

Chapter 4

Socio-economic and Demographic Profile of Study Area

4.1 Geographical Location

Jhapa district is situated in the eastern development region of Nepal (Figure-4.1 and 4.2), which lies between $87^{\circ} 39'$ and $88^{\circ} 12'$ East longitudes and between $26^{\circ} 20'$ and $26^{\circ} 50'$ North latitudes. The district is bounded in the East and South by West Bengal and Bihar state of India respectively, in the North by Illam and in west Morang district. The district covers an area of 1,606 Square Kilometers, and stretches 29 Kilometers north to south and 46 Kilometers west to east. The district is located at an altitude from 58- 380 m above sea level. Topographically district can be divided in two regions, the southern plain which covers almost 50 percent of land area. The southern plain is characterized by the presence of fertile alluvial soil deposited by the rivers. The northern part of the district covers rest of the 50 percent area, which is gently sloping towards south with black gravelly alluvial soil. Politically, district is divided in to 47-Village Development Committee and three Municipalities.

4.2 Hydrology and climate

The district is located in the humid subtropical climatic zone. The highest mean monthly temperatures occur in April or May and mean monthly maximum temperatures during this period range from $30 - 35^{\circ} \text{C}$. December and January are the coldest months, during this period the mean monthly temperatures drop down to $14-16^{\circ} \text{C}$. The rain occurs due to the southwest monsoon, generally starts on June and lasts until September. As the monsoon enters from the southeast to the kingdom, the district receives early rainfall than the rest of the country. October through May is mostly dry. The mean annual rainfall is 2,804 mm. Maximum and minimum monthly average rainfall recorded in 2002 was 1,055 mm in July and 3 mm in January respectively.

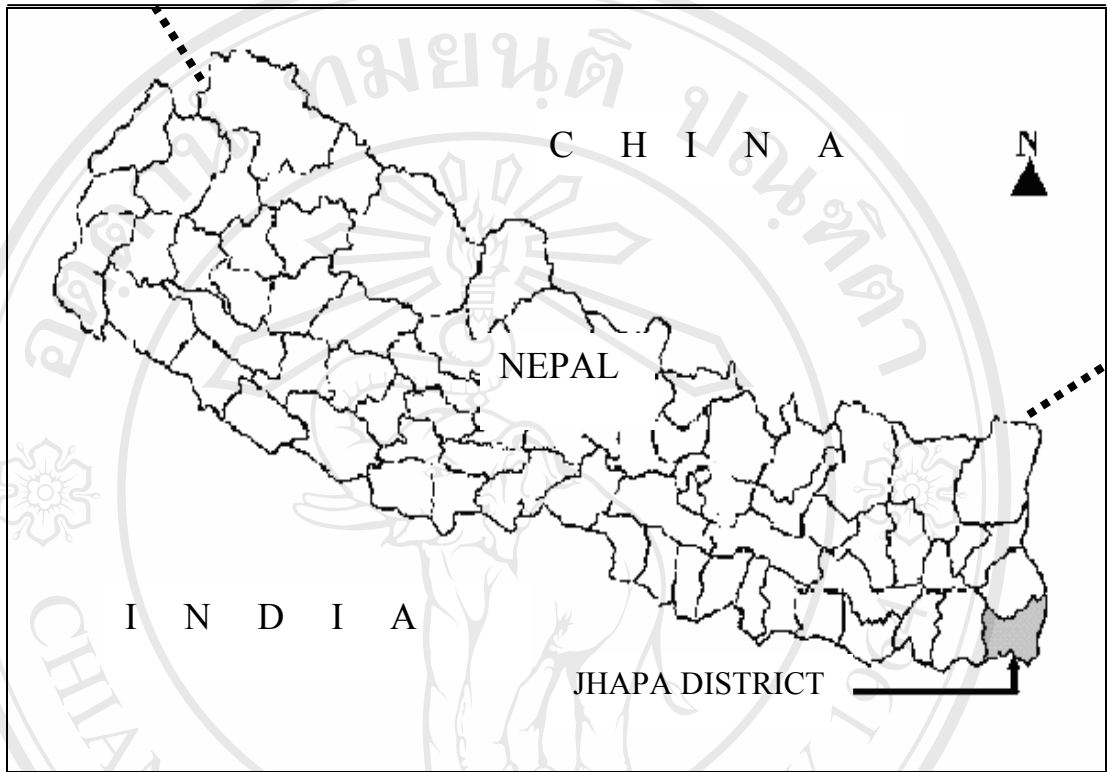


Figure 4.1: Map of Nepal showing Jhapa district

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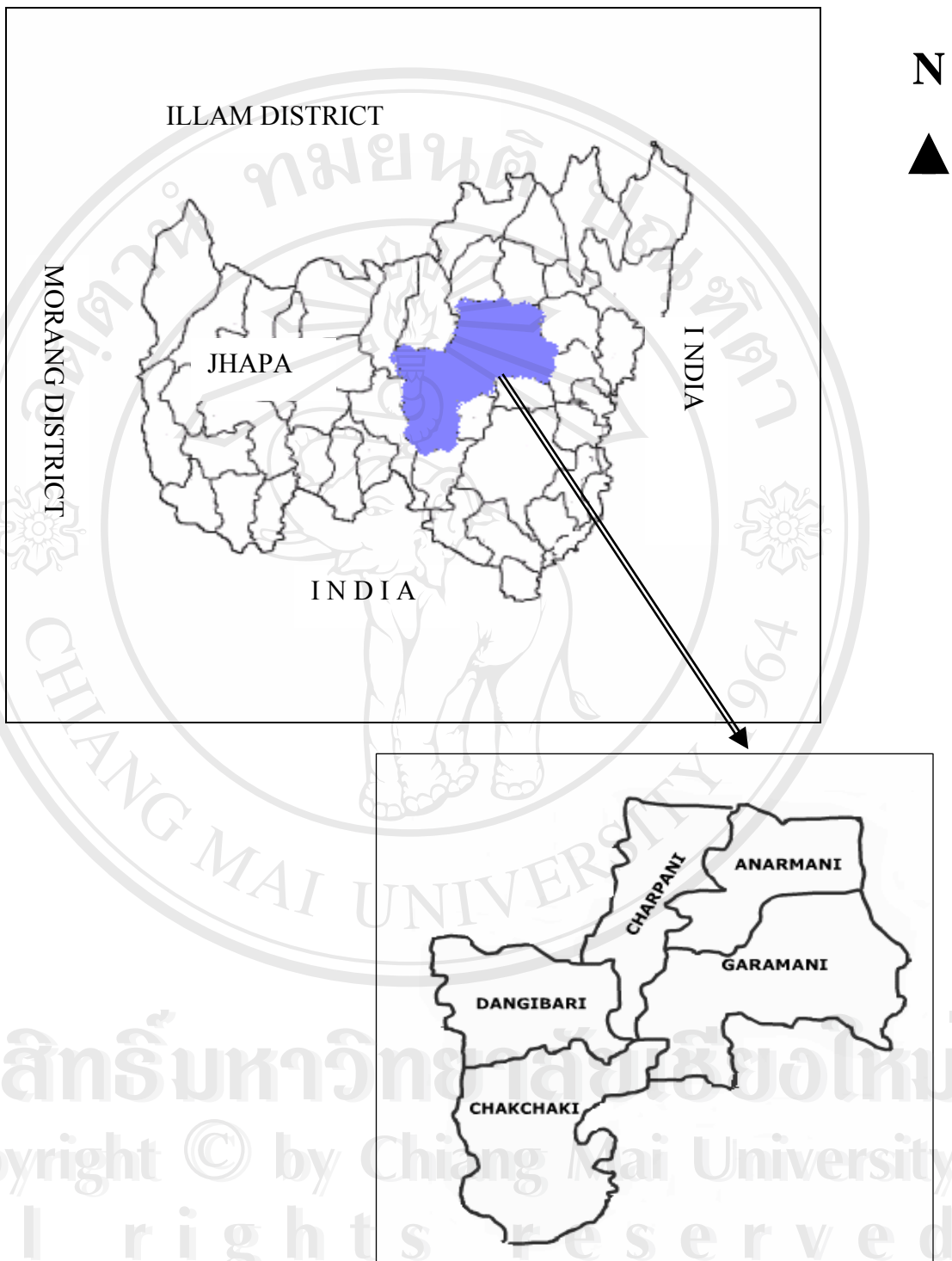


Figure 4.2: Map of Jhapa district and village development committees showing study area.

