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SOCIO-ECONOMIC IMPORTANCE OF BUFFALO FARMING IN SAMTSE DISTRICT

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ABSTRACT: The study was aimed to assess the socio-economic importance of buffalo farming in Dorokha, Samtse, Lharini, Gumouney and Sipsoo gewogs under Samtse district. A total of 34 households were purposively sampled and surveyed using semi-structured questionnaire for the study. Data gathered were analyzed descriptively and multi regression analysis was applied. The study found out that the socio-cultural and economic importance of buffalo is declining in general, yet for those buffalo rearing households it still has some importance during marriages as dowry, inheritance to children, gaining access to social and financial services serving as surety or mortgage and serves as social status in the community. Economic contributions from buffalo are similar to neighboring regions with substantial contribution of 19.2% to the overall household income and 66.2% towards dairy income. Among the household assets, household size and number of household members with tertiary literacy level determines 25% of variance of buffalo herd size. Household size significantly affected the buffalo herd size. Majority of farmers (94.1%) attribute decline of buffalo population to fodder scarcity and non-availability of buffalo breeding bulls. With the current level of policy and technical support from the government, buffalo farming is doomed to decline further. Nonetheless, with appropriate and timely interventions particularly subsidy on breeding inputs and pasture development policy could perhaps revive and sustain the buffalo farming tradition.

Keywords: Buffalo farming; herd size; household income; socio-cultural importance; subsidy.

1. INTRODUCTION

Agriculture farming in Bhutan is traditionally a subsistence type based on integration of crop and livestock. But livestock has more multi-functional roles ranging from provision of food, manure, cloths and draught power to provision of social security such as insurance, mortgage and dowry. Cattle dominates livestock species in Bhutan with over 90% of households owning them (MoA 1999). However, the importance of livestock varies depending on functionality, contribution to household income and geographic locations. Buffalo (*Bubalus bubalis*) is one of the versatile livestock species fulfilling social, cultural and economic functions in southern foothill districts in Bhutan Globally, buffalo farming has significant contribution of milk and meat product in south west and south-east Asia. Majority about 70 % of global buffalo population is concentrated in India (98.5 million head), Pakistan (29.8 million head) and Nepal (4.4 million head). Cruz (2010) reported an annual increase in buffalo population by about 1.5 percent in the aforementioned countries. Buffalo rearing dates back to many years with population concentrated in warmer regions of southern districts in Bhutan. Nonetheless, unlike other buffalo rearing countries in the region the buffalo population has declined sharply over the years despite it possessing better productivity, reproductive efficiency and higher economic return as compared to local *Siri* cattle (Tamang et al. 2009). Nanda (2003) also reported better performance of buffalo over the local Indian cattle. However, the superior performance of buffaloes couldn't draw as much attention as cattle from scientists, policy makers and other relevant stakeholders, and to this the buffalo has remained as the "undervalued asset" of the household in most of the livestock dominated regions (FAO 2000). Similarly, despite buffalo farming having significant contribution to the socio-economic development of rural households had not received

adequate policy attentions in Bhutan. In addition, research studies were neither undertaken nor planned to document the socio-economic roles of buffalo farming to the rural household livelihood in Bhutan. Thus, this study was conducted to document the socio-economic importance of buffalo farming to rural populace under Samtse district.

2. MATERIALS AND METHODS

2.1 Site selection and characteristics

The study was conducted in five gewogs (sub-districts) viz. Samtse, Sipsoo, Lharini, Dorokha and Gumouney of Samtse district (Figure 1). Aforementioned sites were selected due to highest numbers of buffalo rearing farmers with buffalo population of 479 heads (DoL 2008) in the country. In the district, buffalo farming spreads from the lower plains to the hilly areas. Wetland cultivation is an important activity with rice as the main staple food, and the people also depend on maize, orange and cardamom cultivation in the district.

The study area selected for the study lies between 300 to 2100 meters above sea-level (masl) and experiences mean annual rainfall of 1500-4000 mm, and mean temperature ranges between 15 to 30 degree Celsius (NSB 2010).

