

CHAPTER 3

CONTEXT OF NAM DONG DISTRICT

3.1 Geographical and topographical conditions

In central Vietnam, Nam Dong is mountainous district located in the Southwest of Thua Thien Hue Province. Domain has cubic shape with breadth from the East to the West is 39 km, and length from the North to the South is 27 km. The approximate co-ordinates of Nam Dong district extend from 15°59' to 16°11' North latitude and 107°27' to 107°53' East longitude (Duy, 1997). The administrative boundary map indicating geographical location of this district is shown in Figure 3.1.

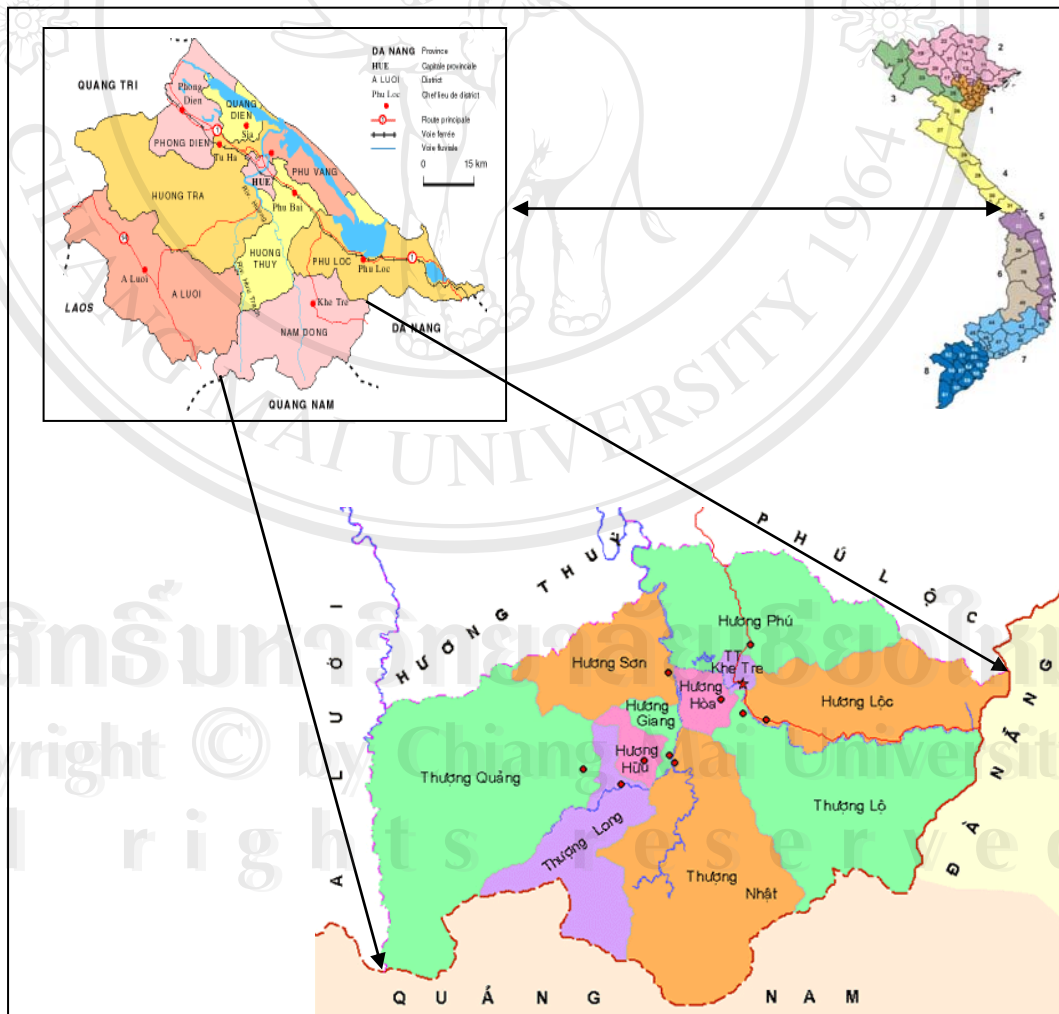


Figure 3.1 The map of Thua Thien Hue province and Nam Dong district

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

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, topography of the district can be divided into three sections: (1) mound zone mixed Khe Tre valley with basin shape stretch on the Southnorth direction, (2) low hill zone, and (3) medium hill zone. 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 minimum and maximum altitude is about 40 m a.m.s.l and 1,700 m a.m.s.l, respectively. The average altitude is 300 m a.m.s.l.

3.2 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 has formed into different soil types in Nam Dong district. The soil in Nam Dong is very abundant and diversified. It can be summarized in Table 3.1.

