

Scope Of Food Security and Poverty Alleviation In Rural Areas Through Large Ruminants

Chakrapani Luitel*

INTRODUCTION

Food is important for human being to carry out economic activities and occupations. Various technologies have been introduced to meet the food demand for steady increasing population. Sufficient food and nutrition is necessary to increase the physical and mental capacity of the people. An adequate quantity of balanced and nutritious food helps to build up the efficiency of the people and is a primary indicator of quality of life, human welfare and development.

The demand for food, in the world and Nepal, is increasing due to the tremendous growth of population over the years in spite of the efforts and investment for its control. Production process is largely traditional, available productive resources, either natural or man made, have not been fully utilised at optimum level which could not meet the increasing demand for food. Poverty and under-nutrition has been apparrant at large among population and this situation is increasing over the years indicating the unavoidable forthcoming alarming situation. Once the country is trapped in this circle it would be difficult to escape from this. To remove this situation necessary steps have to be taken. In this context, there will be a need for more intensification of existing production system to meet the demand for food (Devendra 1993).

Sufficient amount of food and nutrition, the means to increase the efficiency, is necessary for human capital formation which can play a significant role in economic development. This requires sufficient food in addition to training and education. Reports of the Food and Agricultural Organisation shows that the diet of the inhabitants of the developing countries is hardly sufficient in terms of dietary calories, mainly from vegetable origin and in short in animal proteins (Hazarika 1990).

To address the problem of food shortage, which is increasing in nature, productivity of agriculture sector is necessary to increase. But crop production cannot be increased for a long time due to the limited expansion of land and its capacity. Crop intensity is possible only if sufficient irrigation facilities are provided throughout the country. But this is not possible at quick pace, at least up to near future, in Nepal. In this

* Mr. Luitel is Lecturer, Dhankuta , Campus, Dhankuta Nepal.

situation variable and sustainable resource base is necessary to explore entire agriculture as soon as possible.

Nepal is heavily trapped in food problem and this situation will be more serious in succeeding years. About 51 percent of the total population are in under consumption level and 47 percent are meeting just bare need. This problem is more serious in the mountain, where more than 63 percent are living on below the requirement level followed by hill, 54.67 percent, and the tarai, 44.86 percent, respectively. Similarly, this problem is serious in Far-western Development Region followed by Western, Central, Eastern and Mid-western Regions respectively. The problem is acute in rural areas than urban however, the extent of the problem is uneven in urban than rural areas (CBS 1995).

Land holding size of the country is divided in small parcel. About 70 percent of the total population are relying on less than one hectare of land, which indicate the necessity of other economic activities for livelihood, specially, to meet the demand for food. But the knowledge and mobility statue of the farmers is not adjustable to other productive activities, which are different in Nepal. (CBS/NPC 1995)

CATTLE AND BUFFALO FOR FOOD SECURITY

Cattle and buffalo constitute significant place in food security in the Nepalese economy. These two species provide directly meat and milk for consumption and indirectly helps to raise the agricultural production by providing manure and draft power. Cattle and buffalo convert the unused agricultural by-products, which other wise may be wastage, and crop residues into the edible items. Draft power and manure are significant inputs for agricultural production throughout the country, where mechanisation in agriculture is less and difficult at present, near future too, and supply of chemical fertiliser is sharply inadequate throughout the country in all season.

Livestock sector constitutes significant place in the Nepalese economy. Its is about 41 percent in Agricultural Gross Domestic Production (AGDP) and 17 percent in Gross Domestic Production (GDP), excluding the other role such as the supply of manure and draft power. The share of livestock is increasing over the years and shows the bright perspective in the economy in the years to come.

Table 1
Livestock And Agriculture Contribution On GDP
 Rs. In Million)

Fiscal Year	GDP	AGDP	LGDP	FGDP	AGD P percent	LGDP percent	LACDP percent	FAGDP	F/L percent AGDO
1984/85	44441	22761	7388	95	51.22	16.62	32.46	0.42	32.88
1985/86	53215	27136	8972	202	50.99	16.86	33.06	0.75	33.81
1986/87	61140	30623	10304	259	40.09	16.85	33.65	0.85	34.99
1987/88	73170	36755	12937	351	50.23	17.68	35.20	0.96	36.16
1988/89	85830	42572	15492	417	49.60	18.05	36.39	0.98	37.37
1989/90	99702	50470	19208	530	50.62	19.27	38.50	1.05	39.11
1990/91	116128	56368	21315	632	47.68	18.36	38.50	1.14	30.64
1991/92	144931	65155	25269	848	44.96	17.44	38.78	1.30	40.09
1992/93	165262	70090	27383	840	42.41	16.57	39.07	1.20	40.27
1993/94	190959	81621	32484	1001	42.74	17.01	39.80	1.23	41.03
1994/95	210532	87072	35762	1209	41.35	17.00	41.07	1.39	42.46

Source :- Upendra Mishra and Nanda Prasas Shrestha, *National Research Strategy to Promote Sustainable Production of Livestock and Fisheries for Food Security*, Proceeding of First National Workshop on Livestock and Fisheries Research in Nepal, Kathmandu National Agriculture Research Institute, (NARC), Kathmandu.

