**Buffalo Production:**
**A Prosperous Enterprise to Empower Women Farmers and to Sustain Subsistence Farming**

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***Abstract:***

Livestock is a paramount component in Nepalese Agriculture. It's economic contribution both to rural households (28.5%) and national economy (18%) is in increasing trend. However, the share of animal products in dietary energy supply is merely 7.5%. Buffalo contributes 69.4% and 64.6% to the total milk and meat production respectively. Its contribution to the total livestock income is 35.09% in the case of sample households. Besides, manure & draft power are two key inputs to maintain soil fertility & agricultural operations. However, it has not been given top priority.
The study was conducted in the mid hills of Nepal. The field data were collected applying multi-stage random sampling technique. The collected data have been analyzed using descriptive statistics, econometric models, and qualitative analysis. Additionally, annual compound growth rate of buffalo population and products, factor productivity, and inputs elasticities have also been analyzed. It seems no point to satisfy with the increasing trend as the per capita availability of animal protein is far below than the requirement specified by the basic need program. The model results reveal high possibility to increase factor-product ratio and total economic contribution of buffalo to the economy of rural households.
The empirical findings underpin the buffalo production potentialities in livestock-led subsistence farming system, where producers expect state intervention for its development.

***Key words***: buffalo enterprise, factor-product relationship, household economy

**Introduction:**

Agriculture to date is the major source of livelihood for 81% rural inhabitants of Nepal. Livestock is an indispensable component of the agricultural production system in the country, which contributes 31.5%, the second highest next to field crop to agriculture and 18% to national GDP. It is considered a provider of food for humans, manure for plants, draft power for farms and cash income for farm families. Of the farm animals, cattle, buffaloes, sheep, goat, pigs and poultry are the major livestock species reared across different agro-ecological zones. However, Buffalo is of paramount importance amongst the livestock enterprises as it contributes 53% to the total livestock GDP (Singh & Chapagain, 1999). Buffalo contributes 70.08% to the total milk and 64.1% to the total meat production (Karki & Bauer, 2005).

Table 1: Consumption, requirement, and balance of livestock products in Nepal.

| Animal products | Consumption/person/year | Requirement[1] /person/year | Total balance |
|---|---|---|---|
| Milk (litres) | 48 | 57 | -128 Mt. |
| Meat (Kg) | 8.4 | 14 | -191 Mt. |
| Egg (Numbers) | 22 | 48 | -58.2Crores |
| Wool (Mt) | - | - | 598.010 |

Source: DLS, (2004), 1 Crore = 10 million [1]*= based on basic need fulfilment program*

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This study, therefore, was designed to assess the role of buffalo in rural households' economy, to identify the possibilities of widening farm employment opportunities thereby increase farm income in order to combat under-nourishment and reduce rural poverty.

**Methodology:**
A household survey was conducted and primary data were collected applying multi-stage random sampling procedure that consisted of 60 subsistence households from the mid hill district "Kavrepalanchowk", where The Hills Leasehold Forestry and Forage Development Project was implemented. Besides, necessary secondary data were also collected. The collected quantitative data were analysed using SPSS software package.

**Growth trend: population, milk and meat production:**

The annual compounded growth trend is calculated to observe the farmers' preference over the years as follows,

$$Gt = f(t)$$

$$Gt(\ln y) = \alpha_0 + \beta_0 \sum_{i=1}^{t} T_i + \mu_i$$

Gt (lny) = Growth trend of buffalo population, milk and meat production over the years t,
$T_i$ = time in year (1991-2004), $\alpha_0$ = Intercept, $\beta_0$ = parameter to be estimated, $\mu_i$= error term

The variables included in calculating annual compounded growth trend (buffalo population, milk and meat production) revealed positively significant coefficients (Table 2) as compared to the base year. However, there is still a tremendous potential to increase the supply of buffalo products as per capita milk and meat consumption is fairly low than the basic need program (Table 1). The demand may apparently increase as per positive economic indicators of the country. This is based only to meet the domestic demand. Thereafter, producers may enter into the international market if state motivates them by implementing liberalized policies for production and export promotion.