Table 3.1 Statistics on soil types in the Nam Dong district

Name of soil types	Area		Humus	N	P ₂ O ₅	K ₂ O
	---ha---	---%---				
Red yellow soil on magma acid rock	12.62	19.22	2.5	0.024	0.012	0.090
Yellow red soil on clay and faded rock	43.395	66.14	2.8	0.072	0.019	0.126
Brown yellow soil on ancient alluvial land	1.665	2.54	2.8	0.040	0.013	0.012
The alluvial soil on springs and stream	2.051	3.13	2.6	0.045	0.017	0.071
Red humus soil on magma rock	1.883	2.87	2.5	--	--	--

Source: Nam, 2003

Nam Dong is a mountainous district so soil is mainly yellow red soil. The red yellow soil occupies almost area of the district. Other soil types make up small area and distributing scattered.

There are five main soil types in Nam Dong district (Table 3.1). 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.

The red yellow soil in Nam Dong has more types. The feature of each type depended on rock type, terrain condition, altitude, as well as impacts of people. Generally, in Nam Dong, the terrain medium sloping with heavy rainfall, and it is also impacted by improper exploitation of people so the soil in hill zone was degraded. Most soil with thick of layer is 30-50 cm deep. Some areas are composed of gravel and stone and can not be used for agricultural production. The content of nutrient is poor. The content of humus fluctuates from 2.5% to 2.8%, nitrogen (N) is from 0.04% to 0.07%, phosphorous (P_2O_5) is around 0.2%, and the content of potassium (K_2O) is also low (Nam, 2003).

3.3 Climate characteristics

Locating in central Vietnam and in the North of Hai Van mountain pass so 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 (dry and hot) from April to September and Southeast wind in winter (wet and cold) from October to March.

The annual average temperature at Nam Dong valley is $24.6^{\circ}C$. Due to effect of higher terrain, the temperature is lower with higher elevation. In the west mountain, the average annual temperature reduces as $18-20^{\circ}C$. In the months of winter season

(from November to April), because of monsoon, the temperature decreases and it is almost 22.1 °C. In the months of summer season (from May to October) the annual average temperature is 27.3 °C (Annual report of Hydro Meteorological Station of Nam Dong). The Figure 3.2 indicated the monthly average during 1987 to 2003.

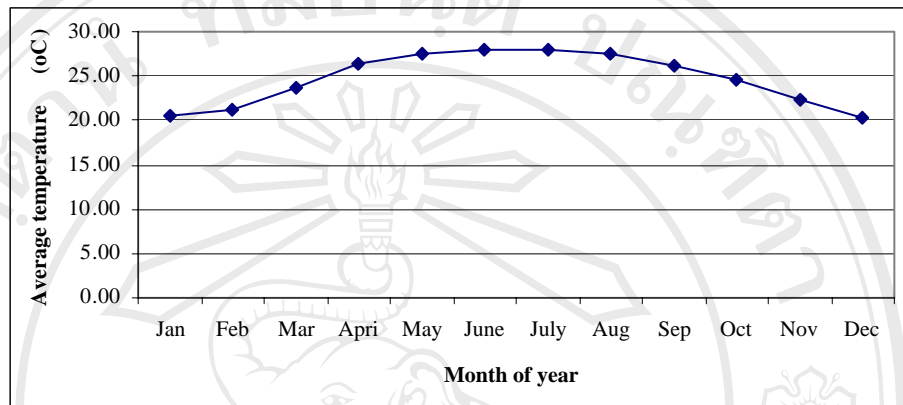


Figure 3.2 The monthly average temperature in Nam Dong district

Source: Annual report of Hydro Meteorological Station of Nam Dong

The lowest temperature is less than 10 °C. Meanwhile, the highest temperature is 39.7 °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.

Every year in Nam Dong, it gets high rainfall. The annual rainfall in Nam Dong is 3,823 mm (1987-2003). The monthly total rainfall is shown as Figure 3.3.

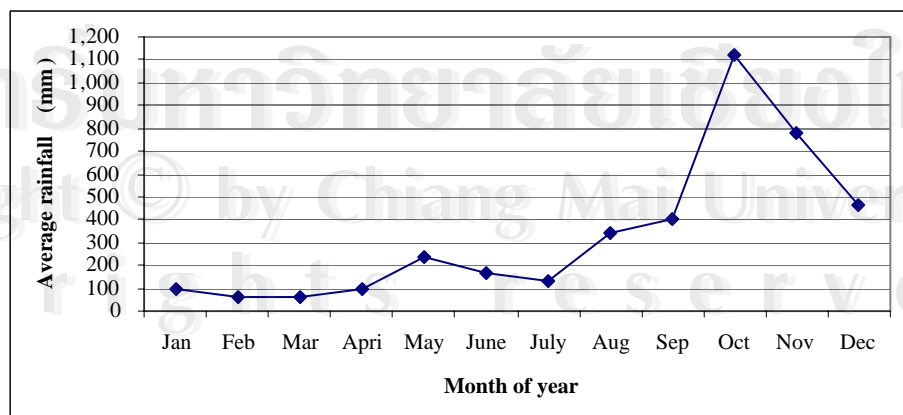


Figure 3.3 The monthly total rainfall in Nam Dong district

Source: Annual report of Hydro Meteorological Station of Nam Dong

The rainfall in Nam Dong has strong differentiation and diversification. 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.