SCOPE OF CATTLE AND BUFFALO FOR FOOD SECURITY

Cattle and buffaloes are widely accepted economic resources in Nepal and provide the base for food supply throughout the country with better nutritional standard. This is more viable in all ecological regions as it has been available. Most of the the cattle and buffalo are concentrated in the hill region followed by the terai and mountain respectively. The concentration of the cattle and buffalo in the hill and the terai region is caused by the demand for agricultural power and progressively commercialisation of the livestock sector being profitable.

Table 2
Cattle And Buffalo Distribution By Ecological Belts In Nepal Fiscal Year 1996/97

(In Number)

Livestock Species	Mountain	Hill	Terai	Total
Cattle	825827 (11.8)	3429753 (48.8)	2769195 (39.4)	7024755
Buffalo	304537 (9.1)	1918722 (57.1)	1139176 (33.8)	3362435

Source : HMG/Ministry of Agriculture, *Statistical Information on Nepalese Agriculture 1996/97*, Ministry of Agriculture HMG/N.

Cattle and buffalo are important for food security and nutrition for households as they provide milk and meat for consumption and save substantial amount of cash, earned from other sectors of the economy. They provide the basis for food security in the following ways:

- Many poor small holders would have direct access to more food of livestock origin as they are reared at their home.
- Cattle and buffalo help to produce more food through supplying manure for maintaining soil fertility to produce more, which helps to reduce the price, through sufficient production for consumption and surplus for marketing.
- It helps to preserve the foreign currency, reducing the importation of livestock origin food items, which can be invested in other productive activities.
- Livestock sector may promote industrial food production, supplying milk and meat as raw materials, which makes possible to preserve the food for regular supply.
- Livestock is divisible asset and can be sold during crisis, which can be used to purchase food to escape from starvation malnutrition and other productive inputs for agricultural production.
- Livestock is the single most viable source of agricultural power for cultivation and helps to produce more food from crop land. Specially it has no alternative in hill agricultural system.

Cattle and buffalo constitute significant place in households wealth portfolio and serve as the capital assets providing regular output in various forms. These two species and their production are divisible and can be sold during contingency at required amount to meet the demand. Providing employment opportunities for income generation and cashable production to the households, for the increment of the level of income, increases the purchasing power, which is the basis for industrial expansion. Cattle and buffalo are living banks for many raisers and plays critical role in the agricultural development, specially strengthening the food base for people.

Milk Production

Milk is important aspect of the cattle and buffalo production. The production level depends on the genetic structure, feeding techniques and management system of the given species. Various studies have indicated that the productivity of improved cattle and buffalo are higher than that of the local in many cases throughout the country. The share of milking cattle and buffalo is about 11 and 25 percent in the country. Comparatively low

percentage of the milking cattle is mainly due to the existence of unproductive cattle and more simple management system throughout the country. The regionwise situation shows the variation in these percentages.

Table 3
Milking Cattle And Buffalo By Ecological Regions In Nepal in 1996/97
(In Number)

Regions	Total Cattle	Milking Cattle	Total Buffalo	Milking Buffalo
Mountain	825827	102078 (12.4)	304537	82586 (23.8)
Hill	3429753	440493 (12.8)	1918722	542606 (28.3)
Terai	2769195	273699 (9.9)	1139176	242228 (21.3)
Total	7024775	816270 (11.6)	3362435	857420 (25.5)

Source: HMG/MOA *Statistical Information on Nepalese Agriculture, 1996/97*, HMG/MOA Ministry of agriculture, HMG/N, Kathmandu.

The main source of milk is the cattle and buffalo and level of milk production depends upon the efficiency of the milk production parameters of these two species. The region and specieswise milk production situation, clearly indicate the significant place of buffalo in milk production. Buffalo constitute about two third shares of milk and rest by the cattle. Similarly, about 57 percent out of total milk are produced in the hill region in overall situation and this is consistent in case of cattle and buffaloes followed by the terai and mountain regions respectively. The regionwise milk production data clearly indicate that cattle constitute higher share in the terai and mountain than buffalo.

Table 4
Distribution Of Milk Production By Ecological Belts 1996/97
(InKg.)

Ecological Region	Milk Production		
	Cow Milk	Buffalo	Total Milk
Mountain	32657 (10.5)	51375 (7.3)	84032 (8.3)
Hill	158869 (51.2)	419573 (59.8)	578442 (57.2)
Terai	118657 (38.3)	231032 (32.9)	349689 (34.6)
Total	310183 (100.0)	701980 (100.0)	1012163 (100.0)

Note : Figure in the parenthesis indicate the percentage of total.

Source : HMG/MOA *Statistical Information on Nepalese Agriculture 1996/97*, Ministry of Agriculture HMG/N, Kathmandu.

Meat Production

Meat is another significant production of livestock sector in Nepal. The sources of meat are buffalo, goats, sheep, poultry and pigs but buffalo constitutes about two third shares in total meat production and this is consistent in view of the data of various years as well.