There are two rainy seasons- one in the summer from June to September when the southwest monsoon brings more than 80 percent of the total rainfall. Other is in winter rain from December to February, when monsoon from the west brings occasional rains during winter and early spring accounting for less than 20 percent of the total rainfall. Figure- 4.3 shows monthly average rainfall distribution and temperature in Jhapa district.

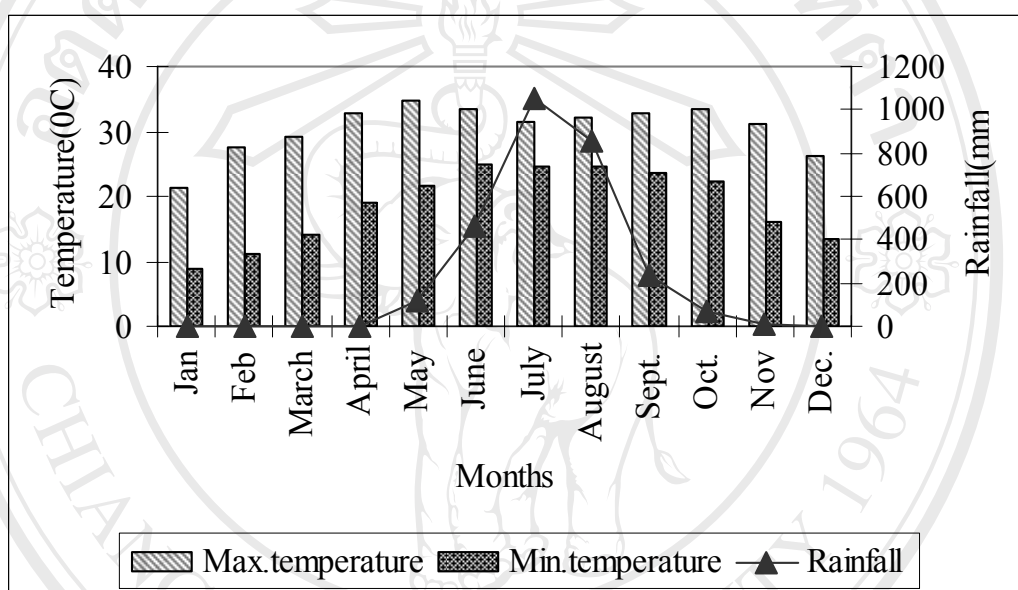


Figure 4.3: Monthly average temperature and rainfall distribution of Jhapa district

4.3 Land and land use

The total area of the district is 156,500 hectares, of which 63.9 percent is under agricultural activities (DADO, Jhapa, 2003). Deforestation is a major problem in the district. The district lost most of its forests because of increased demand for fodder, fuel wood, and land for agriculture and settlement. At present, only 10.3 percent of the district's area is under the forest cover. Livestock production is also a major component of the agriculture but only 1.1 percent of land in district is under pasture. Due to population pressure and urbanization, the area under settlement has increased and almost 13 percent of the land is under settlement. About 11.4 percent of land is covered by the river, reservoirs, rocks and others (Figure-4.4).

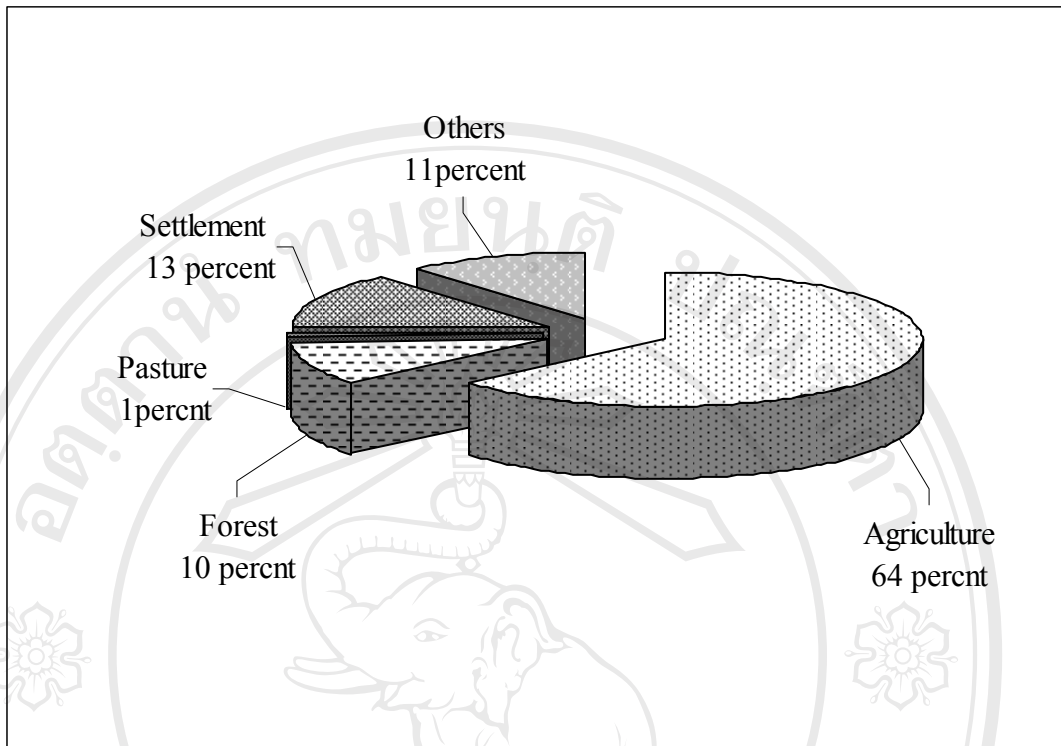


Figure 4.4: Land use in Jhapa district

4.4 Demographic, social and economic characteristics of the study area

4.4.1 Demography

The district's estimated population in 2002 is 688,109 and rural population accounted for 71 percent (Central Bureau of Statistics, Nepal, 2002). Over all, Women slightly outnumber the men i.e. 101 women to 100 men. The average family size is 5.01. The population growth rate is 1.52 percent and population density is 428 per square kilometer. Out of total population, 57.9 percent over the age of 15 are considered economically active and 42 percent of women and 58 percent of men economically active in the district (Central Bureau of Statistics, Nepal, 2002).

The male and female ratio in the study area differs from that of the district average. It is found that the male and female ratio in the study area is 112 women for 100 men. The average family size of the surveyed Village Development Committees is 6.15 persons per family, which is slightly greater than the district average. It varies

among the different communities as shown in the Table-4.1. The hill migrated-poor household has the least and the hill migrated-medium household has the highest number of members per family among the different economic strata.