3.4 Hydrographic conditions

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/km². 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.

3.5 Social conditions

3.5.1 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. Transportation roads connect all communes. 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 the moment, a lot of roads are presently under construction and old gravel roads are being transformed into asphalted roads, which can take the loads of trucks and reach the villages during the rainy season. There are two markets in the district. The most important market is the market that located in Khe Tre town. Next to this important trading center, there is a small market located in Huong Giang commune is called Nam Dong market. Nam Dong market is important for the communes, which are located in the Southwest of the district.

3.5.2 Demographic and labor

According to statistic of Nam Dong district, population in 2003 was 22,333 consisting of 4,195 families. There are two main ethnic groups in the district, Kinh and Cotu group. The population size and their distribution are shown as Table 3.2.

Table 3.2 Population and density distribution by commune

No.	Commune	Area ----km ² ----	Population		Density ---People/km ² ---	No. of village
			No. of households	No. of people		
	Total	650.518	4,195	22,333	34.33	66
1	Khe Tre	4.316	654	3,407	789.39	5
2	Huong Loc	66.20	399	2,302	34.77	3
3	Huong Hoa	11.09	441	2,154	194.23	4
4	Huong Phu	79.48	579	2,970	37.37	8
5	Thuong Lo	106.40	194	1,065	10.01	4
6	Huong Son	43.76	214	1,284	29.34	7
7	Thuong Nhat	114.10	340	1,764	15.46	7
8	Huong Giang	7.723	306	1,351	174.93	6
9	Huong Huu	9.899	396	2,286	230.93	7
10	Thuong Long	51.25	381	2,185	42.63	8
11	Thuong Quang	156.30	291	1,628	10.42	7

Source: Nam Dong Statistical Office, 2004

The population has difference in terms of distributing to communes. In the communes located in center of the district had more population such as Khe Tre town, Huong Loc, Huong Hoa, and Huong Phu commune. Because this area has more facilities as compared with other areas, especially, this is the biggest business center in Nam Dong district. Conversely, the less population presented rather evidently in Thuong Lo, Huong Son, Thuong Nhat, Huong Giang, and Thuong Quang commune. Their population was around 1,200 people. Hence, corresponding with total area caused critical level in density of each commune, it also has different particular features. The highest density was in Khe Tre town it reaches to 789.39 people/km², followed by Huong Huu, Huong Hoa, and Huong Giang commune with density was around 200 people/km². The commune has the lowest density was Thuong Lo commune (about 10 people/km²). The average household size in this district was 5.3 people with density was 34.33 people/km².

In 2003, available labor was 10,714 people distributed into 15 economic domains and occupying 48% of total population in the district. The majority of labor was in agriculture and forestry production (8,492 people or 79% total labor), followed by education (443 people), repair business (410 people), processing industry (381 people), etc. The lowest labor force was in culture and sport domain, they just occupied 0.1% of total labor (12 people). (Nam Dong Statistical Office, 2004)

3.6 Economic conditions

The economic situation of Nam Dong district in some recent years already has changed positive in all economic domains. Some fields have increased suddenly therefore leading to the economic growth of the district was over plan that is illustrated as Table 3.3 below.

From Table 3.3, the growth of total product of almost economic domains was increasing year by year. In 2003, the general growth was 10.2%, of which the Agriculture-Forestry-Aquaculture (AFA) domain was the highest growth as 12.7%, followed by Industry-Construction (IC) (11.1%). Finally, the lowest growth was Business-Service (BS) domain (6%).

Table 3.3 Growth of total product value by economic domain

Category	Year				
	1999	2000	2001	2002	2003
Total	6.8	8.6	7.5	8.2	10.2
1. Agriculture - Forestry - Aquaculture	1.3	5.7	4.9	6.9	12.7
- Agriculture	21.4	5.7	4.1	5.7	11.6
- Forestry	-37.5	2.7	7.4	10.3	18.8
- Aquaculture	-4.6	27.3	9.3	9.9	3.2
2. Industry - Construction	7.8	25.5	19.4	13.6	11.1
3. Business - Service	16.9	6.3	5.6	7.4	6.0

Source: Nam Dong Statistical Office, 2004

In recent years, a progress trend in economic development of Nam Dong district is observed. In 1999, total product in the district was VND 41,060 mil. (Table 3.4). The income per capita was VND 1,970 mil. (People Committee of Nam Dong District, 1999). Meanwhile, in 2003, the growth rate of economic development was 8.2% with total product value in the district was VND 63,937 mil. and the income per capita was VND 2,895 mil. (People Committee of Nam Dong District, 2003). However, based on estimations from the district office, although the average income per capita in Nam Dong is increasing but was still low as compared with income of national average, US\$ 185/year (VND 2,895 mil./year) and US\$ 438/year (VND 6,854 mil./year) (<http://www.planetretail.net>), respectively (2003). The agriculture and forestry was major domain contributed to this development compare with industry, service and other businesses.