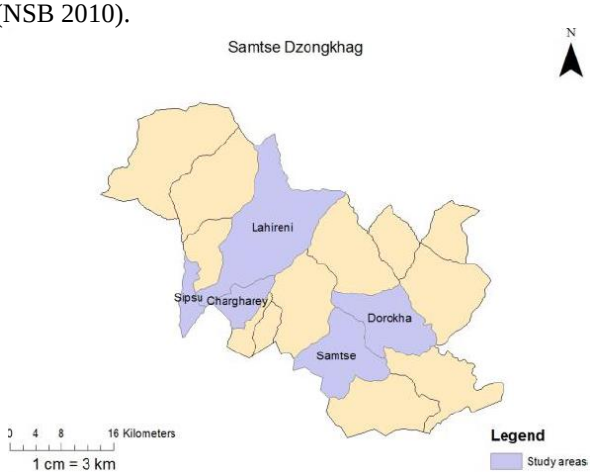

Figure 1: Map showing the study locations

2.2 Sampling and data collection method

Initially secondary data on buffalo population were collected from the Livestock Statistics 2008 compiled centrally by the Information and Management Section (IMS), Department of Livestock (DoL). The data gathered centrally was authenticated with records maintained at the District Livestock Sector (DLS). The DLS records 77 households rearing 356 numbers of buffaloes in Samtse in 2008. However, on field verification for the study recorded only 44 households rearing about 181 heads of buffalo in five sub-districts viz. Dorokha, Sipsoo, Lharini, Gumouney and Samtse. From this total buffalo rearing households, 34 households were purposively sampled for the study. The data on economic variables, labor and inputs variables, household assets and socio-cultural contribution were collected using semi-structured questionnaires developed based on the conceptual framework (Figure 2). In addition to the field data specified in the socio-cultural conceptual framework historical information on buffalo farming in Bhutan and their future prospects was gathered using focus group discussion.

The conceptual framework was adopted to assess economic and socio-cultural contribution from buffalo farming towards household income. Indicators relevant to socio-cultural and economic are illustrated under respective functions. Surety, which fulfills both socio-cultural and economic functions, is shown as items with dual functions.

Information gathered from the survey questionnaires were validated with available secondary information.

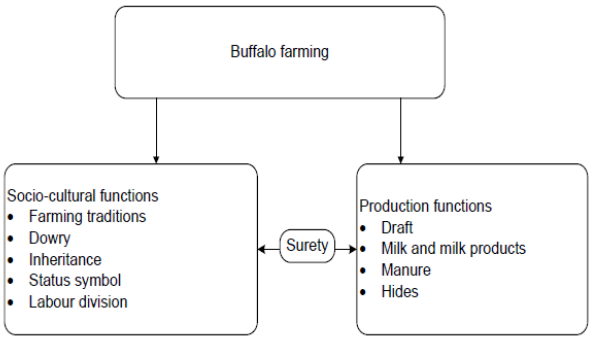

Figure 2: Framework of investigation of socio-cultural and production functions of buffalo farming on household income

2.3 Data Analysis

Data collected was analyzed using statistical software – Statistical Package for the Social Sciences (SPSS version 16). Descriptive statistics and multiple regression were applied for data analysis. Multiple regression was modeled as:

$$\mu_i = \beta_0 + \beta_1 S_i + \beta_2 e_i + \varepsilon_{ij}$$

Where μ_i = Buffalo herd size for household i (i= 1…, n_i)
S_i = household size in nos. for household i (i= 1…, n_i)
e_i = household members with tertiary education level in nos. for household i (i= 1…, n_i)
ε_{ij}= random errors, assumed to be independent and N (0, σ^2)
β_0 = constant
β_1= pooled within group regression coefficient of household size

β_2= pooled within group regression coefficient of nos. of household members with tertiary education level.

3. RESULTS AND DISCUSSIONS

3.1 Socio-demographic profile of buffalo rearing households

Table 1 shows socio-demographic information of the respondents. Majority of respondents in the study were male constituting 82.4% and remaining 17.6% were female. The respondents involved in buffalo farming consisted of five casts namely Chhetri (11.8%), Ghalley (2.9%), Rai (20.6%), Sharma (32.4%) and Uraon (32.4%) rearing buffalo.

