

## Chapter 3

### CHARACTERISTICS OF THE STUDY AREA

The study area is generally described in this chapter. Some basic information, especially relating to the characterization of the geographical and topographical, biophysical, socio-economic and cattle farming systems in Nam Dong district are provided. Prior to assessing the production profitability and adoption of local and crossbred cattle, it is essential to know environmental situation in which cattle raising systems of smallholder farmers are practiced.

#### 3.1 General geographical and topographical description

In central Vietnam, Nam Dong is mountainous district located in the Southwest of Thua Thien Hue Province. The district has cubic shape with width from the East to the West is 39 km, and length from the North to the South is 27 km (Duy, 1997). The administrative boundary map indicating geographical location of Nam Dong district is shown in Figure 3.1. The district is surrounded in the North by the Phu Loc and Huong Thuy district, in the West by the Aluoi district, in the East by the Quang Nam province, and in the Southwest by the Lao PDR. The district is far from Hue city about 53 km on the North. There is only 14B road with 65 km lengths go through Khe Tre valley. This is main road connecting communes in the district, at the same time it is also the main road connecting the district with national highway through La Hi mountain pass.

In general, the sloping direction is from the South to the North. This characteristic affected to flow direction of hydrographic network. There are differences of altitude in the district area and the neighboring districts. The ridges range from a height of 1,700 metres to a low of 40 metres above sea level. The average of ridges range is 300 metres.

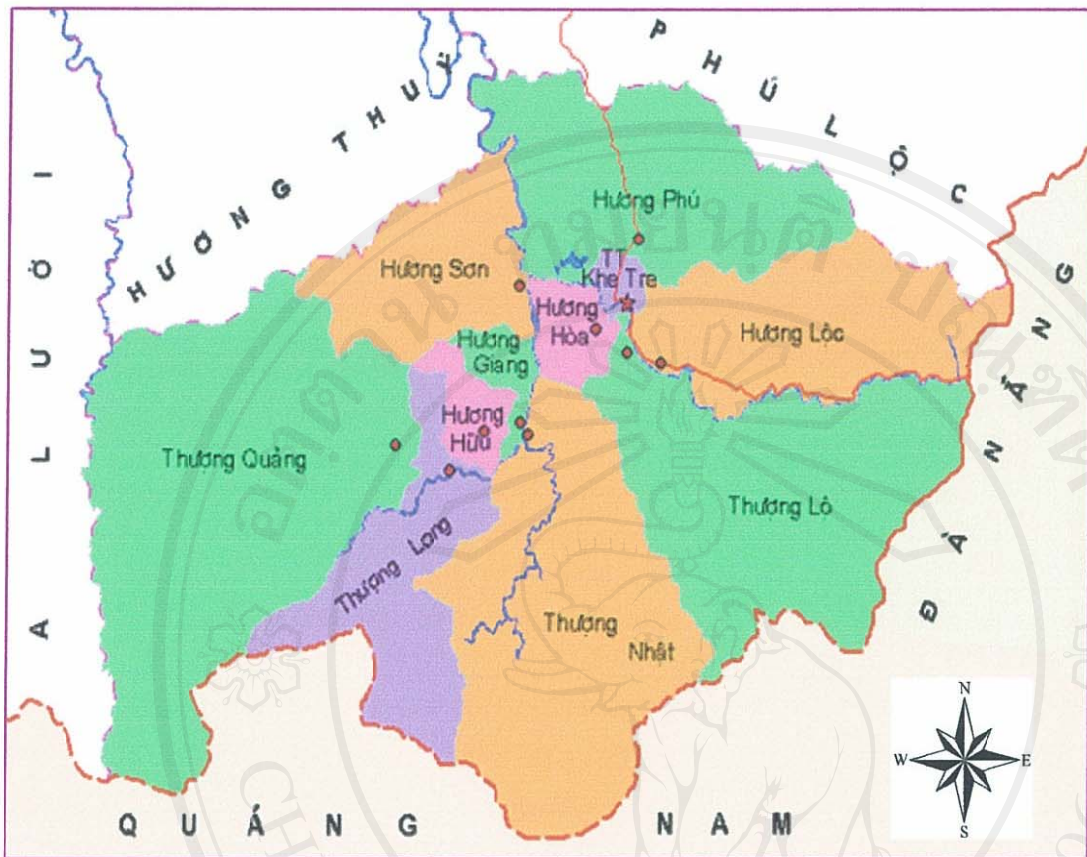


Figure 3.1 The map of study area

Source: <http://www.thuathienhue.gov.vn/Gioithieu/Bando>

### 3.1.1 Climate characteristics

Nam Dong climate is humid tropical climate with cold winter season. However, due to geographic and topographical conditions, besides the general characteristics of climate of tropical zone, Nam Dong has individual typical characteristics that stand for mountainous zone. There are two main windy seasons in the year. Those are Northwest wind in summer from April to September and Southeast wind in winter from October to March.

The annual average temperature at Nam Dong valley is  $24.7^{\circ}\text{C}$ . Due to effect of higher terrain, the temperature is lower with higher elevation. In the west mountain, the average annual temperature reduces as  $20 - 26^{\circ}\text{C}$ . In the months of winter season

(from November to April), because of monsoon, the temperature decreases and it is almost  $22.1^{\circ}\text{C}$ . In the months of summer season (from May to October) the annual average temperature is  $27^{\circ}\text{C}$  (Annual report of Hydro Meteorological Station of Nam Dong, 2005). The Figure 3.2 indicated the monthly average temperature during 2001 to 2005. The lowest temperature is less than  $12.5^{\circ}\text{C}$ . Meanwhile, the highest temperature is  $39^{\circ}\text{C}$  usually occurring in summer season due to the impacted of hot and dry westerly wind. The period that has high temperature in year focuses on June to August.

