

Estimation of Costs and Returns and Factor Productivity in Livestock Enterprise in Northern Areas, Pakistan

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Abstract

Livestock rearing is an integral source of household income in the northern areas of Pakistan. This study was conducted with the aim to trace out the role played by livestock in the rural economy of the area. The average family size in the research area was found to be 17 persons, 50% were illiterate while only 9 % were educated who were above the level of matriculation. Five adult male were engaged in on-farm activities while only one adult male worked off-farm out of six adult males per household. Cattle and goats are the major livestock kept by farmers. About 6 cattle and 44 goats were kept on average per household. Foot and Mouth, Diarrhea, Pneumonia, Fever and Black Quarter were the most common animal diseases in the area and only 21 percent of the farmers got vaccinated their animals against these diseases. And also the area farmers were unaware of artificial insemination. Per capita milk consumption was found to be 40 liters per annum and all the surplus milk was converted into ghee. Almost all the livestock herders slaughter their own one dry cow in the beginning of the winter season every year. They dried the meat and later used the same for the whole of the winter season. Women were involved in almost all livestock activities and spent about five to six hours daily in livestock management. On average livestock owners earned Rs.244601 as gross income per annum with a major share of milk and young stock to the tune of Rs.164235 and Rs.78155, respectively. The analysis revealed that size of family, number of livestock, quantity of feed and labour days engaged were the major factors contributory to household income. The livestock enterprise showed increasing return to scale. Thus, indicating investment potentials in future time period. Availability of quality breed, veterinary services and milk processing equipment were necessary for the development of livestock enterprise in northern areas.

Key words: Livestock enterprise, costs, returns and productivity analysis, Northern areas

Introduction

Livestock is an important sub-sector of Pakistan's Agriculture. It contributes about 49.6 percent of agriculture value added and 10.8 percent to overall national GDP. Livestock rearing is primarily a subsistence activity to meet household food needs and supplement farm income. Almost every rural household owns some livestock and men and women as well as children are engaged with the husbandry. This sector engage 35 million of rural population in various production activities (GOP, 2007).

Domestically livestock has emerged as a growing sub-sector. It almost achieved the envisaged targets of 8th five-year Plan (1993-98). During last decade (1996-2006), the growth of livestock sector ranged from 5-6 percent per annum and population of livestock registered an increase of 45 percent. Milk production increased from 56 to 77 billion liters. In future, the demand for livestock products is expected to increase due to rapid increase in population, rise in household income and change in food taste and preferences. Presently, per capita consumption of milk and meat is estimated at 68.6 and 14.5 kilograms per annum, respectively. These statistics are far below the recommended dietary allowance (RDA) level for an individual in most of the advance countries.

In Pakistan, though per capita income has increased over the years, yet a quarter of the country population lives below poverty line (GOP 2007). The absolute number of poor in the rural areas is significantly higher than urban areas. The bulk of rural population constitutes agricultural labourers, marginal and small farmers and rural artisans. About half of their income is derived from agriculture and non-farm sources. Unequal distribution of land is one underlying factor responsible for rural poverty. Since prospects for increasing cultivated area are limited, the strategy for poverty alleviation calls for significant increase in crop and livestock productivity through substantial enhancement of output per unit of land, animal and labour.

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The food situation in Pakistan has always been fragile. Demand and supply situation of various food items indicates that country's food production system is not keeping pace with the food requirements of the rapidly increasing population. Malnutrition and protein deficiency is widespread and visible in both urban and rural areas. Because of this scenario, Pakistan along with 17 other developing countries has been declared by World Trade Organization (WTO) as a net food deficit country. Though Pakistan is ranked fifth regarding milk production in the world but still the country is not self-sufficient in milk production and a huge amount of valuable foreign exchange is spent to import milk and milk products (Nestle, 2003). During 1998-99, milk and

milk products of worth Rs.1075 million were imported. It is expected that with the present population growth rate of 2.8 percent and rising per capita income level, the demand for milk and milk products is likely to increase.

