

CHAPTER III

CHARACTERISTICS OF THE STUDY AREA

3.1 Description of the study area

3.1.1 General Information and Characteristics of the Central Highlands region

The Central Highlands (Tay Nguyen) has been envisioned a few decades as new lands to be developed (Thao, 1997). Regarded as the roof of Vietnam, only lies in a group of plateau of marble bedrock with red soils, attaining average heights of 900 m above sea level. It includes some heights of over 2,000 meters, like Ngoclinh, (2,598 m), and Ngoc Phan (2,225 m).

As one of the seven-agroecological regions of the country, the Central Highlands has three provinces Gia Lai, Kontum, and Daklak. With a total area of 45,300 km², or 14.5 % of the whole country' area, the Central Highlands is considered as the second largest region and its area is equal to 4 times the area of the Red River Delta (Kim, 1996).

Daklak, with a total area of 19,800 km², is the largest province in Vietnam. Gia Lai is fourth with an area of 16,212 km² and Kontum, with an area of 9,334 km², is 9th. Daklak is bordered in the east by Khanh Hoa, in the south by Song Be, and in the west by Laos and Cambodia. (See the map on next page)

Despite its large area, the population of the Central Highlands was only about 3,062,000 in 1998, accounting for 4% of the country population and is the least populated of the seven agroecological regions. In 1998 the region had an

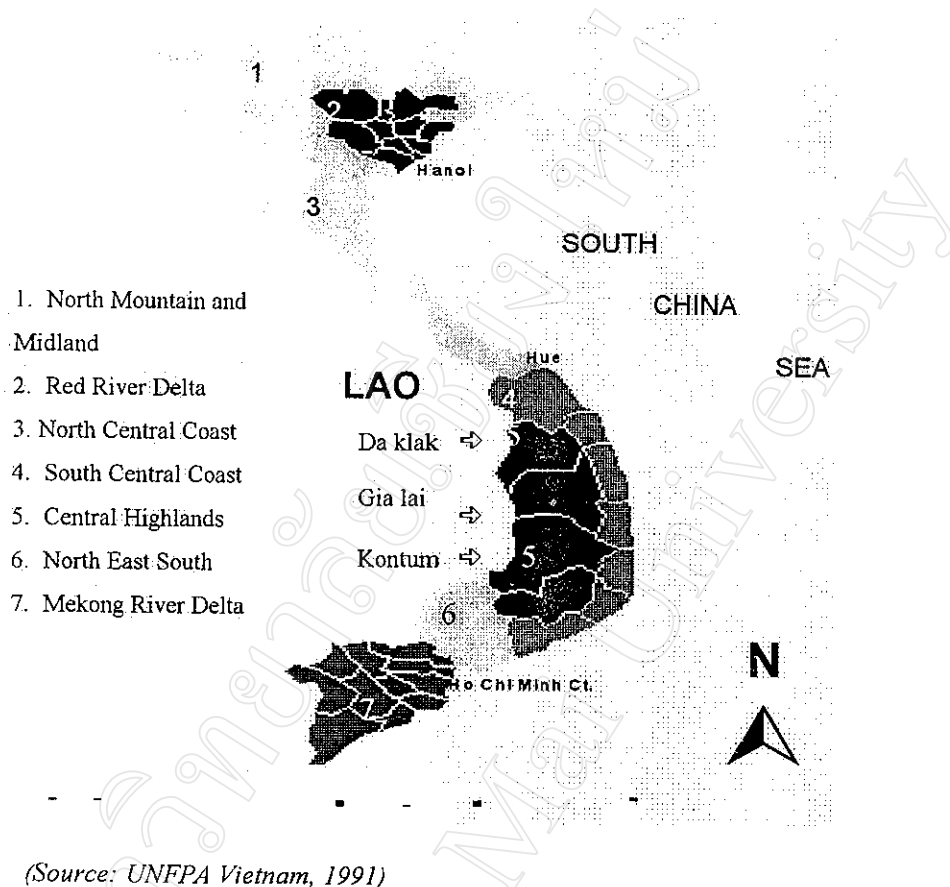


Figure 3.1 The map of seven agroecological regions in Vietnam

average population density of 67 per km² in comparison to 240 per km² in the whole country and 401 per km² in the Mekong River Delta (Statistical yearbook, 1999).

