

#1 Pr

PRO-ADM 276

ISSN-32380

## The Private Profitability of Livestock in a Nepalese Hill Farming Community

R. L. J. Shrestha\*

&

D. B. Evans†

Development Studies Centre, Research School of Pacific Studies,  
Australian National University, Canberra, ACT 2601, Australia

(Received: 11 October, 1983)

### SUMMARY

*The Nepalese hills are heavily overstocked with livestock, causing deforestation and erosion. Many policy makers in Nepal have argued that livestock production is unprofitable, but that farmers raise animals because of tradition. Accordingly, the only way to solve these problems is to attempt to change ingrained attitudes. The private profitability of livestock production is examined in this paper. The results of a sample survey undertaken in Chautara Panchayat suggest that it is profitable for hill farmers to raise livestock despite the social costs. Attempts to change attitudes will not, therefore, be successful by themselves.*

\* Present address: Agricultural Projects Services Centre (APROSC), Kathmandu, Nepal.

† Written while a Visiting Fellow at the Economic Growth Center, Yale University, USA.

## INTRODUCTION

Nepal has one of the highest livestock populations per unit of land in the world.\* In hill areas, the current stocking rate is estimated to be nine times larger than the carrying capacity of the forest.<sup>1</sup> This has led to rapid deforestation and consequently to serious problems of soil erosion. The social cost of keeping livestock is very high. For some time planners in Nepal have been considering ways of solving these problems. A common argument has been that livestock production in hill areas is unprofitable, but that animals are kept largely for social reasons or because of tradition. This argument implies that stopping deforestation requires a basic change in attitudes and customs.

This paper is a first attempt to examine the livestock enterprise from the point of view of the hill farmer in Nepal. The data are based on information gained from a sample of 40 farmers in Chautara *Panchayat*.<sup>†</sup> Initially the survey area, sample selection and survey methodology are described briefly. Then a form of partial budgeting is used to examine the private profitability of livestock production. The approach taken in this paper is similar to that outlined by Brown.<sup>3</sup> Policy implications conclude the paper.

## THE SURVEY AREA

Chautara *Panchayat* lies in Sindhu Palchok District. It consists of a series of ridges to the north-east of Kathmandu, the capital of Nepal. Chautara village, the administrative headquarters, lies at an altitude of 1460 m above sea level.

Terraced farming is practiced in Chautara as in most other hill regions in Nepal. *Pakho* land is unirrigated land terraced into hillsides which slope at about 45°. *Khet* land is irrigated and is found either in valleys near water sources, or on the sides of hills near springs. There is not enough rain to allow *Pakho* land to be cultivated during the dry winter period from November to February. It is planted to maize after the brief winter rains which fall late in February. About a month before the maize is harvested, millet is planted between the rows. After the maize harvest,

\* As an indicator, the World Bank estimated that the average Indian household kept 3.9 animals compared to 5.3 in Nepal.<sup>2</sup>

† A *Panchayat* is a subdivision of local government in Nepal, just below the District level.

the millet is often intercropped with a variety of beans. *Khet* land, on the other hand, is cultivated throughout the year. Paddy is planted with the arrival of the summer monsoons, while crops such as maize, mustard and wheat are planted in winter.

However, land holdings in the hill regions are generally small and segmented. The average family in Sindhu Palchok District was estimated to cultivate 0.52 ha in 1971.<sup>4</sup> Partly because of this, families rely heavily on livestock as an alternative source of food and income. Studies in other areas of Nepal suggest that peasants keep different animals for different purposes.<sup>5</sup> Nepal is officially a Hindu state, and the slaughter of cows, bulls and bullocks is forbidden by law. Bullocks are kept mainly for ploughing the farmer's own land and for manure. However, they can be rented out and can also be sold fairly easily if the farmer is in need of cash. Although cows provide milk and manure, they are kept mainly because they may yield bulls for the farm. If farmers want to keep livestock mainly for milk, they choose buffaloes in preference to cows. Local buffaloes yield more milk than cows. Besides this, there is a strong demand for buffalo bulls in the market, as buffalo meat is consumed by a high proportion of the population. However, the importance of the motherhood concept in the Hindu religion means that it is also socially unacceptable to kill female livestock. Male livestock therefore have a much higher market value. Buffaloes also provide manure for the farm. Because they are almost always stall-fed their manure is easier to collect.