Table 1: Social demography profile of the buffalo rearing household

	Parameters	Percentage
Caste	Chhetri	11.8
	Ghalley	2.90
	Rai	20.6
	Sharma	32.4
	Uraon	32.4
Gender	Male	82.4
	Female	17.6

3.2 Buffalo rearing system

Figure 3 illustrates the buffalo rearing system and their interaction with different components. Inputs like feed concentrate, roughage (straw) and molasses were required for buffalo production. The input in the form of household labor was required for buffalo rearing, but in return buffalo also supplemented household labor requirement.

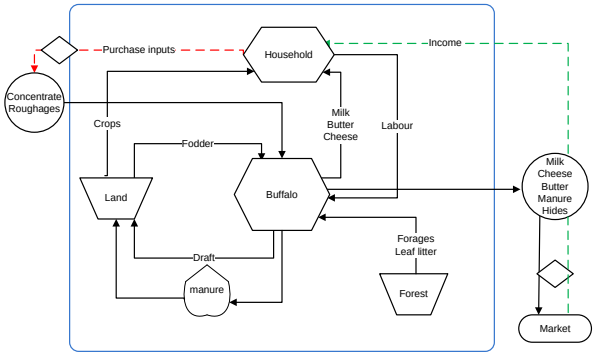

Figure 1: Buffalo rearing system framework

Major outputs from buffalo rearing were milk, butter, cheese and draught power for ploughing land. Milk, butter and cheese were either consumed at household level or sold to the market to generate cash income. Forest grazing and rice straws were the major roughage for buffalo. Buffalo provided manure and draught power which helps in crop production for sustenance of the household system.

Due to less income generating options in the rural areas, outputs especially butter and cheese constituted the main income generating sources. Where there was labor shortage, buffalo draught power also served as an alternate and substituted the labor shortage issue through hiring and bullock exchange system in the locality.

3.3 Buffalo husbandry practices

Majority of farmers do not provide shelter for buffaloes with exception to calves. Calves are provided with shed or kept close to homestead for about a year. Other categories of buffaloes are tethered in the open field and such practices is reported to saves household labor through dung being directly deposited to agriculture field.

Buffaloes are let loose and taken for grazing in the forest beside grazing freely in open field. Buffaloes were also left to graze the of fodder or grasses along the waysides. The buffalo in general were found to graze in the open field freely for around 7-8 hours a day. Farmers reported that buffaloes prefer to browse on their own than feeding cut forages. The animals are tethered in the evening, and fed rice straw which is the major roughage source and looped green fodder. Rice bran and hulls were also fed whenever available. Farmers reported that commercial concentrate feed are fed to milking buffaloes only.

Farmers in general believe that buffaloes are more resistant to diseases as compared to cattle. Nonetheless, worm infestation and tick infestation in buffalo are reported as the most important problem encountered by 61.8% and 20.60% respondents, respectively. Farmers reported that diseases such as Foot and Mouth Disease (FMD), Black Quarter (BQ) and Hemorrhagic Septicemia (HS) are the common concern in cattle farming but it is not a threat to buffalo. The respondents reported that wallowing (locally known as *aal khel)* at least once a day for buffalo is necessary to cool their body temperature, and having access to wallowing result into enhanced milk production. Farmers in general preferred to rear one or two cattle along with buffalo herd to improve market access for buffalo products in particular to butter. The farmers interviewed reported that the butter of buffalo being whiter in color than the butter of cattle is not preferred by the consumers readily.

3.4 Buffalo breed preference

Figure 4 shows the buffalo breed preference by the farmers under Samtse district. *Murrah* buffalo locally known as *Gujarati* is highly preferred due to high milk producing capacity, followed by *local breed. Dobla* the crossbreed between the local and *Surti breed* followed by *Kagay* is the least preferred buffalo breed mainly due to its' low milk producing capacity and small body size. The

study found that 85.3 % respondents preferred Gujarati followed by local (11.8%) and 2.9 % for the *Dobla*.