Daklak is the most populous province with a population of 1,655,000 accounting for nearly 2% of the country's population and with a population density of 83.5 per km² ranking it 22nd in population and 49th in population density among Vietnamese 61 provinces (Social-economic statistical data, 1999).

Daklak has over 700,000 hectares of rich red soil, 100,000 hectares of alluvial black soil, and tens of thousand hectares of natural grass meadows. This is related to the flat topography of the plateau, which is young, geologically and not much eroded which was probably formed in the Miocene period or a little later, approximately 1,000,000 years ago. The whole region has an average altitude of 500 meters, having a large, flat, and slightly undulated terrain. The average altitude of Daklak is lower than that of Gia Lai, so its average temperature is higher (about 24 °C changing varying to the season. The rainy season last 7 months, from May to November, and the dry season is from December to April (Thao, 1997).

North of Central Highlands includes Gia Lai and Kontum provinces. These two provinces were merged into one in a plan to establish large provinces, but after 1989 they were separated again. Gia Lai-Kontum combined had area of 26,146 km². The area of Gia Lai is nearly double that of Kontum, and its population is three times greater, its agricultural land (395,000 hectares) is also 3 times larger than that of Kontum (about 132,000 hectares), and the population is always concentrated in the plains. Kontum is surrounded in the north, west, and east by the aforesaid Ngoc Linh blocks with 1500-2000 m high peaks. The Kon Plong plateau in the northeast of Kontum is also cut up in to hill 50-60 m of height.

During the process of restructuring the economy and seeking comparative advantages for each economic region, particularly the capacity of the Central Highlands, has been increasingly developed and is becoming the biggest economic region of Vietnam (Table 3.1).

Table: 3.1 Selected social-economics characteristics of the Central Highlands (1998)

Items	Unit	Whole Country	Central Highlands	Gia Lai	Daklak	Kontum
Population	'000 persons	76,324	3,062	971.9	1,655	314
Population density	Person/km ²	230.0	67.0	60.0	83.5	33.7
Total area	'000 km ²	311.7	45.3	16.2	19.8	9.3
Agricultural area	'000 ha	7,348.4	681.9	181.9	392.3	107.7
	%	100	9.3	26.7	57.5	15.8
Coffee area	'000 ha	362.2	214.9	38.2	169.6	7.1
	%	100	59.3	17.8	78.9	3.3
Total coffee output	'000 tons	409.3	294.8	41.7	246.9	6.2
	%	100	72.0	14.1	83.7	2.2
Value of agricultural output	'000 bill VND	107.9	5.5	1.1	3.9	0.3

Note: Figures in italic are in percentage to the Central Highlands

Source: *Social-economic statistical data, 1999*

In Vietnam, rice cultivation is the most traditional farm trade, but it is not popular in the Central Highlands. The Central Highlands has favorable conditions for cultivation of annual industrial plants and food crops other than rice. Regarding animal husbandry, it is similar to the South Central Coast, with opportunities for the development of great animal.

Food production is not great in the Central Highlands. Most agricultural development in the Central Highlands is the cultivation of industrial plants especially in perennial such as coffee, rubber, pepper, cashew, and tea. According to Thao (1997) Daklak is in a strong position to ensure its prosperity. Presently no other place is more favorable for coffee to grow than there. For the whole territory, communications are still under developed. The major lines are Highway No14 from

west Hue-Da nang to Buon Ma Thuot city and Song be province, Highway No19 linking Pleiku (main town of Gia Lai) to Qui Nhon, Road No 7 from bifurcation Chu Xe on Road No 14 to Ayun Pa and Tuy Hoa province.

To develop the Central Highlands become one industrial plant area, which are specialized. It is needs to improved the living conditions of a great part of the people there and to solve a shortage of labour, particularly specialized labour force (Thao, 1997).

3.1.2 Coffee production in the study area

Coffee is a tropical and subtropical crop which grows well in the Central Highlands. Coffee represents one of most important crops in the Central Highlands's agricultural economy. Sometimes coffee had been cut down to cultivate rice when people had to be self-sufficient for food or when market prices fluctuated greatly, resulting in unstable conditions for coffee marketing.