Goats are kept for manure and meat. Moreover, goats are the easiest animals to sell in the market, apart from chickens, and can therefore provide cash at short notice. The demand for goat meat is very high as it is preferred to any other type of meat, apart from chickens. Pigs and sheep are kept by a very few people in Chautara. They are used mainly for meat, but sheep wool is also used at times.

### SAMPLE SIZE

The sample was selected at random from a list of households which owned livestock and lived within a 2-h walk of Chautara village. It was decided not to spread the sample beyond a 2-h walk. Even then it would take a whole day of walking to visit 15 farmers. There was trade-off between the representativeness of the sample, the number of farmers who could be visited, and the amount of time spent with each. Samples could have been

collected from distant communities, say within half a day's walking distance. Perhaps this would have produced data more representative of the whole *Panchayat*, but it would have been necessary to adjust by reducing the sample size, or by asking fewer questions, or both.

Clearly, the aim when selecting the sample size, the households to be included and the survey technique, was to obtain as much information as possible from as many farmers as possible. However, time constraints allowed only four weeks in Chautara and resources allowed only one helper to be hired. Obviously, the sample size had to be decided in conjunction with survey technique. Given the survey technique described in the next section, 40 families were selected.

### SURVEY TECHNIQUE

The field survey was conducted in January-February 1982. Questionnaires had been prepared beforehand and necessary adjustments and improvements were made after some trial interviews in the field. The total time available for interviewing in the field itself was one month. An additional two weeks were spent collecting secondary information and material from different departments and institutions in Kathmandu. Different types of questionnaire were designed for different visits. For the first visit, a preliminary questionnaire was prepared seeking information about basic socio-economic variables such as family size, religion and general details about the crop and livestock enterprises. It took five days to test the questionnaires, select the sample and conduct the preliminary visits.

Each household in the sample was visited every alternate day for the remainder of the survey period. At each visit, an 'intensive questionnaire' was completed. Details were sought of the daily activity of all household members on the day immediately before the visit. The quantities of firewood and fodder collected and the returns provided to the family by livestock were recorded. Detailed information about ten days' activity was recorded for each household using this method. Allowing for the difficulties involved in locating some farmers, this process took 23 days to complete. It was hoped that these interviews would help to describe the farming system over the crop year. However, the survey had to be conducted during winter when no crops were being cultivated. Thus, during the time that the intensive questionnaires were being completed

three other questionnaires were also used. They concerned human and animal labour requirements for paddy and for maize and millet production during the previous year.

Completing these questionnaires was time-consuming, and it was not possible to administer them to the entire sample. Moreover, they asked for detailed information about last year's activities, so the questions were asked of a selected number of farmers who seemed to have good memories and who were willing to devote considerable time to answering questions. Obviously, it would have been better to collect information from a larger sample over a longer period of time. However, within the time and resource limits that were available, it is considered that the method described above produced interesting and useful information. Although it may not be as representative as if it had been possible to interview 100 families, or as accurate as if it had been possible to observe each family over a year, the survey design and sample size reached a compromise between the representativeness of the sample and the completeness of information for each family. As a rough test of the data, the limited information which could be obtained from secondary sources seems to be consistent with these data.

## COST OF RAISING LIVESTOCK

In this section, yearly costs of livestock production are estimated. They are average figures derived from the sample of 40 households in Chautara *Panchayat*. Selected characteristics of the average family are given in Table 1.