Cattle and buffalo have significant place and better prospects in the Nepalese economy at present for food production and likely to be remained in the foreseeable future too. Most of the rural households keep cattle, about 76 percent of total households, and buffalo, about 48 percent of the total households, in different numbers and loosely affected by ethnicity than other species of livestock. Due to the rugged topography of the country and availability of cattle and buffalo, they are the special means for draft power for Nepalese agriculture throughout the country. Cattle and buffalo are viable and there is much scope to increase the productivity in Nepal. Improved cattle and buffalo can provide higher level of milk. Stall feedings of cattle and buffalo can produce more manure and helps to maintain the soil fertility for higher level of production, which is necessary condition for food security.

Table 5
Meat Production And Distribution In Nepal By Ecological Region And Species

(In Mt.)

Sources of Meat	Ecological Belts			
	Mountain	Hill	Terai	Total
Buffalo Meat	32657 (10.5)	51375 (7.3)	84032 (8.3)	113482
Mutton	1155 (39.8)	1305 (45.0)	440 (15.2)	2900
Goat Meat	2733 (7.9)	14399 (41.7)	17418 (50.4)	34550
Pig Meat	1115 (9.0)	7151 (57.8)	4108 (33.8)	12374
Chicken	711 (6.7)	6458 (60.5)	3502 (32.8)	10671
Duck Meat	6 (2, 1)	55 (18.9)	230 (79.0)	291
Total	15362 (8.8)	94007 (54.0)	64899 (37.2)	174268

Source : HMG/MOA, *Statistical Information On Nepalese Agriculture 1996/97*, Ministry of Agriculture, HMG/N.

Poverty is too much serious problem in Nepal and nearly half of the total population is trapped in this circle with poor resource base, low efficiency and less mobility. In this context, they cannot increase production at the existing situation and leave their house easily to be adjusted in other occupations for earnings to meet the demand. Traditionally, they have been relying on agriculture and livestock raising and have gained some efficiency on it. The development and improvement of livestock as economic resource base can be the special and viable means

for poverty alleviation. In spite of the illiteracy of the rural farmers, they have specialised knowledge in cattle and buffalo raising due to long experience than other productive activities.

LIVESTOCK AS THE INPUT FOR AGRICULTURAL PRODUCTION

Power

The domestication of animal for draught purposes is estimated to have started over 5000 B.C.. In many parts of the world, especially of the agricultural countries, animal traction has been accepted by farmers and policy makers as an appropriate, affordable and sustainable technology, requiring few external inputs. They are the means of power supplier for agricultural operation in the developing countries. Animal supply draught power for land development, tillage, seeding operations, inter-cultural operations, lift irrigation, harvesting, threshing and transport. The buffalo is the popular draught animal in the rice dominant agriculture of South-East Asia. Cattle are important work animals in agriculture in the Indian sub-continent, in some countries of the Middle East and in many countries in Africa and Latin America.

Animal, especially, cattle and buffalo constitute significant place in the supply of agricultural power in the hill and mountain regions. Farmers, with some land holding, use to keep draught animals to plough the land, pulling cart in plain areas, puddling the land for rice plantation, harrowing, threshing, pumping water and so on. In developing countries, which are basically dependent on agricultural activities, cattle and buffalo are the important and viable source of power. Various researchers have mentioned the superiority of animal power for agricultural production which runs as follows (Singh 1998).

- The source of energy already exists in the region. Draught animal power does not have to be manufactured or bought at a high cost from abroad.
- The use of animals increases a farmer's 'work force'. It enables the farmer to plant diverse crop species to increase the area cultivated and carry out agricultural work in time.
- Machine based energy results in the concentration of production on a limited number of crops, thus reducing the diversity of the system.
- Animal-drawn implements are cheaper than mechanised equipment. Animal drawn implements can be made locally and are more suitable for the small, often fragmented and scattered, mountain farms.
- Draught power does not need expensive and non-renewable fuels. Draught animals can also be fed residues and by-products available on the farm, producing in return not only energy but food, milk from the female cattle and buffalo and meat from buffalo, methane, bio-gas, manure as well as other products obtainable after their death.

- The use of draught animals enables farmers to integrate livestock and crop production and permits the exploitation of the potential of cattle kept settled, subsistence farms.
- Mechanisation causes direct labour displacement in land preparation. If it does not also contribute directly to increasing cropping intensities and yields, or to facilitating a switch to more labour-intensive crops, there will be a net loss of employment opportunity in areas where alternative sources of income are scarce.
- Fossil energy used in machine is a finite resource and its use has a considerable negative impact on the environment. Most farmers in the mountains can not afford fossil energy-based technology.
- Where animals are used as draught power, it is possible for farmers to either cultivate more land or use the time for other activities.

Nepalese farmers are heavily dependent on animal power for cultivation and other agricultural activities. Draught animals are a great capital asset of many farmers. Therefore, they are invariably treated with great care. The variation of the size of draught animals tends to be related to the size of land holding. The variation of the size of draught animals tends to be related to the size of land holding. The small holders tend to keep small animals. Only male cattle, buffalo and yaks are used in agricultural operations. The use of female cattle and buffalo for work is contrary to social practices at present (Oli 1984.)