Coffee production in the Central Highlands had an important role when the policy of Vietnam's 10th Central Committee Conference decided to transfer land and forests to farmers, and expansion of trade relations with foreign countries. Until now, farmers have a much larger area for coffee cultivation area than state farms. Coffee production in Central Highlands has increased rapidly in terms of area as well as output. In 1995 the Central Highlands had only 109,000 hectares under coffee and a yield of 160,000 tons but this amount reached 215,000 hectares and output of 295,000 tons in 1998. Thus, comparing the coffee area and coffee output in the Central Highlands between 1998 and 1995, the coffee area increased 197 % and the coffee output increased of 184 %. Now the coffee area and coffee output in

the Central Highlands (CHL) accounts for 59.3 % of the total coffee area and 72.0 % of the coffee output of the whole country (Table 3.2).

Table: 3.2 Coffee area and coffee output of the Central Highlands (CHL), 1995-1998.

Province	1995		1996		1997		1998	
	area 1000 (ha)	Output 1000 (tons)	area 1000 (ha)	output 1000 (tons)	area 1000 (ha)	output 1000 (tons)	area 1000 (ha)	output 1000 (tons)
Kontum	3.27	1.73	4.69	2.53	5.46	5.9	7.03	6.2
Gia Lai	18.6	8.4	22.8	14.5	30.6	33.7	38.3	41.7
Daklak	87.2	150.0	126.0	212.0	165.0	260.0	169.0	246.0
CHL	109.0	160.0	154.0	229.0	201.0	300.0	215.0	295.0
Country	186.0	219.0	254.0	317.0	340.0	420.0	362.0	409.0
%	58.5	73.2	60.7	72.3	59.0	71.3	59.3	72.0

Source: *Social-economic Statistical data, 1999.*

Having appropriate weather and good soil, the coffee yield in this area is noted as being the world's highest, reaching 1.8 to 2.0 tons per hectare while the world's average productivity is over 500 kg per hectare. Sometimes this yield is 4 tons per hectare in some places, like Easin, Ea Chucap, Tasao 1 in DakLak, and D'rao areas in Gia Lai (VINACAFE, 1999).

Despite its considerably large coffee area, Central Highlands coffee will develop more if further positive exploitation of the region's potentials and advantages is carried out. In addition, because of high yields, coffee gives more benefits than other crops, despite great fluctuations in world markets prices.

According to Kim (1996), in order to ensure a stable and effective coffee development, it is necessary to simultaneously solve two problems of seedlings and manufacturing. Almost all coffee farms grow robusta coffee, which offers high productivity but low quality and is satisfactory for only the East European market. It is necessary to give attention to biological and technical conditions to extend the area of arabica coffee. According to VINACAFE (1997) there are about 15,000 hectares of arabica coffee with a total output of less than 10,000 tons (approximately 2% of Vietnam's coffee production). Furthermore, it should strengthen the yield of coffee, and limit the export of robusta coffee beans in order to increase coffee export value for both producers and exporters.

In addition, the Central Highlands' weather and soil conditions are also very suitable for the planting of rubber and pepper. Rubber trees have been planted in this area for 88 years. The present rubber production area in this region is about 75,264 hectares, representing 20,8% of the total rubber production area of Vietnam. Peppers have also been rapidly developed in the Central Highlands. In 1985, the area under pepper cultivation in the region was only 45 hectares, representing 3.2% of the country's under-exploitation pepper area. The figures increased to 3,710 ha or 31.4% in 1998 (General Statistical Office, 1999).

3.2 Government Policies

3.2.1 Incentive policies in the agricultural sector

The development of any product can not be done without considering macro-economic issues such as national policies, and managerial skills as well as at micro levels like production conditions, knowledge, and experiences. To focus on coffee

processing systems would have to consider government strategies, which are seen as the keys of facilitating and support for the systems.

3.2.1.1 Land reform

The Vietnamese government has promulgated a law of land allocation which says that all land belongs to the state. The state hands over long term land use rights to farmers. The land user has the right to transfer, rent, inherent, and exchange land. Land reform laws have encouraged farmers to invest more in their land and increase the ability of land acquisition, to facilitate mechanization, and have more ability to do agricultural businesses. The law gives the length time for farmers to use the land, *i.e.* they can possess the land for 20 year if their land is categorized as annual crop land and for perennial crops the land holding time can extend to 50 years or even longer.

Realizing this, in 1988 along with market-oriented reforms in economy, the government began to reverse its policy with emphasis on the role of individual farmers. Cooperative land was assigned to farm households on the basis of the number of family members. Farmers were encouraged to invest and manage individually. Similarly, land in state farms was assigned to their workers. Private farmers and state farm workers became the real owner in agricultural production.

With this change, government intervention in agricultural production was reduced by eradicating the centrally planned system. The state farms were given greater autonomy in production decision making. Competition among producers has led to the improvement in marketing their crops.