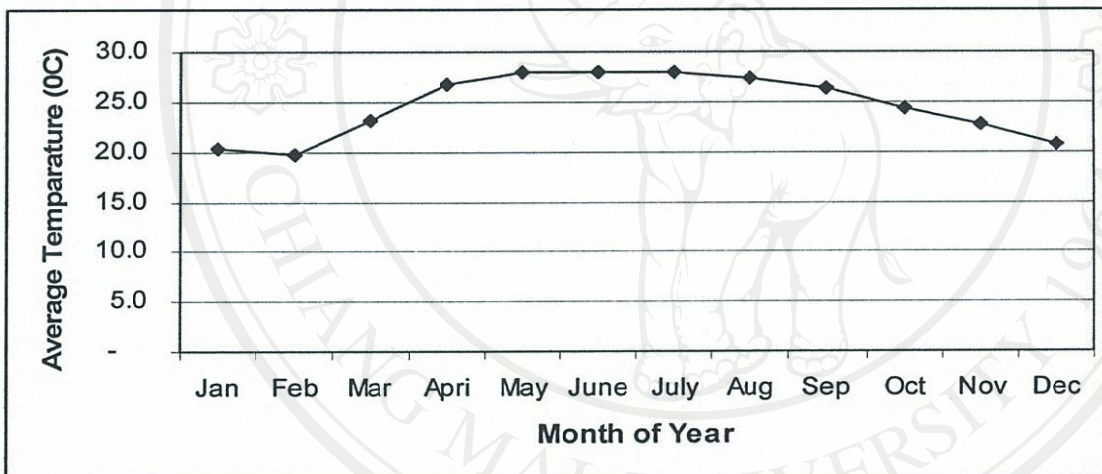


Figure 3.2 The monthly average temperature in Nam Dong district

Source: Annual report of Hydro Meteorological Station of Nam Dong, 2005

Every year in Nam Dong, it gets high rainfall. The annual rainfall in Nam Dong is 3,446 mm (2001-2005). The monthly total rainfall is shown as Figure 3.3. The rainfall in Nam Dong has strong differentiation and diversification. Figure 3.3 presents the rainfall pattern for 12 months in the study area in 2001 to 2005. Light rain period is from January to July with total rainfall makes up 20-30% total of annual rainfall. The heavy rain period is from September to December with total rainfall makes up 70-80% of total annual rainfall.

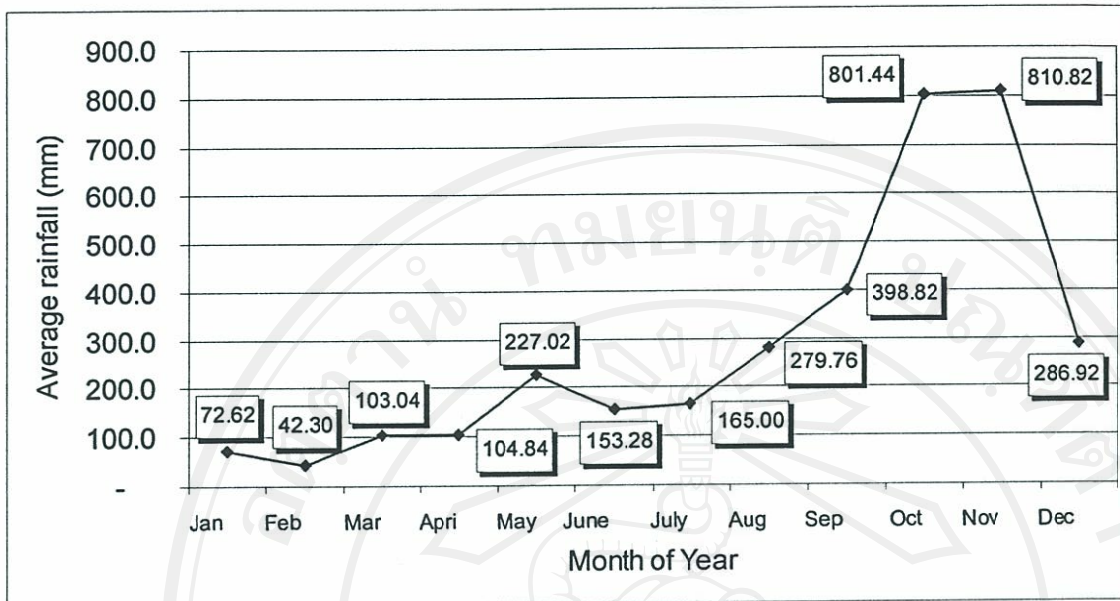


Figure 3.3 The monthly total rainfall in Nam Dong district (2001-2005)

Source: Annual report of Hydro Meteorological Station of Nam Dong

### 3.1.2 Soil characteristics

Soil is one of the components reflected entirely interaction between natural geographical components of landscape. In addition, with complex of topography and different mother rocks have formed into different soil types in Nam Dong district. The soil in Nam Dong is very abundant and diversified.

Nam Dong is a mountainous district so soil is mainly yellow red soil. The yellow red soil on clay and faded rock has greatest area (43,395 ha), it makes up 66.14% of total land area, followed by red yellow soil on magma acid rock (19.22%). The lowest area is brown yellow soil on ancient alluvial land and the alluvial soil on springs and streams (Nam, 2003).

### 3.1.3 Water resources

Nam Dong domain belongs to upstream zone of Huong river with rather dense watershed and drainage network forms rivers and streams, its average is about 0.65-

0.67 km/km<sup>2</sup>. The Huong river originates from Nam Dong mountain area includes two main branches those are Ta Trach and Huu Trach. The Ta Trach river has 70 km in length and including some main estuaries such as Aro stream, La Van stream, and Bara river. Those estuaries flow almost communes in the district therefore they can supply water for irrigating and living of people. The Huu Trach is located in the West of the district with total length is 80 km includes some main estuaries such as Dang stream, Mu Nu stream, etc. Moreover, locating in monsoon tropical zone the rivers and streams in Nam Dong have abundant water source and differentiating evidently following rainy and dry season. The annual flood season coincide with rainy season, and its discharge makes up about 80% of total in a year. Meanwhile, the discharge just makes up from 10% to 30% of total in dry season and critical time is in March, April, July, and August.