Around 50 percent farmers of Nepal live in the hill region and a small piece of land is basis for their livelihood. Farm mechanisation process in the hill region is limited due to inaccessibility and limited extension of infrastructure. A pair of draft animal and a simple wooden plough, are the usual and prevalence means of land preparation. In narrow traces, where a pair of oxen is impossible to drive, hand hoes are used. Substantial mechanisation in the hill and mountain regions is not feasible because of dominance of small sizes, sloped conditions and limited access to the field. This problem is compounded by the continuous fragmentation of land.

Draught power is one of the basic requirements for crop farming in an agricultural system. Notwithstanding the availability of good seeds, fertile soil, irrigation facilities, and favourable climate, crops cannot be shown and harvested without draught power. Untimely and inadequate supplies of draught energy led to a decrease in crop production (Singh 1998).

In the mountain, the productivity of farming system depends on the conversion of fodder into manure. In mountain areas, especially at high altitudes, crop residues decompose very slowly. The ruminant digestive system helps speed up nutrient recycling. Ruminants also help to transfer the soil nutrients from forest vegetation to cropland, improving the fertility of the agro-ecosystem. The dung produced in the stall is transferred to cultivated land, and this requires a long time, apart from human labour,

and due to nutrient loss its quality decreases. *In situ* manuring, i.e. by tethering the animals directly in the fields, is an important strategy developed by mountain farmers over the ages and in which draught animals play a crucial role. During the dry season, cattle and small ruminants, graze harvested fields left fallow and provide manure directly. The draught animal provide also manure directly to the fields while performing agricultural operation (Singh 1998).

Animal power is significant for Nepalese economy and it has high economic value especially in case of hill region where 58 percent of cultivated land and 62 percent of rural population are found in the hill and mountain areas. Only a limited area is accessible by road and the majority comprises small, fragmented and steeply terraced land where modern agricultural equipment could not be used efficiently. Traditionally, only male animals are used for draught purposes, and only male members of the family operate them usually in pairs. Almost all land preparation is performed by animals, and will be for a considerable period of time to come (Joshi 1992).

Cattle and buffalo oxen are the main source of draught power for agriculture in Nepal. Bullocks are used to plough throughout the country except Kathmandu valley and buffalo oxen in the terai region. The supply of draught power depends upon the number and working hours and day per year. Cattle oxen are found throughout the country as the distribution of cattle. Draught power is the prime reason why cattle are maintained in the Eastern hills and, wherever possible, a farmer will keep a pair of ploughing oxen.

Table 7
Cattle And Buffalo Oxen Population In Nepal in 1994/95
(In Numbers)

Development Region	Ecological Region							
	Mountain		Hill		Terai		Total	
	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo	Cattle	Buffalo
EDR	67668	72	269226	1457	379212	58776	716106	60305
CDR	72791	10	115463	126	427371	9133	615585	9269
WDR	1493	0	374639	122	268194	17476	644326	17598
MWDR	44619	0	291193	713	179025	73455	514837	74168
FWDR	61492	19	137953	7	104188	51210	303633	51236
Total	248063	101 (0.05)	1188474 (42.53)	2425 (1.14)	1357950 (48.59)	210050 (98.81)	2794487 (100.00)	212576 (100.00)

Source : HMG/MOA, *Statistical Information on Nepalese Agriculture 1994/95*, MOA.

In Nepal, there are about 2,794, 487 cattle oxen and about 48.59 percent out of that are concentrated in the terai region followed by hill 42.53 percent and mountain by 8.8 percent respectively. The main region of

such distribution is the result of uneven distribution of the availability of arable land. About 98.8 percent buffalo oxen are in the terai region and it indicates that buffalo oxen are valuable only in the terai region. About 1.2 percent buffalo oxen are in the mountain and hill but are not utilised for the draft purpose.

Animal constitutes significant place in the supply of agricultural power in Nepal and this is consistent with for all ecological region and different crops. Cattle oxen constitute higher place than buffalo in all regions. Due to less mechanisation in the agriculture, tractor and other machines constitutes less than one percent contribution in this regard. Buffalo constitute quite significant place in western development region.

Table 8
Proportion Of Farmers Reporting Use Of Animals For Ploughing

(In Percent)

Ecological Development Region	Rice			Maize		
	Bullock	Buffalo	Tractor	Bullock	Buffalo	Tractor
High Mountain	100	0	0	92.2	0	0
Middle Mountain						
FWDR	99.6	0.4	0	100	0	0
MWDR	100	0	0	100	0	0
CDR	99.7	0	0	100	0	0
Kathmandu						
Hill Slope	0	0	0	77	0	0
Valley	0	0	0	43	0	0
Upper Terai	91.3	7.8	0.9	94.5	4.5	0.9
Main Terai						
FWDR	97.5	2.5	0	97.2	2.8	0
MWDR	88.3	11.7	0	87.6	12.4	0
WDR	96.8	2.2	0.5	-	-	-
CDR	98.8	1.2	0	97.6	2.4	0
EDR	96.6	3.1	0	90.8	9.2	0

