goat was noted Rs. 12169 and on sheep farm it was Rs. 26674 [11].

Sheep farming profitability analysis in Turkey demonstrated that by using (8, 5 & 3%) discount rates they get positive NPV as ($77.33, $149.06 and $212.73/head) and the CBR were found to be greater than 1 along with IRR, which was 12.92 percent which confirm that the business is economically viable and profitable [12].

Roopa (2007) conducted research on economic-analysis of sheep and goats rearing in Chikmagalur district-Karnataka state. The finding showed that the NPV for goat was Rs. 9,789.75 and for sheep Rs. 9,945 at discount rate of 12 percent, BCR were 1.86 and 1.43, and IIR were found to be 42.25 and 41.23. The net return obtained from goat rearing was Rs. 10,684.37 and from sheep rearing it was Rs. 10,092.37 per herd per year. The findings revealed that goat and sheep rearing business is a profitable venture. The major constraints found in keeping animals were unavailability of high reproductive breeds, poor technical skill; market facilities were insufficient and high-mortality rate of animals, poor feed and fodder. Negative growth rate were observed among the population of animals. Furthermore, they observed a better socio-economic-condition of the farmers during 1972-2003 [5].

5. Conclusion

Based on findings of the study, it was concluded that the goat rearing enterprise in the study area made a significant net contribution to the economic welfare of the sample respondents. The Benefit cost analysis reveals that benefits exceed costs for all values of discount rates taken into account for the sampled enterprise. The values of IRR further indicate the robustness of the results and support the main conclusion. The values of IRR are far greater than prevailing discount rate and signify that the schemes will remain viable at any discount rates below estimated IRR for the enterprise. Therefore, the study suggests that enterprise under consideration is profitable and may be extended to farmer communities experiencing the same climatic and socio-economic conditions and interested farmers should be provided technical and financial assistance in starting the goats rearing enterprise.

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