The lake in Nam Dong mainly is small size lake and concentrating at Khe Tre-Nam Dong valley zone. The biggest lake is Ka Tu lake that located in Huong Phu commune. Besides, in Nam Dong district still has an irrigative dam network such as Khe Bo, Amun-aron, Khe Choi, Laoai, Bara, etc. They had effects in terms of supplying the water for agricultural production and living in that area. In addition, due to water balance is positive so underground water is abundant in Nam Dong district. In general, source of underground water in Khe Tre-Nam Dong valley is more abundant than others such high terrain areas around the district. The most abundant is area that has deposit alluvial, and ancient alluvial base. The underground water level ranges from 1 m to 20 m.

#### **3.1.4 Communes and infrastructure**

Nam Dong district has 11 communes, which contains 66 villages. One of these communes is Khe Tre, which is the most important trading center of the district. The roads connecting the communes are mostly asphalted. In addition, there are smaller roads, which are graveled connecting the villages to the main road. At this time, a lot of roads are being transformed into asphalted roads. Nam Dong market is important for the communes, which are located in the Southwest of the district.

## 3.2 The agricultural sector

### 3.2.1 Agricultural land use

With the increase of human population, land laws were changed to give the land to the tiller putting production in the hands of smallholders. The 1993 land law provided farmers with a longer land tenure (20 years for annual crops and 50 years for perennial crops and forest land) with the right to exchange, transfer, lease, inherit and mortgage such land right. Though land remains in public property, in fact the land use right has been privatized and subject to market conditions. At this point in time 90% of agricultural land and 10% of forestry land have been allocated to farm households out of which 70% have licenses for long term land use. So, natural pasture has been cut into small areas. Grasses in the natural pasture are of poor nutritive value. Improvement of natural pasture is expensive and has low efficiency because of lack of water and fertilizer.

In this study, crop production played a more important role than livestock production. The important crops in the study area were rice, maize, sweet potato, cassava and chili as annual crops and rubber and fruit trees such as jackfruit, cinnamon and banana as perennial crops. Paddy rice was usually grown two times per year in Nam Dong district. Rice is grown for both household consumption and sell for cash. Its residue, rice straw and rice bran, were used for livestock production. Maize was planted mainly for household consumption. The leaves and stalks of maize were used to cattle feed after harvesting. The sweet potatoes could be planted for both tuber or forage production, depending on purpose and season. Both tubers and wines of potato were mainly used for pig and sometime were used for cattle. Cassava was also planted for both animal feed and sell for cash. It was mainly stored as feed for cattle in winter. With perennial crops, banana stalks were used to feed for cattle when natural grass was shortage in the winter. While the crop production contributed by products to the livestock production as feed, the livestock also supply manure for crop production. The use of animal manure in crop production contributes to the maintenance of soil fertility and reduces the input cost of crop production. One can

see that there were well linkages between crop and livestock production in the study area.

The four selected communes are Huong Phu, Huong Loc, Huong Hoa and Thuong Lo. The areas of these communes are 6,633.6 ha for Huong Loc, 7,948 ha for Huong Phu, 1,109 ha for Huong Hoa and 10,640 ha for Thuong Lo. It presents 40.48 % of the whole district area. The average agricultural surface per person is 0.016 ha in Huong Loc; 0.34 ha in Huong Phu; 0.29 ha in Huong Hoa and 0.086 ha in Thuong Lo commune. Table 3.1 showed the area of different land uses in the four selected communes.

Table 3.1 Area and land use of four study communes in 2006

No.	Commune	Total	Distribution		
			Agriculture (ha)	Forest (ha)	Fallow land (ha)
	Whole district	65,051.8	3,953.6	42,691.4	16,747.6
1	Huong Phu	7,948.0	1,013.1	5,059.0	1,632.4
2	Huong Loc	6,633.6	36.9	5,667.7	742.1
3	Huong Hoa	1,109.0	638.4	163.1	199.8
4	Thuong Lo	10,640.0	93.2	8,150.7	2,248.3

Source: Nam Dong Statistical Office, 2006

Table 3.2 showed clearly that there were big differences in the area of agricultural land of households between communes. It is due to the topographical conditions and administrative boundaries. In the Huong Hoa and Huong Phu communes, agricultural land used for perennial crops made up high percentage, 82.11%, and 71.37%, respectively. Meanwhile, in the Thuong Lo and Huong Loc communes, most agricultural land was used for annual crop (91.7 % and 94.6 % respectively). While, the land classified as miscellaneous areas has the smallest area, it was only less than 2% in total land used for agricultural production.

Table 3.2 Agricultural land use in the four study communes in 2006

No.	Commune	Agricultural land ha	Distribution					
			Perennial crop		Surface water		Annual crop	
		ha	ha	%	ha	%	ha	%
	Whole district	3,953.6	3,001.5	75.92	53.2	1.35	952.1	24.1
1	Huong Loc	36.9	0	0	2.00	5.42	36.9	94.6
2	Huong Phu	1,013.1	723.1	71.37	7.0	0.69	290.0	28.6
3	Huong Hoa	638.4	524.2	82.11	6.9	1.08	114.3	17.9
4	Thuong Lo	93.2	7.4	7.94	2.0	2.15	85.5	91.7

Source: Nam Dong Statistical Office, 2005

Due to limitation of flat areas, paddy fields are quite rare in the communes. The popular agricultural systems are based on cash crops with annual and perennial plants. The home gardens located around the households are quite diverse. Farmers planted pepper, pineapples, jackfruit trees, cinnamon trees, banana, and other kinds of trees in their home gardens.

### 3.2.2 Livestock production

From the survey in 2006, animal raising was very popular in this area, especially cattle and pigs. Pigs were raised by more than 80 % of the surveyed households. The average number of the pigs kept was about 4-6 heads per household per year. There were two reproductive cycles in a year. That means it was about 2-3 heads per cycle. The survey results also show that about 50 per cent of households raised sows for breeding. The mainly breed are Mong Cai which is not local breed, but well adapted because it has been for many years in Vietnam. The Mong Cai sow was important for breeding but the males had a very low price which made it difficult for farmers to keep the pure breed. The demand was only for females. The farmers were to keep the Mong Cai sows for breeding and to cross it with an exotic breed such as Large White for fattening. The average one sow produced about 8-10 piglets at one farrowed which average weight was 8 kg for one piglet. It could produce two cycles in a year. Rice bran, cassava root and sweet potato root were used as the main feeds for pig raising which was provided from their own production. With the sows, sticky rice was used



for the celebrations or special occasions. The farmers feed some sticky rice, green beans or chicken eggs when the sows have farrowed or some days before. However, about 30 percent of household went to the market to buy the cassava. Sweet potato leaves, banana stalks and wild-grass were also collected for feeding.

