

VIETNAM

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Introduction

Vietnam covers an area of about 333 thousand km² and extends for some 1600 km from 23°08'N to 6°50'N. Three-quarters of the land area comprise hills and mountains. The population of the country in 1994 was 72.5 million with about 80% residing in rural areas. Average population density is 218 persons per km². Between 1980 and 1990, the population's annual growth rate was 2.3%. The annual per capita income in 1994 was US\$213 (General Statistical Office 1995).

Although the country lies almost entirely within the tropics, the climate varies from humid tropical in the southern lowlands to temperate in the northern highlands. The average annual temperature at sea level is about 27°C in the south, falling steadily northward to about 21°C in the extreme north. Most of the country receives about 2000 mm of rainfall every year, but the mountains of the narrow central region are considerably more humid, with an annual rainfall of up to 3000 mm. The southeast part of central Vietnam is very dry, having an annual rainfall of only 800 mm.

The road system is relatively poor, the whole country has about 87,000 km of all-weather, four-wheel vehicle road. In general, most of these roads are national and provincial roads. District and village roads are in poorer condition. The vegetable marketing institutions are not developed yet as the economy is moving from a centrally controlled economy toward a market oriented economy.

The Vietnamese diet is heavily dominated by rice, which accounts for 56.7% of the total daily per capita food consumption. With a share of 24%, vegetables make up the next important food in the diet, while fruits claim a share of only 0.3%. Other cereals and tubers contribute 5.8%, livestock products and seafood 7.5%, and other food items, such as sugar, beans, sauce, etc., 5.7% (National Institute of Nutrition Research 1992).

Rice is the most important crop in the country, occupying about 66% of the total cropped area. Other important crops are industrial crops (rubber, coffee, sugarcane, and soybean), maize, sweet potato, cassava, and fruits. Vegetables are grown on 325,000 ha, contributing about 3.5% of the total cropped area.

Total production of vegetables in Vietnam in 1996 was recorded at over 4.07 million t valued at about 900 billion Vietnam dong (US\$ 200 million). With an estimated population of 73.5 million in

1996, annual per capita vegetable availability was about 55 kg. The most important vegetables in the southern lowlands are cabbage, tomato, fruit vegetables, such as beans and cucurbits, leafy vegetables, such as lettuce, mustard, amaranth and garland chrysanthemum, and root vegetables, such as radish, yam, and taro. In the central highlands and in the northern regions, the cool winter is suitable for many temperate vegetables, such as cauliflower, kohlrabi, Chinese cabbage, and Irish potato.

Agroecological Regions

With the diversified environmental and socioeconomic conditions, vegetable production and consumption patterns vary across ecoregions of the country. The seven relatively distinct ecoregions in Vietnam include the North Mountain and Midland, Red River Delta, North Central Coast, South Central Coast, Central Highlands, Eastern Mekong Delta, and Mekong Delta.

North Mountain and Midlands

This region occupies arable area of 1.3 million ha, or 17.6% of the total land area of 7.3 million ha (Table 1). About 22% of the area is forest land. Arable land which is of degraded gray soil accounts for 12.4%. This region is influenced both by the tropical monsoon and northeastern winds, giving this region climatic characteristics distinct from the rest of the country. There are four seasons: winter (cold), summer (very warm), and spring and autumn (between the two extremes). Average total annual rainfall is about 2400 mm, concentrating during July-August. The population of this region is composed of many ethnic minorities, distributed throughout, with a density of about 120 people/km².

Table 1. Basic demographic and agriculture statistics of various regions in Vietnam in 1994

Region	Population density (person per km ²)	Arable land		Vegetable area		Vegetable production	
		000 ha	% share	000 ha	% share	000 t	% share
North Mountain and Midland	120	1293.1	17.6	56.1	19.1	607.0	17.4
Red River Delta	1124	721.3	9.8	70.9	24.2	1056.1	30.3
North Central Coast	190	693.0	9.4	42.6	14.5	326.6	9.4
South Central Coast	167	533.2	7.3	33.6	11.5	206.3	5.9
Central Highlands	53	572.7	7.8	9.8	3.3	149.7	4.3
Eastern Mekong Delta	378	937.3	12.8	28.9	9.9	451.0	12.9
Mekong Delta	400	2597.8	35.3	51.4	17.5	688.2	19.7
Vietnam	218	7348.4	100.0	293.3	100.0	3484.9	100.0

Source: Department of Agricultural Statistics (1995).