### ESTIMATED LABOUR INPUTS TO LIVESTOCK RAISING

The daily activities of the 40 families in the sample were noted on each day for a period of 10 days. The responses reveal that over this time the average family spent a total of 1.54 man-hours, 3.99 woman-hours and 2.04 child-hours in activities directly related to livestock. These included collecting fodder, looking after livestock at home and supervising grazing livestock. Details are given in Table 2.

An estimate of the average family's labour input to livestock over a year is given in Table 3. It is calculated on the assumption that the daily inputs of Table 2 would apply throughout the year. However, the survey on

5

**TABLE 1**  
Selected Characteristics of the Average Chautara Household

<i>Description</i>	<i>Average number</i>	<i>Standard deviation</i>
<b>Family size</b>		
Males older than 15 years	2.08	(1.53)
Females older than 15 years	2.21	(1.70)
Children	1.94	(1.47)
<i>Total</i>	6.23	
<b>Farm size (ha)</b>		
<i>Khet</i> owned	0.08	(0.06)
rented in <sup>a</sup>	0.05	
<i>Pakho</i> owned	0.25	(0.18)
rented in <sup>a</sup>	0.01	
<i>Total</i>	0.39	
<b>Livestock numbers<sup>b</sup></b>		
Cattle	2.13	(1.95)
Buffaloes	1.56	(1.15)
Goats	3.55	(2.89)
Other	0.13	(0.07)
<i>Total</i>	7.37	
<b>Trees on private land</b>		
Fruit	3.70	(7.35)
Fodder	7.83	(6.70)
Fuel wood	5.48	(9.42)
<i>Total</i>	17.01	

<sup>a</sup> Only two and five farmers rented *Pakho* and *Khet* land, respectively.  
<sup>b</sup> Excluding poultry.

**TABLE 2**  
Average Labour Inputs to Livestock During Ten Days

	<i>Collecting fodder</i>	<i>Looking after livestock at home<sup>a</sup></i>	<i>Grazing livestock</i>	<i>Total hours (ten days)</i>	<i>Average hours per day</i>
Man-hours	2.3	6.0	7.1	15.4	1.54
Woman-hours	15.9	17.4	6.6	39.9	3.99
Child-hours	3.8	2.2	14.4	20.4	2.04

<sup>a</sup> Looking after livestock at home includes feeding at home, cleaning, etc.

**TABLE 3**  
 Estimated Average Yearly Labour Inputs to Livestock

	<i>Collecting fodder</i>	<i>Looking after livestock at home</i>	<i>Grazing livestock</i>	<i>Total hours</i>	<i>Total days</i>
Man-hours	82.1	219.0	261.0	562.1	80.3
Woman-hours	580.4	633.6	242.0	1 456.0	208.0
Child-hours	138.0	79.6	528.5	746.1	106.6

which the daily estimates are based took place in winter. In Nepal, fodder is relatively scarce in winter and plentiful in summer.<sup>6,7</sup> It is not clear what difference this would make to labour inputs. The farmers in the sample claimed that they would still go to the forest about the same number of times in summer, suggesting no major differences in labour inputs. On the other hand, other studies have shown that livestock in some areas of Nepal are in a semi-starved condition during winter, suggesting perhaps that more fodder would be collected in summer, involving higher labour inputs.<sup>6</sup> The conclusion would seem to be that the estimates of Table 3 would, if anything, understate the yearly labour inputs to livestock.

At the time of the field survey, unskilled male labour earned Rs 6 per day for farm work in the local region, while women performing similar work were paid Rs 4 per day.\* (Rates were higher for skilled work such as masonry and carpentry.) No clearcut labour market for children under 15 years existed as the hiring of children was almost non-existent. However, an imputed opportunity cost of their time of Rs 2.50 per day would seem appropriate. Work, however, was available mainly during the peak season of the agricultural cycle. This lasted for about seven months of the year. During the slack season, household members had a much lower chance of finding work and the shadow wage rate would therefore be lower. It is assumed that during the peak season, anyone who wished could find work. The market wage rate therefore represented the opportunity cost of time. It is further assumed that the probability of finding work during the slack months was only 20%. The shadow wage rate then would only be a fifth of the market rate. On these assumptions, the opportunity cost of the time the average family devoted to livestock amounted to Rs 1053.50 per year.

