CHAPTER 5

CHARACTERIZATION OF STUDY SITE

As has been mentioned in Chapter 3 about general context of Nam Dong district. In order to have a good overview, characteristics such as geographical and natural condition, social characteristics relating to crop production systems (CPSs), surveys of households and fields were studied through the methods that were presented in Chapter 4 such as participatory rural appraisal (PRA), Strengths-weakness-opportunities-threats analysis (SWOT), group discussion, etc. Thereby, this chapter showed specific characteristics, problems, challenges and opportunities of the micro-zones and basis information of the three study communes in both natural and social conditions in relation to crop production system (CPS).

5.1 Biophysical and socio-economic characterization

5.1.1 Land characteristics

In order to develop socio-economic for mountainous area at the same time as to protect sustainable environment, one needs to carry out studies to cover both socio-economic as well as natural geographical conditions of the study area. The modes of production have to be designed based on characteristics of specific ecological zone and can achieve practical efficiency.

The research on ecological patterns of mountainous areas showed that the mountainous area of Vietnam can be classified into three main ecological zones, those are high mountain zone (greater than 1000 m a.m.s.l), midland zone (500-700 m a.m.s.l), and valley zone. Based on the difference of altitude, the topography of Nam Dong district is classified into three important zones (Table 5.1).

Table 5.1 The topographical characteristics of Nam Dong district

No	Communes	Zones	Altitude	Slope		Area
			----m a.m.s.l---	-----level-----	------%------	------ha------
1	Huong Loc, Huong Hoa Khe Tre	Valley	< 300	1	0-14	7,359
				2	14-27	5,789
				3	27-47	13,553
				4	>47	212
				Total		26,913
2	Huong Huu, Huong Son Thuong Lo, Huong Phu Huong Giang, Thuong Nhat	Medium hill	300-700	2	14-27	2,116
				3	27-47	18,243
				4	>47	1,579
				Total		21,938
3	Thuong Long, Thuong Quang	High hill	> 700-170	2	14-27	284
				3	27-47	5,936
				4	>47	1,955
				Total		8,175

Source: Forest Enterprise of Khe Tre

The Nam Dong topography develops essentially on granite rock. Besides, some places are developed on clay and faded rock (Thuong Long commune), and sandstone (Huong Loc commune) created different on topographical shape. The major shape is midland intermixed with valleys. The low hills (less than 100 m a.m.s.l) usually have plain peak, gradual slope, the popular altitude is from 25 m to 60 m a.m.s.l. The medium hill and high hill zone (greater than 1000 m to 1300 m a.m.s.l) often have narrow peak, side of hills are sloping at the same time the hills can prolong continuously into rows. Generally, Nam Dong topography has medium sloping level between of 27% to 47% (Table 5.1).

The valley zone has alluvial soil including Huong Loc, Huong Hoa commune, and Khe Tre town. The average altitude is from 70 m to 100 m a.m.s.l, with the popular slope is between from 0% to 27%. This is area that has potential in terms of agricultural production. The valley topography consists of some sub-topographies are valley bottom, high alluvial grounds, and erosion valley spout – assemblage. The valley bottom with walls form alluvial plains along the river with relatively high banks are from 2 m to 3 m, wide level is tens of meters and prolong along the river. It was created from alluvial material that was deposited in the flooding seasons. Due to relatively flat slopes, abundant source of water, soil is rather fertile nutrient therefore this is favourable condition for planting food crops and temporary industrial crops. In

the alluvial plains, surface is often flat, gradual slope, and usually submerged during big floods. It is composed of clay and gravel. This ancient alluvial bench gives an advantage for cultivation. The erosion valley spout – assemblage in Nam Dong has more hollow spouts extend tens to hundreds of meters. Because terrain is rather flat and there are abundant sources of water, it is easy to irrigate for rice cultivation and any farming. Aquaculture is also be possible.

The medium hill is an area where most inhabitants of Nam Dong district live. Agricultural activities essentially happen in this area. The medium hill area lie much in the North of the district such as Huong Son commune, the areas along 14B road, Huong Phu commune, Khe Tre collective farm, etc. The altitude of this area is almost 50 m to 300 m a.m.s.l. This area belongs to upstream area of Huong river with area in Nam Dong is about 21,938 ha, making up 36% in total area of the district and distributing rather broad. This is also intermediary area between valley area and high hill area. From Khe Tre – Nam Dong valley, the terrain is gradually higher in all of three sides as the East, West, and South. The average slope is between from 49% to 70%. In addition, this area is divided seriously by high densely stream network that originates from high mountains (over 1,000 m). This creates complex terrain with relative high level is about 100 m. The mound topography in Nam Dong consists of some shapes as follows:

The low mound (50-100 m a.m.s.l): It usually has flat peak, side of a hill has a gradual slope (14%-27%). This terrain has advantages in agricultural production therefore most of it is exploited to grow farm production particularly perennial industrial crops such as rubber, tea, coffee, as well as building home garden and planted fruit trees intermixed with industrial crops. Between the hills are small valleys can be designed into fields of rice, other crop production, or digging ponds to feed fishes.