About one fifth of the country's vegetable area is in this region. A narrow selection of vegetables is grown. Major species include convolvulaceae (*Ipomoea aquatica*, *Ipomoea reptans*), field cabbage (*Brassica capitata*), cucurbits, and root vegetables (radish, taro, cocoyam, etc.). Kangkong (*Ipomoea aquatica*) is the most widely grown vegetable species, accounting for nearly one-third of the total planted vegetable area in the region.

Red River Delta

The Red River Delta covers 0.7 million ha, mainly lowlands with degraded riparian alluvium soil. The land holdings in the delta are the smallest in the country, and the region has the highest population density (Table 1). The region's Thai Binh province is the nation's most densely populated. Pressure on cultivated land is greatest as there are only 512 m² of arable land per person, or 2397 m² per agricultural laborer in this region. This region has unique potential, unequaled by other regions: it has excellent conditions for high-value vegetable crop production on a large scale during the cool months, and for high-value fruit production, such as lychee, small-seed longan, and jujube. This region accounts for about one-fourth of the vegetable area in Vietnam.

North Central Coast

This region is characterized by partly denuded and moderately eroded hills and mountains and sand bars along the coast. Population density is 190 people/km² (Table 1), concentrated in small deltaic areas along the coast. Some 712 m² of arable land is available per person. Ethnic minorities living in small tribes in the mountains practice slash-and-burn farming.

South Central Coast

This region has a climate similar to the rest of southern Vietnam, except for some extremely dry locations during the dry season (e.g., Phan Rang has only 800 mm of rainfall per year). Alluvial deltas are suitable for rice production and many other cash crops. The population density is 167 people/km². Prior to 1975, vegetable consumption in this region depended on supply from Da Lat in the adjacent highlands. This supply source declined with the drive for self-sufficiency and the abolition of private marketing. With the return of a market system, however, the reliance is shifting back to Da Lat.

Central Highlands

This vast highland has mild temperatures and humidity, suited to growing high value crops. Soils of the western high plateaus are of reddish brown basalt types rich in nutrients when properly covered. Tens of thousands of hectares of precious forest have been wantonly exploited, the soils are denuded, exposed to severe erosion and are becoming acidic. A large part of the region is still not cultivated. Population density is relatively low (Table 1). The region presents an example of an integration of lowland Vietnamese and ethnic minorities. This region has a high potential for industrial crops, e.g., rubber, tea, coffee, fruit trees, and high value vegetables.

Although the share of area planted to vegetables is not large (Table 1), this region has an important commercial vegetable production center (Da Lat) supplying high value vegetables to Ho Chi Minh City (HCMC), which is 300 km away, and many other urban areas in the southern region. Da Lat also has potential for vegetable production for export.

Eastern Mekong Delta

Soils of this region belong to two major groups: reddish brown basaltic soils adjacent to the highlands, and degraded gray soils (with patches of acid sulfate soils). Both soil groups are being eroded due to exploitation of forests and defoliation during war. This region accounts for 10% and 13% of the country's total vegetable area and production, respectively (Table 1).

Mekong Delta

Soils of the Mekong Delta are young alluvium, about 40% of which are acid sulfate soils and seasonal saline soils. This region is the rice bowl of Vietnam; 1.923 million ha (or 45.3%) of the country's rice land is in this region. The Mekong Delta has the highest per capita arable land, 1639 m² per person, or 4627 m² per agricultural laborer. Important commercial vegetable areas are in Tien Giang province (with more than 11,000 ha, or 22% of total vegetable area of the Delta). These areas supply vegetables to Ho Chi Minh City.