Table 4. 1: Demographic situation of study area.

Community	Population			Family Size	Economically Active*		
	Male	Female	Total		Male	Female	Total
Hill migrated community							
Poor	34	37	71	4.7	21 (44.7)	26 (55.3)	47 (66.2)
Medium	32	39	71	7.1	22 (46.8)	25 (53.2)	47 (66.2)
Rich	13	17	30	6	8 (42.1)	11 (57.9)	19 (63.3)
Local community							
Poor	46	50	96	6.4	31 (50.0)	29 (50.0)	60 (62.5)
Medium	33	36	69	6.9	24 (53.3)	21 (46.7)	45 (65.2)
Rich	16	16	32	6.4	11 (52.4)	10 (47.6)	21 (65.6)
Total/ Average	174	195	369	6.15	116 (48.5)	123 (51.5)	239 (64.8)

Source- Field Survey, 2004

* Population 15 years of age and over.

Figures in parenthesis represent literacy percentage.

People above 15 years age and above are thought to contribute in economic activities (MoAC, Nepal, 1995) and 65.8 percent of men and women are economically active. The dependent ratio in the study site was lower than the over all district average. Among different economic classes the distribution of people engaged in economic activities are more or less same. In the study site, more women were engaged in economic activities than that of men. In hill migrated community, the proportion of the economically active women were greater than that of men while in local community it was greater for men than that of women except local-poor.

4.4.2 Education

In the district the literacy rate for the population of 6 years and above is 71.45 percent. The literacy rate for women is only 63.2 percent which is less than that literacy rate for men i.e.79.8 percent (CBS- Nepal, 2003).

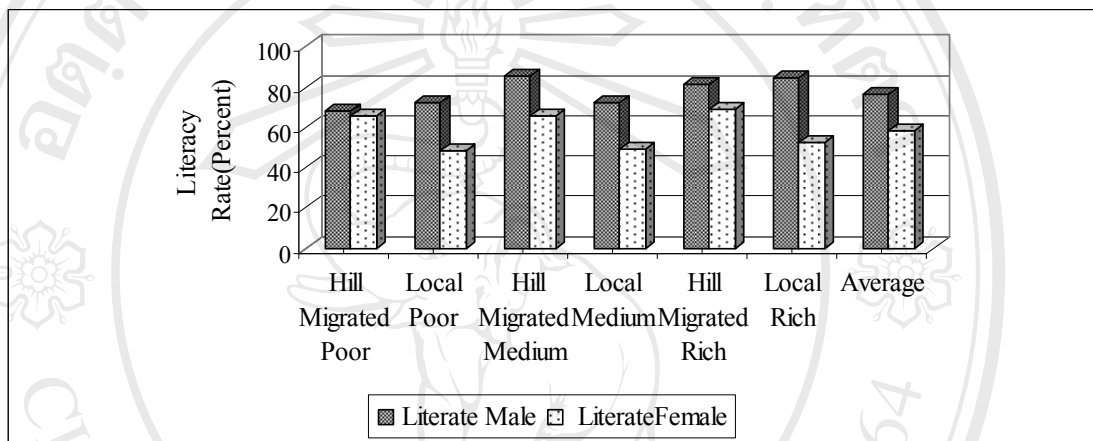


Figure 4.5: Literacy in the study area
Source: Survey, 2004

The Figure- 4.5 shows the literacy rate in the study area. The over all literacy rate in the study site was 67.3 percent. The literacy rates for male and female are 76.2 and 58.3 percent respectively. The survey result showed that the women of hill migrated community were more literate than the women of local community. Among different income groups, the highest percentage men and women of hill migrated-rich economic class were literate. The lowest literacy rate was observed in women of local-poor economic class.

4.4.3 Infrastructure

Road network has positive impact on agriculture development of district. It is noticed that road has brought the markets, electricity, telephone, better educational institution and more agriculture inputs. All the village development committees are being connected with district head quarters. The district has 581 kilometers road in

operation of which 136 kilometers paved, 206 kilometers gravel and 239 kilometers earthen roads (District Development committee, Jhapa, 2002). The irrigation network is increasing and it has covered almost 74 percent of arable land area of in the district. However, still many potential irrigable areas have no irrigation facility. In fact, farmers are also using the available sources for irrigation by their own traditional methods (District Development committee, Jhapa, 2002).

As mentioned above, development of communication depends on road network development. Post office network has established in all Village Development Committee of the district. Telecommunication facility in the district is also increasing. All Village Development Committee centers of the district have access to telephone service. There are 9,500 telephone lines all over the district (District Development committee, Jhapa, 2002). Rural electrification has strong relationship with development, which helps for the establishment of small-scale industries. In some part, electricity is only the means of irrigation. Out of 47 Village Development Committees and 3 municipalities, 44 Village Development Committee are partially covered by electricity and large portion of the population still have access to electric power.

Fertilizer supply is still limited in relation to demand. The demand of chemical fertilizer is high, mainly in the peak season. Agricultural Input Corporation is a public agency, responsible for supplying fertilizer in the district. Fertilizer business has been privatized and there are many private dealers in the rural area to supply fertilizers and pesticides. Agricultural extension service is sole responsible of government and extension service is reached in almost all area through 19 Agricultural Service Centers (District Agricultural Development Office, Jhapa 2003). Providing public health-care facilities is largely the responsibility of the government. Private health facilities are also existed in district mainly in the urban area. There are one government and two private hospitals, one eye hospital and three nursing homes located in the urban areas and 50 health posts in the rural areas of the district. Although, the district is rich in freshwater resources, only 57.4 percent of people have access to the improved drinking water (District Development committee, Jhapa, 2002).

4.4.4 Occupation and income

The agriculture as the major source of livelihood, directly related to income distribution. Cereal and vegetables crops, livestock particularly dairy product, and off-farm activities are the major source of income for a household in the study area. This income directly contributes to the daily household expenses. 66 percent economically active population in the district engaged in agriculture (District Development Committee, Jhapa, 2002). The pattern of women's participation in the labor force varies across the district depending upon caste, and socio-economic classes. Almost all female in the rural area participate in agriculture. The proportion of women employed in this sector is 80.7%, compared to 62.7% for men (District Development Committee, Jhapa, 2002).

Different types of off- farm activities are carried by the different economic classes. Men from poor economic class in both communities work as seasonal agricultural laborer, as laborer in brick factories, carpenter, animal traders etc. and women mainly as farm laborer and also run small-scale business. Homemade wine is the major source of off- farm income for most of the poor ethnic households (*Meche, Rai, Limbu, Gurung* etc.) as women from these groups brew the wine and sell in the local market.

The average income per family in the survey area was found NRs.88618.0 (US \$ 1254.3) as in Table-4.2. Agriculture play major role in the livelihood in the district. Of the total income, almost 70.0 percent was contributed by agriculture alone. In agriculture, cereal and vegetable crops were the primary sources of income. Animal husbandry was the major component in the mixed farming system, which contributes significantly to the household income in the district. The share of off-farm income in rich economic class was smaller than that of other economic classes. However, both farm and off- farm income was the lowest among all, the share of off-farm income in the household earnings was found the highest in the local-poor households. The highest off-farm income was observed in local-medium households followed by hill

migrated-medium and poor. It is partly due to that the local ethnic households earn extra income by the local wine business.