Cattle were mostly kept for cash income rather than for plowing. Meanwhile, the main purpose raising of buffaloes was plowing (see Table 3.3). The average number of the buffaloes kept was about 1-2 heads per household. According the survey result, Huong Hoa commune had the biggest the number of buffaloes (205 heads of buffaloes).

Farmers raised mainly local poultry breeds such as Ri chicken or Bau and Co ducks. The Ri breed makes up the major proportion of chicken flocks in Nam Dong since it is a dual-purpose bird, well adapted to prevailing keeping and climatic conditions, and with the ability to scavenge. Besides local breeds, crossbreds of local and exotic breeds are becoming increasingly popular such as Rhode-Ri and Kabir-Ri, due to their higher production performance. Chicken were raised by more than 90 % of the surveyed households. The average number of the chicken kept was about 16-20 head per household per year. Hen and chicken were allowed to free ranging in gardens, but some households kept them in chicken-house and used concentrate feed, which was higher investment cost. Usually poultry were mainly raised for household consumption. Poultry feeding in smallholder households is based on agricultural crops and agricultural by-products. Rice was the main feed to use in the dry season, followed by the slice of dry cassava which was used in the rain season.

Table 3.3 Livestock population

Description	Number of animal (head)	
	Whole district	Four communes
Total cattle	3,594	1,606
Draught cattle	23	-
Total Buffaloes	1,373	398
Buffaloes (Draught)	692	-
Total pig	6,317	2,890
Sow	627	-
Poultry	48,000	23,900
Chicken	45,000	20,500
Others	3,000	-

Source: Nam Dong Statistics Office, 2005

### 3.3 The cattle sub-sector

#### 3.3.1 Cattle population

Total numbers of cattle in Nam Dong district were 3,594 heads, which consist of local breed cattle 41.32% and crossbred cattle (Red Sindhi x local Yellow cattle) 58.68% (Table 3.4). Total crossbred cattle of the four study communes were 849 heads which was about 40.26 per cent of the total crossbred cattle of the district. Total local cattle of the four study communes were 757 heads, occupying 50.98 per cent of total local cattle of the district. The two largest numbers of cattle were raised in Huong Phu and Huong Hoa commune with 583 heads and 495 heads of cattle, occupying 16.22% and 13.77% of total cattle of district, respectively.

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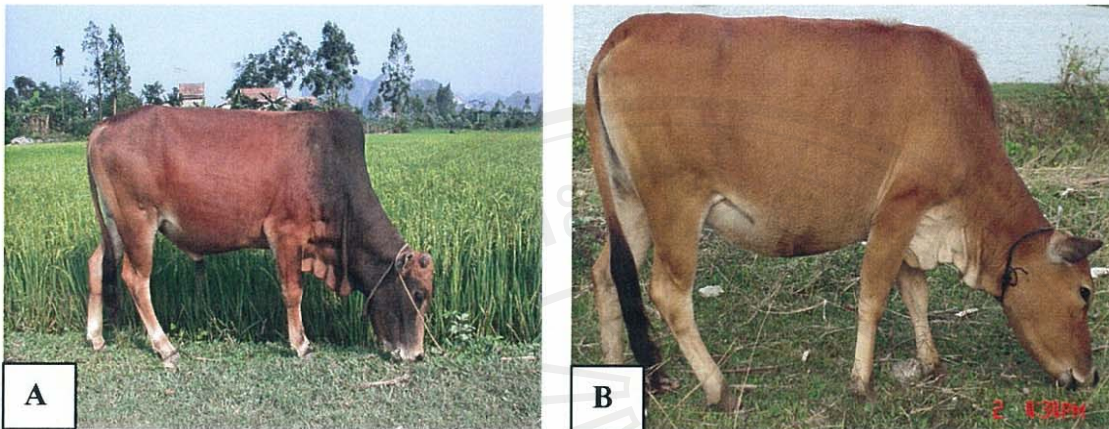
Table 3.4 Total households and cattle in study area (heads)

Commune	Total cattle		Local cattle		Crossbred cattle	
	No.	%	No.	%	No.	%
Whole district	3,594	100	1,485	41.32	2,109	58.68
Total four communes	1,606	44.69	757	50.98	849	40.26
Huong Phu	583	16.22	311	20.94	272	12.90
Huong Loc	273	7.6	87	5.86	186	8.82
Thuong Lo	255	7.10	98	6.60	157	7.44
Huong Hoa	495	13.77	261	17.58	234	11.10

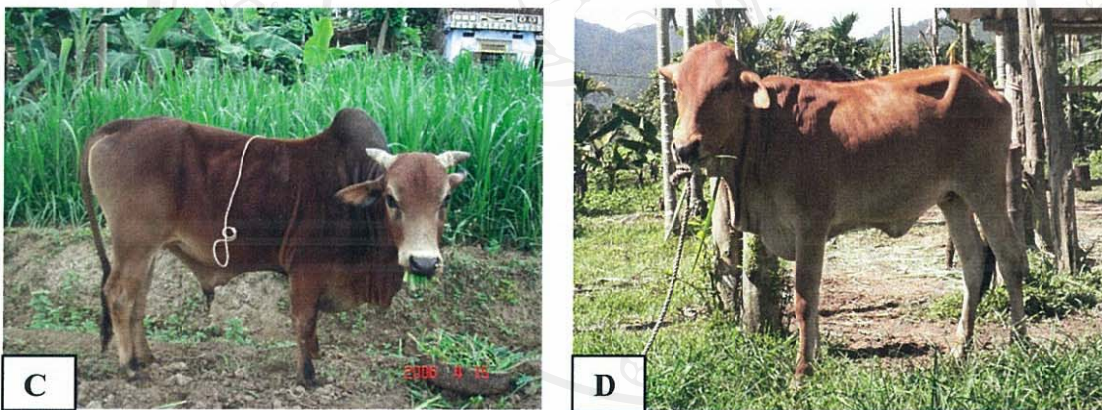
Source: Nam Dong Statistical Office, 2006