Major Vegetables

Being situated along several parallels, and influenced by different climate regimes, the geographical conditions and the environment in Vietnam are suitable to many tropical and temperate vegetable crops. In addition, high variation in the distribution of arable land and population pressure on land result in varied vegetable production practices and types of vegetables grown across different ecoregions of the country. More than 70 plant species are used as vegetables or processed into vegetable products, but only 30 species are commonly planted, and data are available on only 19 species that have dominant economic value.

National data on individual vegetable species are rarely reported. Recently, the Research Institute for Fruits and Vegetables (RIFAV) collected vegetable data by species and by province from the official files of the Statistical Department of the Ministry of Agriculture and Rural Development. Most common vegetables grown, and major production provinces are reported in Table 2. Mustard, vegetable beans, cabbage, kangkong, and garlic are important vegetable species.

Table 2. Major vegetables and major production areas, 1997

Crop and planted area [% of area of all vegetables]	Production location (% of total area of the given vegetable)
Baby corn [0.1]	An giang (100)
Cabbage [7.6]	Lam dong (13.9); Nam dinh (8.4); Bac ninh (5.9)
Carrot [0.5]	Lam dong (82.59); Thai binh (10.65); Thanh hoa (2.13)
Cauliflower [0.4]	Lai chau (30.0); Lam dong (21.1); Binh thuan (19.3)
Chayote [0.1]	Lam dong (100)
Chili [1.4]	Quang Nam (21.5); hai duong (15.9); Quang tri (11.1)
Chinese chieve [0.1]	Baclieu (72.6); Vinh long (27.4)
Cucumber [1.9]	An giang (20.3); Soc trang (11.9); Hai duong (10.7)
Cucurbits [3.6]	Ho Chi Minh (16.7); Vinh phuc (6.5); Ba ria-vung tau (6.0)
Garlic + multiplier onion [5.8]	Hai duong (30.09); Soc trang (14.46); Bac ninh (5.14)
Kangkong [5.9]	Ha Tinh (14.57); Nam dinh (12.32); Thanh hoa (10.54)
Kohlrabi [4.6]	Nam dinh (11.5); Thai binh (7.9); Ha tay (7.3)
Mungbean [0.5]	Yen bai (50.8); Cao bang (34.0); TP.Ho Chi Minh (15.2)
Mustard [19.4]	Soc trang (16.99); Dong nai (13.04); Thai binh (12.28)
Onion [0.4]	Lam dong (32.2); Ninh thuan (25.12); Bac ninh (22.63)

Contd. Table 2.

Crop and planted area [% of area of all vegetables]	Production location (% of total area of the given vegetable)
Tomato [3.5]	Lam Dong (21.1); Hai duong (8.0); Hai phong (6.9)
Vegetable bean [9.9]	Ho Chi Minh (19.1); Quang Nam (15.0); Lam dong (9.6)
Water melon [1.1]	Bac lieu (50.93); Soc trang (30.35); Quang nam (12.97)
Others [33.0]	Nghe an (13.9); Ho Chi Minh (8.7); Thanh hoa (8.1)

Source: Official files of Statistical Department, Ministry of Agriculture and Rural Development.

The percentage of total area, in brackets, is based upon those provinces where cropwise data are available. In some provinces the cropwise classification was not available.

Lam dong is the major vegetable growing area in the country, especially famous for cabbage, carrots, chayote, onion, and tomato. The dominant vegetable species grown in Hanoi during the wet season are kangkong, on nearly 27% of the total vegetable area, cucurbits on 25%, and crucifers on 14% of the total vegetable area. Dry season species are more diversified, and include cabbage, kohlrabi, cauliflower, and carrot. Ho Chi Minh City is famous for cucurbits and vegetable soybean.

A recent farm survey conducted in northern Vietnam by the Asian Vegetable Research and Development Center (AVRDC) suggested that most vegetables are grown after summer, so they are abundant during the winter season in November-February. Summers are hotter and wetter in southern Vietnam, so seasonality is expected to be more pronounced there.