The medium mound (100-300 m a.m.s.l): It usually has narrow peak, hillside is sloping at the same time the hill peaks often prolong into rows. Forest areas are rather large and distributed nearly inhabited area so this area has a potential to expand the area into agroforestry cultivation as well as livestock activities.

The high hill zone with altitude level is from 700 m to 1700 m a.m.s.l mainly distributed in the South of Nam Dong district or the places that confine with Quang Nam – Da Nang region. It consists of Thuong Long, Thuong Quang commune. This area also borders with Bach Ma – Hai Van. The total area is 5,963 ha, making up 10% total area of the district. The average sloping level is greater than 47%. Thus, can see that these mountains are like an important climate wall. The monsoon winds almost do not have enough potential to overcome these mountains. At the same time, under terrain shield, making this district become one of center areas of the country with annual rainfall is heavy.

Based on topographical characteristics, Nam Dong district can be divided into three major zones. In each zone, there are characteristics that provide had differences in production patterns, especially agricultural production. Therefore, the assessment of sustainability of CPS should be corresponded with each micro-zone. Three communes are then selected as shown in Figure 5.1. Huong Loc commune represents for valley zone, Huong Phu, and Thuong Quang commune represents medium hill zone and high hill zone, respectively.

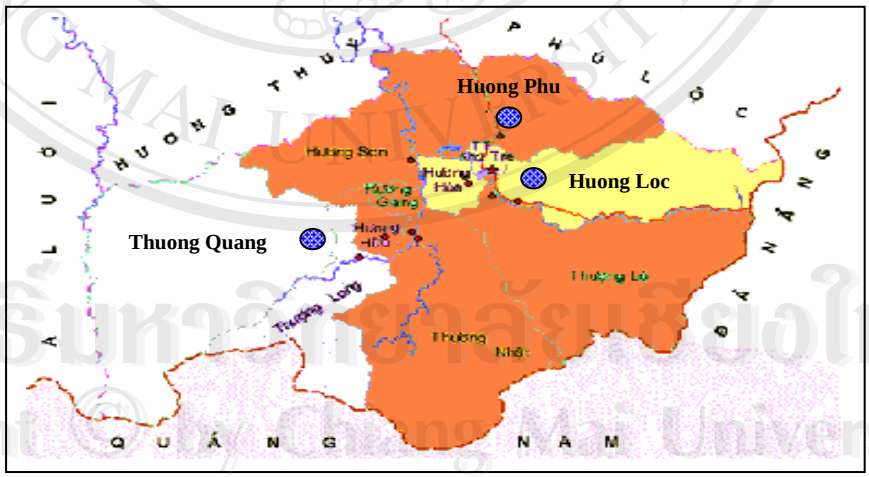

Figure 5.1 Map of Nam Dong district and the position of the study communes

Note: ⊛ *indicated selected communes to study*

Huong Loc commune is settled in the Southeast of the district and is connected to Khe Tre town by asphalted roads; the commune is about 4 km away from Khe Tre market and is along one of branch of Ta Trach river. Thuong Quang

commune lies in the Southwest of the district. The commune office of Thuong Quang is located about 17 km from Khe Tre market on the Road no. 591. Meanwhile, Huong Phu Commune is on Westnorth of the district, as it would seem gateway of district.

5.1.2 Socio-economic characteristics

5.1.2.1 Social conditions

In Nam Dong, there are two communities are living together those are Kinh and Cotu community. The Cotu is indigenous people in this area. They came in this area before the Kinh people and they have lived there for a long time. The Kinh people were relatively recent settlers. They came from plain areas after independence period (1975).

Table 5.2 Distribution of population by commune in Nam Dong district

Zone	Commune	Total		Allocated by ethnic			
				Kinh		Other ethnic	
		No. of households	No. of people	No. of households	No. of people	No. of households	No. of people
	Totall	4,195	22,333	2,567	13,220	1,628	9,113
I	Khe Tre	654	3,407	645	3,374	9	33
	Huong Loc	399	2,302	399	2,302	-	-
	Huong Hoa	441	2,154	440	2,151	1	3
II	Huong Phu	579	2,970	562	2,826	17	81
	Thuong Lo	194	1,065	13	64	181	1,001
	Huong Son	214	1,284	-	-	214	1,284
	Thuong Nhat	340	1,764	21	125	319	1,639
	Huong Giang	306	1,351	306	1,351	-	-
	Huong Huu	396	2,286	36	194	360	2,092
III	Thuong Long	381	2,185	19	91	362	2,094
	Thuong Quang	291	1,628	126	742	165	886

Source: Nam Dong Statistical Office, 2004

Note: I: Valley zone; II: Medium hill zone; III: High hill zone

Each ethnic group in Nam Dong has separate resident areas. The Kinh people are living essentially in five communes and towns, namely Huong Phu, Huong Loc,

Huong Hoa, Huong Giang commune, and Khe tre town. The Cotu people are living in the other areas of communes of Nam Dong district (Table 5.2). This issue has already caused difficulties dealing with communication as well as integration of the two communes.