In terms of structure of production value, the structure of economic continues transfer into such trend was Agriculture-Forestry-Aquaculture, followed by Industry-Construction, and Business-Service domain in sequence. Especially, in 2003, the Agriculture-Forestry-Aquaculture domain transfers faster than others. Those issues are illustrated in Table 3.4 and Figure 3.4.

Table 3.4 Total product value distributed by economic domain

Category	Year				
	1999	2000	2001	2002	2003
	mil.VND				
Total	41,060	44,839	51,420	56,883	63,937
1. Agriculture - Forestry - Aquaculture	20,392	21,533	23,240	25,685	29,898
1.1. Agriculture	15,594	16,471	17,093	19,031	21,828
1.2. Forestry	4,039	4,113	4,764	5,052	6,443
1.3. Aquaculture	759	949	1,383	1,602	1,627
2. Industry - Construction	6,125	7,717	10,464	12,094	13,753
3. Business - Service	14,543	15,589	17,716	19,104	20,286

Source: Nam Dong statistical Office, 2004

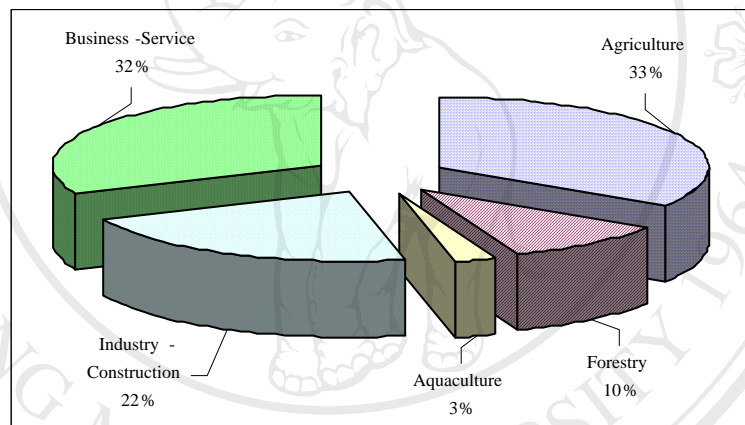


Figure 3.4 Percentage of contribution of economic domains in 2003

In general, the Agriculture-Forestry-Aquaculture domain made up high proportion (46%) compared with others, followed by Business-Service (32%) and Industry-Construction (22%) in sequence. The contribution of Agriculture-Forestry-Aquaculture domain was about 46% (2003) increased 1.6% compare with 2002. This increase was mainly due to forestry and cultivation. The total forest product was VND 6,443 mil., an increased of 27% from that in 2002. For cultivation domain, it occupied 75.4% in agricultural production more dominant than livestock domain (24.6%). The aquaculture domain just increased in moderation. Although, the Industry-Construction domain had rather high growth but the transfer of economic structure was not considerable because the additional value of this sector makes up of small rate in total product. In the Business-Service field, the increase just focused on sector that has

immaterial commodities (subsidized by the state). There was not gigantic change therefore led to contribution of this sector was more and more reduced.

3.7 Land use surfaces

The total area of Nam Dong district is 65,051.8 ha (Nam Dong Statistical Office, 2004). Of which, 64% of the area is covered by forest land. These forest areas especially protective forest areas in the upstream zone of Huong river are very important in the protection of ecological environment for this district. The land used for special purpose just occupied 0.59% but it has an important role in developing socio-economic infrastructures and cultural community. This area is increasingly expanded and improved. About 4,019.38 ha (6.18%) of land are used today for agricultural purpose with the majority of land area in permanent crops (2,710.1 ha or about 67.4% of total agricultural land). Besides the growth of replanted forest areas, the land for agricultural purpose has also increased during few recent years through the conversion of fallow land. The distribution of each land use type following changes during 2000 to 2003 is shown in Table 3.5.