Table 2: Growth Trend of Buffalo population and milk and meat production

| | ***Period (1991-2004)*** | | | | |
|---|---|---|---|---|---|
| ***Variables*** | ***Intercept*** | ***Coefficient*** | ***Standard Error*** | ***t Statistics*** | ***$R^2$*** |
| Population (No) | 14.89193 | 0.01984*** | 0.00076 | 25.99 | 0.98 |
| Milk production (No) | 13.25732 | 0.02858*** | 0.00129 | 22.10 | 0.97 |
| Meat production (Mt.) | 11.41616 | 0.02863*** | 0.00120 | 23.84 | 0.97 |

*** indicates significant at 1% level

**Factors influencing buffalo farming:**

Being one of the most important livestock entities in Nepalese farm economics, the inhibiting factors for Buffalo keeping, growth and development should be addressed both in policy and action. The Cobb-Douglas production function approach has been used to identify the influencing factors of buffalo milk production.

$$Y_i = \gamma_o + \delta_j \sum(X_{ji}) + \alpha_n \sum(E_{ni}) + \beta_k \sum(H_{ki}) + \mu_i$$

$Y_i$ = output (milk liter) for observation i, $\gamma_0$ = intercept, $\delta_j$, $\alpha_n$ and $\beta_k$ = parameters to be estimated, $X_{ji}$ = vector of production inputs (roughages (Kgs), veterinary services (NRs), labor (man-days), concentrate (Kgs), breeding (NRs), $E_{ni}$ = vector of socio-economic factors (farm size (ha), credit availability (binary), off-farm income (binary), member of farmer group (binary), $H_{ki}$ = vector of human capital and demographic factors (formal education (years), skill promoting trainings (binary), extension service (binary), experience (years), $\mu_i$ = stochastic error term.

In the production function model, the coefficient of roughage is found to be positively significant to the dependent variable milk production. Accordingly, a one percent increase in roughage input leads to about 0.17% increase in milk production under ceteris paribus condition. This concept applies also to the coefficients of labor, veterinary services, and farm size. Similarly, the positively significant coefficient of education implies that the output variable increases by 0.99% with every year increase in schooling. Similar influence is observed with farmers' experience.

Of the dichotomous variables, credit, training, and affiliation to farmers group reveal positive influence to the output implying that they have positive linear relationship to the target variable.

Although the variables, off-farm income, concentrate feeding, breeding and extension service show positive but insignificant coefficients to the dependent variable.

Table 3: MLE of the Cobb-Douglas functional form for buffalo milk production

| Variables | Coefficient | Standard-error |
|---|---|---|
| Constant | 0.13749 | 0.098814 |
| Roughage | 0.16967*** | 0.020796 |
| Labour | 0.24152*** | 0.076061 |
| Veterinary services | 0.32467*** | 0.055014 |
| Farm size | 0.29200** | 0.16324 |
| Credit | 0.47354** | 0.023427 |
| Training | 0.10489*** | 0.23313 |
| Experience | 0.13735* | 0.084928 |
| Education | 0.98787*** | 0.17462 |
| Group member | 0.27275** | 0.12546 |
| LR test | | 53.672*** |
| Observations | | 60 |

****, ** and * indicate significance at 1 %, 5 % and 10 % levels respectively*

**Challenges:**

Due to enormous potentialities of buffalo farming, Nepal imports about 1,20,000 head of buffaloes annually primarily to supply meat in the Kathmandu Valley (Shrestha *et al*., 1998). Therefore, buffaloes can be even more important in the economy of many peri-urban and rural villages, as they are used for all three purposes: milk, meat and traction, whereas cattle have been used for two purposes (milk and traction).

Despite unanimous importance of buffalo for the livelihood of rural households, producers should also be made responsive of the possible consequences if a proper system is not adopted. Buffalo being the highest consumer of forage may create a negative impact on natural resource and environment by depleting the vegetation coverage that might accelerate soil erosion. Hence, plant biodiversity may greatly be affected due to elimination of the preferred species leading to the less productive botanical composition.

**Policy recommendation:**

The support being given to the farmers should necessarily address the factors of production, and optimize resource allocation by upgrading farmers' capacity in forage-gardening-production, farm-labor management, intensifying farm enterprise, diversifying milk and meat products, encouraging to work in the farmer's group in order to increase productivity as they revealed positive coefficients in model results.

The buffalo enterprise should be accorded top priority as it provides farmers with multiple products to meet the family needs and sustain the agrarian system.

A focus on policy is urgently required to dig up the draft potentiality of native buffalo particularly on hauling purpose besides its milk and meat attributes. Furthermore, research work needs to focus on developing a draft breed that can substitute ox in the long run to make the buffalo an economically more competitive farm animal.

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