Livestock production in the rainfed mountainous free grazing areas has tremendous potential for development and has comparative advantage with desired profitability margin. But, unfortunately, the sector confronts host of constraints which if circumvented can double the output of livestock products. Livestock population in northern areas consists of 1.047 million heads of goats, 0.518 million heads of sheep, 0.398 million heads of cattle and 6,208 heads of buffaloes (Table 1).

Table 1 District-wise livestock population of Northern areas.

Livestock District	Diamer	Gilgit	Ghizer	Skardu	Ghanche	Total
Goats	349,311	288,798	76,907	239,430	92,839	1,047,285
Sheep	59,920	161,958	44,424	177,104	74,646	518,052
Cattle	82,620	114,286	50,535	106,867	43,649	397,957
Buffaloes	5,579	171	06	440	12	6,208
Total	497,430	565,212	171,872	523,841	211,144	1,969,502

Source: IUCN, 2002

Table 1.1 reveals that goat is the most popular milk animal in the northern areas. The mountainous nature of the area, free grazing communal land, fodder shortage and less susceptibility to diseases, contribute to the adoption of goats.

With a view to study the status of livestock management and the potential and opportunities of this sub-sector in the northern areas of Pakistan present study was conducted with the following objectives:

1. to record livestock inventory and general characteristics of livestock owners
2. to estimate costs and returns associated with livestock production
3. to study the contribution of various factors responsible for livestock production
4. to estimate returns to scale in livestock production

Materials and Methods

Northern areas of Pakistan include districts of Diamer, Gilgit, Ghizer, Skardu and Ghanche. The area is almost rainfed mountainous. This study was conducted in district Diamer in the year 2002-03. A two-stage simple random sample design was used to select the sample respondents. The first stage included 20 villages and the second stage comprised 100 livestock herders; i.e. 5 herders were selected from each village at random. All the respondents

were personally interviewed using a comprehensive interview schedule.

Model 1

To capture the effect of various physical factors affecting livestock production, the econometrics model was applied following Pervaiz et.al. (1985), Sadiq *et al.* (2003) and Sugiyanto (1983).

$$Y = \beta_0 + \beta_1 FS + \beta_2 AU + \beta_3 FD + \beta_4 LAB$$

where :

Y is livestock production

FS is the size of the family of the respondent

AU is the animal units

FD is total feed (green and dry) used in kgs and

LAB is total labor days whereas β s are the coefficient of these variables to be estimated

Model 2

The Cobb-Douglas production function was also applied to work out return to scale in following Pervaiz et al., (1985), Sadiq et al. (2003) and Sugiyanto (1983):

$$Y = C (FS)^{\beta_1} (AU)^{\beta_2} (FD)^{\beta_3} (LAB)^{\beta_4}$$

where

Variables Y, FS, AU, FD and LAB are defined earlier and carry exactly the same meanings while C is the constant and depends on the units of measurement of Y, FS, AU, FD and LAB. The coefficients β s are the elasticities of output with

respect to FS, AU, FD and LAB inputs respectively. These collectively measure the return to scale. Thus, if $\beta_1 + \beta_2 + \beta_3 + \beta_4 = 1$ there are constant return to scale. If $\beta_1 + \beta_2 + \beta_3 + \beta_4 < 1$ there are decreasing return to scale and if $\beta_1 + \beta_2 + \beta_3 + \beta_4 > 1$ there are increasing return to scale.

Results and Discussion

Livestock herders

General Characteristics

The following characteristics of respondent farmers are discussed based on results mentioned in Table1:

Family size and composition

According to Pakistan demographic survey a family or a household can be defined as all those persons who usually live together and share their meal. The average family size in the research area was about 17 persons which are higher than the average family size of the country (6.5). Several reasons may be responsible; like the trend of more than one marriage in the area is common, the trend of services in remote areas of the country is discouraging and lastly the area people are religious and dislike any family planning measures. The male: female ratio in the research area was 1:1.22.