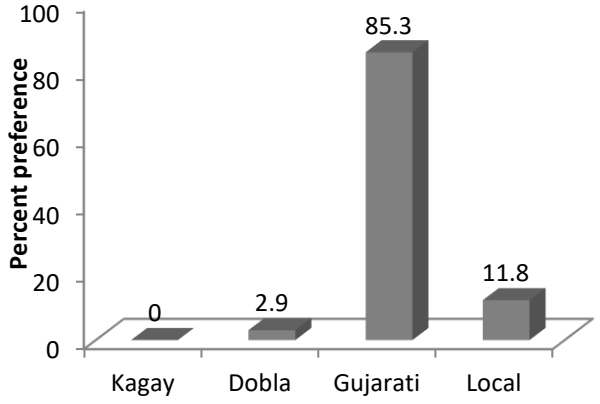

Figure 2: Buffalo type preferences by respondents

3.5 Sources of livelihood

The households surveyed in this study are mostly depend on livestock rearing, crop cultivation and partly on horticulture for their livelihood. The study recorded that more 90 % of respondent are dependent of mixed crop-livestock farming for their livelihood, and the rest are dependent on business and off farm activities for livelihood sustenance.

3.6 Socio-cultural beliefs and importance of buffalo

In contrast to cattle, people associate and perceive buffalo as unholy. This is due to their association with water that buffaloes need for wallowing "*aal khel* (wallowing or puddling in marshes and ponds)*"* on daily basis in dirty ponds and marshes. The belief that buffalo emerged from ocean also culminate it as unholy animal. In addition, buffalo by myth is considered as ghost or demons as such milk and milk products of buffaloes were not used in the religious offerings. In line, unlike cow dung which is popularly used for plastering homes, buffalo dungs were not used in plastering homes attributing to the above myth. However, there is a logical reasoning for not using buffalo dung for plastering of homes. The buffalo dung is comparatively finer and smoother than cow dungs and when plastered, it tends to peel off unlike the cow dung.

The exact date when buffalo rearing started under Samtse district could not be traced. But most respondents in this study claimed that the buffalo was reared since their grand parents' time. The study areas fall under different topographical settings and buffalo rearing was found to be accustomed in accordance to topography and its importance. For instance, farmers in Dorokha gewog reared buffalo only for milk and manure, and are never used for draught purpose. Whereas, in the lower plain area buffaloes are reared for milk, meat manure and draught too.

Among Hindus, some castes eat buffalo meat as such these groups prefer to rear buffalo than cattle. Even if a buffalo dies accidentally or otherwise, there is a saying that "*Charo khuto moryo bune eek khuto uben cha*" which means that they will recover the cost of one limb even if four limbs die. Therefore, at all times some part of household income is assured from buffalo carcass.

The age-old tradition like bullock carts or *ranga gari* (bullock carts drawn by buffalo bulls), marts and melas, bull fights are lost due to socio-economic development and better road connectivity. Today, most of the cart wheels drawn by the buffaloes in the past can be seen hanging on the walls. Currently, buffaloes are only used for ploughing in the study area. Most respondents (73.5%) reported that the buffalo has a socio-cultural

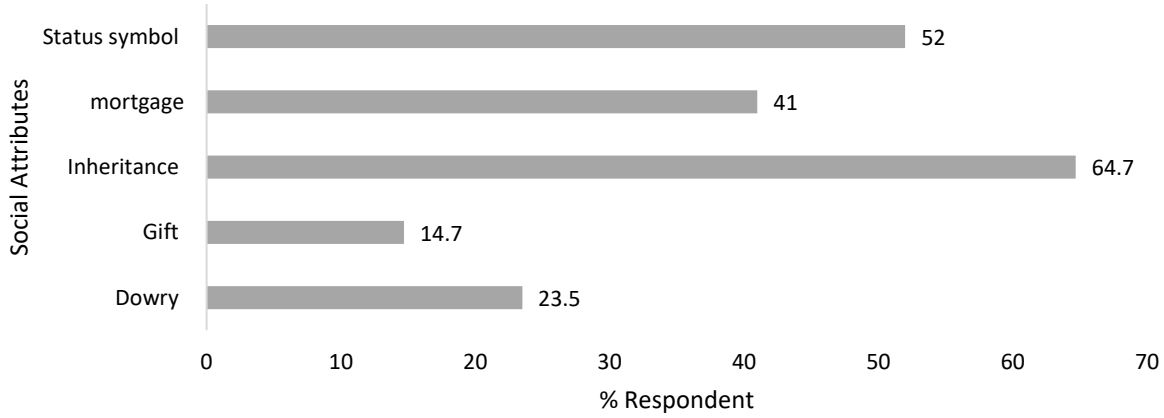

Figure 5: Percentage of households against respective social attributes

significance, and it is changing or dying. Buffalo is inherited to their siblings as reported by 64.7% of the respondents in this study, and 23.5% of the respondents reported buffalo as a medium of payment for dowry during marriages (Figure 5).