### 3.3. 2 Cattle breeding

The main objective of raising cattle is for cash income. No cattle are used for ploughing. The local cattle breed, Vietnam Yellow Cattle, is small size. The average live weight was about 160- 180 kg per head for female and 240-280 kg per head for male. They had light bone structure, with a killing out the carcass weight by 42 to 44 percent (see figures 3.4). Natural mating is widespread in this area, as normally the cattle are kept together and there was no control. Some farmers that wanted to improve their cattle using artificial insemination obtained semen from the veterinary services in Nam Dong district. One cow usually had less than one calf per year with the weigh ranged from 7-10 kg at birth. The calves are suckled for 7 to 8 months by which time they had weighed 60-80kg. After two years, they could reach 180 kg and 270 kg per head for female and male, respectively.



Figures 3.4 Local breed cattle, male (A) and female (B), in the study area



Figures 3.5 Laisind crossbred cattle, male (C) and female (D), in the study area

Since 1992, the cattle crossbreeding program has been implemented by Thua Thien Hue provincial Department of Agricultural Extension and Rural Development. The main task of this program was to provide Red Sindhi breeding males for crossing to improve the body weight of the local cattle herd. One commune was provided one or two breeding males depend on the number of local cattle. Bulls of Red Sindhi breed crossed with local breed cow to make the crossbred cattle, called Laisind. This program also trained an artificial insemination technique for extension workers in Nam Dong district. Red Sindhi semen was supplied to farmers for cross breeding with local cattle. Laisind crossbred cattle have reddish coat. The body weight of a Laisind calve aged 24-27 months could reach 280-350 kg and would have the carcass percentage of 47 to 49% (see Figures 3.5). Laisind cattle are often used by farmers as

a first-cross when attempting to increase the size of cattle. Heifers usually deliver their first calf at around 3 to 3.2 years of age and continue with one calf every 1.2 to 1.5 years. A breeding cow can produce 6 to 7 calves during its reproductive life. Laisind cattle were well adapted to poor feeding condition and changing the climate.

The survey result in the Table 3.5 indicated that the average number of raising cattle of non-adopters and adopters were 3.25 and 3.45 heads, respectively. Most of the local breed and crossbred cattle raisers kept between 2-3 heads of cattle per household (75% for non-adopters and 67.5% for adopters)

Table 3.5 Number of cattle per household

Items	Non-adopters	Adopters	All	Prob.
Number of cattle per household	%	%	%	
2 -3 heads	75.0	67.5	71.3	
4-6 heads	25.0	32.5	28.7	
Mean cattle per household (head)	3.25	3.45		.406 <sup>NS</sup>
SD	(±1.03)	(±1.10)		

Source: Survey, 2006 (NS) Not significant

Remark: non-adopters means local cattle raisers and adopters means crossbred cattle raisers

### 3.3.3 Cattle feeding

Most of cattle feed is natural grass. In summer, cattle are often grazed for 4-8 hours per day along the edge of rice-field, in rubber farm and uncultivated areas. In winter, they were kept in the cattle-shed and supplied rice straw and cut natural grass. In the study area, rice is mainly grown for household consumption and can be cultivated two times per year. Rice straw is the major stored feed for cattle in the winter. Rice bran was also used to feed the cattle. Another important feed is cassava. Cassava was grown by 75 % of non-adopters and 93% of adopters. About one third of cassava products were used for feeding cattle in both adopters and non-adopters but

the average kilogram of cassava used as feed of adopters (1,227 kilograms of fresh root per household) is higher than that of the non-adopters (748 kilograms). Cassava was mainly produced in the form of cassava chip for cattle feed. However, some farmers also feed the cattle with the fresh root cassava. Other cattle feed are by-products of sweet potato and various vegetables. So, feeding system for cattle is based on local available feed resources such as natural grass, rice straw, rice bran, cassava and sweet potato vines. Commercial feeds were rarely used because they were more expensive. However, natural grass is often poor quality and low nutritional value.

### 3.3. 4 Cultivated grasses

As mention above, grass land was a problem in the study area. In winter, the households raising cattle did not have grass for feed. So, they had to go into the communal grassland on roadsides, hills and forest-sides, which were highly seasonal dependence, to cut and carry grasses for cattle. The two varieties of grass that have been mostly cultivated were elephant grass (*Pennisetum purpureum*) and Guinea grass (*Panicum maximum*). These grasses were highly productive with elephant grass yielding 200 t/ha/year equivalents to 22 t dry matter (DM). Guinea grass, which has high drought tolerance, can yield 100 t/ha/years (19 t of DM). Its productivity depending on the amount of fertilizer applied. These two grasses are preferred by farmers. They can be grown in the garden but obtain higher yield under better management. The result of survey showed that 43.8 per cent of households did not have area of own grass land. Most of non-adopters have their own grass land. Whereas more than a half of adoption did not have owned grass land (see from Table 3.6). An average of owned grass land of non-adopters and adopters were 0.748 sao (0.037ha) and 0.338 sao (0.017ha), respectively (see from Table 3.10)

Table 3.6 Area of grass land of local and crossbred cattle raisers

Characteristics	Non-adopters (%)	Adopters (%)	All (%)
Area of own grass land (Sao)			
0 Sao	27.5	60.0	43.8
0.1-0.99 Sao	22.5	15.0	18.8
1-1.5 Sao	27.5	22.5	25.0
>1.5 Sao	22.5	2.5	12.5

Source: Survey, 2006 1 Sao = 0.05 hectare

### 3.3.5 Characteristics of the cattle raising households

#### 3.3.5.1 Age of households' head

The survey result indicated that 11.2 per cent of household head are over 50 years old, 83.8 per cent are in between 35 to 50 years old and 5 per cent are below 35 year old (Table 3.7). Most of household head of adopters was in 35-50 years old group. There was no significantly different age of household head between two groups. The average age of household head of local cattle raisers and crossbred cattle raiser was 43 year olds and 44 year olds, respectively.