Among these groups, about 60% (13,220) of the population belonged to Kinh ethnic group that is majority group, and 40% (9,113) belong to Cotu and some small ethnic groups. The Cotu ethnic group mainly settled in the South and the Southwest communes of the district. Conversely, the communes in the center or near district center, the Kinh ethnic group is more dominant. The average household size of this district is 5.3 people. In which, the average household size of Kinh group is 5.1, while Cotu group is 5.6 people.

In traditional society, the life of people belong and become fond of nature. Many traditional customs reflect concepts about universe, people, and society. They present strongly national characters. Due to differences on history, social development and culture, the ethnic groups in Vietnam have different habits and customs.

Beside common characteristics, the Kinh and Cotu ethnic group have different habits and customs. The Kinh is an ethnic group has a long-standing development history. The main religions are Buddhism, Confucianism, and Catholicism. In agricultural-related beliefs, the Kinh people worship sun god, monkey reproduction, and other personed gods. Those have a long-standing origin and they still exist until the present times. Within a year, the Kinh people have more festivals, and one of the biggest festivals is New Year festival. That festival starts first of January in every year. In these days, the Kinh people carry out the activities following a custom that presents clan god relationship, and social relationship in community. Beside folk creed and religion, the Kinh people still have other customs such as funeral, marriage, abstaining in family as well as in production, etc. These customs exist popularly in Kinh community at Huong Giang, Huong Phu, Huong Loc, Huong Hoa commune, and Khe Tre town in Nam Dong district.

In the areas where Cotu people are living, in the customs have particular characteristics. The Cotu people believe that around the world has so many gods include ferocious gods and good-natured gods, it is called Yang. Yang' rice is respected so much by Cotu people, followed by Yang' river, thunder, rain, storm, etc. Every year, they organize some periodic agricultural rituals to immolate for gods, praying welfare, having a bumper crop, and meet more favourable in living.

Huong Loc is a commune located in valley zone with a high percentage of kinh people (100%). For Huong Phu commune, there are a high percentage of Kinh people (95%), remains of 5% was population of Catu ethnic group. This commune represented for medium hill zone. Meanwhile, Thuong Quang commune has nearly even share of both ethnics, it is located in high hill zone. Table 5.3 showed the number of villages, population and households of the three communes.

Table 5.3 Villages, population, and households of study communes in 2003

No	Commune	No. of villages	Total		Allocate by ethnic				Average HHs size
					Kinh		Other ethnic		
			No. of households	No. of people	No. of households	No. of people	No. of households	No. of people	
1	Huong Phu	8	579	2,970	562	2,826	17	81	5.12
2	Huong Loc	3	399	2,302	399	2,302	-	-	5.76
3	Thuong Quang	7	291	1,628	126	742	165	886	5.59

Source: Huong Phu, Huong Loc, and Thuong Quang Commune Office, 2004.

The average of household size was different between three communes, in which Huong Loc is commune had high household size (5.76), followed by Thuong Quang (5.59), and Huong Phu commune (5.12).

5.1.2.2 Economic orientation

In some recent years, with marketing mechanism, the economic bases in Nam Dong district have already developed rather quickly and the rural economy has undergone rapid changes. The guidelines of economic development were to promote marketing, diversification of economic components, encouragement of farmers to get high income, and reduction of poverty.

At the same time with national and provincial development, in Nam Dong guidelines are being carried out about eliminating hunger and reducing poverty through connecting with economic development program such as the 327 program, employment solution program, credit for poor households, anti-illiterate program, etc. In general, eliminating hunger and reducing poverty in Nam Dong in some recent years already is yielding results. The number of poor households is reducing, there are stable settlements. Perennial industrial crops, improving miscellaneous gardens, high valued fruit trees, improving process of intensive cultivation, developing livestock are among emerging economic activities. In general, the economy of the households has new development turns, more abundant and diversified.

In Nam Dong district, in territerial plan also divided this district into three important zones with differences in present strategies that are presented as follows: The fist is high hill zone towards the upstream area of Ta Trach and Huu Trach river and bordering with Bach Ma natural park. These functions are to protect strictly upstream forest areas, to protect primitive forest areas, and to restore the forest. The second zone is concentrated on low mountain areas, and medium hill areas with purpose of building the protective forest areas combining with agriculture and forestry. The third zone is Khe Tre – Nam Dong valley zone, with functions are reforestation, developing agriculture and forestry, and services.