3.2.1.2 Taxing policy

The law on land tax was passed on 1st January 1995. Farmers now pay land tax according to land classes and the tax is fixed for 10 years. This policy has encouraged farmers to invest in their land because they know the amount of tax they must pay.

After 1997 the Vietnamese government set up a new tax policy, the Value Added Tax (VAT). Through tax policies and price support, the Vietnamese government has encouraged exporting activities on all economic aspects of coffee products. With the VAT system, exporters do not have to pay export taxes for exported coffee. The exporters can also receive refunds of value added tax on its input. This is a great benefit for all exporters in this sector.

The Government supports exporting companies which try to penetrate new markets by diplomatic relations, providing necessary information about the markets, and create good information networks so that this information is updated and accurate.

3.2.1.3 Investment policies

The Vietnamese government has invested in upgrading and constructing irrigation, electricity, and mechanization systems. Farmers have to pay an irrigation tax which was lower than its originally was. The government also has a policy for lending money to farmers. Agricultural producing and business households who need capital and are able to fulfill bank requirements will be loaned money from banks with interest rates lower than in other sectors.

3.2.1.4 Marketing Policies

The role of the government in the agricultural products market was very much different in the past. After the liberalization of the agricultural marketing system in 1990, the government now only participates, not monopolizes in the purchasing or storage of strategically important agricultural products such as rice and cotton. In the new liberalized marketing system, the government has adopted a number of measures to promote marketing of agricultural products in order to obtain a reconciliation of the interests of the city consumers and rural producers. These measures include A) Improving physical marketing facilities. Sheltered wholesale and retail markets were built in major production areas and market centers were also improved. The financial sources of market construction were mainly from commercial companies, but heavily subsidized by the government by both direct subsidies in construction costs and reduction of taxes for the operation of markets specifically for agricultural products. B) Reducing marketing costs. Farmers who sell their own products are almost free from tax. C) The government also pays close attention to maintain price stability in markets. The government also changed its attitude towards private, long distance traders. Their role in promoting local production is allowed and their trading activities encouraged and protected.

In addition, changes in prices, wages, and banking with liberalization of trade since 1985 are resulting in a restyling of production and consumption in the whole country. The structure of agricultural management institutions in Vietnam has changed dramatically in the last decade. These institutional changes were regarded as the main factors for establishment of the open market for agricultural inputs and outputs. The government's policies and strategies have been positively affecting the development of the coffee industry in Vietnam.

3.2.2 Policies and strategies related to the development of the Central Highlands

The Central Highlands with its large potential for development, has been considered as a main industrial plantation crop zone in Vietnam. In recent years the Vietnamese government has proposed some priority policies for developing industrial plantation zones which have full development potential. The Central Highlands is marked as a key region on national planning for socio-economic development strategies in the 21st century of Vietnam. Under the government's support, the social-economic development strategy of the Central Highlands is manifest with a series of investment projects. Much attention is given to key sectors as:

1. Enlarging specialized farming for industrial crop plants, develop large livestock husbandry, which will be the foundation to formulate more agro-forestry manufacturing establishments.
2. Exploit hydro-electric potential, constructing small and large power plants to supply electricity not only to the Central Highlands, and also other.
3. Building infrastructures with priority given to the establishment of communication, transportation, and electricity supply networks.
4. Giving much attention to hill tribe people's life and encourage agricultural and forestry development in Central Highlands by stopping free migration to Central Highlands from other regions which is ruining the land. Now in Vietnam, hill tribe people have equal rights like other Vietnamese and they often receives much support from the Vietnamese government with money, lower credit interest, extension services, and priorities in education.

Investments of \$ USD 200 millions have also been made for coffee manufacturing and cultivation projects. Several projects have been established in Daklak for new cultivation of 10,000 hectares, developing a processing establishment with a capacity of 5,000 tons per year, and expanding the scale of Daklak's coffee cultivation to 1,200 tons per year. State budgets have also been used for hydrology irrigation development in the Central Highlands in order to support intensive farming of all industrial plants (Kim, 1996).

The Vietnamese government has just formulated a new credit policy which is to help coffee farms, processing firms, and exporters who borrow money for storing coffee in case world coffee prices are low. This policy will help people in the coffee industry to avoid losing their profits when world coffee prices are very low.