\* Rs 13.20 = US\$ 1.00 at the time of the survey.

## OPPORTUNITY COST OF CAPITAL INVESTED IN LIVESTOCK

The average household in the sample owned 7.37 animals, excluding chickens. The different types of animal and the approximate price each would have raised at the local market are provided in Table 4. If the average household sold its animals, it would have obtained about Rs 4000. This money would have earned a return of 8% when invested at the local bank. Thus the opportunity cost of capital invested in livestock was Rs 320 per year.

**TABLE 4**  
Average Opportunity Cost of Capital Invested in Livestock

Animal	Cow	Calf	Bull	Bullock	Buffalo			Goat			Others
					Adult male	Adult female	Young	Adult male	Adult female	Young	
Number	0.75	0.5	0.03	1.05	0.13	0.85	0.58	0.65	2.05	0.85	0.13
Approximate price in rupees	625	225	750	750	1000	1850	400	340	220	50	50

### Other costs

None of the sample farmers had private uncultivated land, or land set aside purely for grazing. Livestock was tethered around the human shelters, or allowed to graze on communal or forest land. It is not therefore appropriate to impute an opportunity cost of land involved in the livestock enterprise. Other costs of raising livestock were negligible. No animal feed was purchased, and the crop residues that were fed to animals had few other uses. Families owned very little capital equipment. Thus the average annual cost (labour plus the capital invested in livestock) of raising livestock can be taken to be Rs 1373.50.

## RETURNS TO LIVESTOCK PRODUCTION

### Milk production

During the ten intensive visits the average milk production per household was 4.6 litres, or 0.46 litres per day. The farmers stored 0.2 litres of this for

making ghee and other milk products. The rest was consumed immediately.

According to the farmers in the survey area, milk production is low in winter due to the unavailability of green fodder and the lack of other nutritive feed. This is supported by the findings of other studies.<sup>6</sup> The summer monsoon ensures that there is plenty of green grass and that the livestock are well fed. Farmers in the survey area claimed that milk production in the peak season of feed availability is double the winter production. On this basis, a rough estimate of the yearly milk production per household can be made. Given the lack of data on seasonal variations in milk production, an assumption is made that there are six months of lean production in which the figures outlined above would apply. Then there are six months of peak production at twice the winter level. Of course, this is not entirely accurate as production is likely to build up gradually over spring and decline gradually during autumn, but it is probable that these variations would average out over a year.

Another problem relates to the fact that only one half of the female bovine livestock owned by sample households were lactating at the time of the survey. If this proportion changed over the year, the estimate of yearly production would be incorrect. Shah<sup>6</sup> has shown that both buffaloes and cows calve fairly regularly throughout the year in Nepal, suggesting that the assumption of a constant 50% lactation rate would be roughly accurate. These assumptions are the best possible in the circumstances. The average milk production, assuming 0.46 litres per day per household for six months and 0.93 litres per day for the remainder of the year, would be 253.5 litres. If this milk had been purchased on the local market at Rs 3.50 per litre, it would have cost the average household Rs 887.2.

Hill farmers occasionally sell milk, goats and chickens. If the farmer is desperately in need of cash, a larger animal may be sold. Bullocks, in particular, are sometimes sold if a farmer has more than the necessary number for ploughing. During the intensive surveys, the average household sold Rs 5.05 worth of animal products per day. If it could be assumed that sales followed an even pattern over the year, the average family would sell Rs 1825 worth each year. Patterns of consumption and sale depend on festivals and events of major importance such as weddings. The assumption of continuity throughout the year is not strictly true although it is the best available in the circumstances. The figures should therefore be treated as only a rough guide.

