

## **CHARACTERISTICS OF RURAL SUBSISTENCE SMALL HOLDER LIVESTOCK PRODUCTION SYSTEM IN MOUNTAINOUS AREAS OF NWFP, PAKISTAN**

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### **ABSTRACT**

A study was conducted in the rural mountainous areas of North West Frontier Province of Pakistan to characterize small holder's subsistence livestock production system. Livestock farmers (n=82) were interviewed in 16 villages of Batagram and Mansehra districts. The farmers were keeping on an average 4 buffalos, 1 cattle, 12 sheep or 13 goats per household. More than 94% farmers were keeping 4 buffaloes per household as compared to only 40% keeping 1 or 2 cattle. Buffaloes were main dairy animals producing 7.9 liters of milk/day or 2370 liters per lactation of 300 days. Local non-descript cows were producing only 2.5 liters of milk per day. Animals of all species were found to be underfed, as they depended mostly on self growing local grasses for grazing. Only milking animals were offered some concentrates in the form of cottonseed cake and wheat bran. Milk was mostly consumed at the household level or converted into butter oil. Age at first calving and calving interval of buffaloes were longer than those of cows. Incidence of livestock diseases was high in the area. Major diseases in cattle and buffaloes were haemorrhagic septicaemia and internal parasites. Pleuropneumonia and parasitism were major disease problems in small ruminants. It was estimated that gross profit averaged Rs. 32475 per buffalo, Rs. 3320 per sheep and Rs. 5314 per goat per year. Gross margin for cattle was negative and the farmers were sustaining a loss of Rs. 1960 per cow per year. Keeping in view the poor production environments, the overall performance of animals was encouraging and offered considerable scope for improvement.

**Key words:** Pakistan, livestock, small holder, production system, gross margin analysis.

### **INTRODUCTION**

Agriculture, including livestock farming, in North-West Frontier Province (NWFP) is mainly subsistence and is characterized by low inputs (Rehman and Shah, 2003). Most farms are fully integrated mixed units consisting of cattle, buffaloes and sometimes sheep or goat or both. Traditionally, cattle are kept as draught animals with milk as a by-product and buffaloes as dairy animals.

There are four main systems of production of cattle and buffaloes in Pakistan. These include rural subsistence small-holder production system, rural market oriented smallholder production system, rural commercial dairy farming system and peri-urban commercial dairy farming system (Afzal, 1997). Majority of national livestock population is distributed in small units throughout Pakistan. Smallholders shoulder major share of the population of large ruminants keeping 60% buffaloes and 55.5% cattle, with less than 6 animals per household

(Anonymous, 1996). The situation is almost similar for goats and more than 45% of the national goat population is maintained in small flocks having less than 15 animals.

Under the rural subsistence smallholder production system which is most common in Pakistan, milk is produced for the family at minimal cost. Grazing provides most of the feed requirements of animals. Some roughages and a small quantity of concentrate are given only to milking animals. More than 90% of the milk produced under this production system is used for family consumption. This traditional system makes heavy demand on family labour (Afzal, 1997). In small holder production systems, it is important to integrate genetic improvement programmes with other livestock development activities such as health cover, nutrition and management as well as access to output markets (Trivedi, 2002).

Characteristics of small holder's subsistence livestock production system have not been studied in Pakistan for the last two decades. As far as could be

ascertained, a study conducted during 1986 is the latest report describing main features of livestock production systems in Pakistan (Anonymous, 1987). Since then, several changes might have taken place in the patterns of livestock production in the country. The present study was, therefore, planned to examine the role of livestock in small holder mixed farming system of remote parts of the country using rural areas of NWFP as a model. Main objective of the study was to update the previously reported characteristics of small holder subsistence livestock production system. Associated objectives were to assess the role of livestock in the uplift of socio-economic status of the rural population of the area and to study the livestock management practices in terms of feeding, breeding and disease control.

## MATERIALS AND METHODS

Data regarding various components of the small holder's subsistence livestock production system were generated through a field survey study. The survey was conducted in the rural areas of Mansehra/Kohistan Division of North West Frontier Province (NWFP) of Pakistan during the month of October 2003. The survey area is located in the mountainous region of the province having moderate climate in summer. Average annual rainfall in the area is 2000 mm (Anonymous, 2004). A team of scientists from Pakistan Agricultural Research Council, Islamabad visited the area with active support and collaboration of officers and staff of Livestock and Dairy Development Department, NWFP. A survey questionnaire was developed to collect information and a total of 82 farmers located in 16 villages of Batagram and Mansehra districts were interviewed. Fifty structured questions were asked to each farmer in order to examine the housing facilities available for livestock, income from sale of milk and meat, daily and annual expenditure on keeping livestock and type and cost of feed made available to the livestock (Belay, 2003). About 10 farmers from each village (3 villages in each tehsil) were planned for interview at random. However, in some villages, all farmers were not available at the time of visit and the number of respondents varied in each village.