Note : EDR - Eastern Development Region
 CDR - Central Development Region
 WDR - Western Development Region
 MWDR - Mid-Western Development Region
 FWDR - Far- Western Development Region

Source : HMG/MOA *Land Resource Mapping Project, 1986* cited in *Livestock Master Plan (1995), Vol.3, P.390, MOA.*

Oxen are ploughed in the form of pairs. In this sense, work burden per pair is significant for economic valuation of draught power availability. Calculation of work burden assuming zero contribution of male buffalo in the hill and mountain region, clearly indicates that in the hill and terai region, oxen have to do a lot work. In mountain region, per pair oxen have to prepare less than 1.7 percent hectare land for cultivation, where as in the terai region 2.24 hectare is common. Similarly, in the hill region each pair has to plough about 2.36 hectare (Calculated from the data of Statistical Information on Nepalese Agriculture)

As cattle and buffalo are main source of agricultural power, the demand for bullock and buffalo oxen is positively associate with the land holding size i.e., higher the land the farmers have, higher would be the demand for draught animals and this relationship is consistent in all ecological regions.

Table 9
Availability Of Animal Power By Farm Size In Different Region
(In Percent)

Region/Explanation		Farm Size			
		I	II	III	ALL
Mountain	Farmers owing none	56.3	11.65	-	30.2
	One draught animals	10.4	43.35	28.0	35.5
	Two draught animals	25.3	25.02	65.0	28.1
	Three draught animals	8.0	19.98	7.0	6.2
	Total	100	100	100	100
Hill	Farmers owning none	84.10	27.43	-	44.53
	One draught animal	10.64	45.15	29.0	23.47
	Two draught Animals	5.26	20.28	64.0	28.43
	Three draught animals	-	7.14	7.0	3.57
	Total	100	100	100	100
Terai	Farmers owing none	72.2	20.0	5.95	53.6
	One draught animals	16.6	50.0	51.35	28.6
	Two draught animals	5.6	10.0	33.20	7.1
	Three draught animals	5.6	20.0	7.50	10.7
	Total	100	100	100	100

Note : Farm Size I = 0-2 hectare of land holding
II = 2-4 hectare of land holding
III = 4 + hectare of land holding

Source : HMG/MOA (1995) *Livestock Production in the Terai, Hills and Mountain*, P 13-14, MOA.

Farm Management Study of 1983-85 has estimated the animal labour per hectare land in different ecological region for different varieties of crops. The study report has shown mixed results for various crops. Paddy cultivation in hill region requires 55 animal days per hectare followed by the terai and mountain 54. Maize, wheat, millet cultivation in the terai region requires highest animal labour days than other region.

The study has indicated that animal power is necessary for all crops and this is the significant determinant for crop intensity. It can be concluded that the demand for animal labour increases with the crop intensity and animal power is necessary for agricultural development. (DFAMS 1986).

Animal draught power places significant position for agricultural activity in Nepal. Assuming that a pair of draught animals can generate an estimated 0.4 kilowatt of power under acceptable level of animal husbandry system, about 0.8 million kilowatt of power is generated by the estimated two million draught animals. This might vary depending on the type of cultivation, nature of soil etc. However, if 0.4 kilowatt is desirable for one hectare of land, an estimated 1.37 million kilowatt of power is required to cultivate Nepalese cropped area, 2,330,000 hectares, where approximately 50 percent of the land is under double crop. Such estimate of power requirement certainly increases when nature of soil, gradients of hills, up hill ploughing and cropping system are considered (Oil 1984).

Manure

The traditional hill farming has been entirely dependent on locally available manure for maintaining soil fertility. Farmers keep livestock specially cattle and buffalo for manure. Population of Nepal is increasing continuously resulting heavy pressure on arable land. In this situation production has to be increased in agricultural sector, specially cereal crops, to meet the food requirement. But due to continuous pressure on land, arable land is nearly ended up. In this situation, intensive farming is unavoidable. With limited availability of arable land, increase in agricultural production can only be achieved by the increase of plant nutrients. However, it is difficult to see how the increased plant nutrients demand for higher yields can be met by traditional methods, mainly the use of farm-yard manure (Suwal, Subedi and Gurung 1991).

Livestock, specially, cattle and buffalo provide significant amount of dung for compost converting the forest resource, crop residues and other wastage in to manure. Soil fertility is sustained by the importation of nutrients from the forest. (Suwal, Subedi and Gurung 1991).

Cultivation on arable land exploits soil nutrients. To grow more crops, soil maintenance is necessary. The cropping remove a substantial amount of plant nutrients even at the present national yield level. This should be maintained for sustainable crop production. It is estimated that a

farmer with a half hectare of *Khet* land for rice-wheat-maize systems would need at least six cattle, with the associated fodder to meet the total nitrogen needs with the traditional FYM preparation. (Suwal, Subedi and Gurung 1991).