Table 3.5 Area of agricultural, forest, and fallow land in Nam Dong district

Category	Year				-----%-----
	2000	2001	2002	2003	
	-----ha-----		-----ha-----		
Total	6,5051.8	6,5051.8	6,5051.8	6,5051.8	100
1 Agriculture land	3,224.7	3,193.9	3,454.5	4,019.4	6.18
- Annual crops	1,708.1	1,540.7	1,383.4	1,147.7	1.76
- Miscellaneous garden	105.7	101.5	103.6	106.4	0.16
- Perennial crops	1,364.2	1,504.4	1,919.4	2,710.1	4.17
- Lands have surface water	46.7	47.3	48.2	54.2	0.08
2. Forest land	41,850.7	41,935.8	41,955.6	41,779.3	64.22
3. Specific land	295.5	305.1	312.6	382.3	0.59
4. Residential land	77.9	83.4	88.5	93.8	0.14
5. Fallow land	19,370	19,532.6	19,240.6	18,757.1	28.83

Source: Nam Dong Statistical Office, 2004

A large area of Nam Dong was fallow land (28.83%), which is extensively used by farmers as swidden agricultural land and to collect products such as fertilizer or the broom making plant. Besides swidden fields, farmers have paddy fields for wet rice, cash crop fields that are planted with beans and pepper, fields with perennial crops, home gardens and fish ponds. Due to the topographical characteristics, the paddy rice production is important. The main agricultural system is cash crop fields, fields with perennial crops such as coffee, banana, and swidden fields that are planted with cassava or dry rice. The home gardens have quite small surface, but they are quite important for the household's economy due to their high diversity.

In Nam Dong district, agricultural land is vastly different among communes due to difference of geographical and topographical conditions. These differences are shown clearly as Figure 3.5 below.

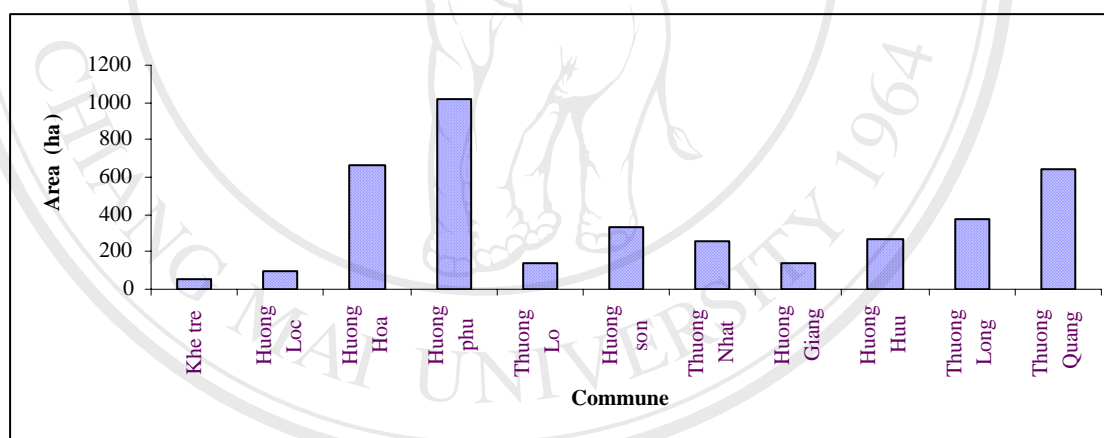


Figure 3.5 Agricultural land area distributed for each commune

Source: People Committee of Nam Dong District, 2004

From Figure 3.5 and Table 3.5, we can see that Huong Phu is a commune that has the biggest area of agricultural land (1,018.92 ha or about 25.4% of total agricultural land of the district), followed by Huong Hoa (668.6 ha) and Thuong Quang commune (642.63 ha). The smallest agricultural land area was Khe Tre town (58.61 ha or 1.5% of total agricultural land of the district). The remains of communes, agricultural land area was around from 100 ha to 300 ha.

3.8 Crop production systems

3.8.1 The change of cultivation pattern during the period of 1975-present

Before independence (1975), the mode of cultivation of Cotu ethnic group was cultivation at fields that located in the mountains with major crops were upland rice and maize. Besides rice, in the mountain field, farmers still intercropped rice with maize, peas, millets, etc. At the same time, in that period, farmers also considered some fruit trees such as jackfruit, banana, pineapple, etc. However, in the structure of crops, there are no perennial industrial crops yet. Although cultivation still follows shifting cultivation and nomadic mode but due to low population density, the level of forest destruction, and soil erosion was low.

After independence, the policy of state was to build new economic zones with in-migration so there were more Kinh ethnic group migrated from the plain districts has come to establish livelihood in Nam Dong district. This led to fast population increase. From end of 1980, the government already enacted policies that encouraged economic development of individual households. One of the economic models was the garden economy. The garden economy affected to process of development and transition of the economy. Thus, cultivation area of food crops in Nam Dong was in a decreasing trend. At the same time, a new cropping system is established being more diversified and complex as illustrated in the section below.

3.8.2 Cropping systems

Agriculture of Nam Dong is tropical agriculture. The ecological potential suits for crop types and animals that are transition between the North and the South zone of Vietnam. However, the agricultural production systems are still of self-sufficiency form. Crop cultivation occupied 75.4% in the total structure of production.