While the tradition of *doya* (requesting for buffalo from relatives and neighbors) are rare now, 14.7% responded that they still gave buffalo as gifts to their immediate friends and family. In most areas, having large herd of buffalo is still considered as rich and affluent individual in the community. The study observed that all family members are engaged in buffalo farming but differs in time of engagement. In average father was found to be engaging more time about 8.6 hours a day managing buffaloes. The other household members also shared their time on buffalo farming (Table 2).

Table 2: Daily engagement of household members in buffalo farming

Family member	Time allocation (hr)
Father	8.6
Mother	1.7
Children	1.4
Hired Labor	1.1

All respondents interview reported that buffalo do not have any religious significance in contrary to the findings of Tamang et al. (2009), who reported use of buffalo as sacrificial animals. It was also observed that none of the products from buffalo were used in the festivities and religious offerings in the study areas.

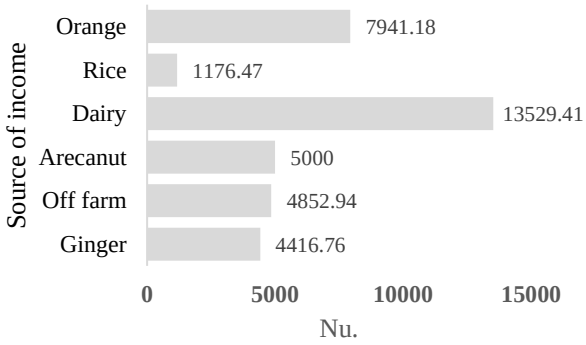

Figure 6: Annual income (Nu) contribution from various sources

3.7 Income from buffalo farming

Figure 6 and 7 represents different annual income sources for the buffalo rearing households. Income from various sources was assessed to determine proportion of income contributed through buffalo rearing to the household annual income. The study recorded the highest mean annual income of Nu. 13529.41 from dairy farming, followed by Orange and Arecanut farming of Nu. 5000 and 4852.94, respectively. The household also generate additional cash income through engagement in off farm activities and sale of vegetable and cardamom.

On further assessment of annual income generated for the household from dairy farming, the study observed that buffalo farming contributed to 66.2% of the total annual income of the household. It was observed that most respondents do not market fresh milk but they processed into butter and cheese for home consumption and excess produced are sold. The sale of butter and cheese contributed to 55% and 23 % of the household annual income, respectively. The remaining income of about 22 % was contributed through hiring of draught animals (Figure 6). The dung produced by buffaloes are not monetized and not included in the income source for

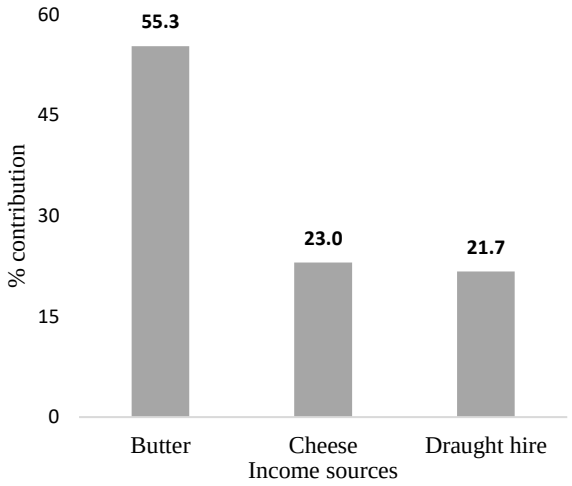

Figure 7: Income contribution (%) from buffalo milk and milk products

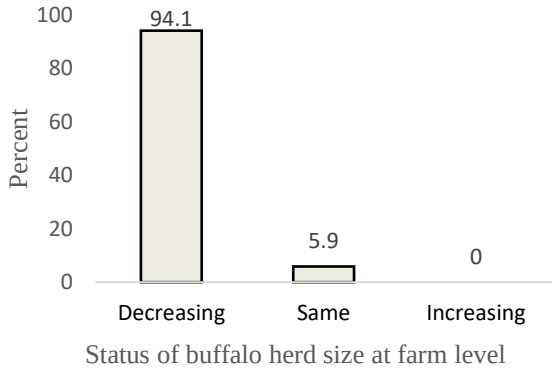

Figure 8: Respondents' opinion on the buffalo population trend

this study as it is used to fertilize the agriculture field directly.