## RESULTS AND DISCUSSION

### Herd structure and size per household

Distribution of livestock population by area surveyed, farmer's ownership and species is presented in Table 1. Sixteen villages of Batagram, Shinkiari,

Mansehra and Boofa tehsils of Batagram and Mansehra districts were visited. Number of farmers interviewed in each tehsil varied due to various factors. The main causes of variation were: responsiveness and cooperation of farmers, size of the village and farmer's availability at the time of visit. Among 82 farmers interviewed, it was observed that goats and buffaloes were maintained in larger number as compared to sheep and cattle in the area (417 and 326 vs. 242 and 55, respectively). Few farmers were keeping mules and donkeys for transportation of goods and other household items.

Table 2 gives the details of average number of animals per house hold. It was observed that majority of farmers (94%) were keeping at least one buffalo. About 40% of the farmers were maintaining at least one cow and/or one goat. Only 24% of the farmers kept at least one sheep. Average numbers of goats and sheep per household were higher as compared to buffalo and cattle (13.0 and 12.1 vs. 4.2 and 1.7, respectively). There was large variation in the number of animals maintained per household. Number of livestock increased with socio-economic status of farmer. Other workers had reported similar findings in their studies. Baley (2003) reported that number of livestock per unit area of cultivated land increased significantly with the density of rural population.

Buffaloes and goats were found to be higher in number than other livestock per household in the peri-urban areas of Mansehra due to the higher income of farmers. A farmer was found keeping 190 buffaloes and another 150 goats in Shinkiari, a peri-urban Mansehra town. Almost all households were keeping a buffalo and a goat. About two-third of the farmers were keeping cattle alongwith buffaloes and the number of cows per household was only one. Raja (2001) has reported that small holders in rural areas with no satisfactory market aim to produce only that amount of milk which is sufficient to meet family requirements at minimal cost.

The buffaloes found in the area were generally purchased from Punjab. Local farmers called them 'desi' buffaloes but phenotypically they were similar to the Nili-Ravi breed (Shah, 1991). Some samples of Swati buffaloes were also found, distinguished by prominent golden colour of skin and hair. Similarly, local cattle were also called 'desi' which were small sized and weighed approximately 300-350 kg. A reasonable number of crossbreds with Holstein or Jersey were also seen in the area. Sheep breed found in the area was Kaghani (Hasnain, 1985). However, migrants from Afghanistan were keeping Balkhi breed in larger numbers (300-500 sheep per herd). Many

**Table 1: Distribution of livestock population by species, area surveyed and farmers ownership in Mansehra and Batagram districts of NWFP**

Tehsil	Number of villages	Number of farmers interviewed	Number of livestock maintained by farmers				
			Buffalo	Cattle	Sheep	Goats	Others <sup>1</sup>
Batagram	4	33	22	14	-	9	1
Shinkiari	5	20	75	20	115	229	8
Mansehra	4	12	27	6	60	22	-
Boofa	3	17	202	15	67	157	7
Total	16	82	326	55	242	417	16

<sup>1</sup> Other animals included horses, mules and donkeys.

crossbreds of Rambouillete with Kaghani were found around Mansehra city. Almost all types/ breeds of goat were found in the region. Goats belonging to Kaghani breed were found in larger number than other breeds.

**Table 2: Average number of animals per household in Mansehra and Batagram districts of NWFP**

Species	Numbers of households keeping at least one animal of the species	Total number of animals	Average number of animals per household
Buffalo	77 (94%)	326	4.2 ± 13.5
Cattle	33 (40%)	55	1.7 ± 1.3
Sheep	20 (24%)	242	12.0 ± 63.7
Goat	32 (39%)	417	13.1 ± 31.4
Other <sup>1</sup>	4 (5%)	16	4.00 ± 1.0

<sup>1</sup>Other animals included: horses, mules and donkey

### Feeding practices

Availability of feed is the most important factor in livestock production. Without optimum feeding, the animals do not produce upto their production potential and are vulnerable to various diseases. In the area surveyed, it was observed that self growing local grasses were available on hill tops and sides of pathways. The leaves of different plants were also available for goats. Other feeding material available for livestock included wheat bran, green maize, corn stubbles, wheat straw rice straw, left over bread, vegetable and fruit wastes, cottonseed cakes, maize grains and wheat grains. Most of the feed ingredients were available at the household level with few exceptions such as cottonseed cakes, wheat/rice bran and wheat straw, purchased from local markets. Local corn crop was not only used as green fodder but also as dry roughage preserved for winter feeding. Corn grains were also used as concentrate mostly for small

ruminants feeding. Most of the feeding requirements of all types of livestock were met from grazing and stall feeding of small quantity of roughages. Supplementation with cottonseed cakes or grains of wheat or maize was made only for lactating cattle and buffaloes in proportionate with their daily milk yield.