For a long time, in Nam Dong, there existed a diversified cropping system, consisting of food crops, temporary industrial crops, food-stuff crops, fruit trees, etc. The crop types had changed progressively due to the impact of socio-economic elements in different periods of time. The area of crop types is presented as Table 3.6.

Table 3.6 The cultivation area of each crop type in Nam Dong district in 2003

No.	Crop types	Area	
		-----ha-----	-----%-----
	Total	4,423	100
1	Annual crops	1,830	41.4
1.1	Food crops	929	21.0
	Rice	787	17.8
	Maize	142	3.2
1.2	Tuber crops	627	14.2
	Cassava	451	10.2
	Sweet potato	125	2.8
	Other potato	51	1.2
1.3	Food-stuff crops	190	4.3
	Vegetables	73	1.7
	Beans	97	2.2
	Capsicum	20	0.5
1.4	Temporary industry crops	84	1.9
	Peanut	35	0.8
	Sugar-cane	48	1.1
	Sesame	1	0.02
2	Perennial crops	2,593	58.6
	Perennial industry crops	2,053	46.4
	Fruit tree	483	10.9
	Other perennial crops	57	1.3

Source: Nam Dong Statistical Office, 2004

Figure 3.5 and Table 3.6 indicated that in Nam Dong district, agricultural land only occupies 6.8% of total land area in the district and is mostly distributed in Huong Hoa, Huong Phu and Thuong Quang commune. Perennial crop land occupied more than half of agricultural land area (about 58% of total agricultural land), therefore this is good in terms of the economic value and ability to protect the environment. Perennial crops consist of industrial crops occupied about 46% of total agricultural land area, fruit trees occupied 10.9%, while other perennial crops was very few (almost 1.3% of total agricultural land area). For annual crops, food crops consist of rice and maize which were dominant compared with others (929 ha or about 21% of total agricultural land). Following food crops were tuber crops and food-stuff crops with a proportion almost 14.2% and 4.3% respectively. Temporary industrial crops consist of peanut, sugar cane, sesame, and capsicum that occupied a minority of annual crop land (190 ha or about 2% of total agricultural land).

Moreover, the area of perennial crops increased year by year, at the same time always occupied the highest proportion as compared with others. Temporary industrial crops and other perennial crops made up of small area and did not change so much by time. Other crop types such as food crops, tuber crops, fruit trees, etc. also are present. They are shown specifically in Table 3.7 and Figure 3.6.

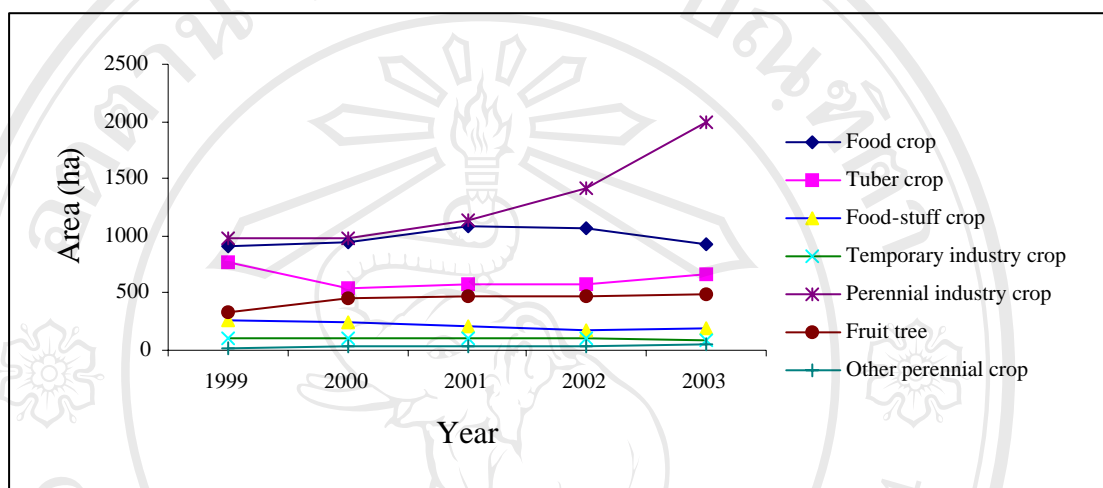


Figure 3.6 The trend crop types from 1999 to 2003 in Nam Dong district

Annual crop land: Since 1999, annual crop area slightly decreased from 2,050 ha to 1,830 ha in 2003. Paddy rice area was maintained as double rice crop, paddy rice area always in the priority area in local economic policy aiming to keep the local food security. Most of upper sloping area where farmers grew cassava about 140 ha in 1999 were changed into other crops (rubber) in 2003 because this land use type is low in efficiency, as well as easy to degradation of land quality (erosion). Field crops and industrial crops land were also reduced from about 110 ha in 1999 to 84 ha in 2003. The major crop was sugar cane with 48 ha (2003), this crop has cultivation area increased year by year (16 ha in 1999), and other two crops were peanut and sesame. The sesame area was very small it is almost 1 ha at present (Table 3.7).