Education level

Level of education plays an important role in the formation of human capital (Sharif, 1983). Fifty percent of the respondents were illiterate whereas only 9 percent had education above matric. The reasons for low literacy are that schools are located at distant places and the trend of services is not encouraged therefore the people of the area were not inclined towards education.

Employment status

Only adult male were taken as the work force of the farm household. The adults who were fully engaged in the farm activities were considered as on-farm employment. Employments in services, business and royalty were assumed to be off-farm employment. The results indicated that out of 6 adult males 5 were engaged in on-farm activities while only 1 adult male was engaged in off-farm activities.

Income from off-farm employment

The head of the family were asked of their income from off-farm sources including services, business and royalty from. For farm households total off-farm income was found to be Rs.82691 per annum. The major share to off-farm income was contributed by services and royalty from forest. Royalty was only received by medium and large farm categories. Off-farm income was also contributed by performing different kind of businesses at local level.

Cropping pattern

Two major crop seasons in the country are Rabi and Kharif. However, due to climatic diversity and

receipt of snowfall these seasons vary in northern areas. For example, tehsil Astore is a single-crop zone whereas both seasons are prevalent in tehsils Chilas and Darel. Wheat is the major Rabi crop grown by more than 80 percent of farmers. Wheat is not only grown as cereal crop but it also fulfills the requirements of the farmers as a green and dry fodder for livestock. On the other hand Maize is a major Kharif crop grown by more than 95 percent of farmers. It is primarily used for fodder purposes. Besides two major crops vegetables and fruits are also grown. However, due to small land holdings and lack of market potentials the production of vegetables and fruits was limited to home consumption only. Swanchal (leafy vegetable), spinach, radish, turnip, cauliflower, tomato, potato, brinjal, and okra were the common vegetables. Apricot, walnut, grapes, apple, almond, cherry, mulberry and peach were the common fruits produced in the area.

Livestock rearing

Table2 reflects results related to livestock rearing activities of respondent farmers that are discussed below:

Livestock profile

The proportion of different species of livestock relates to the geography of the area. If buffaloes concentrate in plains, sheep and goats dominate in hilly areas. The proportion of large ruminants is significantly low as compared to small ruminants in the research area (Table-2). Cattle and goats were the major livestock kept by the area farmers. On average each farmer keeps 6 cattle and about 44 goats. Similarly, on average 20 adult animal units were kept per household including 9 adult unit of large ruminants and about 11 adult animal units of small ruminants.

Fodder used

Livestock was fed fodder to meet nutritional requirements. The livestock herders use communal lands for free grazing which helps in a relatively more economical way to meet the dietary needs of the animals. They do shift their livestock in the beginning of May to very distant alpine meadows. The farmers do not shift their entire family but one or two of the family members shift with their livestock. They shift along with the foodstuff and other requirements sufficient for the period of five to six months. In September when the temperature turn to be cooler farmers return back with livestock to the lower meadows within a month time period. Some milch stock is kept at home and is fed Shaftal (clover) and maize as green fodder. In winter dry fodder (*bhusa*) and dry fodder maize stalk are fed to the entire livestock along with, dry clover and grasses. During the year 43 mounds of green fodder,

63 mounds of dry fodder bhusa and 49 mounds of dry fodder maize stalk were fed to the livestock.

Milk and by-products (ghee)

It was noted that milk marketing is not common in the study area. Per capita milk consumption was found to be 33.14 liters. Per capita milk consumption among large farmers was very low (33 liters) as compared to small (42 liters) and medium farmers (37 liters). The reason for this was the preference given to ghee extraction by large farmers (125 liters) as compared to small (23 liters) and medium farmers (54 liters). The average ghee production per household was 67 kgs/ year. The household uses their local ghee and purchase ghee rarely from the market. They believe that this local ghee is good for health and help in extending their life for being pure and nutritious. The pattern of meat consumption in the research area is quite unique. Almost all the livestock herders slaughter their own dry cow in the beginning of winter season every year. They dry it and then use the meat for the whole season. In summer too the area farmers slaughter young goats at many occasions and buy meat from market very rarely. The farmers had the opinion that due to extreme cold and distant markets they follow this practice.