Table 4. 2: Household income in study area

Economic categories	Farm Income			Off- farm income			Total
	Crop	Livestock	Total	Male	Female	Total	
Hill migrated community	-----NRs.-----						
Poor	21,540	14,851	36,391	19,533	6,966	26,500	62,891
Medium	52,750	18,071	70,821	26,200	6,000	32,200	103,021
Rich	112,350	32,810	145,160	23,000	4,600	27,600	172,760
Local community							
Poor	14,893	6,940	21,833	19,200	5,433	24,633	46,466
Medium	47,087	12,992	60,079	36,500	0	36,500	96,579
Rich	108,525	23,440	131,965	12,480	0	12,480	144,445
Average	44,154	17,812	61,966	22,818	3,834	26,652	88,618
			(69.9)			(30.1)	

Source: Field survey-2004.

Figures in Parenthesis indicate Percentage

Exchange rate US \$ 1 = NRs. 70.65

In fact, remittance was also a major off-farm income as men from the poor and medium economic classes are working abroad elsewhere. Men from the medium and rich economic classes are engaged as schoolteacher, in other government jobs, small to medium scale business etc. Women are also engaged in small-scale business and few are school teachers.

4.4.5 Land holding and tenurial arrangements

The land ownership pattern is highly skewed. Almost 33 percent of households in the district are landless. 38.3 of the total holdings have less than one hectare and 24.6 percent have 1.0- 3.0 hectare of land indicating most of the household fall under small and medium farmer's category (Table-4.3). On the other hand, 3.4 and 0.8 percent of the households have 3-5 hectares and more than 5 hectare respectively. As a result of growing populations, land resources per household are decreasing, with division and fragmentation of land over the generations. Land fragmentation is mainly the result of traditional Hindu law of succession whereby the male off springs are entitled to the parental property, including land.

Table 4.3: Land distribution by farm size in Jhapa district

Holding Types	Number of Household	Percentage
Landless	36,449	32.9
≤ 1.0 ha	42,460	38.3
1.0- 3.0 ha	27,281	24.6
3.0 - 5.0 ha	3,763	3.4
>5.1 ha	941	0.8
Total	110,894	100

Source: District Development Committee, Jhapa, 2002

In the district, there are three holding categories. The first category is the pure holding, which is owned and cultivated by landowners themselves. Second, mixed tenure in which tenurial arrangements is authorized to tenants and owners by registration and tenants claim on one-fourth of the area or equivalent value of land from the owner and third, the rented land. The actual number and the area under each category were not available.

Fragmentation of land is one of the causes of small holding size in the district. The average operational land holding size in the study area is 1.86 hectare per family

(Figure-4.6). Within each economic class, local household own lesser land than the hill migrated households except local-rich. Local-poor households own 0.51 hectare of land per family, the lowest among all categories. This uneven distribution of land has its significance impact on income opportunities and also put extra pressure on marginal land.

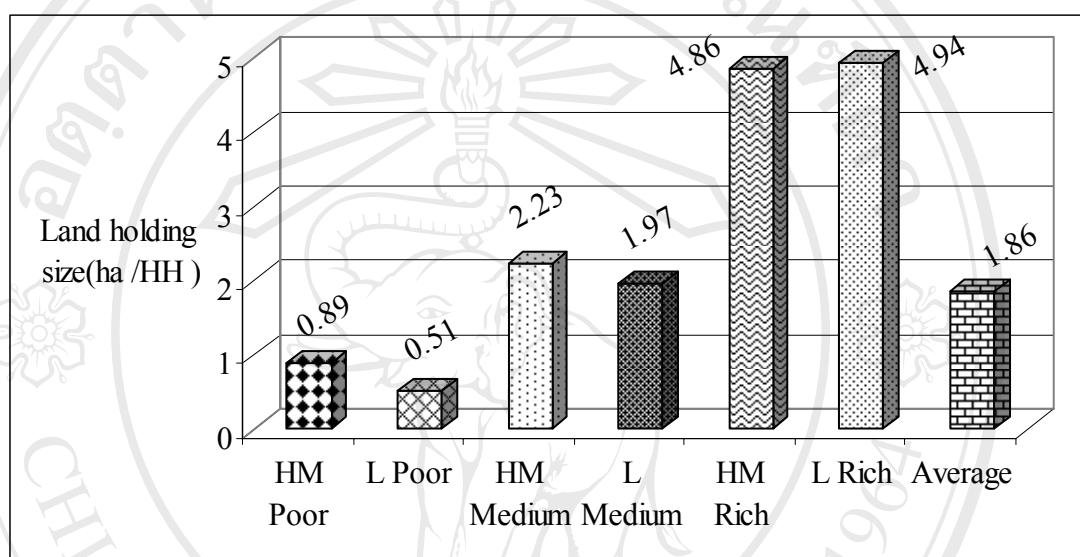


Figure 4.6: Land holding size of study area
Source: Field survey-2004.

4.4.6 Livestock holding

Livestock is an important component of the farming system providing food for human, manure for plants, and draft power for farms and cash income for farm families. Cattle, buffaloes, goat, pigs and poultry are the livestock species reared in the district. The cattle population is the largest of all type of livestock and they are the main source of animal draft power and manure in the district (District Livestock Development Office, Jhapa, 2002). The average size of the animal holding in the district is 7.5 per household (Figure-4.7). Among all other animals, the number of cattle owned by each household is the highest and it is due that every household keep at least a pair of bullock for draft power. The size of goat holding comes second after cattle, which is most popular source of meat. The pig holding size per family is the least because it is kept only by selective caste in the district.

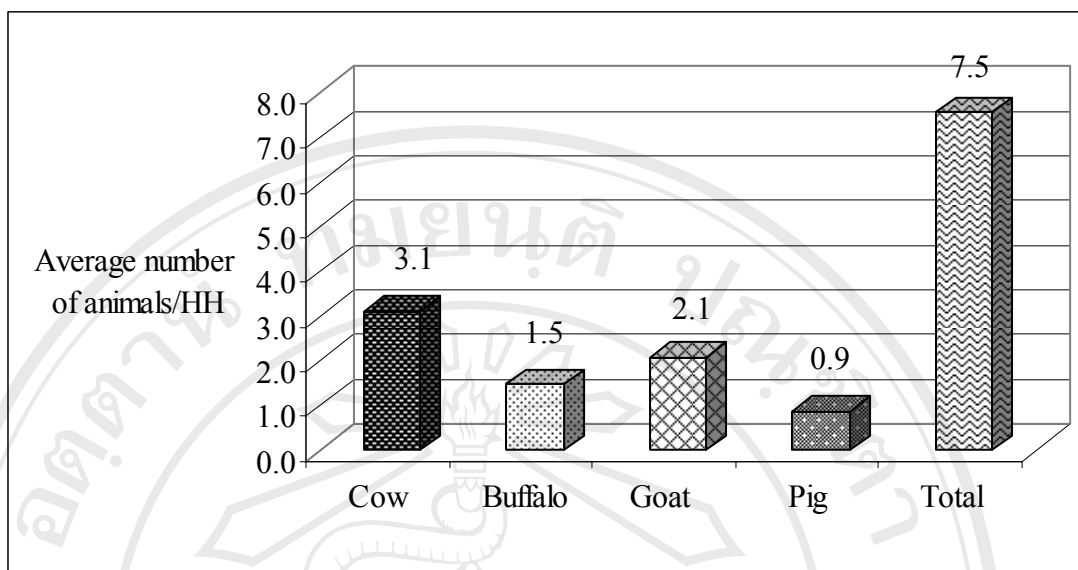


Figure 4.7: Average number of animal holding

Source District Livestock Development Office, Jhapa, 2002.