National and Regional Trends

National Trends

The total output of vegetables in 1996 was 4.07 million t from a planted area of 325,000 ha. There was a steady linear increase in area and production during 1977-96. Total planted area of vegetables increased at 3.9% and 3.4% per annum during 1977-86 and 1987-96, respectively, while annual production growth rates were 3.3% and 3.7% in the respective periods. Vegetable yield remained stagnant, fluctuating between 11 and 12.5 t/ha over the period (Fig. 1). From the aggregate data, it is not possible to evaluate trends for individual vegetable species.

Regional Trends

Vegetable area increased linearly in four out of seven regions, as well as for the whole country in the period 1984-96 (Table 3). No trend in area was observed in the northern central coast, while the trend was quadratic in the southern central coast. In the eastern Mekong Delta, area first decreased as the linear term was negative, and then the decrease was stopped or even increased in the latter years as the quadratic term became positive.

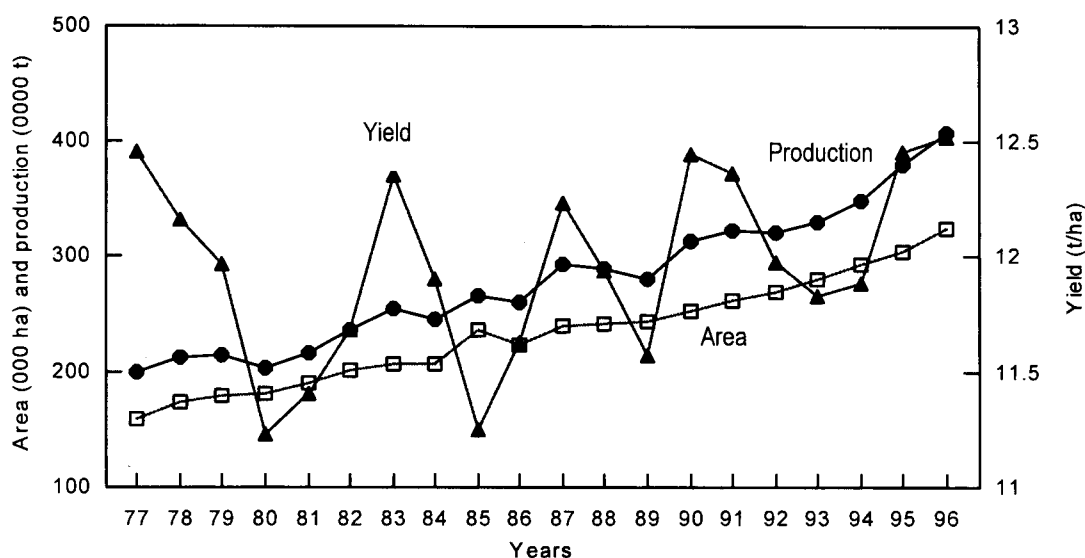


Fig. 1. Trends in vegetable area, production, and yield in Vietnam, 1977-96

Table 3. Trends in area, production, and yield in vegetables by region, 1984-96

Region	Area		Production		Yield	
	t	t ²	t	t ²	t	t ²
North Mountain and Midland	0.040	-	0.037	-	-	-
Red River Delta	0.041	-	0.042	-	-	-
North Central Coast	-	-	0.065	-0.003	0.061	-0.004
South Central Coast	-	0.003	-0.045	0.004	-	-
Central Highlands	0.064	-	-	-	-0.045	0.003
Eastern Mekong Delta	-0.065	0.006	-0.101	0.008	-0.037	0.003
Mekong Delta	0.060	-	0.098	-	0.039	-
Overall Vietnam	0.017	-	0.022	0.001	-	-

- implies that the coefficient was not significant at the 10% level.

Source: Estimated from data reported in Department of Agricultural Statistics, various issues.

No trend in yield was observed in three out of seven regions and for the whole country. The Mekong Delta is the only region where yield increase contributed significantly to the increase in production throughout the period. In other regions, the overall trend is either not significant, or the opposite sign of linear and quadratic terms suggests no overall change in yield.

Thus, increase in vegetable production was linear in the North Mountain and Midlands, Red River Delta, and Mekong Delta, mainly because of the linear increase in area, while in the Central Highlands, no trend in production was observed. In other regions, opposite sign of linear and quadratic terms suggests no overall change in production during the study period.