4. Women participation

In Pakistan, rural women constitute 36 percent of the total population. Rural women actively participate in agricultural activities particularly in livestock management. Due to very small land holdings and dependency of crops on rainfall have squeeze the participation of women in crop sector, however women are actively involved in livestock management. Several studies revealed that rural women participate more in livestock related activities than crop production activities. Ahmad et al. (1993) and Ahmad and Khan (2001) have reported that majority of the women are engaged in cleaning of animal sheds, watering and milking of animals and milk processing. Female participation in livestock related activities ranges from 65 to 70 percent (Ahmad et al. 1988). In the research area, women are almost fully involved in cleaning of livestock sheds, collection of farmyard manure, stall feeding and watering the animals. Fodder cutting, chopping and milking are the other significant activities where women participation is significant. According to Freedman and Wai (1988) women are involved in fodder cutting (53 percent), animal care (50 %), cleaning and watering animals (93%) and collection of farmyard manure (91%). The results presented in Table2 indicate that shed cleaning and manure gathering are the activities specific for women. Similarly, watering the animals, stall-feeding and fodder chopping are the other activities where maximum responsibilities were shared by women.

Fodder cutting seems to be the more time consuming activity that took about one hour per day. Stall-feeding was the second task for women in term of time spent (53 minutes/ day). Milking, farmyard manure gathering and cleaning of animal sheds are the other major activities where women where more than 68 percent of the time was spent on four activities including fodder cutting, stall-feeding, milking and farmyard manure gathering.

Disease incidence and animal breeding

Table 3 reflects results related to disease incidence and breeding among the livestock that are discussed below:

Disease incidence

Animal health is given high importance. With the passage of time new methods have been developed ranging from the use of herbs to processed medicines for the treatment of diseases. Disease incidence is common in both large and small ruminant in the northern areas. As the number of goat population is high compared to other animals in the area likewise mortality rate is also high among goat population. As shown in Table 3, disease incidence among goat was 43 percent including different diseases, 23 percent among cattle and 15 percent among buffalo. Foot and Mouth, Diarrhea, Pneumonia, Fever and Black Quarter are the most common animal diseases in the area. Foot and mouth is the common seasonal epidemic among large ruminants and leads to mortality among buffaloes and cattle. This disease affected 74 percent of buffalo and 41 percent of cattle. Besides foot and mouth, diarrhea happened to be the most prominent disease causing mortality in goats and sheep as high as 69 percent among goats and 56 percent among sheep. Pneumonia and fever was also common among large and small ruminants. Black quarter also occurred among the livestock in the area. The poor health care measures are attributed to high disease infestation.

Almost all the farmers treated their animals against different diseases. However, the lack of sufficient veterinary services hinders the proper and timely treatment of the area livestock. Farmers usually did get the available medicines from the local shop and treated the animals according to their own experience. The death rate is very high among the animals in the upper alpine meadows, when some epidemic diseases spread there in the meadows, loses hundreds of animals. The farmers could do nothing due to unavailability of proper veterinary facility in the distant remote meadows. The area farmers had negligible knowledge about the vaccination against some chronic epidemic diseases of animals. About 86 percent farmers treated their animals against different diseases and majority (45%) was medium size farmers. Majority of the farmers (61%) treated their

animals at home. About 20 percent farmers reported that they did follow vaccination to their animals.