Table 3.7 Age and education level of household head in study area

Items	Non-adopters	Adopters	All	Prob.
Age of household head (years)	%	%	%	
<35	7.5	2.5	5.0	
35-50	77.5	90.0	83.8	
>50	15.0	7.5	11.2	
Mean of age of household head (years)	42.7	44.25		.279 <sup>NS</sup>
SD	(±7.25)	(±5.05)		
Education of household head	%	%	%	
Primary level	27.5	47.5	37.5	
Secondary level	47.5	45.0	46.3	
High level	25.0	7.5	16.2	

Source: Survey, 2006 (<sup>NS</sup>) not significant

### 3.3.5.2 Education of households' head:

Table 3.7 shows that most of the non-adopters have the household head with the secondary education level or higher level, whereas almost a half of adopters' household head have only primary level education. Twenty five per cent of household heads of local cattle have high level education and only 7.5 per cent of household heads of crossbred cattle have high level education.

### 3.3. 5.3 Household members and labor

As Table 3.8 shows, there was no significant difference between the household number of non-adopters and adopters. The average household number was about 5 persons in both cattle raising systems. However, the average numbers of children aged less than 7 years old and labor age of non-adopters and adopters were significantly different at 5 per cent and 10 per cent level, respectively. The average number of family member aged 15-60 years old (labor age) of local cattle raisers was significantly higher than that of crossbred cattle raisers (2.47 persons compared with 2.20 persons). Labor resource was also played an important role in grazing cattle. They not only looked after cattle but also had to cut and carry grass for cattle feeding. In this study area, children aged 7 to 14 years old were defined as young children. For crossbred cattle raisers, the average number of younger children was 2.45 heads compared to 2.15 heads for local cattle raisers. But they were not significantly different between two groups.



Table 3.8 The average numbers of household members in different age groups

Characteristics (unit = persons)	Non-adopters (n = 40) Mean (± SD)	Adopters (n = 40) Mean (± SD)	Prob.
Total household members	5.40 (± 1.70)	5.00 (± 1.43)	.26 <sup>NS</sup>
Labor age (15 – 60 years old)	2.47 (± 0.84)	2.20 (± 0.60)	.10*
Young children (7-14 years old)	2.15 (± 1.35)	2.45 (± 1.15)	.28 <sup>NS</sup>
Very young children (<7 years old)	0.62 (± 0.80)	0.25 (± 0.63)	.02**
Elder (> 60 years old)	0.15 (± 0.48)	0.10 (± 0.37)	.60 <sup>NS</sup>

Source: Survey, 2006

Note: (<sup>NS</sup>) Not significant; (\*\*) Significant at 5 % level; (\*) Significant at 10% level

Table 3.9 indicated that there was significant difference between labor availability in the family of non-adopters and adopters. The average labor available in household of adopters and non-adopters were 2.48 persons and 2.20 persons, respectively. 72.5 per cent of households have from 2 to 3 working person available for agricultural activities, 25 per cent have more than 3 working persons available for agricultural activities. So, most of the households had 2 to 3 persons available for cattle raising activity.

Table 3.9 Number of available family labor in the study area

Characteristics	Non-adopters	Adopters	All	Prob.
	%	%	%	
Number of available family labor (>15 years)				
<2 persons	2.5	2.5	2.5	
2-3 persons	65.0	80.0	72.5	
>3 persons	32.5	17.5	25.0	
Mean of labor per household (persons)	2.48	2.20		.10*
SD	(±0.84)	(±0.60)		

Source: Survey, 2006 (\*) Significant at 10% level

### 3.3.5.4 Land use

The total land of the households consists of agricultural land, rubber land and house and garden areas. All land of the farmers is rent in the long term (ranged from 20 to 50 years) from the government. It is considered as the farmer owned land. Table 3.10 shows that there was no significant difference in total land area between two groups. The average number of total land area per household was about 1.5 ha. The land used for paddy-rice, cassava and fruit tree was very small (ranged from 0.1 to 0.3 ha). However, the land used for cassava of the adopters was significantly higher than that of non-adopters at 1 per cent level. Whereas the rubber land or rubber tree planting area is the biggest area, the average rubber land was about 1 ha per household. Farmers grow rubber trees that exploited resin for cash income. Some households planted *Acassia aneura* tree on rubber land. The trees can be sold after seven years; it is used for producing paper.

Table 3.10 Total land area, land area for paddy rice, cassava and fruit

Characteristics (Unit: ha/household)	Non-adopters (n =40) Mean (± SD)	Adopters (n = 40) Mean (± SD)	Prob.
Total land area <sup>(1)</sup>	1.55 (± 0.99)	1.48 (± 0.85)	.75 <sup>NS</sup>
Land area for paddy rice	0.18 (± 0.14)	0.18 (± 0.11)	.94 <sup>NS</sup>
Land area for cassava	0.13 (± 0.17)	0.31 (± 0.24)	.00***
Land area for fruit tree	0.21 (± 0.12)	0.22 (± 0.17)	.83 <sup>NS</sup>
Rubber land	1.03 (± 0.93)	0.96 (± 0.83)	0.62 <sup>NS</sup>
Land area for owned grass land	0.037 (± 0.029)	0.017 (± 0.022)	.001***

Source: Survey, 2006

<sup>(1)</sup> House and garden included; (<sup>NS</sup>) Not significant; (\*\*\*) Significant at 1 % level

### 3.3.6 Household income and its sources

From the results of households survey in Table 3.11 indicated that the percentage of adopters in the household income group of less than 15,000,000VND is 10 per cent and that of local cattle is 17.5 per cent. Maximum percentage of non-adopters and adopters were in the household income group of 15,000,000-30,000,000VND with 57.5 and 70.0 per cent, respectively. There is no significant different in the household income of both groups. The average of household income for local cattle raisers and crossbred cattle raisers were about 24,854,401 VND/household and 23,573,981 VND/household, respectively.