Perennial crop land: Perennial crop land area increased significantly during 1999-2003. In 1999, the area was 979 ha but increased to 2,053 ha in 2003. Perennial crops land area occupied the highest proportion in agricultural land area (58.6% of total agricultural land). However, the rapid increase in perennial crops land has caused a pressure on the land, unbalancing distribution of crop production. Farmers focus on

increasing perennial crop land area, of which rubber is the major crop (about 1,800 ha in 2003). Other perennial crops are fruit trees, their areas also increased from 330 ha in 1999 to 443 ha in 2003. At the same time as the increase in area, farmers also changed some crops that had low economic potential (jackfruit) into other crops such as orange, rambutan, mango, longan, etc. with a hope of higher return.

Table 3.7 The past and current situation of crop area in Nam Dong district

No.	Crop types	Year				
		1999	2000	2001	2002	2003
		----- ha -----				
	Total	3,381	3,199	3,529	3,862	4,423
1	Annual crops	2,050	1,737	1,880	1,935	1,830
1.1	Food crops	912	941	1,082	1,063	929
	Rice	787	780	899	883	787
	Maize	125	161	183	180	142
1.2	Tuber crops	761	546	578	585	627
	Cassava	602	391	422	415	451
	Sweet potato	133	106	117	111	125
	Other potato	27	50	51	59	51
1.3	Food-stuff crops	267	250	212	177	190
	Vegetables	34	41	48	56	73
	Beans	224	188	151	103	97
	Capsicum	10	20	14	19	20
1.4	Temporary industry crops	110	105	104	111	84
	Peanut	90	83	77	69	35
	Sugar-cane	16	19	22	40	48
	Sesame	3	3	5	0	1
	Tobacco	2			2	-
2	Perennial crops	1,330	1,462	1,649	1,927	2,593
	Perennial industry crops	979	982	1,145	1,415	2,053
	Fruit trees	330	446	469	475	483
	Other perennial crops	22	34	35	37	57

Source: Nam Dong Statistical Office, 2004

In fact, agricultural land increases slightly, in which annual crop land decreases and transforms into perennial crops. Within the perennial crops, fruit tree and coffee area seem rather stable. Meanwhile, pepper, areca, especially rubber area are increasing. Conversely, tea and coconut area are decreasing significantly because of unstable market prices (Figure 3.6, Table 3.7).

3.8.3 Characterization of crop production

Food crops and tuber crops

Although the area under food crops had reduced in the recent years, food crops are still the major source of food for people and cattle. It has attracted most of labor and making up to almost 34.2% in value of cultivation. In food crops rice, maize, sweet potato, and cassava make up most of the cultivation area (Table 3.6 and Table 1A in Appendices).

The cultivation area of rice in Nam Dong includes paddy rice in valley zone that is located along streams, and upland rice in the mountain fields. The area decreased in recent years from 899 ha in 2001 to 787 ha in 2003. The yield ranged from 27 to 40 quil./ha. In Nam Dong, paddy rice was grown in two seasons. The winter-spring season normally had greater area than summer-autumn season, 356 ha and 344 ha, respectively (2003). The summer-autumn season often lacked water and therefore the yield was low, with an average of 33 quil./ha. The upland rice was grown in the hillsides, especially in upland communes. The ethnic minority group mainly pricked hole and put the seeds in it. The cultivation season starts from May and harvesting is done in July. The cultivation fully depends on natural conditions and thus the yield was generally lower (9 quil./ha) (Table 3.6; Table 1A-3A in Appendices).

Other important crops were maize, cassava, and sweet potato, of which cassava made up the highest area. They were planted in hillsides and home gardens. However, in recent years, the cassava area had reduced seriously due to low profit of cassava compared to other crops and the difficulty in consumption due to lack of processing technique. Cassava was essentially sliced and made as a feed for cattle. In 1999, the cassava area was 602 ha, but currently it is about 451 ha. The productivity varied from 81 to 87 quil./ha.

Maize was the second important in food crops in Nam Dong. However, the area decreased in recent years from 183 ha in 2001 to 142 ha in 2003. Maize was

grown in alluvial soil along streams where the altitude is low, with abundant humidity, and medium soil nutrient. In addition, the farmers already changed from extensive farming to intensive farming, leading to the higher yield of cassava, increasing continually from 18.5 quil./ha (1999) to 24.5 quil./ha (2003).