Animal breeds and breeding

Different geographical areas have specific breeds of livestock to be reared. However, farmers try to raise livestock breed that are more profitable in terms of net revenue. Almost all farmers in the study area were rearing local breeds of cow, and sheep besides other animals. A very small proportion of buffaloes are present in the area that was Neeli Ravi. About 70 percent of the Karachi breed of goat was found in the area along with local breed (Table 2). Almost 100 percent of the breeding in buffalo, cow, goat and sheep was performed naturally. There was only one case that performed artificial insemination in cows. Many farmers pointed out that they even remain unaware of the crossing in their cows and goats. It is totally performed naturally in the meadows.

Returns from livestock

TableIV reflects results related to costs and return from livestock enterprise that are discussed below:

Total revenue

The total revenue from livestock mainly comprised of sale of milk, wool, farm yard manure and young stock per annum. The revenue from livestock mainly comprised of sale of milk and young stock. Milk contribution towards revenue on small, medium and large farm was 81, 78 and 63 percent respectively. On an average, revenue from sale of milk was Rs. 363388 on large farms, Rs.90831 on medium farms and Rs.38487 on small farms. Similarly, revenue from sale of young stock was Rs. 204703 on large farms, Rs. 21827 on medium farms and Rs.7934 on small farms. In other words sale of young stock contributed to total revenue about 36, 19 and 17 percent on large, medium and small farms respectively. On over all bases total revenues were Rs.47330 at small farms, Rs.115148 at medium farms and Rs.571325 at large farms. Similarly, larger numbers of animal units (50.93) were kept at large farms whereas animal units at medium and small farms were 8.46 and 2.81, respectively. Hence, milk and young stocks sales were very high on large farms as compared to medium and small farms.

Costs on livestock rearing

The major components of total cost were green and dry fodder, veterinary medicines and labor. On an average labour costs were Rs.25385, Rs.44052 and Rs.58708 on small, medium and large farms, respectively. Similarly, total costs were Rs.35881, Rs.68997 and Rs.99936 on small, medium and large farms, respectively. It was found that labour cost accounted for about 59-71 percent of the total cost across different farm categories. Labour cost was higher at small farms (71%) as compared to medium (64%) and large farms (59%). Large farms proved to

be cost-efficient attributable to economies of scale as compared to medium and small farms.

Cost for buying fodders (green and dry) was calculated at Rs.10230, Rs.24167 and Rs.39167 on small, medium and large farms, respectively. Cost for buying fodder (green and dry) accounted for 28-39 percent of the total cost across different farm categories being the second largest cost component in the total costs. It was found that the cost was lower (28%) at small farms as compared to medium farms (35%) and large farms (39%).

Net revenue from livestock rearing

It was found that net revenues excluding labour cost were Rs. 36834, Rs. 90203 and Rs. 530097 on small, medium and large farms, respectively. Net revenues dropped to Rs. 11449, Rs. 46151 and Rs. 471389 when labour cost were included in calculating net revenues on small, medium and large farms, respectively. Small farms no doubt were making very nominal net returns however these farm households continue to run their livestock units to earn their livelihoods in maintaining their families. The net returns to labour are estimated at Rs.91, Rs.159 and Rs. 842 per labour day on small, medium and large farms, respectively. The large farm yields the highest net returns per labour day as compared to medium and small farms and the highest net returns per animal unit reared.

Returns to scale

In the research areas, livestock act as a full time enterprise. Due to small land holdings and uncertain weather conditions, crop sector attain no due attention and farmers pay their entire attention to livestock sector. Therefore, it becomes very important to analyze the scale of return for the livestock enterprise in order to find out whether opportunities exist for the farmers to invest more in this sector or otherwise. The econometric model below was applied to analyze return to scale:

$$Y = 2.19 + 0.67FS + 0.31AU + 0.66FD + 0.62LAB$$

$$(3.43) (2.26) (2.00) (3.84) (5.73)$$

$$R^2 = 0.88 \quad F\text{-value} = 71.72$$

The above stated empirical results reinforces the idea results of the previous model that the family size (FS), number of animal units (AU), quantity of fodder (FD) and labour days utilized (LAB) significantly contributed to returns from livestock production.