4.4.7 Social structure

According to the country study and guide, Nepal, 1991, the district comprises three major ethnic groups. The Indo-Nepalese – they are originally from the hill and migrated in the district. *Brahmans* and *Chhetris* fall in this category and are considered the higher castes. *Brahmans* and *Chhetris* with their higher levels of education, technological knowledge and access to wider outside resources have dominated the other caste economically, socially and politically. Tibeto-Nepalese – they are also from the hill and mountain and migrated in the district. *Rai*, *Limbu*, *Gurung*, *Magar*, *Tamang* etc. are castes of this category. The indigenous Nepalese, which are original dwellers of the district, comprises of tribal communities, such as the *Dhimal*, *Meche* and *Rajbanshi*. Nepali is commonly spoken language in all communities but people from the local community use their own languages among them. People from both hill migrated and local communities belief in Hinduism but Buddhism also major religion in the district. There is some Muslim community in the southern part of the district. Most of the people both hill migrated and Tarai (plain area) dwellers are primarily agriculturalists, but a majority of them also rely on other activities to produce supplementary income.

They generally raise some farm animals, particularly cows, buffalo, goats, pig, chicken and duck for domestic purposes. Family is the basic social unit and extended families break apart as sons separate from parents and brothers from each other. At the time of separation, the family property is equally divided among the sons. Family separation always results in a division of family landholdings, so landholdings are extremely fragmented. The extended family has important implication that it helps to meet farm labor needs, especially during the planting and harvesting seasons, when there is shortage of labor. If a household cannot afford to hire farm labor, it usually depends on the mutual labor-sharing system called *Parma*, exchange labor for labor at times of need. Women's relative status varies from one ethnic group to another. The status of women in *Rai, Limbu, Gurung, Magar, Tamang* etc. is relatively better than that of Brahmans, *Chhetris* and local community women.

4.4.8 Product and market

The agricultural marketing system plays an important role in determining the prices received by the farmers and those paid by the consumers. The performance of the marketing system depends on the structure of the market and on the conduct of the market functionaries. Food grains are grown mainly, for consumption and districts produces a surplus food grains. Food grains especially rice is exported to the food deficit district. The district is surrounded by India from east and south. As Nepal has open boarder with India so, there is free movement of all kinds of goods and services between two countries. The food marketing in the district is unorganized and dominated by private agents. These include private individuals operating in the system as assemblers, traders, large-scale merchants, millers, brokers and retailers of grain products. There are several *bazaar* (market place) in the rural and urban area and several wholesale and retail markets have emerged in the district. Most of these *bazaars* have the facilities for procurement of inputs, consumer's goods and also the selling of the farm products. Farmers are also directly participating in the wholesale system, selling of their products to retailers through farmers group and cooperatives. At village level, the local traders do collection of the food grains. Food grains are

bought by the wholesalers by contacting farmer directly by themselves or by the small brokers or by horse riders (*Baniya*). The small traders sell their collections to the wholesalers and/or millers. Nepal Food Corporation (NFC), the state-owed body is responsible to buy major food items from food-surplus regions and fill supply gaps in food-deficit regions. With a view to fulfilling this responsibility, various activities such as procurement of food grains, building up and maintenance of food stocks, their storage, movement and delivery are undertaken by NFC.

Vegetable farming has played a vital role in the rural economy of the district. Vegetable is the cash crop and main source of family income especially for the small and marginal farmers. The area under vegetable cultivation is growing very fast and mainly concentrated near and around the metropolitan area, along- side of the highways and feeder roads. The reason behind the fast growth of vegetable cultivation in this district is due to the fast growing urban as well as rural population, and growing level of nutritional consciousness among people. In rural area of the district, vegetable marketing facilities are very limited. There is direct marketing relation between farmers and consumers i.e. some farmers from the rural areas sell their products in the *haat bazaar* (weekly local market). Framers can supply their products to collection agents, retailers and wholesales, which play an important role in linking producers, wholesalers and retailers. In some cases, the collection agents go to the farmer's field and decide the price and in their comfortable time they take the commodity for market. Cow, buffalo, bullock, goat and pig are generally bought and sold in the weekly markets. Farmers bring their animals to sell to the market or buy from the market. Another practice is that the animal traders buy from the farmer's herd and sell in the weekly markets. In most cases, men are involved in marketing of food grains and livestock and women in the marketing of vegetables.

Problems related to agricultural marketing in the district are the insufficient basic transport facilities in most parts of the district, and lack of managerial and technical know-how to utilize available facilities and opportunities effectively. In fact, the latter problems are related to the lack of technical and managerial know-how

about production, packaging, processing, storage and distribution that can take advantage of the existing facilities and market opportunities.

4.5 Agricultural system in the study area

Agriculture dominates the economy of the district. 63.4 percent of the total land area is under cultivation. District comprises of mixed farming systems where crop cultivation and livestock rearing together form integrated components of a single farming system. The interaction of natural resources, climate population and the dominant pattern of farm activities and household livelihoods, including relationship to markets and the intensity of production activities determine the physical basis for farming systems (Dixon et al, 2001). Agriculture is traditional, subsistence in nature and dominated by the food grains. A large number of cropping patterns are practiced traditionally, which have developed as a result of long experiences and need/preferences of the local people. The present agricultural production system is characterized by the high man- land ratio, a great disparity in land ownership, a system of share cropping which inhibits the motivation of tenants, absentee land ownership, a large number of poorly fed livestock with low productivity, inadequate knowledge of new technology, ineffective extension and deteriorating environment and declining soil fertility (MoAC, 1993). There is more or less same agricultural production system through out the district. Before knowing the over all gender status, we should have knowledge on the agricultural system and the inter-linkage of different constituents of the production system in the district.

4.5.1 Crop sub-system

Rice is the major crop in term of area and production followed by the wheat and maize and the general farmer accord always-top preference in their production. Paddy, maize and wheat are grown on 101,150 hectares, 38,152 hectares and 16,511 hectares respectively. Paddy is grown in both spring, and rainy season but rainy season is the main season for paddy. A single crop of paddy is taken in the area where there is no irrigation. Maize is grown in summer in rainfed condition; however, the

area under irrigated maize has increased considerably (DADO, Jhapa, 2003). Wheat is grown in winter with partial irrigation. Though, most of the land of the district is low land, the finger millet and buck wheat are grown in the rain fed upland which covers the area of 2,000 hectares 1,450 hectares respectively. Among the cash crops jute is a major crop and grown in 1200 hectare. Rapeseed mustard and sesame are common oilseed crops and grown for home consumption in 3,087 hectares of land. Pulse crops include lentil (*Lens esculenta*), grass pea (*Latliyrus sativus*), chickpea (*Cicer arietinum*), mung bean (*Vigna radiata*), black gram (*Vigna inuiigo*), and soybean (*Glycine max*). Virtually all farmers in the district grow one or more species of grain legumes, which occupy about 2,921 hectares.

Vegetable is the common cash crop and it is the main source of livelihood and family income especially for the small and marginal farmers. Farmers, especially small holders in the district are attracting towards vegetable cultivation so that both the area and production is growing very fast. Generally winter vegetables like cauliflower, cabbage, radish, brinjal, chili, tomato, potato, carrot, bean etc are grown extensively. Cucurbits are grown in early summer as off-season and late summer as main season vegetable crops. The area under vegetable is 3,000 hectares. The potato is the most common vegetable crop. It is grown all over the district in 9,900 hectares as a winter crop.