3.3 Background on the firms interviewed

3.3.1 Distribution of coffee processing firms surveyed

The 45 coffee firms included 13 firms from Gia Lai and 32 from Daklak, were randomly sampled for the study. They are all state firms. The distribution of the coffee processing firms surveyed is shown in Table 3.3.

Table 3.3 shows that the number of wet, dried, and mixed processing firms surveyed were 20%, 60%, and 20%, respectively. On the total sample, there are 13 firms (28.8%) from Gia Lai and 32 firms (71.2%) from Daklak provinces.

Daklak has 78% of the area and 83.7% of the coffee output of the Central Highlands region, while Gia Lai only has 26.7% of the area and 14.1% of the coffee output of the whole region. Thus, choosing 71.2% and 28.8% of the coffee

processing firms in Daklak and Gia Lai for the survey is reasonable. Because sampling was small and there was no clear difference in coffee processing in these provinces, the firms surveyed were grouped into three groups for analysis.

Table 3.3 Number and percentage of coffee processing firms surveyed classified by technology used and location in the CHL, 1998.

Items	total		wet		dried		mixed	
	No	(%)	No	(%)	No	(%)	No	(%)
Whole region	45 (100)	100	9	20	27	60	9	20
Gia Lai	13 (28.8)	28.8	3	33.3*	7	25.9	3	33.3
Daklak	32 (71.2)	71.2	6	66.6	20	70.1	6	66.6

Note: * denotes % to the total of sample

3.3.2 Time of establishment and technological innovations of the coffee processing firms surveyed

Although many state coffee plantations were established since 1976, but on the average coffee processing firms have 13-14 years of processing experience (see Table 3.4). This means that most processing firms surveyed were established in 1984. In the 1980s, coffee production was much improved in terms of planting area, but post-harvest processing technology was regarded as a minor factor because the central planned mechanism for the whole economy only focused on the volume of coffee produced. With support from the former Democratic Republic of Germany, some Vietnamese coffee processing firms used machines from there for coffee processing. These were machines for husking, classifying, and polishing coffee beans. Most of these machines became too old, so the rate of broken coffee beans was very high and quality was low. At that time, all companies did not care about

the quality of coffee because most of the coffee was consumed in the former socialist countries where the demand was usually higher than the supply.

Table 3.4 Average years of establishment and technological change of the firms surveyed, CHL, Vietnam, 1998.

	average	wet	dried	mixed
Average years of experience	14	14	14	13
Average years of technological change	4	3	5	5

Coffee processing technology changed after the Vietnamese economy changed to an open economy. Since the collapse of the Socialist system, the Vietnamese coffee industry lost all of its traditional markets. Vietnamese companies had to seek new markets for their products. To enter the world market, Vietnamese companies had to deal with high competition, but they have steadily their own image. To succeed in new markets, the quality of coffee has been seriously considered by these companies as being very important factor to be achieved. Every coffee processing firm had to change their processing technology, but the survey data shows that, on the average, coffee processing firms changed their technology or expanded their factory 3-5 years or around in 1994. The time for technological change was 5 years in dried and mixed processing firms and only 3 years in wet processing firms from 1998. These changes affected the economic efficiency of different coffee processing firms.

3.3.3 Size of the coffee processing firms surveyed

Generally, given the same input, different firms may produce different outputs according to their labor force, knowledge, and production methods.

Table 3.5: Average size of factors indicating size of the coffee processing firms surveyed, CHL, Vietnam, 1998.

Items	Unit	average	wet	dried	mixed
Average number of laborer	Persons/firm	41.8	54.7	36.5	44.9
Managerial laborers	Persons/firm	3.3	3.0	3.4	3.4
Workers	Persons/firm	38.5	51.7	33.1	41.4
Total capital	Mill. VND	6,634	7,668	6,095	7,216
Fixed capital	Mill. VND	4,625	5,796	3,869	5,722
Working capital	Mill VND	2,009	1,873	2,226	1,495
Processed coffee	ton green beans	2,138	3,442	1,825	1,772

The coffee processing firms surveyed are classified as small and medium sized. Table 3.5 shows that, on the average, the coffee processing firm had 41.8 labourers and a total capital of 6,634 millions VND. The number of labourers and amount of capital decreased from wet to mixed and finally dried firms. The average size of wet processing firms was the largest and had a labour force of 54.7 persons and a total capital of 7,668 million VND in 1998.