### **Bullock labour**

The three major crops grown by farmers in the sample were paddy, maize and millet. Very detailed questionnaires concerning the necessary labour inputs, both manual and animal, to these crops were completed for seven farmers. The reasons why these questions were not asked of all 40 families were outlined earlier.

From the seven responses, the time it typically took to prepare, plant, maintain and harvest 0.1 ha of land was calculated for each crop. The figure for a particular crop was then applied to the average area planted for that crop by the 40 farmers in the larger sample. This produced an estimate of the average family's labour input to the crop. Obviously this method does not allow for any economies of scale in cultivation. This is not, however, serious because the average land-holding was very small (0.08 ha of *Khet* and 0.25 ha of *Pakho*) and the maximum land-holding was only 0.21 ha of *Khet* and 0.79 ha of *Pakho*. These figures indicated that the average family needed to apply 55.7 bullock-days to prepare and harvest the three major crops. However, only 19 families in the sample owned bullocks so the other 21 had to hire bullocks for these tasks.\* Thus the labour provided by the bullocks owned by the families in the sample amounted to 1057.7 days. On the local market, a pair of bullocks costs Rs 8 to hire per day (or Rs 4 per bullock). This is for bullocks without a driver. At this rate, the 1057.7 bullock-days can be valued at Rs 4230.9, which averages out at Rs 105.8 for each of the 40 households.

The 19 farmers who owned bullocks were also questioned about the number of times they had rented their animals to other families during the 1981 season. These farmers rented out a pair of bullocks for a total of 110 days, i.e. for 200 bullock-days. At Rs 4 per bullock per day, this income amounted to Rs 880. If this figure is averaged over the 40 families, the average sample household received a cash income of Rs 22 per year from renting out bullocks. Bullocks were used for no other purposes. Thus, the average household gained labour worth Rs 105.8 and cash worth Rs 22 per year from the bullocks it owned.

### **Manure**

Farmers in the Chautara region do not as yet use chemical fertilizer in significant quantities. They rely mainly on manure to fertilize their fields,

\* One family owned only one bullock. This family would have had to hire bullocks to work in the farm, and so was included with the 21.

and accordingly manure is regarded as the most important reason for keeping large animals. In the three very detailed questionnaires on labour requirements for maize, millet and paddy described earlier, questions were asked about typical manure applications to each crop. These revealed that the average family applied a total of 204 loads (2744 kg) of manure each year to crops. There is no market for manure in the area, so the entire quantity must have been produced by animals owned by the farmers. The lack of a market makes it very difficult to value this manure in money terms. The only way to do this would be to estimate the marginal value product of manure in crop production—this would require extensive data which are not available. This is perhaps an important area for further research.

### POLICY IMPLICATIONS

The returns to animal production which could be valued averaged Rs 1836.2 per family. Manure production was an extra benefit which could not be valued in monetary terms. The average yearly cost of raising livestock was Rs 1373.5. Thus the returns from animals would appear to significantly outweigh the costs involved in rearing livestock. Results are summarized in Table 5.

This attempt to compare costs and benefits is, of necessity, fairly rough. Many relatively arbitrary assumptions had to be made because of the short period of time available for fieldwork. However, it represents a first attempt to consider the relative magnitudes of the costs and benefits of livestock raising in the survey area. The findings of this analysis strongly suggest that raising livestock is profitable from the farmer's point of view, despite the time involved in collecting fodder and looking after the livestock. This is contrary to the general belief in Nepal that it is unprofitable, and that people keep livestock for social reasons or because of tradition.

However, for the economy as a whole, there are undoubtedly large social costs involved in raising livestock. If livestock were kept purely for social reasons or because of tradition, it might be possible to solve the problems of overstocking and deforestation by trying to change attitudes towards livestock. This will not work by itself, however, where raising livestock is a profitable activity. Other policies must also be considered.