In mixed farming, animal can be the good source for manure. Animal provide dung and urine and that would be helpful for maintaining soil fertility. In areas where crop livestock mixed farming is emerging manure is an important link. Manure is of paramount importance in these areas because most soil are fragile and of low inherent fertility. (Sansoucy, Jabber, Fitzhugh 1995). The use of compost as manure has other various benefits in addition to the net add in productivity. Various studies have shown beneficial aspect using animal manure and chemical fertiliser. The combination of compost and chemical fertiliser gives results for crop yield. Crop yields are very low when only one or the other is applied. The application of chemical fertilisers results in good yields. The compost is needed as a sponge to soak up the water which in turn retards percolation from the plot. Water dissolves the chemical fertiliser but its effects are retained for a long period by the compost materials. An addition of compost loosens the soil and preserves the compaction around the roots. The chemical fertilisers have some negative effects and applying compost is a partial remedy (Tamang 1991).

Maintaining soil fertility is urgent task for Nepal and other developing countries, which are basically relied upon the agriculture. Nepal is heavily based on agriculture and its productivity has to be maintained for overall development. Nutrient recycling is an essential part of any strategy for sustainable agriculture. Integration of livestock and crop allows for efficient recycling through use of crop residues and by-products as animal feeds and for animal manure as crop fertiliser. Cattle dung contains about 8 kg. of nitrogen, 4 kg. of phosphate and 16 kg. of potash per tone of dry matter to the soil helping to maintain its structure as well as its water retention and drainage capacities. (Sansoucy, Jabber, Fitzhugh (1995).

Nepal is suffering from low productivity and this problem is necessary to be solved. Intensive manuring is necessary for this. An immediate solution of the nutrient shortage could be the use of artificial fertilisers. The importance of artificial fertilisers can not be totally ignored since there is much evidence that the judicious application of chemical fertilisers have increased world food production tremendously. However, at present, hill farmers who cultivate nearly half the agricultural land in Nepal use less than 1/5 of chemical fertiliser pool, an average of 9 kg. nutrients/hectare. Within the hills, fertiliser use is also skewed towards accessible areas. In the remote interior parts of the hills, wide scale use of fertilisers is restricted because of: (1) lack of transportation facilities, (2) lack of awareness of the hill farmers, (3) low purchasing power of the

majority of the farmers (4) unavailability of fertilisers at the right time and right amount (Suwal, Subedi and Gurung 1991).

Chemical fertiliser helps to produce more but a study conducted by D.B. Chhetri has pointed out various problems in a widely use of this. The common problems with these fertilisers are that they have to be imported from foreign country, which requires a huge amount of foreign currency. Also due to lack of transportation, fertiliser distribution, especially in the hills is hampered (Chhetri 1996).

Most of the farmers in the hill region use compost for maintaining soil fertility and the amount used varies accordingly the crops and crops rotation. An average of 39 ton/hactare compost, the highest rate, is applied in potato and maize production system. Usually farmers do not apply compost on *khet* for rice crops. The main reason for not using the compost on *khet* land is the long distances from the farms. However, practice for *in-situ* manuring in *khet* during crop intervals is common (Khadka and Chand 1987).

Most of the farmers in the hill region are illiterate and unable to use the chemical fertiliser in proper ways. They have not got sufficient information about the use of chemical fertiliser. Moreover, compost is superior than chemical fertiliser in case of Nepal. Application of large amount of compost is good for soil. The soil becomes loose, allows excess water to drain and at the same time, retains moisture, in dry season, it becomes easier to plough, there are less clods, and soil aeration is improved. Even poor soil can be improved over time by application of compost. Applying compost can decrease some of the negative qualities of chemical fertiliser (Tamang 1991).

Cattle and buffalo help to make the fertile land in various ways. These two species transfer the forest resources to farmland. Farmer can use the animal for manuring either collecting dung or mixing with other waste or in *situ* form. In the former case, dung is collected and piled near the shed mixing with leaf litter and wastage straw and stoker. But in *situ* manuring process is different than this.

SOURCE OF EMPLOYMENT AND INCOME GENERATION

The hill region of the country is extremely suffered by the lack of employment opportunities. There are negligible employment opportunities especially for educated youth. This has led to a migration flow of rural male to the urban areas and the terai region in search of employment opportunities. This process is depleting the capable manpower in hill region, and seems likely to remain in future too. The depletion of manpower in the hill region has decreased the production of cereal and cash crops. In this situation, to maintain the hill agriculture sector at sustainable level, manpower balance and stability is necessary. In order to

reduce the migration of rural hill male to the urban and the terai region, alternative opportunities have to be increased in the village level.

Livestock, which is prevailing since long, may be the special measure to cope the migration problem in Nepal. It would be viable aspect, specially, for landless and capital deficient groups. Proper development of livestock sector provides job opportunities and food items, such as milk, meat and other related productions. Land distribution pattern in Nepal is heavily uneven. About 70 percent families are being based on less than one hectare of land. This situation, clearly indicate the poor resource base of the majority of the people. Comparison with the productivity data, it can be concluded that majority families of the Nepalese people are not able to produce food grains for family and they have to search any kind of job for their livelihood.