Wet processing firms use more direct labor (51.7 people) than mixed and dry processing firms (41.4 and 33.1 people) do, respectively. Table 3.5 also shows that the amount of processed coffee of wet processing firms was nearly two times larger than that of the other two firms. This is because most all of wet processing firms

equipped with modern instruments and processing machinery, and had higher processing capacity, which in turn, requires more labourers to work under strict time schedules.

Unlike wet processing firms, the size of dried processing firms is smaller. Most of these firms were established in 1970s, while their machines were simple and now obsolete. This is why dried processing firms had lower depreciation costs compared with that in other groups.

3.3.4 Processing machines of the coffee processing firms

It is difficult to precisely describe the coffee processing equipment and machines systems of coffee processing firms. Generally, according to VINACAFE (1997), the present coffee processing machine systems can be divided into three groups. They are: primary coffee processing machines which are small and manually operated, primary coffee processing machines imported from foreign countries; primary coffee processing machines produced in Vietnam.

The first group included some machines which were produced in Vietnam by copying foreign machines. These machines have a small capacity of around 30 to 1000 kg/h and are used mainly in coffee processing on farms.

The second group consists of two small groups: (a) machines which were imported before 1975. Most of them were made in the 1960's so these machines are now too old and mostly out of order and (b) coffee processing machines which have been imported in recent years including some dried processing ones. These were imported from Germany and England with a capacity of 2,000 tons to 5,000 tons per year and are present in VIETDUC and VINACOFEXIM companies. In general,

these machines are modern in technology and high in quality, but still these companies have not attained their full capacity yet.

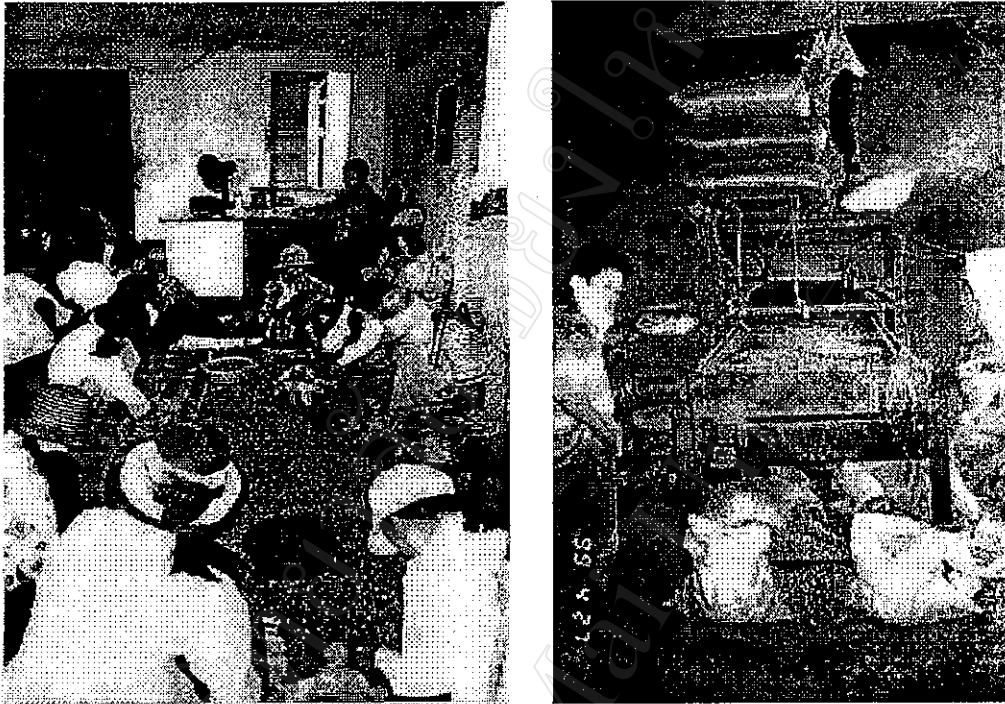


Figure 3.1. Grading coffee green beans by hand (left) and simple local machine (right)

The third group includes machines, which were produced in Vietnam copied from a Germany's Hansa or Braxin models for dried and wet processing methods. The dried processing machines have capacity of 800-1.500 kg/h. The wet processing machines, which were copied from Raøeng, have a capacity of 750-3000 kg/h and can process, classify, polish, and package in a semi-automated and full automated system.