It can be seen that land is the initial factor and the most important one for economic development as well as giving wealth to farmers. It has profound impact in the areas that are not developed and still in self-sufficiency state as Nam Dong district. Thus, from soil characteristics, farmer households carried out improvement in cropping systems, and applying progressive rotation pattern in order to achieve more products in each specific land.

In valley zone: Beside patterns of garden-pond-livestock, the farmer households are concerned with intensive farming in paddy rice, with an average area of 1,000 m^2 to 2,000 m^2. The intensive farming of rice is not only for food but also to support livestock. However, due to the difficulty to control sources of irrigation water,

sometimes crop productivity depended more on climate. Beside rice cultivation, farmers can develop crops with high profit such as peanut, bean, and vegetable.

In medium hill and high hill zone: Farmers can grow milpas (field in the mountains), and miscellaneous garden under agroforestry pattern. Combining forest trees with fruit trees such as orange, citrus, mango, pineapple, etc. to achieve high income.

At the same time as cultivation and livestock, the households in Nam Dong have already engaged in traditional careers such as forger and handicraft. The markets of these products are those in the district, and in the neighboring districts. Beside the careers above, in Nam Dong district, there are also has some private processing plants. These provided advantages to agricultural production. They encouraged farmer households in expanding cultivation areas.

In brief, in some recent years, the economy of private households in Nam Dong has been improving. The structure of economy has been more diversified. The diversification is presented in the structure of crops, career, and other service activities. The income of farmer households is increasing (income per capita: VND 1.970 mil. in 1999; VND 2.895 mil. in 2003). The number of poor households has been evidently reduced (35% reduction in 1993 and 15% in 2003 (People Committee of Nam Dong District)). The livelihood is better than before. Most of households have accumulated wealth due to the diversification in the sources of income, the change in the composition of crops and livestock, as well as through the support provided by different projects. Therefore, from the production for self-sufficiency, the households followed gradual shift under commodity pattern to satisfy demand in the market.

5.1.3 Cropping systems

The commune surface of Huong Loc is 6,620 ha; Huong Phu extends on 7,948 ha and the commune surface of Thuong Quang on 15,630 ha which in total represent 46.42% of the district surface. The average agricultural surface per person is 0.043 ha in Huong Loc; 0.343 ha in Huong phu and 0.394 ha in Thuong Quang commune (2003). The agricultural surfaces on commune level have also increased since the last

few years. Table 5.4-5.6 showed the surface of different land uses, agricultural land use, as well as area of some crop types in the three communes.

Table 5.4 Land surface and land use of three study communes in 2003

No.	Commune	Total	Distribution		
			Agriculture	Forest	Fallow land
		----------ha----------			
	Whole district	65,051.8	4,019.38	41,799.31	18,757.05
1	Huong Phu	7,948	1,018.92	5,071.58	1,768.7
2	Huong Loc	6,620	99.09	5,313.7	1,167.72
3	Thuong Quang	15,630	642.63	10,251.6	4,700.84

Source: Nam Dong Statistical Office, 2004

Table 5.5 Agricultural land use in three study communes in 2003

No.	Commune	Total area	Agriculture land	Distribution					
				Perennial crop		Lands have surface water		Annual land	
		----------ha----------		---ha---	---%--	---ha---	---%---	---ha---	---%---
	Whole district	65,051.8	4,019.38	2,817.43	70.10	54.24	1.35	1,147.71	28.55
1	Huong Loc	6,620	99.09	60.24	60.79	2.00	2.02	36.85	37.19
2	Huong Phu	7,948	1,018.92	731.64	71.81	7.02	0.69	280.26	27.51
3	Thuong Quang	15,630	642.63	517.91	80.59	9.50	1.48	115.22	17.93

Source: Nam Dong Statistical Office, 2004

From Table 5.4 and Table 5.5, it showed clearly that there were big differences in the area of agricultural land of households between communes due to the topographical conditions and administrative boundaries. All of three Huong Loc, Huong Phu and Thuong Quang commune, agricultural land used for perennial crops is making up high percentage, 60.79%, 71.81%, and 80.59%, respectively. Followed by land for annual crops. While, the land for miscellaneous gardens especially land with water surface has the lowest area, it was only less than 2% in total land used for agricultural production (Table 5.5).

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, and other kinds of trees in their home gardens. The area of some crop types was showed clearly as Table 5.6.