In spite of the poor condition of the cattle and buffalo, they are the special means for rural employment. They provide employment for rural people through out the year and help to reduce the disguised unemployment and off farm passiveness. Livestock can be regarded as the economic resource and it helps to provide employment opportunities for all seasons, The potentiality of livestock for employment generation can be justified on various grounds in case of Nepal. Livestock raising can be operated in rural areas with a few capital resource and locally available raw materials. Livestock specially cattle and buffalo provides raw materials for livestock based industries such as leather and tanning, milk processing, carpet weaving, meat processing and other activities such as trade of livestock related products produced in rural areas. Development of commercial livestock sector provide impetus for feed industry and agricultural by-product trade such as hay, straw, maize-stoker, etc. these all activities provide substantial amount of employment to rural people in Nepal.

The livestock sector in Nepal is not so much developed yet. There is dominance of subsistence oriented livestock production system. Due to little commercialisation of this sector, full potentiality has not been used up yet. Livestock sector can be the special and viable means of poverty elimination in Nepal. Widely acceptance, multi-benefit and within the affordable capacity of the farmers have made it more viable for rural people. Integrated raising system with crop production has led to optimum use of raw materials and low input cost. Providing employment and income generating capacity at household level has affected significantly on the farmer's economic life.

Livestock, in case of Nepal, is important source of income generation in rural as well as urban areas. It helps to increase the level of income in various ways. It directly provides the live animals and livestock products to the people, which can be sold for earning. Similarly, manure is important for raising the productivity level of land. High level of

production with the help of manure is also helpful for income generation. Cattle and buffalo are the good source for income generation in Nepal. They provide milk, meat, hide and bone for direct cash earning and manure for raising the productivity of land. There is no systematic study regarding the cash generation from the livestock sector. Due to the dominance of household consumption of milk and meat of small ruminants and local use of other products, such as wool and skin and manure, it has been very difficult to evaluate the exact situation of income. But various researchers have tried to estimate it, applying various methods.

Livestock enterprises constitute a major source of income for the average household in Nepal. A multipurpose household budget survey published in 1988 A.D. showed that, in the total household income, livestock sources contributed 21.2 percent in mountain 19.7 percent in the hill region and 9.7 percent in the terai region (Nepal Rastra Bank 1988). In a household survey in mid-hill village of western Nepal, it has been reported that only 12.9 percent of annual cash income come from agricultural activities, of which livestock enterprise contributed 8.6 percent and the major livestock products for cash generation is ghee followed by live animals. (Joshi 1992).

Livestock sector contributes significant place in income earning on the national scale. The livestock sector earned a total of 1.6 million rupees during 1987/88, which accounted for 64 percent of total agricultural exports. The major commodities for export from large ruminants are ghee, live animals, and hides and skins. these represent about 50 percent of the total export of livestock commodities.

Livestock is significant component of farmers' wealth portfolio. Livestock number, and sometime breed too, houses and land are subject of prestige of Nepalese farmers. In spite of government efforts for improvements of crop production, productivity has remained far below or more or less constant. A modest growth at national level is felt by the expansion of cultivable land but now a days the expansion rate started to decline and, it will not take more time to be end. Again fragmentation of land has compounded the problem of mechanisation and large-scale production. In this situation, farmer income source in the form of crop production is being weak and only way to rely on livestock is necessary.

Livestock sector, not only serve as the source of income but it also serve as the basis for income generation providing employment to surplus labour and off farm employment to the farmers. Providing raw materials for cootie industry livestock sector creates off farm employment opportunities in the rural areas. It provides manure and draft power for agricultural activities, which makes possible for crop intensity creating more jobs in the same farm. Income from per head livestock varies by ecological belt and breed of species. Improved breed of cattle and buffalo

provide higher yield than local and this notion is consistent for all ecological region and climate (DFAMS).

CONCLUSION

Cattle and buffalo, constitutes significant place in food security in the Nepalese economy. These two species provide directly meat and milk for consumption and indirectly help to raise the agricultural production by providing manure and draft power. Cattle and buffalo convert the unused agricultural by-products and crop residues into the edible items. Draft power and manure are significant inputs for agricultural production throughout the country, where mechanisation in agriculture is less and difficult at present and near future too, and supply of chemical fertiliser is sharply inadequate throughout the country. Cattle and buffalo constitute significant place in the household wealth portfolio and serve as the capital assets providing regular output in various forms. These two species and their production are divisible and can be sold during contingency at required amount to meet the demand. Providing employment opportunities for income generation and cashable production to the households, for the increment of the level of income, increases the purchasing power, which is the basis for industrial expansion. Cattle and buffaloes are living banks for many raisers and plays critical role in the agricultural development, specially strengthening the food base for people.

Cattle and buffalo have significant place and better prospects in the Nepalese economy at present, and likely to be remained in the foreseeable future. Most of the rural households keep cattle in different numbers and loosely affected by ethnicity than other species of livestock. Due to the rugged topography of the country and availability of cattle and buffalo, they are the special means for draft power for Nepalese agriculture throughout the country. Cattle and buffalo are viable and there is much scope to increase the productivity in Nepal. Improved cattle and buffalo can provide higher level of milk. Stall feedings of cattle and buffalo can produce more manure, and helps to maintain the soil fertility for higher level of production, which is necessary condition for food security.