Additionally, the parameter estimates (β s) representing elasticities of production indicated that 10 percent increase in family size (FS), number of animal units (AU), quantity of fodder (FD) and labour days utilized (LAB) the returns would respectively increase by 6.7 percent, 3.1 percent, 6.6 percent and 6.2 percent. Similarly, the addition of $\beta_1 + \beta_2 + \beta_3 + \beta_4 = 2.26$ which is >1 indicates increasing

return to scale. There are greater opportunities of investment in the livestock sector. It is exactly the same that more investment in this sector will help in improving the socioeconomic conditions of the farmers in the area.

Conclusions and Recommendations

Livestock is an integral part of the farming system of the northern areas. This sector significantly contributes the household income and provides employment opportunities at household and community levels. For example, family labour is paid at a rate of Rs.331 per day on average indicating the economic importance of the livestock rearing in the area. Similarly, such enterprises are major sources of jobs for females who are engaged in different kinds of farm activities including milking, farmyard manure gathering and cleaning of animal sheds; etc.

The results further indicate that majority of the farmers own local breeds of cow, goat and sheep and trend towards artificial insemination including cross breeding is not common. This had led to lack of variation in animal breeds. However, keeping in view the specific features of the area, grazing and reproduction potential goats and sheep are more economical farm animals. Results also suggest that large farms are relatively more productive and efficient by giving higher returns as compared to small and medium farms. Similarly, incidence of different diseases and insufficient veterinary facilities including lack of medicines in local markets resulted adverse effects on the livestock population and returns to farmers.

Based on the findings of the study, following recommendations are extended for the development of livestock sector in northern areas:

1. veterinary extension services should be strengthened in the area including upper alpine pastures particularly in summer
2. the availability of improved cattle and goat breeds should be further enhanced. Moreover, the practice of artificial insemination for cross breeding should be encouraged for the improvement of livestock breeds
3. establishment of dairy industry in the area is highly needed for value addition of milk and the transport network should be strengthened for transportation of surplus milk to other parts of the country
4. the development of large livestock farms should be encouraged, as these are more cost efficient and productive than smaller farms. The proper knowledge of young stock fattening may lead to a profitable venture to

produce and supply quality milk, beef and mutton to the corporate food chain.

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Table 1 Livestock owners general characteristics

Family composition (number)	Farm size				significance
	Small	Medium	Large	All	
Family size	11.45	14.25	25.70	16.93	.000
Male	6.18	7.95	11.69	8.61	.008
Female	5.27	6.30	13.84	8.27	.000
Male: female ratio	1:1.27	1:0.94	1:1.62	1:1.22	.264
Education level (percent of respondents)					
Illiterate	18	18	14	50	not applicable
Primary	5	14	9	28	
Matric	2	9	2	13	
Above matric	0	5	4	09	
Employment status (number)					
Adult male	4.36	5.45	7.31	5.80	.019
On-farm	3.36	4.35	6.69	4.80	.004
Off-farm	1.00	1.10	0.62	1.00	.242
Sources of off-farm income					
Total off-farm income (Rs)	51272.73	47119.40	164000.00	82690.64	.005
Services (Rs)	17454.60	42000.00	63230.76	42136.32	.300
Business (Rs)	33818.16	4619.40	27692.28	18736.08	.352
Royalty from forest (Rs)	0.00	500	73076.92	21818.18	.011
Cropping pattern of the area					
Rabi season	Percent of respondents				
Wheat	6.8	18.2	11.4	36.4	not applicable
Shaftal	2.3	0.0	2.3	4.5	
Wheat + shaftal	6.8	22.7	15.9	45.5	
Kharif season					
Maize	22.7	43.2	29.5	95.5	not applicable