Supplies from Peri-urban Areas

The most dynamic development in vegetable production was observed in the peri-urban areas of large cities, especially in Ho Chi Minh City and Hanoi, the country's two biggest cities. Before 1975,

most of the vegetable demand for Ho Chi Minh City was met by supplies from uplands, such as Da Lat, 300 km away from Ho Chi Minh City in Lam Dong province. Total peri-urban vegetable area in Ho Chi Minh City was only 5500 ha, producing only 88,000 t of output.

From the mid 1970s to mid 1980s, the government pushed a drive for local self-sufficiency, supported by the introduction of new species of temperate vegetables that can be grown in tropical conditions, and banned vegetable supplies from uplands. This reduced the domestic trade volume of vegetables between specialized regions and cities, and gave a push to vegetable production in the peri-urban areas of the big cities. For example, area around Ho Chi Minh City increased 173%, from 5500 ha in 1976 to more than 15,000 ha in 1984, and production in this period increased threefold, from 88,000 t to 270,000 t. Vegetable area in the highlands of Da Lat plummeted from 4500 ha to 1900 ha, while production dropped from 113,000 t to 44,000 t during this period (Fig. 2). Such a self-sufficiency drive in Hanoi, much earlier than 1976, developed vegetable production around its periphery on more than 5000 ha. Both cities were almost self-sufficient in vegetables in 1984.

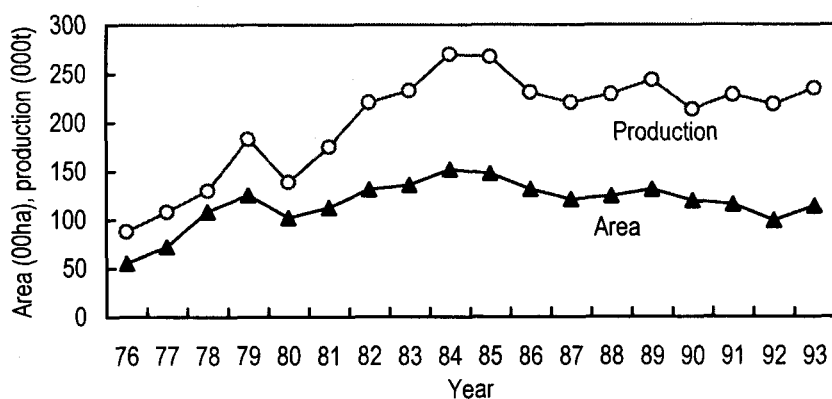
Another swing in vegetable supplies occurred when trade restrictions were relaxed in 1985. Despite the growing demand of Ho Chi Minh City brought about by population growth and income increase, vegetable area in Ho Chi Minh City declined to 11,000 ha in 1993 (Fig. 2). Similarly, vegetable production in Hanoi has not shown a significant increase since 1985, except for a small increase of 1.2% per annum due to an improvement in yield. On the other hand, it started picking up in the adjacent highland provinces where the potential for producing high-value vegetables has attracted investment from state companies and foreign counterparts. For example, vegetable area in Da Lat increased from 1617 ha in 1985 to 3909 ha in 1993, while production increased from 40,000 t to 75,000 t (Fig. 2).

Tien Giang province of the Mekong Delta has 11,000 ha of vegetables and an annual output of 141,000 t, concentrated in the Tan Hiep district, 50 km south-west of Ho Chi Minh City. Major vegetable species grown in this region are Indian mustard, kangkong, cabbage, lettuce and common bean. Vegetable production in Cu Chi district of Tay Ninh province also contributes a significant share of the vegetable supply to Ho Chi Minh City. Currently, vegetable production in the peri-urban areas of Ho Chi Minh City supplies about 68% of demand (State Planning Commission 1989), which is expected to decline as domestic trade restrictions are further relaxed.