Poverty is too much serious problem in Nepal and nearly half of the total population is trapped in this circle with poor resource base, low efficiency and mobility. In this context, they cannot increase production at the existing situation and leave their house easily to be adjusted in other occupations for earnings to meet the demand. Traditionally, they have been relying on agriculture and livestock raising and have gained some efficiency on it. The development and improvement of livestock as economic resource base can be the special and viable means for poverty alleviation. In spite of the illiteracy of the rural farmers, they have specialised knowledge in cattle and buffaloes raising due to long experience.

SELECTED REFERENCES

- ADB/Anzdec/Aprosc (1993), *Livestock Master Plan Vol. III*, His Majesty's Government of Nepal, Livestock Development, Asian Development Bank/ANZDEC Limited/Agricultural Projects services Centre.
- Cheetri, D.B. (1996), *Some Aspects of Poverty in Nepal : Micro-Analysis*, MIMAP Project, Agricultural Projects Services Centre (APROSC) And International development Research Centre (IDRC), Kathmandu.
- CBS (1995) *Nepal Living Standards Survey Report 1996*, Main Findings, Volume II, Central Bureau of Statistics/National Planning Commission Secretariat HMG/N, Kathmandu.
- CBS (1995) *National Sample Census of Agriculture 1991/92, Analysis of Results* Central Bureau of Statistics/National Planning Commission, HMG/N, Kathmandu.
- Devendra, C. (1993) *Sustainable Animal Production From Small Farms System in South East Asia*, International Development Research Centre, Animal Production and Health Paper 106, FAO Rome.
- DFAMS (1985) *Some Aspects of Milk Production in Selected Panchayats of Dhading, Gorkha and Chitwan Districts of Nepal*, Ministry of Agriculture/Department of Food and Agricultural Marketing Services, Economic Analysis Division HMG/Nepal.
- DFAMS/HMG (1985) *Livestock Production in the Terai, Hills and Mountain*, Department of Food and Agricultural Marketing Services, Economic Analysis Division, His Majesty's Government of Nepal.
- DFAMS/HMG (1986) *Main Report on Farm Management Study 1983-85*, Ministry of Agriculture Department of Food and Agricultural Marketing Services Economic Analysis Division. His Majesty's Government of Nepal.
- Hazarika (1999) "Animal Blood-The Liquid Meat-An Important Source of Protein, *Asian Livestock*, Vol. XV., No. 9, September 1990, FAO, Regional Office, Bangkok, Thailand.
- Joshi, B.R. (1992) *The Role of Large Ruminants, Sustainable Livestock Production in the Mountain Agro-ecosystem of Nepal*, FAO, Animal Production and Health Papers 105, Food and Agricultural Organisation of the United Nations, New York.

- Khadka, R.J. and S.P. Chand (1987) "*The Organic Materials: A Valuable Source of Soil Nutrients in the Eastern Hills of Nepal*", PAC Working Paper 12/87, PAC, Kathmandu.
- NRB (1988) *Multipurpose Household Budget Survey*, Nepal Rastra Bank, Kathmandu.
- NARC (1998) *National Research Strategy to Promote Sustainable Production of Livestock and Fisheries for Food Security*, National Agriculture Research Council, Kathmandu.
- Oli, K.P. (1984) *Utilisation of Draught Animal Power in the Hill Agriculture System of Nepal*, Lumle Agricultural Centre, Nepal.
- Oli, K.P., (1985) *Draught Animals in the Hill Agriculture System*, Pakhribas Agricultural Centre, Nepal.
- Sansoucy, R., M.A. Jabbar, S. Ehui and H. Fitzhugh (1995) *Livestock Development Strategies For Low Income Countries*, FAO/ILRT, Addis Ababa, Ethiopia.
- Sharma S. and Patrick Young, (1985), *Livestock Production in the Third World: Past Trend and Projections to 1990 and 2000*. Food and Agricultural Organisation of the United Nations, International Food Policy Research Institute, UNO, New York.
- Singh V. (1998) *Draught Animal Power in Mountain Agriculture, A Study of Perspective and Issues in the Central Himalayas, India*, Mountain Farming System Discussion Paper No. MFS 98/1, International Centre for Integrated Mountain Development, Kathmandu, Nepal.
- Suwal, M.R.S. K.D. Subedi and G. Gurung (1991) *Soil Fertility Thrust Towards Sustainable Agriculture: Experiences of Regional Agricultural Research Centre Soil Fertility and Erosion Issues in the Middle Mountains of Nepal*, Jhikhu Khola Watershed, Nepal.
- Tamang, D. (1991) *Indigenous Soil Fertility Management System in the Jhinku Khola Watershed*, Soil Fertility and Erosion Issues in the Middle Mountains of Nepal, Jhikhu Khola Watershed, Nepal.