Common fruits grown in the district are mango, litchi guava, banana, jackfruit, papaya and areca nut and those cover an area of 3,435 hectares of land. Recently, tea is a popular cash crop in the district and the area under tea has been increasing rapidly. The area under tea cultivation is 6,190 hectares. The over all cropping intensity of the district is 210 percent (DADO, 2003). The productivity of all crops is greater than the national average.

Rice based farming system is the major cropping system in the district (Figure-4.8). Rice based farming system is dominated by intensive wetland rice cultivation in fragmented plots, with or without irrigation. Rice-rice-fallow or rice-rice-wheat is the most intensive farming systems on the main area where assured

irrigation is available. Rice- fallow-maize, Rice- fallow-maize intercropped with mung, rice-wheat-fallow and rice-wheat-mung are also main cropping patterns of the district. Other important patterns are rice-lentil-fallow, rice relay cropped with lentil - fallow and rice relay cropped with lathyrus-fallow. Jute-rice-fallow and jute-mustard or lentil or wheat, rice-mustard-fallow also prevails in the district. Usually, rice is followed by the winter vegetables and potato and this is again followed by the off-season cucurbits and main season cucurbits, lady's finger, beans etc. The production system in such a farming system is intensive and the farm resources are used extensively. The irrigated land is almost covered throughout the year. In this type of farming system, generally the family members carry out all the production activities and hired labors are rarely used. In some places the hired labors are only used during the peak period of labor requirements i.e. planting and harvesting. Farmers generally use both formal financial credit source i.e. Agricultural Development Bank, Small Farmer Development Program, *Gramin Bikash Bank*, farmer co-operatives etc. and local money lenders for production credits. Sometimes farmers take loan from the local rice traders and vegetables wholesalers. Purchased fertilizers are used with farmyard manures and compost. The green manuring crops like *dhaincha* (*Sesbania spp.*), mung bean etc. are used for the soil fertility status improvement. Farmers use agro- chemicals heavily to control the diseases and pest.

The growth rate of agriculture is very low. The reason behind the slow growth rate of agricultural sector is low level of input use. Farmers keep their own seeds and use for years. Even though, rate of fertilizer use is higher than the national average, still fertilizers use is not as per requirement.

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sept.	Oct.	Nov.	Dec.
Wheat			Fallow			Paddy					
Wheat			Paddy			Paddy					
Fallow			Maize			Paddy					
Wheat			Green M.			Paddy					
Fallow						Paddy					
Wheat			Mung B.			Paddy					
Fallow			Maize+Mung B			Paddy					
Lentil			Fallow			Paddy + Lentil					
Fallow			Jute			Paddy					
Potato			Maize			Paddy					
Potato			Vegetables			Paddy					
Oil Seed			Fallow			Paddy					
Vegetables						Paddy					
Vegetables											

Figure 4.8: Cropping pattern of Jhapa district.

Source: PRA, 2004

The low level of fertilizer use may be due to the higher prices, low quality of fertilizer, lack of knowledge and lack of capital (DADO, Jhapa, 2003). The PRA results pointed that the farmers in the district are facing many problems in agricultural production. The major problems faced by the farmers are timely unavailability of farm inputs. Seasonal nature of production i.e. vegetables are produced in bulk only on the main season due to which there is excess supply than the demand, and also the production sites are highly scattered. More over, higher cost of production due to the high inputs price, lack of economies of scale, lack of proper storage facilities, lack of proper marketing information and knowledge are some other constraints that restrict rapid agricultural growth in the district. Further more, the low level of technical know-how, lack of location specific production technology and declining soil fertility are other main problems.

Agro-ecological suitability (temperature and moisture regimes, and soil types), labor availability (family or hired), food requirements, marketability, value of crops, etc. have considerable influence on the kind of crops grown and patterns followed in an area. The annual cropping cycle of district depends on the climatic condition, availability of irrigation water and monsoon rains. The monsoon sets the time for main season paddy cultivation in the rainy season and in irrigated area the spring crop of paddy is also in practice. The main season for paddy harvesting is in the beginning of the winter and immediately after harvesting paddy, farmers are busy for land preparation and sowing of winter crops. The farmers have to sell their products immediately after harvesting crops. Crop cultivation and harvesting as well as storage are determined by the seasonality. Farmers do not tend to fallow their irrigated land at any time. Crop calendar of the district indicates the overall cropping pattern (Figure-4.9). Similarly, crops varieties which can tolerate conditions such as drought or late sowing, disease, cold or warm etc. are also cultivated. Among them, vegetable crops are common which are sown just after rainy season and cucurbits are sown at the end of winter or beginning of the spring season, which is generally known as off-season vegetables. Almost all the farmers in the district are using high yielding short duration varieties of different crops to adjust the cropping season.

Crops	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec
Main Paddy												
Spring Paddy												
Maize												
Wheat												
Finger Millet												
Jute												
Lentil												
Mung Bean												
Mustard												
Sesame												
Potato												
Summer vegetable												
Winter vegetable												
Off-season vegetable												

Figure 4.9: Crop calendar of Jhapa district
Source: PRA, 2004

4.5.2 Livestock sub-system

The livestock is important constituent of mixed subsistence farming system of the district. According to Tulachan and Neupane, 1999, livestock productivity is low in Nepal. Low productivity is due to poor feeding practices; local breeds resulting in less incentive to keep productive animals are the primary reasons behind poor animal production. It is also true in case of Jhapa district that the livestock sector is characterized by poorly fed, large number with relatively low productivity. Still there is large number of local breeds of the cattle, buffalo, goat, and pig in the district. Out of the total population of the cattle, buffalo, and pig 21, 30 and 28 percent respectively are improved breed (Figure-4.10). The improved breeds of the goat in the districts are not successful and farmers keep only local breeds (DLDO, 2002).

Participants in PRA discussion pointed that the present population growth and the family separation have led towards the nuclear family and increased number of farm households, with a decreased farm size. Thus, household numbers have increased and decreased in size of livestock holding. Arable land remains the same, under such situation livestock feed become more scarce which directly affects the livestock productivity in the district. PRA discussion also suggested that labor shortage, inadequate animal health services, lack of capital among the smallholders, and poor marketing facilities are other major constraints in this sector. Pig and goat are becoming more popular among the small holders because they need small amount of capital, easily managed and they feed on a wide range of fodder and grasses. With the deforestation and growing scarcity of fodder and leaf litter, farmers are searching for alternatives. Therefore, area under fodder crops has increased significantly in the recent years (DLDO, 2002).