Table 5.6 The area of some crop types in three study communes (2000-2003)

No.	Crop type	Crops	Crop area								
			Huong Loc			Huong Phu			Thuong Quang		
			2001	2002	2003	2001	2002	2003	2001	2002	2003
			----------ha----------								
1	Food crops	Paddy rice*	10.9	10.4	10.4	36	48.7	48.7	47	49	49
		Paddy rice**	10.9	10	10.4	36	48.7	45	46	48.5	49
		Seasonal rice***	0	0	0	1.6	1	0	15	3.4	5.0
		3 months rice***	0	0	0	0	0	1.7	0	0	0
		Maize	4	3	1	11.8	32.1	33.2	21.5	12.1	7.5
2	Tuber crops	Cassava	11	7.5	6.0	73	53	63.0	47	43.5	53.0
		Sweet potato	15	13.5	14.0	37	31	47.0	16.5	15.5	9.0
		Other potato	6	4.2	3.0	5.7	9.2	17.0	13.5	6	3.0
3	Food-stuff crops	Beans	2.0	1.2	1.0	27.5	20.2	10.5	70.0	15.5	25.4
		Vegetable	5.0	6.5	6.0	8.1	9.9	14.5	8.0	9.9	12.5
		Capsicum	3.0	4.5	3.0	8.0	10.2	12.3	3.0	1.1	1.0
4	Temporary industrial crops	Peanut	3.0	1.0	1.0	9.0	15.1	14.5	11.2	6.3	4.0
		Sugar-cane	5.5	17	17.4	2.5	5.7	4.5	2.0	1	0.5
		Tobacco	0	0	0	0	1.8	0	0	0	0

Source: Annual Report of Commune Office, 2002- 2004.

*Note: * Paddy rice is grown in winter-spring season; ** Paddy rice is grown in summer-autumn season; *** Upland rice*

5.1.4 Mode of production

Complex of geography, topographical conditions, and traditional cultivation has impacted on the existing cultivation systems. The agricultural cultivation pattern in Nam Dong district is relatively diversified. It consists of fields in the mountains, field, home garden, fishpond, livestock, agroforestry, etc. Here some major popular patterns in this district:

Field in the mountains: This pattern was rather popular in Nam Dong and was called milpa (field in the mountains). The milpas usually located in side of hills or in wild

land with low sloping level. They mainly located in high terrains (500-600 m a.m.s.l) or end of hill area adjoined with high zone. The mode of production is to remove all bushes and then to put in seeds of crops. These milpas planted crops that can suffer droughts and scarcity of water sources. At the same time, they were much dependence on nature such as upland rice, maize, cassava, green bean, etc. in either monoculture or mix crops or intercropping practices. Monoculture was major field practices and is applied for maize and cassava cultivation. They are concentrated in rather high areas, where it is difficult to irrigate and rather close to the villages. This pattern was easy to cause soil erosion if terraced cultivation were not applied. Today, in Nam Dong, this pattern remains however some soil conservation techniques were applied such as sloping land preparation, planting crops or trees to cover and fixing the soil, as well as planting protective forest alternately.

Fields in lowland: In Nam Dong district, rice fields were a popular cultivation pattern and are arranged in sunken land area and rather flat along alluvial ground of streams. This pattern was mainly applied by Kinh people, who immigrated from plain areas under the new economic settlement program. This was also applied a small part of ethnic minority groups (Cotu group). Land used for paddy rice cultivation usually was fertile soil and easy to cultivate. In Nam Dong district, there were only about 360 ha land for double cropping of paddy rice. Besides, in some areas the farmers applied one season of paddy rice and one season for another farm produce such as sweet potato, other potato, sesame, etc. In addition, there were some areas where farmers often concentrated on farm produce and planted food-stuff crops (vegetables, beans, capsicum). So field was both supplying food and supplying other type of food-stuff crops (vegetables, beans, capsicum). However, the process of cultivation on rice field land in Nam Dong still faced more difficulties. These fields were usually small and mixed in hills or mountain gorge, so it was difficult to mechanize. This was mainly cultivated by hand-made. The soil was not so fertile, and water was difficult to control. In addition, taking care and applying fertilizer were not popular therefore the productivity was not so high.

Home garden: Home garden is not only a mode of cultivation but also is feature for rural area of Vietnam. As Nam Dong is in mountainous areas, then home gardens are important and present a particular aspect. The gardens are usually arranged in places where there are more favourable conditions such as good soil, near water source to irrigate, and access to transportation network, suitable to build houses, yards, etc. However, the gardens in Nam Dong have particular characteristics different from those in the plain area. Garden areas were usually larger even greater than one ha. The gardens often consist of vegetables, and fruit trees. However, some gardens have industrial crops such as tea, coffee, pepper, etc. The garden usually provides daily vegetables, and other foods for family, while also supplies cash from selling the surplus products. Traditional gardens usually have many crop types but they are arranged improperly, so productivity was not high and the potential to generate income is low. They are called miscellaneous garden. Nowadays, all of 11 communes and towns in Nam Dong also have miscellaneous gardens and hill gardens. Some communes, the gardens were not yet schemed such as Huong Huu, Thuong Nhat, Thuong Quang commune. This was the case for ethnic minority households. Crops in gardens include essentially banana, jackfruit, pineapple, orange, citrus, etc. However, in some recent years, the district already had guidelines on transforming miscellaneous gardens into hill gardens, forest gardens with proper structure. Some crops were imported from other areas to plant in this area were mango, rambutan, sapodila, longan, etc. These initially grown well.