Table 2 Livestock rearing under different farm size

Specie (number)	Farm size				significance
	Small	Medium	Large	All	
Buffalo (adult)	0.00	0.01	2.69	0.84	.002
Buffalo (young stock)	0.00	0.01	1.23	0.41	.001
Cow (adult)	1.64	4.30	11.69	5.82	.000
Cow (young stock)	1.18	2.30	4.38	2.64	.000
Goats	2.80	11.90	129.54	44.39	.000
Sheep	0.00	0.25	1.31	0.50	.195
Adult animal units per farm					
Large ruminant	2.35	5.71	19.22	8.71	.003
Small ruminant	0.70	3.04	32.71	11.23	.000
Total	3.05	8.75	51.93	19.94	.002
Quantity of fodder used per year (mounds)					
Green fodder	16.64	30.50	84.62	43.02	.003
Dry fodder <i>bhusa</i>	38.27	80.00	58.00	63.07	.221
Dry fodder maize stalk	30.91	41.80	75.38	49.00	.001
Animal health facilities (percent respondents)					
Disease treatment (yes)	13.6	45.5	27.3	86.4	

Home treatment	9.1	40.9	11.4	61.4	not applicable
Animal husbandry services	4.5	4.5	11.4	20.5	
Visit of extension agent	0.0	12.1	7.3	19.0	
Vaccination	4.1	11.7	5.6	21.4	
Milk and by-products (ghee) consumption per annum (liters)					
Milk consumption/household	627.48	706.20	356.40	563.36	0.048
Milk consumption/capita	36.91	41.54	20.96	33.14	0.355
Ghee consumption/household	23.00	54.00	125.00	67.00	0.000
Women participation in different livestock activities (percent)					
Fodder cutting	23.50	58.80	17.60	34.2	not applicable
Fodder chopping	57.32	62.61	67.28	63.51	
Stall feeding	87.05	78.92	91.34	86.10	
Grazing	06.11	12.34	02.21	07.10	
Watering (hauling)	85.78	77.07	91.09	83.78	
Shed cleaning	98.76	96.23	95.28	97.21	
Collecting farm yard manure (FYM)	87.34	97.34	97.76	94.37	
Milking	49.34	53.56	67.32	57.49	
Time devoted by women in different livestock activities (hours/ day)					
Fodder cutting	1.08	1.00	0.26	0.69	0.237
Fodder chopping	0.18	0.32	0.26	0.25	0.215
Stall feeding	0.29	1.10	0.59	0.53	0.178
Grazing	0.03	0.11	0.00	0.05	0.177
Watering (hauling)	0.16	0.32	0.24	0.26	0.237
Shed cleaning	0.43	0.37	0.26	0.35	0.836
Collecting farm yard manure (FYM)	0.33	0.43	0.52	0.43	0.064
Milking	0.26	0.47	1.10	0.49	0.007

Table 3 Disease incidence, breeds and animal breeding

Particulars	buffalo	cattle	goat	sheep
1. Diseases incidence (percent)				
Diseases occurrence	15	23	43	19
Mun-khur	74	41	-	-
Moke/ diarrhea	13	34	69	56
Pneumonia/fever	5	17	31	41
Chaur (black quarter)	8	7	-	-
2. Breeds and animal breeding (percent)				
Local	--	98	30	100
Neeli ravi	100	--	--	--
Jarakheil	--	--	70	--
Breeding				
Natural breeding	100	98	100	100
Artificial insemination	00	01	00	00
Access to bulls				
Own bulls	25	37	76	51
Fellow farmers/ communal bulls	75	63	24	49

Table 4 Returns from livestock rearing under different farm size (Rs)