According to Niem (2000) there are two leading coffee processing companies, namely VIETDUC and DAKMAN. Before 1998, VIETDUC used a system of coffee processing provided by the former East Germany which were old, had low capacity, high power consumption, and low quality coffee output. In 1998, the company purchased a processing plant from PINHALENSE of Brazil to upgrade its processing capability. This is the newest generation of automatic coffee processing systems. In this plant, coffee is processed, classified, polished, and packaged in a semi-automated system.

The DAKMAN Company processing plant is ranked as having the highest capacity. Its annual capacity is about 30,000 tons. It has a full-automated system for coffee processing in both wet and dried methods. There was only the DAKMAN company that built the processing plant with modern machines and equipments. Whilst, most of the Vietnamese coffee processing firms were sized with small processing plants. So DAKMAN was considered as a leading company in terms of advanced technology and scale of processing (Table 3.6). All machines and equipment in this company were imported from E.D.& F. Mann, a company originated in England.

In summary, coffee processing machinery systems in the Central Highlands of Vietnam are diverse. The processing machinery system in wet processing firms is better than that in mixed and dried processing firms. Every group of firms need drying yard for drying coffee but most of them lacked yards for drying coffee, especially in the peak season. According to VINACAFE (1997) within the VINACAFE Company there was only 1 ha of yard corresponding to 217 ha of harvested coffee, so that one ha of harvested coffee had only 0.0046 ha of yard for drying. This is one of the main factors affected the quality of processed coffee in Vietnam.

Table 3.6. Machines and Equipment at DAKMAN company

Item	Specifications
Wet processing System	
hulling capacity	4-5 m ³ per hour
Machines	
Remove leaves and sticks	Full automation
Remove stones and heavy objects	
Green and ripe separator	
Floater processor	
Pulper-shaker without water technology	
Rubber Bib Pulper (ripe and repass)	
Iron Bib Pulper (green and hard bean)	
Mucilage Remover (vertical with water)	
Dryer system: "Guardiola" rotary dryers (Costa Rica model), 16 divisions	20 tons a day
Capacity	-Vertical dryer with high air
Wood/ gas heating	volume to dry down 20%.
Double heat exchanger	
Hulling/Peeling and Grading	8 tons per hour
Vibratory Parchment Pre-cleaners and Sizers	
Densimetric Classifier (Oliver type)	
Size Classifiers (Vibratory and Cylindrical)	
Polisher	Semi-automation
Mixers (Any size)	
Manual sorting	
Pneumatic Catador (Suction and Impulse)	
Packaging machine	

3.3.5 Education level of labourers

The education level of laborers in the coffee processing firms surveyed is shown in Table 3.7. The data shows that, on average, the numbers of people who have completed undergraduate, secondary school, and primary school (compared with the firm's total numbers of laborers) were 3.6 %, 8.6% and 87.5%, respectively. Approximately 88% of the laborers in coffee processing firms have low levels of education (lower than secondary school). Since all worker were not equip with machinery and equipment so productivity is normally low. The education level of laborers in wet processing firms was highest compared with that in other firms. Undergraduate and secondary school laborers in wet processing firms were 4.6% and 10.1%, respectively while this were only 3.1% and 7.8% in mixed processing firms. About 5.5 % of the total labor force were reported being trained in 1998. This rate was highest in wet processing firms (6.6 %) and lowest in dried ones (4%). This is true because in resent years wet processing firms have renewed their machines which requires more and new technological skills and managerial expertise than in dried processing firms.

Table 3.7. Average percentage of labourers of processing firms surveyed classified by education levels, CHL, 1998

Items	Unit	Average	Wet	Dried	Mixed
Average number of laborers	Persons/firm	41.8	54.7	36.5	44.9
Undergraduate	(%)	3.6	4.6	3.8	3.1
Secondary school	(%)	8.6	10.1	8.5	7.8
Primary school	(%)	87.8	85.4	87.7	89.1
Trained laborers / total	(%)	5.5	6.6	4.0	4.75

3.4 Summary

The government's policy is a main factor that can significantly influence all sectors of the economy positively and negatively. The land reform and open-market policies of the government had the main positive effect on the development of Vietnamese coffee industry.

On the average, each processing firm had 41 laborers and a total capital of 6,634 VND million. Most laborers (87.8%) finish at primary school.

Although, there have been some changes in coffee processing machine systems in this area, these machines are still small, and old. Modern machines and synchronization are lacking and most of the firms lacked of drying yards. These factors cause negative effects on the quality of processed coffee and the economic efficiency of coffee processing firms.