



Tropentag 2009
University of Hamburg, October 6-8, 2009
Conference on International Research on Food Security, Natural
Resource Management and Rural Development

Socio-economic and biophysical perspectives for sustainable livestock management: A case study of Nepal

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Abstract

Livestock is an integral and important component of Nepalese farming system. Agriculture contributes about 33% to the total gross domestic production (GDP) whereas livestock contributes about 35% of the total agricultural gross domestic production, which has been envisaged to increase at 45% by 2015. In relation to the amount of land per person, the livestock population in Nepal is one of the highest in Asia. However, the productivity of livestock is very low. The livestock production system in Nepal is characterized with harsh agro-climatic conditions, geographic isolation, small holding, degrading soils and diverse socio-economic structures. Nevertheless, livestock products are the important sources of supplementing income for more than 80% of the total farming population of the country. A survey carried out from June to August 2006 to investigate socio-economic and biophysical conditions for sustainable livestock management in Nepal revealed that the herd-size was significantly correlated with the land-size of the household. Milk selling by women was significantly correlated with the household head's education. Year-round forage production was also significantly correlated with the land-size. In addition to these socio-economic characteristics, biophysical conditions, for example, adoption of the livestock species across different agro-climatic zones, forage digestion ability, existence in low plane of nutritional regime, cold tolerance and relatively smaller body size, were found to be significantly correlated to sustainable livestock management in Nepal. Hence, along with the biophysical characteristics, education, land size and women involvement in milk selling are found to be the most important socio-economic determinants for sustainable livestock management and its improvement in Nepal.

Introduction

Adoption of any new technology depends upon the socio-economic factors of the society in specific and of the country in general. Social and economic factors at various levels of social systems form an environment where people interact through roles and relationships defined by gender, age, ethnicity and other social variables ((Huisinga, 1997).

Agriculture is the main source of employment for about 65% of manpower and contributes 33% to gross domestic production (GDP) in Nepal. Nepal has made slow and steady progress in reducing poverty for last decades. It has been estimated that poverty has been declined to 31% in 2004 from 42% in 1996. Social and human development indicators, such as life expectancy, maternal and infant mortality rates, and adult literacy, have improved noticeably. However, Nepal still remains one of the poorest countries in the world with per capita income of US\$ 388 per annum, human development index 0.534 wide income disparities, large gender gap and poor access to basic needs and social services by a large section of the population.

Agriculture is the major determinant of economic activities and the nation's socio-political identity. Livestock is an integral component of the Nepalese farming system that contributes about 35% of the total agricultural GDP and 4% of the total exports of the nation. Out of the total contribution of livestock in the country 53, 38 and 9% is derived from Hills, Terai and Mountain regions, respectively. The Hills are the most important and potential regions for the livestock farming in Nepal. Therefore, socio-economic understanding of the mode of production of the Hills farm-households vis-à-vis their association with the livestock production, one of the vital components of farming systems, is very important.

Economic importance of buffaloes in Nepal has been realised only when they have been reported to contribute 53% of the livestock share in the national GDP (APP, 1995). Buffaloes are ranked as the first animals to contribute these products, milk and meat, to national production. However, more than 80% of the buffaloes are still indigenous. Though indigenous buffaloes are well adapted across different agro-ecological zones, smaller body size, forage digestion ability and cold tolerance, their average productivity is very low (Rasali and Crow, 1999).

The main objectives of this study were to characterize the buffalo farming households, to investigate the socio-economic determinants of buffalo farming in the Mid-hills and to understand the mode of association of some of the important determinants that are relevant to promoting sustainable buffalo farming in the Mid-hills of Nepal.

Materials and Methods

Site selection

This study was carried out in Mid-hills of Western Development Region (WDR) of Nepal. Buffalo is perceived as the first ranked animal in this area. Three out of 11 Mid-hill districts of WDR, namely, Baglung, Gulmi and Arghakhanchi, were purposively selected for this study. The research sites enjoy pleasant climate with warm summer, temperature up to 30⁰ C, and relatively cool winter, temperature up to 5⁰ C. The altitude varies from 500 m to 1500 m from average sea level. The mean annual precipitation ranges from 1500 to 2500 mm but its distribution is not uniform. About 80% of the precipitation is confined to the monsoon period (June to September).

Sampling procedure, data collection and analysis

Altogether 107 farmers from 18 villages of three districts were randomly selected for the questionnaire based survey. The selected farmers for the survey should have at least one buffalo with each of them, and interest and willingness towards the research work. A pre-tested standard questionnaire was used to collect the data. The first part of the questionnaire was basically for the general household information including household demographic data, livestock ownership pattern, land size, educational status of the respondents, son and daughter schooling, etc. The second part of the questionnaire was about the buffalo farming system that included types of buffaloes of their preference, buffalo insemination system, selection of bulls for insemination, gender issues in buffalo farming, forage availability, marketing system of milk, adaptability of buffalo, environmental factors related to buffalo farming, measures for the improvement, etc. Data were analysed with the Statistical Package for Social Sciences SPSS-PC version 15.0.