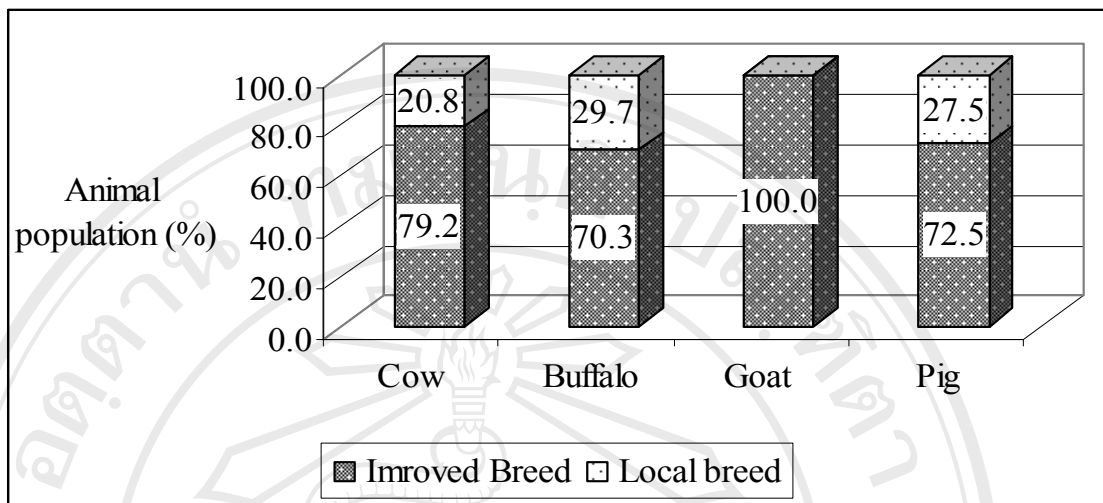


Figure 4.10: Livestock breeds in Jhapa district

Source: District Livestock Development Office, 2002

4.5.3 Off- farm activities

Various types of off-farm activities are performed in the study area and differ in different economic classes. The most common off-farm activity among the poor economic class is the laborer. Both poor men and women work as agricultural labor, laborer in brick factories, carpenters, small-scale business, and animal trading. The women from the poor economic class of both local (*Meche*) and hill migrated (*Rai, Limbu, Magar, Gurung etc.*) communities brew local wine and sell their products in the local market. Very few from the poor economic class are employed as schoolteacher and in other government services. Some of the men and women from the medium and high economic classes are employed as schoolteacher and government services and some hold small to medium scale business. Some men from the poor and medium class of both communities work abroad as laborers.

4.5.4. Interrelation between different components of agricultural system

The agricultural system of the study site is composed of crop and animal production and off-farm activities. These components of the agricultural system are inter-linked and have complementary relationships among each other. In the mixed crop-livestock farming systems, livestock and food production systems are closely integrated. Livestock are the main source of soil nutrients. Livestock manure is heavily used in the crop production. Declining population of livestock and changing practices of livestock management has both positive and negative impacts on soil fertility and agricultural productivity. Fewer feed resources result in fewer animals, further reducing the amount of farmyard manure (Tulachan and Neupane, 1999). According to Bajracharya (1999), livestock help to convert crop residues and fodder/forage to plant nutrients through manure. Application of manure helps to improve soil texture and decompose litter more easily. Using the traditional feeding practices and farmyard manure (FYM) preparation method, a large adult ruminant provides approximately 1,140 kg of FYM and potentially equal to 29 kg of nitrogen per year. This is also true in the context of Jhapa district where manure plays crucial roles in farm production and soil nutrient management. During the PRA discussion, farmers pointed that the bedding materials, (crop residues, leaf litter, left over forage and feed) are spread in the animal shed and are mixed with dung and urine, which is then dumped in to a pit for 6-7 months for decomposition and used as manure. This task is generally performed by women. According to the farmers, during the winter when the land is fallow, animals are kept overnight in the field for 2-3 days to fertilize the field. This is practiced during the whole winter before sowing the crops.

Green manuring is another practice of plant nutrient management in the district. Crop residues are left in the field and allowed to decompose, however, this practice is in a diminishing trend. The most common method of green manuring is growing of suitable green manure crops such as *dhaicha* (*Sesbania spp.*) and mung bean are the green manuring crops used by most of the farmers in the district.

Mulching is another method adopted by farmers for weed control, moisture conservation, and to add the plant nutrients in the soil. Materials, like weeds, unused fodders, crop residues etc. are used for mulching and after decomposition they provide the plant nutrients.

According to Tulachan and Neupane, 1999 in Kaski District of Nepal it was found that use of biogas had favorable impact on the local natural resource base. The general opinion was that biogas had increased the importance of livestock at the farm level. Authors pointed that biogas had reduced the total use of fuel wood by 20-25 per cent, and labor and time have been saved from collecting firewood in the forest thus contributing to conservation of forest and support lands. Due to the population pressure little forest has left and there is shortage of firewood for cooking in the rural areas of the district. The rural farmers in the district have started to use biogas as supplement of fuel wood for household energy needs and in this regard livestock are playing vital roles. The small holders, who cannot invest to build the biogas plants, use the dried dung as firewood.

Crops provide food for both human and animals. Contribution of rice, maize and finger millet straw as animal feed is significant. According to Giri, 1990 (quoted in Tulachan and Neupane, 1999), in Nepal as a whole, agricultural residue makes up 36 per cent of the total fodder. Ground grasses and weeds are additional source of animal feeds and are mostly available during the rainy season. The crop residues are the major feed and bedding materials for livestock in the district. Among all crop residues, rice straw plays important role in the livestock production. Paddy is the main crop grown in the district. The rice straw is the main animal feed especially in the lean season of the year when there is shortage of green forage. Therefore, in most cases the number of animals to be kept depends upon the quantity of land hold by the farm family. Moreover, the rice bran is another source of animal feed. Farmers use rice bran to feed all types of animals i.e. milk and dry animals, oxen, goat, pig and even for chicken and duck. Wheat straw is not common as animal feed in the district but its husk after threshing is stored and fed as roughage during the short supply of animal feed.