Live buffalo serves as a living bank and it is highly valued by the farmers. The use of live buffalo as a surety

to acquire loans and lending was reported by 48.8% of the respondents in this study. The mean value of female and male buffalo reported during the study period was about Nu. 17588.24 and Nu. 18661.76, respectively. However, the value of buffalo was found to vary based on the location and utility. For instance, the price range for buffalo bulls was found higher in the lower plains as compared to mid altitude region mainly due to utility purpose of ploughing field in lower plains area. The study recorded that the buffaloes are not used for draught power in Dorokha gewog.

influence of household assets on buffalo herd size. Among the assets assessed, household size significantly (p<0.05) affected the buffalo herd size. For every unit increase in household size, buffalo herd size increased by 0.24 LU. Similarly, the number of household members with tertiary education level significantly (p<0.05) affected the buffalo herd size. For every unit increase in the number of household members with tertiary education level, buffalo herd size increased by about 0.49 LU in the study area. These household assets explained only 25% of variation of buffalo herd size in the study area.

Table 3: Mean (± SD**)** household assets and distribution of household members by education levels in study area

	Gewogs				
HH Assets	**Dorokha**	**Sipsoo**	**Lharini**	**Samtse**	**Gumouney**
N	12	11	4	2	5
Total HH Size	6.9 ± 3.9	9.1 ± 4.1	14 ± 4.3	6 ± 2.8	5.8 ± 0.8
Total Land Holding	7.5 ± 8.7	5.1 ± 5.1	5.3 ± 2.7	1.2 ± 1.0	5.7 ± 6.4
Total large ruminants	13.5 ± 12.7	9.5± 4.0	18 ± 4.5	8.5 ± 2.1	5 ± 1.5
Education level					
Primary	2.5 ± 1.9	1.2 ± 1.1	2.5 ± 2.5	0 ± 0	1.8 ± 0.8
Secondary	1.3 ± 1.6	0.8 ± 1.1	1.5 ± 1.0	1 ± 0	0 ± 0
Tertiary	0.5 ± 0.9	0.3 ± 0.9	1.5 ± 1.7	0.5 ± 0.7	0 ± 0
No Education	2.2 ± 2.5	6.1 ± 4.1	3.0 ± 0.8	4.5 ± 3.5	3.6 ± 1.5