Fish pond: In the mountainous area, fish ponds were usually difficult to implement because of they easy to be destroyed by floods. However, in Nam Dong, there still existed some water surface areas in rivers, streams, lakes, and ponds that can serve aquaculture. The land area with water surface that can service fish ponds at present is about 54.2 ha. The popular types of fish were carp, bream, mud carp, anabas, etc. However, productivity was not so high. Fish farming was aimed to satisfy a part of food-stuff demand. Consequently, in favourable locations, ditches should be made with water flow automatically to build the water surface for fish ponds in order to get high profit. Besides, one needs to be concerned about the season effects, which can cause flooding and can destroy the ponds.

In fact, from the modes of production as mentioned above, in order to build good production patterns, one needs to combine cultivation types with component of crops and animal corresponding with each specific condition. In each zone, depending on concrete characteristics, there would be different production patterns. The high terrain zone can concentrate on economic forest and forest gardens combined with mountain fields and cattle grazing. If possible, it can be combined with some small ponds in which water would be supplied water from streams. There could be forest trees, perennial industrial crops, upland rice, as well as cows, buffalos, and goats. In the medium hill zone, forest with mountain field, as well as rice field – farm produce with upland rice could be emphasized. The main crop types would be fruit trees, industrial crops (tea, pepper, etc), and one season of paddy rice. At the same time, cultivation under terraced fields together with buffalos, cows, pigs, chicken, and fish would be possible. In the valley zone, there could be a focus on food production, as well as combination of the of chickens, ducks, fishes, etc. The gardens could be planted to more types of fruit trees (such as orange, citrus, banana, jackfruit, etc.), as well as vegetables. Fields would be mainly paddy rice and one season growing vegetables, beans, capsicums, and other temporary crops.

5.2 Potentials and constraints

5.2.1 Potentials

As a mountainous district, Nam Dong has similar characteristics in terms of natural and socio-economic conditions those for general mountainous zone. Beside the potential in natural conditions on the development of agricultural – forestry economy, Nam Dong still has strong force in cultivation of industrial crops and fruit trees. These ecological potentials are suitable for more crop types and animals that bear transitional characteristics property between the Northern and the Southern regions of Vietnam.

The potentials are diversified and present typical features for each micro-zone. In different zones, beside the typical natural conditions, the socio-economic activities also presented typical characteristics for that zone. Therefore, the research to build

good modes of production for each zone is important in both development of Nam Dong economy and guaranteeing potentials of production patterns.

5.2.1.1 Geographical and topographical potentials

The climate in Nam Dong is humid tropical with cold winter season. The annual average temperature is high (24.1^0C), and abundant annual total rainfall (almost 3,800 mm/year). In addition, the soil essentially is red yellow and well distributed throughout the territory. With thick soil layer the content of nutrient is rather abundant. These conditions were favourable to develop tropical agricultural base with fruit trees, industrial crops, and food crops with rather high productivity and approaching to self-sufficiency in food. The ecological potentials of soil in Nam Dong are presented in Table 5.7.

Table 5.7 Ecological potential of soil in Nam Dong district

No	Type of soil	Allocation	Characteristics	Suitable crops
1	Yellow red soil on Granite rock	Whole district	Soft texture with abundant potassium	Tea, tobacco, fruit trees, annual crops
2	Red yellow soil on Gabbros rock	Huong Phu	Abundant humus, poor on nitrogen and potassium	Rubber, fruit trees
3	Brown yellow soil on Diorite rock	Huong Son, Huong Giang Huong Huu	Thick soil layer (greater than 70 cm), abundant humus, poor on nitrogen and potassium	Rubber, pineapple, tea, bean
4	Red yellow soil on clay schist rock	Khe Tre, Thuong Long, Thuong Quang, Thuong Lo	Acid soil, medium nitrogen; poor on phosphate and potassium	Rubber, tea, pineapple, fruit trees
5	Gray on ancient alluvial land	Thuong Quang, Thuong Long	Sub-sandy soil, acid soil, medium humus; poor nitrogen	Rice and annual crops
6	Brown yellow soil on ancient alluvial land	Huong Huu, Thuong Long, Huong Phu	Good soil, gradual sloping terrain	Rice and fruit trees
7	Alluvial sloping soil	Hill area	Thick soil layer, soft texture, medium of nitrogen and phosphate; lowland	Paddy rice, annual crops, food-stuff crops
8	The alluvial soil on springs and stream	Springs, streams	Soft texture, medium fertilizer soil, medium water source	Paddy rice, annual crops, food crops
9	Red yellow humus soil (high mountain)	Medium mountain area (greater than 700 m)	Abundant humus, medium total nitrogen	Reforestation and protective forest recover

Source: Duy (1997) and PRA

Nam Dong has two seasons of paddy rice especially in Huong Giang, and Huong Hoa commune where some alluvial soil areas extend along both sides of a stream. Besides the spring-winter season and autumn-summer season, an additional season to farming after harvesting autumn-summer rice is also possible. For places along the streams, higher in terrain and difficult to irrigate during dry season, spring-winter rice and other crops in autumn-summer season or upland rice could be arranged. However, in order to gain high productivity then investment in irrigation would have to be considered.