Results and Discussion

Socio-economic determinants of farming households are closely related to the agricultural production systems world wide. Out of many socio-economic determinants that may affect farming system, household heads' education, land size per household, forage availability and gender roles have been perceived as the most important determinants (Karki *et al.*, 2006) for the buffalo farming in Mid-hills of Nepal. These determinants not only affect on the number of buffaloes per holding but also on the breed type, production system and overall profitability from the farming.

Family size and house type

The average family size (mean \pm SD) in the research area was found as 7.39 ± 3.85 which is almost similar to the national average. More than half of the farmers of the research sites were found houses made of slate-roof with mud-walls followed by galvanised steel (Asbestos sheet), thatched-roof and reinforced concrete cement (RCC) type.

Land holding

The average land-size per holding of Nepal is only 0.79 hectares (NPC, 2002). However, there is a great variation between the rich and poor households. NPC (2002) reports that 75% of the total holdings of Nepal own less than one hectare land per household which accounts only 38.9% area of the total land whereas only 0.75% holdings own more than 5 hectares land per holding which accounts around 7.5% area of the total land of Nepal. So, majority of the real farmers do not have enough land for cultivation whereas some elite people have more than needed land. This could also be a reason of lower national agricultural production of the country. The average land-size (mean \pm SD) per holding in the research sites was found as 1.2 ± 0.87 hectares. The minimum land size was 0.2 hectares whereas that of maximum was 4.6 hectares per holding.

Animal types and number with the farmers

Most of the farmers practice integrated farming system. A single farmer, normally, cultivates his/her farm for cereal crops, vegetables, cash crops and keeps animals like, buffalo, cattle, goat, poultry, etc. The animal statistics of the farmers in the research sites have been shown in Table 1.

Table 1: Major animal statistics with the farmers under the study (n=107)

Types of animals	Total number	Minimum number	Maximum number	Mean \pm SD
Buffalo	251	1	7	2.33 ± 1.29
Cattle	176	0	10	1.64 ± 1.72
Goat	226	0	22	2.11 ± 2.76

Breed types and number of buffaloes with the farmers

Lime and Parkote are the main indigenous breeds, and Murrah-cross and Murrah are the improved breeds of buffaloes found in the Mid-hills of Nepal. It was found that farmers have significantly higher number of Parkote buffaloes ($p < 0.01$) followed by Lime, Murrah-cross and Murrah. The difference was not significant ($p > 0.05$) between Murrah-cross and Murrah breeds.

Availability of year-round green forage

Nepalese agriculture is mainly based on rain-fed system. Only 32% of the cultivated land is under irrigation (CBS, 2002). About 80% of the total annual precipitation occurs during June to September. Farmers find surplus forage for their livestock during rainy season but there will not be enough green for the remaining periods. In this study, only 6 farmers reported that they get green forage almost year-round for their buffaloes whereas 12, 42 and 47 respondents replied that they get year-round green forage only for less than 4, 4 to 6, and 6 to 9 months, respectively. Almost all farmers reported that the scarcity of the green forage for more than six months was one of the main reasons of not rearing Murrah and its cross-breeds of buffaloes. This was also the cause of lower production and productivity of buffalo in Nepal. Almost all (99%) farmers under the survey responded that they feed hay to their animals without any treatment.

Correlation between some major socio-economic parameters related to buffalo farming

The correlations between some important socio-economic parameters were calculated by using Pearson, Kendall-tau_b, and Spearman methods accordingly with SPSS 15.0 package. The results are presented in Table 2.

Table 2: Correlation between some socio-economic parameters related to buffalo farming

Socio-economic parameters	r-value	p-value
Animal number and land size	0.418***	0.000
Family size and household-head's education	0.126	0.196
Feeding hay and household-head's education	-0.163	0.063
Household-head's education and year-round green availability	0.084	0.314
Land size and household-head's education	0.076	0.434
Milk selling by women and household-head's education	0.168*	0.042
Milk selling by women and land size	-0.185	0.057
Total number of buffalo and land size	0.363***	0.000
Year-round green availability and land size	0.287**	0.003

Conclusions and Outlook

The productivity of animals depends not only upon their genetic make-up but also depends upon the way of feeding, housing and health care management (Singh and Pundir, 2001). Though buffalo farming is a long tradition in the Mid-hills of Nepal it is highly correlated with several socio-economic characteristics. The positive correlations between the land-size and herd-size, and between the land-size and green forage availability denote the positive relationship between the herd-size and forage availability. Since there was no significant correlation between land-size and breed preference but there was the positive relationship between the forage availability and land-size, keeping the land-size constant, if we could increase the forage availability, which might be possible by introducing improved seeds, technology, extension services and irrigation facilities, farmers' preferences would be changed from indigenous to Murrah-cross breeds of buffalo. This would be a strong guideline for the breed improvement programme of Nepal.

A balanced education system promotes economic development along with the productivity that generates individual income per capita. The reduction in gender gap and increase in the access to the income of the women have significant effects on the household nutrition and development. Household heads' education increases the involvement of women in milk selling which increases the access of the women to the income. This will have the multiplier effect not only in buffalo farming but also for the development of the society as a whole. Hence, education, land size, year-round green forage and women involvement in milk selling are the most important socio-economic determinants for the sustainable livestock farming system in Nepal.

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