On an average, 2.5 kg each of cottonseed cakes and wheat/rice bran were mixed with 10 kg wheat/rice straw for daily feeding to a lactating buffalo. Approximately 1.5 kg cotton seed cake mixed with equal quantity of wheat bran and 7 kg wheat straw were made available to a lactating cow per day. Small ruminants generally depended on grazing. Some lactating goats were, however, provided 2 kg of wheat bran mixed with equal quantity of wheat straw alongwith 250g of corn grains per day.

Feeding practices observed in the present study are consistent with those reported previously (Anonymous, 1987; Raja, 2001; Aujla *et al.*, 2003) with the exception that now small holders have started feeding some concentrates to their lactating cows and buffaloes. Raja (2001) reported that livestock production system in Pakistan was traditionally based on free grazing. Livestock keeping families used to devote lot of family labour to this activity. Aujla *et al.* (2003) reported that grazing provided 50-60 percent of the feed resources for livestock in the northern areas of Pakistan at no cost other than labour. The remaining feed came from wheat straw and green fodder, whereas concentrates were seldom purchased.

### Productive and reproductive traits of cattle and buffaloes

Farmers were asked about daily milk yield (DMY), lactation length (LL), lactation yield (LY), age at first calving (AFC) and calving interval (CI) of large ruminants. Farmers were not keeping any written record and gave average values of these traits based on their memory. Averages and ranges of the productive and reproductive traits of cattle and buffaloes are summarized in Table 3. It was reported that in

buffaloes, average DMY was 7.9 liters, LL was 300 days and LY was 2370 liters. The corresponding values for cows were 2.5 liters, 292 days and 730 liters. Usmani (1998) reported 305 days milk yield in buffaloes at government livestock farms as 2500 liters and in rural areas (irrigated parts of Punjab) as 1900 liters. The higher LY of buffaloes observed in the mountainous areas of Pakistan (present study) as compared to rural Punjab might be due to lack of severe summer stress in this area. Naqvi (1989) reported average lactation milk yield of non-descript cattle in Pakistan as 888 liters which is slightly higher than the yield observed in the present study. Similar low lactation yields of local cows have been reported by Anonymous (1987) and Aujla *et al.* (2003).

**Table 3: Averages of parameters of productive and reproductive performance of buffaloes and cattle in Mansehra and Batagram districts of NWFP**

Parameter	Buffalo	Cattle
Daily milk yield (Lit)	2.5 (2-5)	7.9 (5-15)
Lactation length (D)	300 (100-360)	292 (150-350)
Lactation yield (Lit)	2370 (1500-4500)	730 (584-460)
Age at first calving (M)	48 (36-60)	36 (30-40)
Calving interval (M)	20 (13-24)	13 (11-15)

Values in parentheses represent ranges.

The AFC reported by the responding farmers averaged 48 and 36 months in buffaloes and cows, respectively. The corresponding values reported for CI were 600 and 375 days. Similar findings have been reported by other workers for buffaloes (Usmani, 1998) and local non-descript cows (Naqvi, 1989). Results of the present study indicate that there is a big scope for improving productive and reproductive efficiency of buffaloes as well as cows under small holder production system. Olivier *et al.* (2002) have suggested genetic improvement programmes with other activities such as management of animal health and access to input-output markets for improved production level of the livestock. While discussing the importance of reproductive efficiency of livestock, several other workers (Valdivia, 2001; Hernandes and Babar, 2001; Devendera, 2001) emphasized efficient use of breeds, appropriate production system, improved strategies for natural resources management and improved marketing system.

### Prevalence of diseases

Infectious and non-infectious diseases of livestock were prevalent in the area because of inadequate

veterinary cover and lack of vaccination against common diseases. Data regarding common diseases of cattle, buffaloes, sheep and goats, alongwith reporting frequency, are presented in Table 4. In cattle and buffaloes, incidence of haemorrhagic septicemia and internal parasites was highest, followed by Foot and Mouth disease and pneumonia. Parasitic infestation was mainly caused by routine grazing practice, whereas the obvious causes of pneumonia were inadequate housing facilities and inability of the farmers to protect their animals against severe cold in winter. Other diseases/disorders of cattle and buffaloes reported by farmers included tympany, mastitis, dystocia, rabies, lameness and indigestion.