The cultivation area of sweet potato had also decreased slightly from 132.5 ha in 1999 to 125 ha in 2003. Previously, the farmers intercropped sweet potato with cassava to salvage land and solving the issue food shortage. At presently, the cassava was planted with some temporary industrial crops such as peanut, sesame, etc. The yield of sweet potato varied from 46 to 51 quil./ha.

Industrial crops

To take full of advantages of mountainous area on planting industrial crops since independence to present, the tropical industrial crops are planted in garden of family as well as in square area of Nam Dong district. At present, the industrial crops make up 20% in total value of cultivation (2003).

The temporary industrial crops such as tobacco, sugar cane, peanut, sesame, etc. have served as raw materials for the processing industries and created commodity products to increase the source of income for households. However, due to the constraints in market price, irrigation, and transportation of commodities the area of some temporary industrial crops is declining. The area of temporary industrial crops in 1999 was 110 ha but it declined to 84 ha in 2003.

The peanut area in Nam Dong was 90 ha in 1999 but only 35 ha in 2003. The average yield ranged from 12.5 to 14 quil./ha. The proportion of peanut area was about 41.6% in total area of temporary industrial crops in 2003.

Tobacco is a crop that is suitable to the natural condition of Nam Dong and gave high productivity. The average productivity during the period 1991 to 1994 was 7.2 to 8 quil./ha. At that time, tobacco was mainly planted in Huong Loc commune, which is the traditional area grown tobacco in Nam Dong. However, season of tobacco is often from January to March, which is also the period of drought, thereby

lead to low yield. This is the major reason as to why tobacco area had declined in this area. Right now, is hardly planted in any commune.

The sugar cane area has been increasing over the years from 16 ha in 1999 to 48 ha in 2003. The yield of sugar cane varied from 275 to 300 quil./ha. This area is a major supplier of major raw material for producing sugar at local commune. Other temporary industrial crops, like sesame area in Nam Dong made up a very small area and they are grown scattered in households with the purpose to meet the food security and food self-sufficiency of the households.

Earlier, the perennial industrial crops in Nam Dong were essentially coffee and tea. Tea was more dominant because the ecological condition in this district favored its growth and created high quality. The tea in Nam Dong were planted on hillsides with sloping level greater than 27%. Due to the difficulties in marketing and also shortage of markets and the low development of processing industry, it lead to a reduction in the total tea area. Considering the profit, cultivation of tea is considered the least efficient as compared to other perennial industrial crops. Other crops like orange, citrus, banana, pepper, etc. gave two or three times higher returns as compared to tea.

The rubber area in Nam Dong in recent years had increased. After 1993, congress of district communist party emphasized that district would increase area of rubber in all three forms: state, collective, and individual households. The change of this crop structure related with task of settlement gradually rejected the custom of shifting cultivation, in addition protecting the forest in upstream of Huong river, as well as building of intensive agricultural field. The communes of Huong Son, Huong Loc, Huong Phu, Thuong Nhat, and Nam Dong collective farm have natural conditions suitable for rubber plantation. The area of rubber already increased to 1,800 ha in 2003. Farmers intercropped upland rice and peas in the rubber fields. The area spreading from Huong Phu through Khe tre town to Thuong Quang commune lies in the plain areas and has basalt soil with high nutrient. In addition, Nam Dong experiences heavy rainfall distributed equally throughout the year, which is good for

increasing the rubber area in the future. So the area of perennial industrial crops when compared to temporary industrial crops is more dominant.

Food-stuff crops

The food-stuff crops made up almost 4.3% of total cultivation in 2003 and made up about 5% in total value of cultivation field. They included vegetables, peas, and some others. The trend in recent years show that the proportion of food-stuff crops area has not changed much even though the area under pea decreased from 224 ha in 1999 to 97 ha in 2003. Conversely, the area of vegetables is increasing year by year from 34 ha in 1999 to 73 ha in 2003.

Fruit trees

Orange, citrus, and banana are special fruit trees in Nam Dong. These crop types are planted in individual households under garden hills, and home gardens. In recent years, some fruit trees such as sapuche, rambutan, mango, longan, etc. have brought improvements in the miscellaneous gardens.

Orange was previously planted in Nam Dong collective farm but due to difficulties in transportation and preservation, and also low productivity, the area under it reduced to 86 ha in 2003 and is mainly grown in individual household gardens. Conversely, banana is planted popularly in home gardens, hill gardens and can be harvested almost year round. Banana already is a major source of high income for local people. Thus, the important issues to be addressed are the planning of fruit tree area, clear determination of type and structures of fruit trees as well as finding markets and processing companies for value addition. The policies relating to subsidy and the encouragement on the use of quality seed, material, technique, and capital also need to be addressed. Moreover, in the way of building the production pattern in Nam Dong, garden economic is a big revolution. The concern is more on the change on the structure of the crops and the adoption of high yielding modern varieties that are more efficient as compared to the traditional crops.