Moreover, in the high terrain with a slope level from about 5% to 14%, upland rice or rice that can withstand dry conditions, combined with other annual crops like sweet potato, bean, maize, peanut could be arranged. As this area has thick soil layer, crops can develop deep root system to take up water from the soil. Hence, these can salvage the natural water source for the application of intensive cultivation. This type of terrain is mainly found in Thuong Long, Huong Huu, Huong Son, and Huong Phu commune with weathered soil from diorite-gabbros rock or sedimentary rocks.

In brown or alluvial soil and high terrain with a slope level about 9%, temporary industrial crops (such as sugar-cane, tobacco, peanut) together with fruit trees (such as orange, citrus, banana, longan, litchi, etc.) under hill garden pattern can be developed. These soil types are popular in Thuong Quang, Thuong Long, Thuong Nhat, Huong Phu, and Huong Son commune.

The climatic condition in Nam Dong is also suitable for many perennial industrial crops such as tea, coffee, especially rubber, and pepper. These crops usually grow well in the soils from diorite-gabbros rock or sedimentary rocks with medium slope level (less than 14%), and as well as with soil layer greater than 70 cm. However, to cultivate those crops there is a need to be concerned about specific features of each crop type. For example, tea can be grown in places that have high slope level and terrain is divided strongly. Rubber and cinnamon can be grown in high terrain but flat and has little division. Pepper and coffee should be grown in the low area where irrigation can be carried out easily.

With the hydrographic network development in Nam Dong district at present, an assessment on density of rivers and streams revealed that average density is 0.67-0.85 km/km^2 in land and 1-1.5 km/km^2 in mountain area. Theoretically, this is very favourable for agricultural irrigation. However, the actual scene in Nam Dong district is that the regulation of water flow was erratic between dry season and rainy season. Moreover, due to the effect of terrain as well as fragmented plant cover, there is an increasing differentiation between two seasons and also difficulties for production as well as living conditions of people. Consequently, to guarantee water sources there is a need to build water reservoir, protecting the forest in upstream area, and covering bare land through reforestation.

Besides, Nam Dong has some lakes (Katu Lake) and some irrigation dams have been built. These water source are also favourable for irrigation supporting the cultivation of different crops in the region. At the same time, it is advantageous for fresh water fish farming to improve farmer's living. Moreover, due to positive balance of water in a year, underground water amount was abundant in Nam Dong district. The underground water in the valley zone and medium hill zone were more abundant than the high hill zone. The most abundant is concentrated on low terrain zone that has alluvial material deposited every year. These proved as an advantage for paddy rice cultivation and feeding fish. In the ancient alluvial bases, the underground water is rather abundant with level of water fluctuating from 1 m to 20 m. This source of water also has been helpful for agricultural cultivation especially perennial industrial crops that have deep root.

5.2.1.2 Socio-economic aspect

In the areas where the Kinh ethnic group live, the residents have productive experiences of working as co-operatives. These were favourable conditions for applying progressive techniques into production to participate in promoting productivity of crops and animals. These patterns can be expanded to develop the economy of this study area.

Moreover, the Kinh people in life have more experiences in cultivation, especially in paddy rice and other fields such as livestock, small industrial, business, etc. In addition, the traditional customs like annual festival ceremony or agricultural ceremony are of considerable concern in this area. Those issues helped farmers to have better trust and relationships among themselves. At the same time, it created good environment for farmers in working to contribute towards increasing the productivity of labor. Besides, the farmers in each ethnic community always helped each other. Therefore, if we are to consider the production organization, then this was a favourable condition to carry out production in the district, especially crop production on small farms.

As compared with other ethnic groups in central of Vietnam, the Cotu community in Nam Dong is an ethnic group that settled in the area since a long time. Therefore, there have been changes in their mode of production such as from passive shifting cultivation that belonged to natural conditions into intensive farming, polyculture, and diversification of career. So the efficiency of resource use improved resulting into high productivity and higher returns. In addition, the traditional cultivation practices of the Cotu ethnic group were changed to better practices due to the effect of local policies, guidelines of the communist party and government, the authority of Kinh people and as well as the effort of Cotu people themselves. This situation also was a favourable condition for production organization in this region.