Table 3.11 Households' income group of non-adopters and adopters

Household income (VND)	Non-adopters (%)	Adopters (%)	All (%)	Prob.
<15,000,000	17.5	10.0	13.8	
15,000,000-30,000,000	57.5	70.0	63.8	
>30,000,000	25.0	20.0	22.4	
Mean per household (VND)	24,854,401	23,573,981		.568 <sup>NS</sup>
SD	(±11,409,882)	(±8,564,204)		

Source: Survey, 2006

Note: (<sup>NS</sup>) Not significant; 1US\$ = 15,500VND (April, 2006)

Source of household income in the study were crop production, animal raising, rubber farming and off-farm activities. Most of the household income was from farm activities. Rubber farming was the main source of household income of non-adopters (31.79%). Whereas crop production was the main source of household income of adopters (29.71%). Table 3.12 shows that per cent of income from cattle raising of adopters was double that for non-adopters (15.85 % compared to 7.83 %).

Table 3.12 Source households' income of local and crossbred cattle

Source income	Non-adopters (N=40)	Adopters (N=40)
Household income (VND per year)	24,854,401	23,573,981
Farm activities	76.85	77.9
Crop production (%)	25.75	29.71
Animal raising (%)	11.48	16.86
Cattle raising (%)	7.83	15.85
Rubber farming (%)	31.79	15.48
Off-farm income (%)	23.15	22.10

Source: Survey, 2006 1US\$ = 15,500VND (April, 2006)

### 3.4 Institutional development

#### 3.4.1 Access to technical training

In 1993, the Ministry of Agriculture and Food Industry officially decided to establish the Agricultural Extension Department. Since that time, each province and district has had its Agricultural Extension Centre. Agricultural extension in Vietnam seeks to be a bridge to link sciences and production, scientists and farmers. The survey results presented in Table 3.13 showed that crossbred cattle raisers had higher percent of farmers access to technical training in comparison to the local cattle raisers (45.0% compare to 32.5%). However, cattle raisers in this study area did not get so much technical support from the government organization. Some non-government organization such as Centre for Rural Development in central Vietnam played important task to train the new technique for cattle raisers. Other farmers get new technologies of raising cattle through their neighbors, cattle traders or some program on the television. The result of surveyed showed that only 38.8 per cent of farmers access to technical training.

Table 3.13 Access to technical training, knowing the crossbred cattle, raising crossbred cattle

Characteristics	Non-adopters (%)	Adopters (%)	All (%)
Access to technical training	32.5	45.0	38.8
Knowing the crossbred cattle			
Neighbors	40.0	30.0	35.0
Traders	30.0	35.0	32.5
Extension workers	30.0	35.0	32.5
Raising crossbred cattle			
Non-government organization	0.0	50.0	-
Extension agencies	0.0	20.0	-
Neighbors and Own experiences	0.0	30.0	-

Source: Survey, 2006

#### 3.4.2 Access to veterinary services

There are quite good veterinary services networks in this area. Veterinary services are placed to provide the artificial insemination (AI), medicines and vaccine. The farmers went to report about their cattle disease or cattle in heat for the vet. The cattle were treated by veterinarians. Some households went to take the medicine and treated by themselves. The motorbikes and bicycles were mainly vehicle to go the veterinary services. Besides, these services are delivered directly to farmers to guide them in the application of techniques and answer farmers' questions. The survey results showed that 100 percent of both groups had access to the veterinary services (Table 3.14). So, the percent of cattle died or infected by the disease was quite low in the study area.

Table 3.14 Access to veterinary services, input market, sale of cattle and credit

Characteristics	Non-adopters (%)	Adopters (%)	All (%)
Access to veterinary services	100.0	100.0	100.0
Access to input market			
Very short (<30 minute)	42.5	32.5	37.4
Short (30-60 minute)	40.0	62.5	51.3
Long (>60minute)	17.5	5.0	11.3
Sale of cattle			
Market	0.0	0.0	
Farm	100.0	100.0	100.0
Access to credit	100.0	100.0	100.0

Source: Survey, 2006

### 3.4.3 Access to input market

There is one market, namely Nam Dong, which is located in the central of district. In the market, the farmers can buy salt, the ingredients for concentrate mixture such as dry cassava, rice bran for cattle and pig. Also they sold their products to the market. However, one hundred per cent of local cattle raisers and crossbred cattle raisers sold cattle at their farms (Table 3.14). The farmers can travel from their villages to the market by motorbike or bicycle. In this case, the time to access the market was computed by minute. If the farmers live in the village more than 10 km and did not have motorbike, they could take a long time to go to the market. The survey results presented in Table 3.14 showed that adopters had higher percentage of farmers taking a short time to access market in comparison to the non-adopters. Only 11.3 percent of both non-adopters and adopters had to take a long time to access the market.

### 3.4.4 Access to credit

Two forms of credit are available in Nam Dong district, formal and informal credits. From the survey results, one hundred per cent of cattle raisers had access to credit since they had land title for use as collateral. But only 56.2 per cent of

crossbred and local breed cattle raisers borrowed money for cattle raising purpose. Most of cattle raisers used formal credit that was 47.5% and 22.5% for local cattle raisers and crossbred cattle raisers, respectively. Formal credit mainly comes from Agricultural and Rural Development Bank, which provided a lower interest rate than informal credit (0.8% /month compare with 1.5% /month). In asking formal credit a land title is usually used as the financial collateral. The average loan was 2,500,000 VND/household which was only for cattle raising purpose. There was a limitation of the loan offered by the bank, i.e. only 3,000,000 VND/household was the offer and the loan period was also limited from one to three years only with interest rate range from 0.6 to 0.8%/month.

The informal credit from the traders or neighbors were available throughout the year with a high interest rate (about 1.5%/ month to 2.5 %/month). However, 27.5 per cent of non-adopters and 15 per cent of adopters got loans from informal sources.