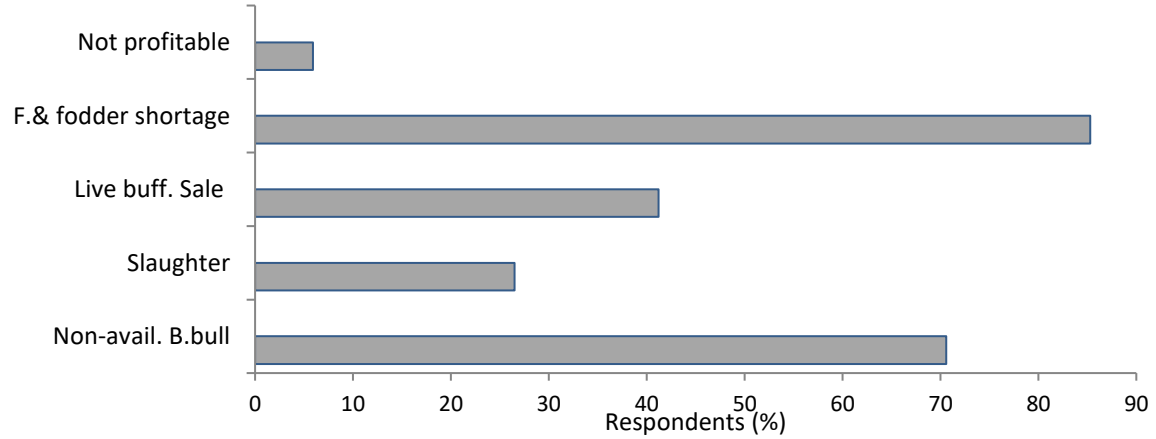

Figure 9: Causes of buffalo population decline

3.8 Influence of household assets on buffalo farming

Table 3 shows the household assets and distribution of household members with different educational levels in the study areas. The study recorded highest and lowest mean household member size of 14 numbers and 5.8 numbers in Lharini gewog and Ghumouney gewog respectively. Whereas, Dorokha and Samtse *gewog* recorded the highest and lowest mean land holding size of 7.5 acres and 1.2 acres, respectively.

Linear regression on buffaloes (in LU) as dependable variable was carried out to assess the

3.9 Perceptions on the future of buffalo farming

A decline in buffalo population both at household and village level was reported. Of the total respondents in this study, 94.1 % reported that the buffalo herd size had decreased at the household level, and the remaining reported that the herd size have not changed over the time (Figure 8). The main reasons attributing to decline in buffalo population as reported by the respondents are feed and fodder shortage (85.3%), non-availability of breeding bulls (70.6%) and sale of live buffalo (41.2%). A few respondents about 5.9% reported low economic returns as

one of the causes for decline in buffalo population (Figure 9). The other factors reported to have contributed in decline of buffalo population in study areas are drying up of wallowing ponds, labor shortage, schooling, rural-urban drift, and shrinking of grazing areas. On the future buffalo rearing prospects, 82.4% farmers responded that they will continue rearing buffalo in the future, while 8.8% of the farmers said that they will stop rearing buffalo in the future. 8.8% of the respondents said that they will increase their present herd size and rear buffalo in future (Figure 10).

There is a clear indication of the need for buffalo breeding bull in the study areas. 44.1% of the respondents were of the view that the supply buffalo breeding bulls by government could help reviving and sustaining buffalo rearing. While 35.3% suggested artificial insemination, if introduced could boost up buffalo rearing. Another 11.8% of the respondents felt that the government land lease and other input subsidy could revive and sustain buffalo rearing (Figure 11).

3.10 Socio-cultural and economic significance

In general, socio-cultural traditions that had relation to buffalo is decreasing in the study areas. This is in contrast to the strong prevalence of traditions such as dowry during marriages and buffalo recreations like bull-cart racing, bull racing, buffalo ploughing contest and bull fights in Pakistan and India (Iqbal et al. 2009). The decreasing roles of buffalo in socio-cultural and traditions activities could be attributed to the availability of other alternative gifts during marriages and other entertainment alternatives in the study areas. The other reasons could be lesser dominance of buffalo farming as compared to cattle and weak policy and technical support rendered in promotion and development of buffalo in the country.

The contribution from dairy accounts to about 66.2% of annual household income, and the study recorded that buffalo farming alone contributed about 19.2% shares to the annual household income. The findings on income contribution from buffalo farming in study area was found similar to the observations of Nanda and Nakao (2003), who reported contributing to about 10-25% of household income from buffalo in the region.

Despite similarities of findings, income contribution from buffalo in our context could possibly be over-estimated due to respondents' inability to exactly quantify the milk and milk products of buffalo and other cattle separately. Milk from buffalo and other cattle in first place are not recorded and it is processed together. Buffalo farming although may not be popular in the study

Table 4: Regression coefficient for selected variables buffalo (in LU) as dependent variable.

	ls mean	s.e[1]	regression	s.e
Buffalo Herd Size (LU)	3.87	0.91		
Household size (No)			0.24*	0.12
No. of HH members with tertiary education (No)				
R^2 full model: 25%			0.49	0.50