Two types of policy are possible: those that increase the availability of

**TABLE 5**  
Estimated Average Annual Profit per Household from Livestock  
Production

<i>Category</i>	<i>Value (rupees)</i>
<b>Returns</b>	
Milk (household consumption)	887.3
Sale of livestock products	821.2
Bullock labour own farm	105.8
hired out	22.00
Manure (204 loads)	
<i>Total returns</i> (excluding manure)	1 836.3
<b>Costs</b>	
Labour	1 053.50
Capital	320.00
<i>Total costs</i>	1 373.50
<b>Gross profit</b> (excluding manure)	462.8

fodder, and those that attempt to reduce livestock numbers. Of the suggestions that follow, numbers 1-3 are examples of the former, while 4-7 take the latter approach.

1. Farmers could be encouraged to grow more fodder and forage crops on their private land. These could be grown on terrace rises and bunds, and on the land which is left fallow in winter. Technical guidance would obviously be needed and extensive research may be necessary.
2. A number of reforestation schemes are presently underway in Nepal. The shortage of fodder could be alleviated to some extent if a greater proportion of fodder trees were planted in these programmes. Farmers in Chautara were highly critical of reforestation programmes which had planted trees that were not useful for fodder. To do this would require much more co-operation between the Ministries of Agriculture and Forestry than is the case at present.
3. Some of the forestry schemes include attempts to encourage farmers to plant more fodder trees on private land. These attempts

- could be valuable. However, this probably requires either greater research or increased extension efforts because farmers in the area believe strongly that more trees would shade the land excessively, and that tree roots would compete with crops, thereby reducing crop yields.
4. Alternative profitable activities could be introduced in order to reduce the relative attractiveness of livestock production. In practice this is difficult in a hilly area where land is relatively barren, and the average land-holding is small.
  5. The quality of livestock could be improved by introducing new breeds or by cross-breeding with improved breeds. This may reduce the demand for animals as the same output could be obtained from fewer animals. Care would have to be taken that total feed requirements do not increase.
  6. Cattle are owned basically because of the need to provide bullocks for ploughing during relatively short peak seasons. At other times they are under-utilized. Cattle do produce milk and manure as a side benefit, but buffaloes are preferred for these purposes. Co-operative ownership of cattle might ensure that only those livestock required for the peak season are kept, thereby reducing the demand for cattle. However, a problem remains in that it is virtually impossible to dispose of unproductive cattle in Nepal. It will be very difficult to solve the problem of overstocking until an answer to this question is found.
  7. One of the main reasons for keeping large animals in Nepal is for the manure they produce. It is mixed with leaves and used as fertilizer. The use of compost pits would probably make this manure more efficient as a form of fertilizer and would reduce the demand for animals correspondingly. Extension officers would need to advise farmers on the best method.

#### ACKNOWLEDGEMENTS

The authors wish to acknowledge the support of both the Development Studies Centre, Australian National University and the Economic Growth Center, Yale University, as well as the assistance of the Nepal Australia Forestry Project.

## REFERENCES

1. Rajbhandary, H. B. and Shah, S. G., Trends and projections of livestock production in the hills. In: *Nepal's experience in hill agriculture development*, Ministry of Food and Agriculture, Kathmandu, 1981.
2. World Bank, *Agricultural sector survey of Nepal*. Report No. 519a-NEP, World Bank, Washington, 1974.
3. Brown, M. L., *Farm budgets*, Johns Hopkins University Press, Baltimore, 1979.
4. Department of Information, His Majesty's Government, *Mechi to Mahakali*, Volume 2, Central Development Region, Kathmandu (in Nepali), 1974.
5. Rockefeller Foundation Team, *A study of hill agriculture in Nepal*, Rockefeller Foundation, New York, 1976.
6. Shah, S. G., *Phewa watershed: animal husbandry and feed resource survey result and recommendation*, FAO HMG of Nepal UNDP, Kathmandu, 1980.
7. Shrestha, R. L. J., The relationship between the forest and the farming system in Chautara, Nepal. Unpublished MADE thesis, Australian National University, Canberra, 1982.