The custom of the Cotu community was to use compost with muck rather than using chemical fertilizers. This is a favourable characteristic for the combination of livestock and cultivation. In addition, the Cotu ethnic group usually lived as group, in which the leader of the village has important position in everyday living as well as in production. He has a strong influence in the decision to carry out most of the works. The ethnic group follow the advise of their leader and so it is often easier to disseminate new technologies and production methodologies through the leader.

It was noticed that processing industry could solve some employment problems as well as utilize commodities very quickly. However, the development of

present processing industries has been slow in Nam Dong district. This has affected the income as well as difficulties in the consumption of crude products. Meanwhile, some directions of development in this district are processing of cassava, fruits, tea, banana, wood, bamboo, rattan, and the goods of handicrafts. But to solve that issue, there is a need for proper transportation network to create circulation and exchange of commodities.

5.2.2 Constraints

The determination of crop production pattern to develop Nam Dong economy needs to be based on the basis of overall research. In that process, the natural factors and the people are in relation with each other. The people are an essential factor as well as are the center to control other factors. Accordingly, beside natural conditions, the economic and socio-culture activities also have great effects and relate closely to the development process in general, and the local production process in particular. Thus, beside the potentials that need to be developed in Nam Dong district, the socio-cultural dimension of people somewhat was a great constraint and caused obstacles in the process of production organization and economic development of this district.

Habits and production customs of people in Nam Dong district were of considerable issues. While the cultivation of paddy rice was popular in Kinh ethnic group, the cultivation of upland rice was popular among Cotu ethnic group. As the Cotu people were more dependent on the products from cultivation in mountain fields, there has been less development in terms of livestock rearing and small cottage industries. In addition, production was basically based on habit, experience, lack of organization, etc. Although, in terms of the natural conditions in Nam Dong district, there are more potential for the development of agricultural, forestry, processing, and development of industrial crops, etc., the reality is that there has been limited exploitation of natural strengths of the regions in production.

Today, in Nam Dong, shifting cultivation and nomadic life have decreased considerably. Almost all people have settled with permanent dwellings and proper fields for agriculture. However, production is still based on traditional practices,

especially in Cotu ethnic group. The essential mode of production is to attain self-sufficiency. The production followed old customs, relying on natural conditions. There have been less improvements in production practices and low adoption of new production technologies. Thus, crop and animal productivity were low. It could not satisfy demand of local livelihood as well as demand of local development.

Beside positive effects of tradition and customs, the farmers in Nam Dong still remained more traditional (Cotu people). For example, they rarely used fertilizers to take care of their crops. The animals were essentially used for sacrifices, and religious purposes. The animals were seldom utilized to serve production and often farmers would slaughter the animals before moving to a new place. In addition, they lacked initiatives in production organization. Such situations were more popular in the Cotu community.

In Nam Dong, some ethnic groups live together and each group has a separate residence area. At the same time, with difference on historical, cultural and religious background, the production practices also differed among the different ethnic groups. These differences are important in understanding and in the development of new production organization, the level of contact about new technologies, selection of crops and animals, etc. These group of farmers have very little or no co-operation or sharing of experiences among themselves in production perspectives. This issue has already caused difficulties in the process of production organization or difficulties in creating equal development for the whole district. Even in each commune, the exchange of productive experience was just spontaneous, individual, lack of organization and management of collective. Therefore efficiency was not high, and good experiences were not expanded in region.

Besides, as opposed collective, the factors mentioned above, the results of the survey also presents that the individual production model was popular in Nam Dong. This model somewhat reflected self-sufficiency production pattern and was a feature pattern for this area. This pattern was a neat organization, easy to carry out as well as to manage. It was suitable for small size production such as mountain field, home

garden, etc. But this system has its own disadvantages. This pattern was difficult to organize for a bigger size production that requires more participants or the complex productive processes that require high expert, high specialization as well as co-operation in productive process. In addition, Nam Dong is one district where the cultural standards of people are not so high. Especially, illiterate people made up high proportion in labor age (more than 1/3 of total labor). This situation has caused difficulties for human resource development. Efficiency of production organization was low. The application of new technologies into production to increase labor productivity was also difficult.

Moreover, the cultural standards of people in Nam Dong differed between different regions, especially in region of Cotu ethnic group. This issue also caused difficulties in organizing production. Production process in this region not only used propagation, reports, or conducting by theory but also required to have organization and conducting specifically and thoughtfully. This also have to use reality works and consequences that could attract the co-operation and participation of local people. These were some of the difficulties that had to be overcome in the process of building up production pattern and developing the economy of Nam Dong. In addition, the infrastructure that serves the community activities are still poor. The natural conditions are harsh posing difficulties in transportation. Such harsh conditions were also some of the factors that caused difficulties in production organization and in building up good production patterns.