**Table 4: Prevalence of livestock diseases in the survey area in Mansehra and Batagram districts of NWFP**

Animals	Disease reported	Reporting frequency (percent farmers)
Cattle and buffaloes	Haemorrhagic septicaemia	24
	Internal parasites	24
	Foot & Mouth disease	19
	Pneumonia	15
	Other diseases/disorders <sup>1</sup>	18
Sheep and goats	Internal parasites	29
	Pleuropneumonia	27
	Abortion	23
	Blue tongue	10
	Other diseases/disorders <sup>2</sup>	11

<sup>1</sup>Include tympany, mastitis, dystocia, rabies, lameness, indigestion, blackquarters, mange.

<sup>2</sup>Include dermatitis, smallpox, metritis, tympany, tuberculosis.

In small ruminants, parasitic infestation and pleuropneumonia had the highest incidence, followed closely by abortion. Occurrence of Blue Tongue disease was reported by 10% of sheep farmers. Other diseases of small ruminants were dermatitis, tuberculosis and small pox. Similar results have been previously reported by Amjad *et al.* (1988) and Rafiq (1995), who observed that bacterial diseases were most troublesome in small ruminants of Pakistan, followed by parasitic and viral infections. Afzal (1998) also reported that pleuropneumonia was a major disease limiting sheep and goat production in NWFP and other parts of Pakistan.

### Economic analysis

Gross margin analyses of livestock production under small holder's subsistence system are presented in Table 5. An average farmer spent Rs.  $49 \pm 23$ ,  $40 \pm 27$  and  $2.5 \pm 1.7$  on daily feeding of buffaloes, cattle and goats, respectively. Sheep, however, depended entirely on grazing or kitchen wastes. Labour was free as family members, mostly women, looked after routine management and feeding of animals. Locally available bulls were used for breeding of cows and buffaloes free of cost. Less than 10% of the farmers, however, reported a small amount charged for natural service of their buffaloes and cows. The facilities of artificial insemination were not utilized by the farmers. Buffalo and cow milk were sold at the rate of Rs. 20/liters and Rs. 15/liters, respectively.

The milk was mostly consumed at house-hold level or converted into butter oil. Goats also provided some quantity of milk besides mutton. Economic analysis revealed that maximum profit was derived from keeping buffaloes. An adult buffalo provided a gross income of Rs. 32475 per year, whereas keeping an adult local cow depicted a loss of Rs. 1960 per year. It may, however, be kept in mind that local cattle are mainly kept for draught purposes and their draught value has not been included in the analysis. Small ruminant farming was also found to be a profitable business. Keeping of goats was more profitable than keeping sheep because of better milk producing ability of the

former than the latter. Annual gross profit was Rs. 5314 per goat and Rs. 3320 per sheep.

### Conclusion

Rural small holder's subsistence production system is the most common livestock production system in NWFP, Pakistan. As observed in the present study, the level of performance and gross margins of buffaloes, goats and sheep maintained under this system are encouraging, keeping in view the poor production environments. Profit margins of buffaloes, goats and sheep can be further increased if the farmers are educated about the economic importance of control of livestock diseases and important role played by proper nutrition in exploiting the production potential of these species. The negative gross margin of local cattle can be reversed by introducing crossbred cattle in the area which could not only be used for draught purposes but also for milk production. Similarly, the low gross margin of sheep can be substantially increased if the wool marketing facilities are provided in the area.

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**Table 5: Gross margin analysis of livestock production under subsistence production system in Mansehra and Batagram districts of NWFP**

Component	Buffalo	Cattle	Sheep	Goat
Average input costs (Rs.) per animal per year				
Feeding	17885	14600	-	912
Vet. cover	nil	-	-	-
Labour	nil <sup>1</sup>	-	-	-
Breeding	nil <sup>2</sup>	-	-	-
Total	17885	14600	-	912
Average value (Rs.) of output per animal per year				
Milk	41160	8540	-	2460
Meat	9200	4100	3320	3767
Other products	nil	nil	nil	nil
total	50360	12640	3320	6227
Gross margin (Rs.) per animal per year <sup>3</sup>	(+) 32475	(-) 1960	(+) 3320	(+) 5314

<sup>1</sup>Feeding and management of livestock was looked after by the family members at no cost.

<sup>2</sup>Some farmers (<10%) reported breeding charges ranging from Rs. 50 to 100 per natural service.

<sup>3</sup> (+) = profit, (-) = loss

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