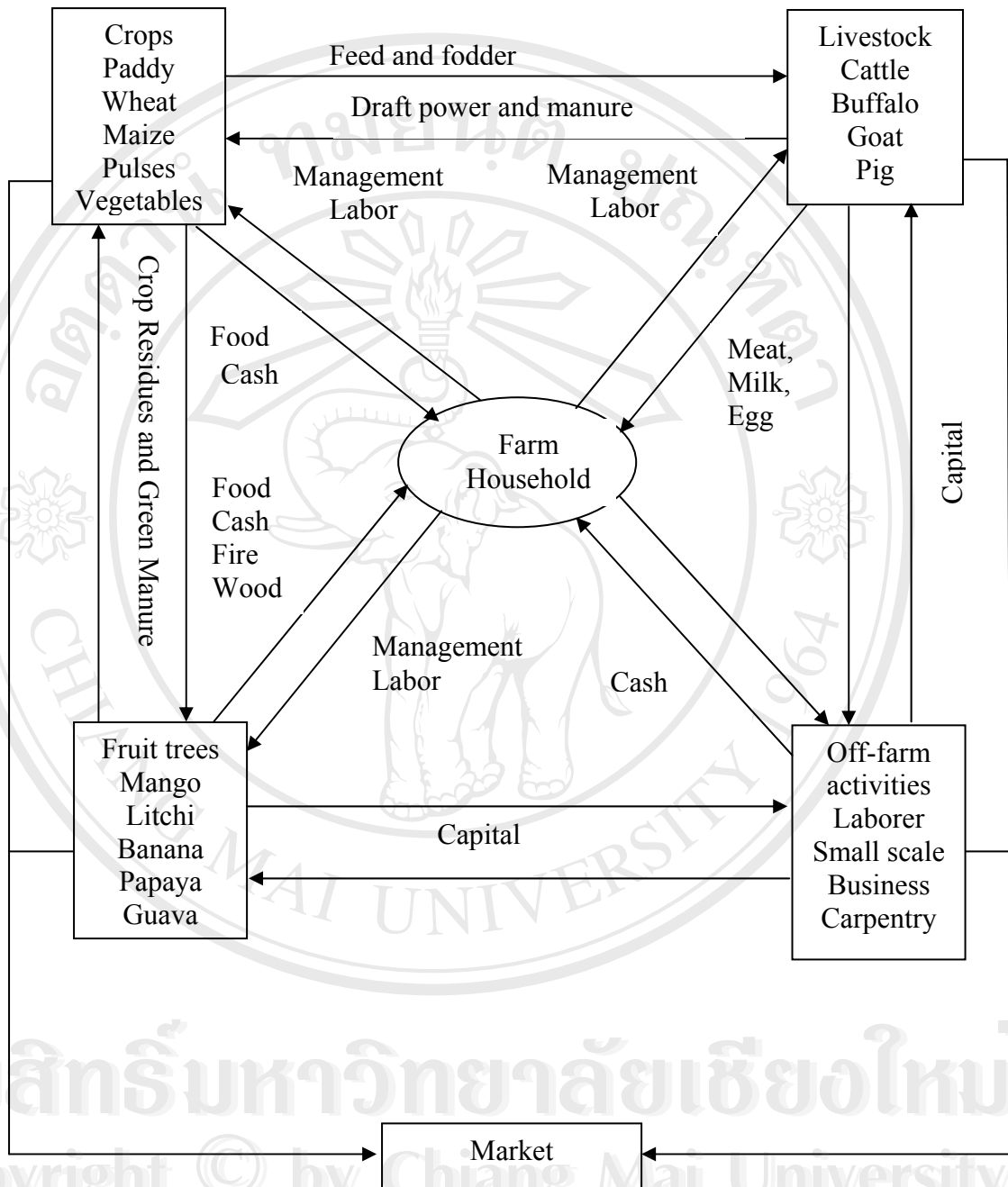


Figure 4.11: Inter-linkage between components of agricultural systems

During PRA discussion farmers pointed that the maize is another important crops from livestock production point of view. Green maize leaves and stalks are fed to ruminants and the dry stalks are kept for rainy season. Household consumption of maize as human food is negligible, and mostly the maize grain is used as the animal feed. The grinded maize is cooked with some other green leaves and rice bran (*Khole*) to feed the milk animals. After harvesting the finger millet, straw is also used as fodder. The excess straw is dried and kept for rainy season. The straw and the husk from leguminous crops such as lentil, lathyrus, mung bean, and black gram are used to feed the farm animals mixed with green forage.

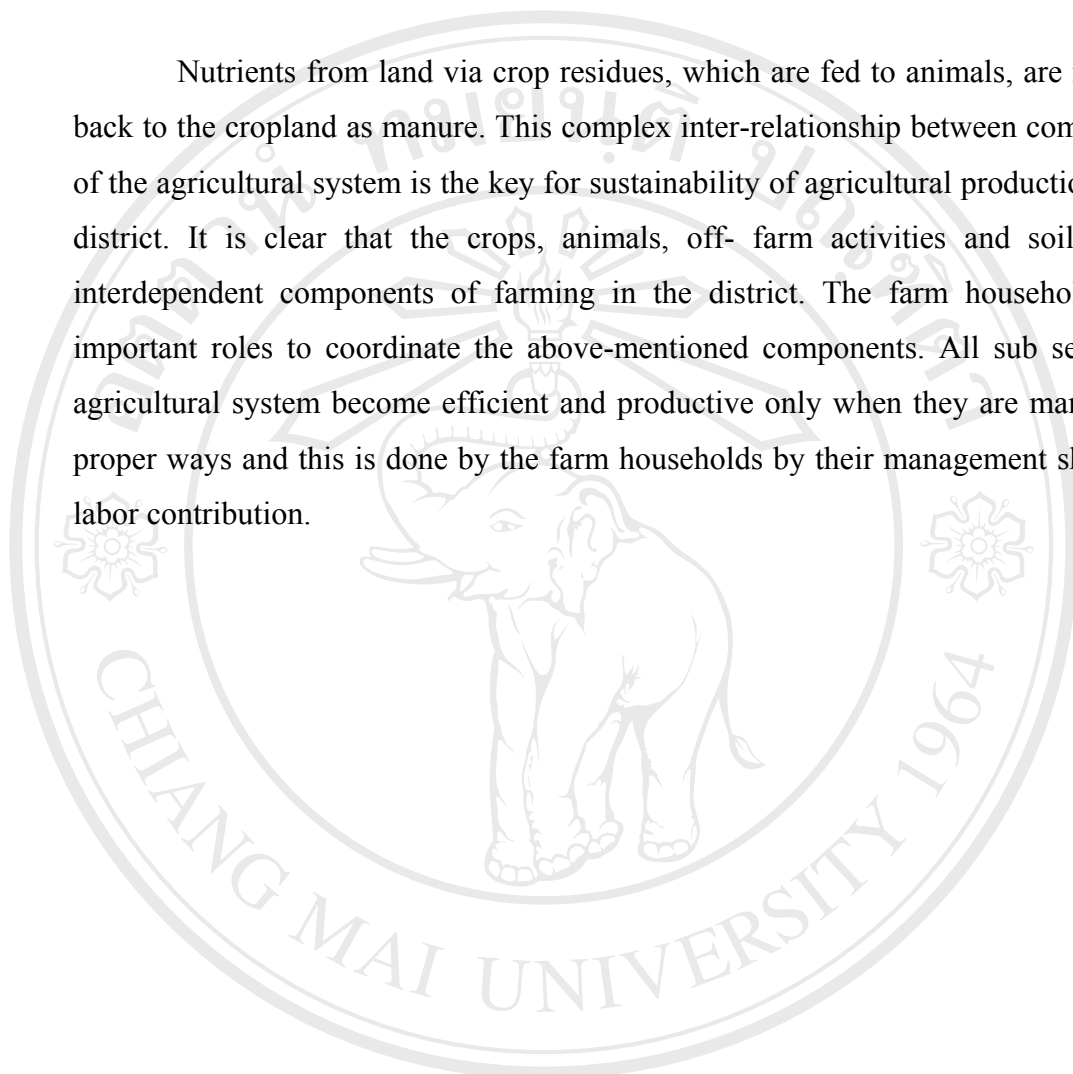
The livestock sub-sector provides the farmers draft power for cultivation, manure and rural transportation. In the study area oxen and he-buffalo are the main sources of power for cultivation of land. The animal traction is also used to carry the manure from home to the field, harvested crops from field to home and crops from home to the market for selling. Some large farmers rarely use the tractor for cultivation of land and transportation.

Food security is an important concern in the district. The agriculture sector as a whole provides essential food products and cash income which are the main basis of food security. As indicated in previous topics, rice is main staple food for the people in the district. The pulses are grown in sufficient quantity, as important supplements of plant protein. Vegetables and fruits are also important cash crop for the farmers in the district. Livestock are sources of essential nutrients contained in meat, milk and eggs.

The off-farm activities are also linked closely with the other components of the agricultural system in the district. According to farmers of the study site, the farm income is not sufficient for the family living. Farming is seasonal and generates cash only in certain interval of time. Therefore, many off-farm activities are necessary to generate the cash for their immediate needs. As mentioned in the previous topics farmers in the study area engage in different task of off-farm activities. The cash

generated is generally used for schooling of children, buying household necessities, and use as capital in the agricultural and livestock production.

Nutrients from land via crop residues, which are fed to animals, are recycled back to the cropland as manure. This complex inter-relationship between components of the agricultural system is the key for sustainability of agricultural production in the district. It is clear that the crops, animals, off- farm activities and soil are all interdependent components of farming in the district. The farm households play important roles to coordinate the above-mentioned components. All sub sectors of agricultural system become efficient and productive only when they are managed in proper ways and this is done by the farm households by their management skills and labor contribution.



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