Particulars	Farm size			
	Small	Medium	Large	All
Milk	38487 ^{ac}	90831 ^{bc}	363388 ^{ca cb}	164235
Young stock	7934 ^{ac}	21827 ^{bc}	204703 ^{ca cb}	78155
Wool	000	060	108	056
Manure	909	2430	3127	2155
Total revenue	47330	115148	571325	244601
Green fodder	1600 ^{ac}	2787 ^{bc}	6204 ^{ca cb}	3530
Dry fodder	8630 ^{ac}	21380	32963 ^{ca}	20991
Concentrate	000	000	000	000
Vet. & medicine	266 ^{ac}	778	2062 ^{ca}	1035
Labour	25385 ^{ac}	44052	58708 ^{ca}	42715
Total Cost	35881^{ac}	68997	99936^{ca}	68271
Animal units	2.81 ^{ac}	8.46 ^{bc}	50.93 ^{ca cb}	20.73
Cost per animal	12770 ^{ab ac}	8973 ^{ba}	2486 ^{ca cb}	8076
Net return (excluding labour cost)	36834^{ca cb}	90203^{bc}	530097^{ac}	219045
Net return (including labour cost)	11449^{ac}	46151^{bc}	471389^{ca cb}	176330
Labor days	403 ^{ac}	568	629 ^{ca}	533
Net returns to labour	113^{ac}	188^{bc}	692^{ca cb}	331
Net returns/ animal unit	4074^{ac}	5455	9256^{ca}	6261

Source: Survey Data, 2002-03

Results of Multiple Comparison “Tukey’s Test”.

ab = small farm is statistically different from medium farm

ac = small farm is statistically different from large farm

bc = medium farm is statistically different from large farm

ca = large farm is statistically different from small farm

cb = large from is statistically different from medium farm

Net return/ animal unit = Net revenue (including labour cost)/ animal units

The Northern Areas of Pakistan form a mountainous, semi-arid region in which subsistence mixed farming is the predominant economic activity for the majority of the population, which numbers around 1 million. Following a period of relative isolation, construction of the Karakoram Highway and the ensuing development activity have been catalysts for rapid infrastructural and social change over the last two decades. Live weight and body condition of livestock in the Northern Areas changed markedly over the annual cycle. Losses of live weight were in the order of 10% over winter while summer gains during the summer season averaged 35% of initial live weight. Key words: Livestock enterprise, costs, returns and productivity analysis, Northern areas. Introduction Livestock is an important sub-sector of Pakistan's Agriculture. It contributes about 49.6 percent of agriculture value added and 10.8 percent to overall national GDP. The bulk of rural population constitutes agricultural labourers, marginal and small farmers and rural artisans. About half of their income is derived from agriculture and non-farm sources. Unequal distribution of land is one underlying factor responsible for rural poverty. Since prospects for increasing cultivated area are limited, the strategy for poverty alleviation calls for significant increase in crop and livestock productivity through substantial enhancement of output per unit of land, animal and labour. 43. Afridi et al. Cost of Energy options in Pakistan le Energy Options in Pakistan. Table 5: Pakistan Livestock Population (1996-2006). Table 6: Rise of Motor Vehicles in Pakistan Mix of GHGs within livestock sector Forest cover in Pakistan, 1990-2005 District Wise Forest Cover in Pakistan Forest Distribution by Region in Pakistan Least Cost ranking of mitigation options in the Forestry Sector Total GHG Emissions 2011-50 Share in Emissions Energy Sector Emissions 2011 - 50 (Business as Usual Scenario) Energy Sector Emissions 2011 - 50. The NEEDS study aims to bring out some of the priority areas for possible climate mitigation while drawing out the probable future course of Pakistan's growth and the costs associated with moving towards a low carbon development pathway. In Pakistan, the productivity of the livestock sector is lower than its capacity due to lack of breeds with high productive potential, nutrition deficiency and poor disease control facilities. This study explores the potential of the livestock sector to move towards more productive breeds of cattle. Estimation of Gross Margins of Livestock Farmers: The gross margins are calculated by using the following traditional formula: $Gross\ Margins = Total\ Revenue - Total\ Variable\ Cost$ (1). Empirical Specification: We employed endogenous. The average variable costs and the gross, unobservable factors associated with selection bias, the margins per animal are provided in Table 8. Overall, the important implication of the error structure is that as the gross margins per animal are Rs.