[1] standard error; * $p<0.05$

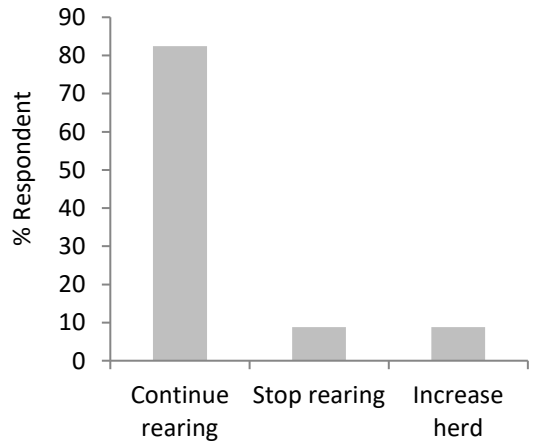

Figure 10: Perception on future of buffalo rearing

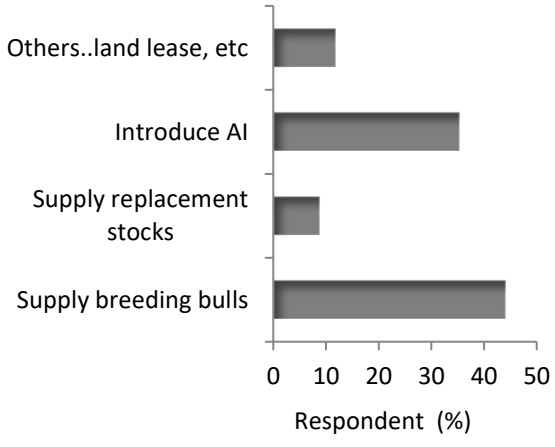

Figure 11: Respondents expectations from the government

areas, it however, has the potential given its sturdy characteristics, strong resistance to diseases and cultural acceptability of certain caste of people.

3.11 Influence of household assets on buffalo farming

Household assets possession significantly affected the buffalo herd size (Table 4). When the household size is bigger, it is more likely that there will be more labor availability and the household could afford to rear more buffaloes. Further, when there are more family members in a household, they can afford to engage in other activities as well. It is also likely that if the household size is bigger, the opportunity to attend school and vocational or agricultural trainings is more. This may affect in decision making and favor buffalo rearing. This finding confirms to the findings of Tamang et al. (2009), whereby one of the causes of buffalo population decline in Bhutan was attributed to labor shortage. Similar findings were also reported (Nanda and Nakao 2003) and Cruz (2007).

3.12 Influence of household assets on future of buffalo farming

Majority of the farmers (94.1%) are of the view that the population of buffalo in the study area is decreasing. The main reasons attributing to decline in buffalo farming are feed and fodder shortage (85.3%) and non-availability of breeding bulls (70.6%) (Figure 9), which is in line with the findings of Tamang et al. (2003). Nanda and Nakao (2003) reported rapid urbanizations resulting in shrinking of grazing areas as one of the causes of buffalo population decline in neighboring regions.

With the enactment of Land Act (2007), it could further exacerbate feed and fodder shortage hence urgent interventions in the form of government land lease for pasture development and subsidy support for breeding inputs is essential to revive and sustain buffalo farming tradition. About 44.1% of the respondents had similarly expressed the need of buffalo breeding bulls while 35.3% expressed the need for AI services.

4 CONCLUSION AND RECOMMENDATIONS

Buffalo farming is a multi-functional enterprise. Buffalo farming system is not bound simply to livestock farming alone but has inter-linkages to crop farming and surrounding natural resources. It has both economic and socio-cultural importance. Socio-cultural importance, although may be on a decline, it still has some importance for: marriage serving *dowry*, family cohesion serving as parental inheritance to children, building social status serving as wealth, gaining access to social and financial services serving as surety or mortgage.

Economic contributions from buffalo are similar to neighboring buffalo rearing countries in the regions with substantial contribution of about 19.2% to the overall household income and 66.2% towards dairy income. However, assessment could possibly be slightly overestimated with the failure to distinctly identify buffalo products from other cattle products.

Among the assets, household size and number of household members with tertiary literacy level determines 25% of variance of buffalo herd size. Household size significantly affected the buffalo herd size. Majority of farmers (94.1%) attributes decline of buffalo population to fodder scarcity and non-availability of buffalo breeding bulls.

With the current level of policy and interventions from the government, the buffalo farming is doomed to decline further. Nonetheless, with appropriate and timely interventions particularly subsidy on breeding inputs and pasture development policy could perhaps revive and sustain the buffalo farming tradition.

A comparative assessment of contribution of buffalo and cattle is recommended to understand the relative socio-economic importance of cattle and buffalo.

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