Table 3.15 Sources of credit of non-adopters and adopters for cattle raising purpose

Credit source	Non-adopters (%)	Adopters (%)	All (%)
Agricultural and Rural Development Bank	47.5	22.5	35.0
Traders	15.0	0.0	7.5
Neighbor	12.5	15.0	13.8
Did not take loan for cattle raising	25.0	62.5	43.8

Source: Survey, 2006

### 3.5 Summary of the main finding

The results of this investigation show that cattle were mostly kept for cash income but only in the small size, 2 to 3 heads of cattle per household. About 59 per cent of total cattle population in the Nam Dong district was Laisind crossbred cattle (Red Sindhi x local Yellow cattle) whereas local breed cattle, Vietnam Yellow cattle, were about 41 per cent of total cattle population. Feeding system for cattle was based on local available feed resources such as natural grasses, rice straw, rice bran, cassava

and sweet potato vines. Commercial feeds were rarely used because they were more expensive. During summer, natural grasses on road sides, along the edge of rice-field, in rubber farms and uncultivated areas were the main feed for cattle. In the winter, cattle were kept in the cattle-shed and rice straw was the major stored feed. Only small areas of grass were cultivated for cattle feed. About 44 per cent of cattle raisers did not have area of owned grass land. An average of owned grass land of non-adopters and adopters were 0.037 and 0.017 hectare, respectively. An average of cassava production area of non-adopters and adopters were 0.13 and 0.31 hectare, respectively. The elephant grasses (*Pennisetum purpureum*) have been cultivated in Nam Dong district for cattle feed.

With regard to characteristics of the cattle raising household, most household heads in both groups had the age of 35 to 50 years old. Most of non-adopters (72.5%) had household heads with the secondary education level or high level whereas almost a half (47.5%) of adopters had household heads with only primary level education. The average household size was about 5 persons of both non-adopters and adopters. However, 65 percent of non-adopters and 80 per cent of adopters had 2 to 3 persons available for cattle raising activity.

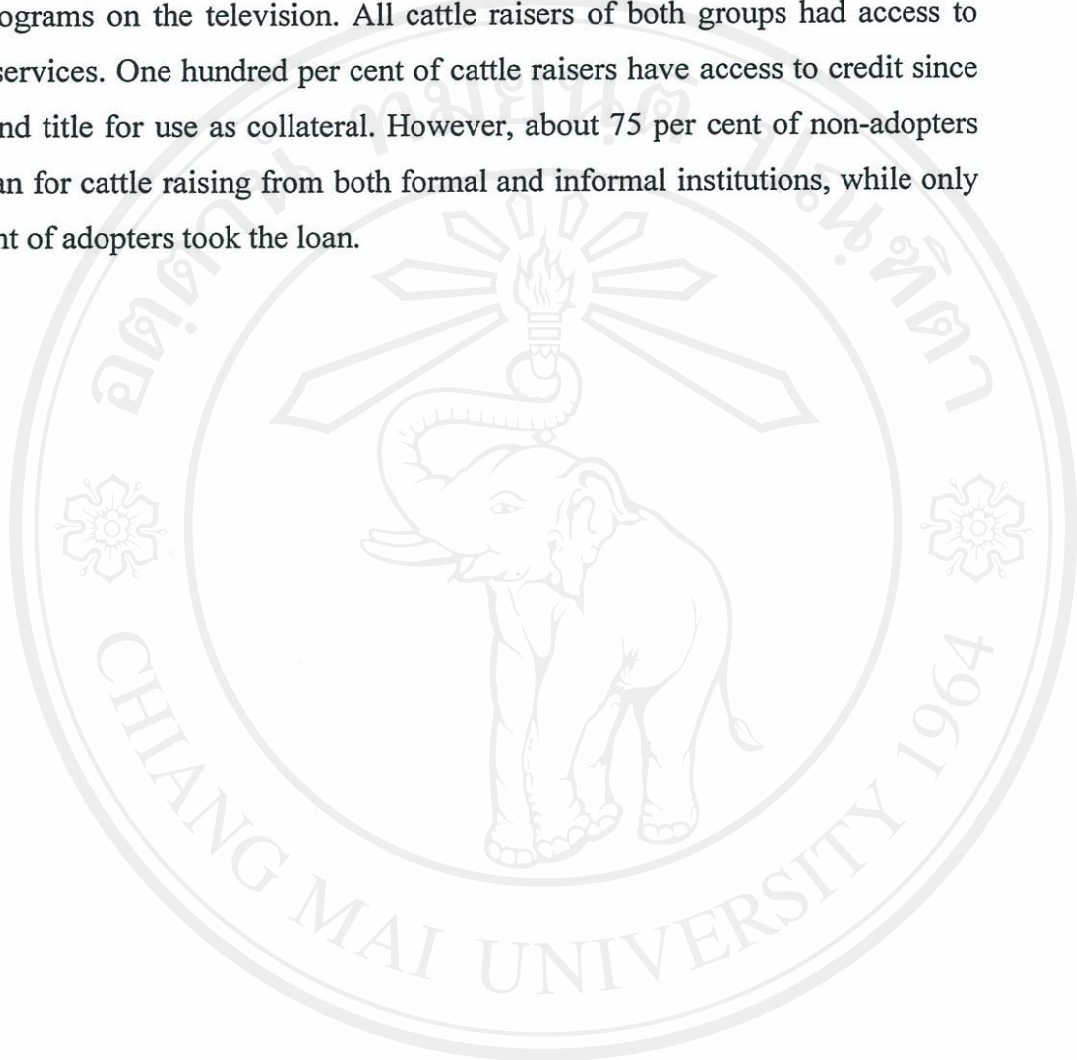
Considering land size and land use of cattle raisers, 1.5 ha was the average size of land and there was no significant difference of land size per household between the two groups. Most of lands, about 65% in both groups, were used as rubber land where rubber trees were mainly grown for cash income. Very small areas, 0.1-0.3 ha, were used for paddy rice, cassava and fruit trees.

Another finding about household income, most of the household income was from farm activities. 57.5 per cent of non-adopters and 70.0 per cent of adopters earned income ranging from 15,000,000-30,000,000 VND per year (1 US\$ = 15,500 VND).

Regarding institutional development, 32.5 per cent of non-adopters and 45 per cent of adopters had access to technical training. Normally, the farmers were trained



the new technologies for cattle raising by non-government organizations. Others farmers had new technologies of raising cattle through their neighbors, cattle traders or some programs on the television. All cattle raisers of both groups had access to veterinary services. One hundred per cent of cattle raisers have access to credit since they had land title for use as collateral. However, about 75 per cent of non-adopters took the loan for cattle raising from both formal and informal institutions, while only 37.5 per cent of adopters took the loan.



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