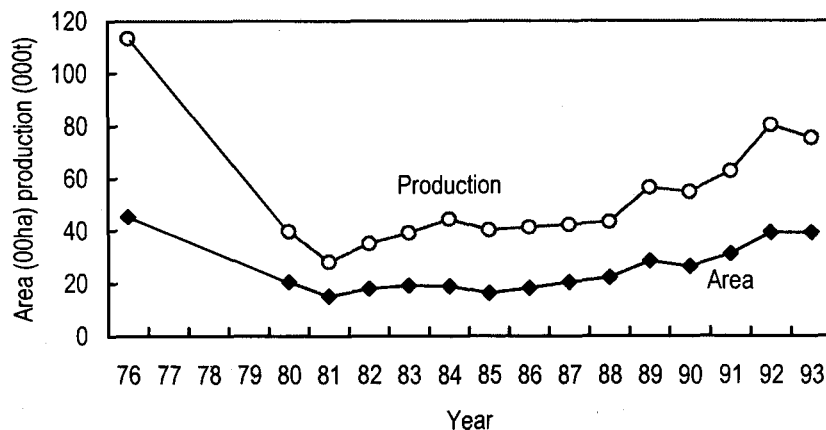
Prices

Under the centralized planned economy, vegetable marketing in urban areas was undertaken by state enterprises, with the prices dictated by them. In general, state-set prices were kept constant, but were readjusted from time to time. Economic reforms in Vietnam, initiated in 1989, have created conditions for market prices to operate freely and reflect the supply and demand conditions, so that they are increasingly becoming signals for producers and consumers.

Ho Chi Minh City



Da Lat



Source: Official files of Department of Agricultural Statistics, General Statistical Office, State Planning Commission, Hanoi.

Fig. 2 Trends in area and production of vegetables in Ho Chi Minh City (1975-93) and Da Lat (1980-93).

A few years after the market liberalization started, vegetable prices in Vietnam began increasing at a higher rate relative to the increases in the prices of other commodities. The rate of increase in the nominal vegetable prices was around 50% per annum during 1986-95. After deflating the nominal prices with the consumer price index (CPI) to account for the increase due to inflation, the average rate of increase was 7.8% per annum (Table 4). The increase was more abrupt during 1988-89 (Fig. 3). The increasing price trend will have serious consequences on the consumption of vegetables, especially for people in the low-income group in the urban centers.

Table 4. Growth rates (percent per annum) in selected vegetable prices, 1986-95

Vegetable	Nominal	Deflated
Tomato	57.5	11.6
Field mustard	53.8	7.9
Cauliflower	52.9	7.0
Cabbage	52.8	6.9
Lettuce	49.3	3.4
Average	53.8	7.8

Source: Estimated from data obtained from official files of Central Price Commission, Hanoi.

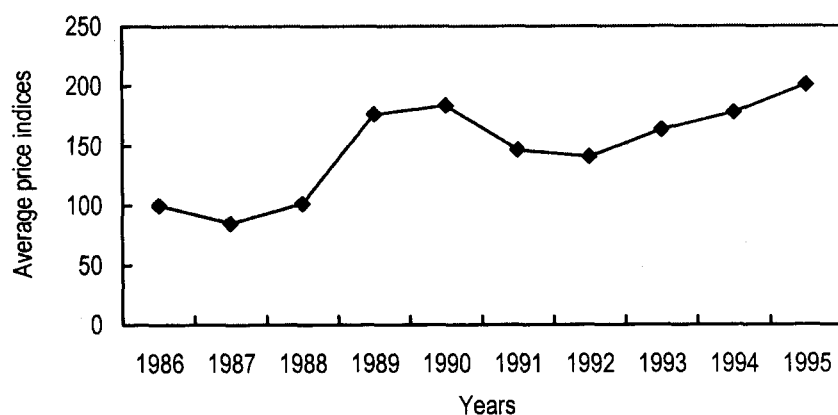


Fig. 3. Trend in real overall vegetable price index (average of selected individual vegetable price indices), 1986-95

International Trade

Since the implementation of the economic reform policy and liberalization of the market system, commercial vegetable production centers have been established in peri-urban areas of Hanoi, Haiphong, Haihung Thai binh, Ninh binh, and Nghe in the northern region, and Dong nai, Song be, Long an, Tien giang, Vinh long, and Can tho in the southern region. Moreover, potential production of high-value vegetable species in the Hanoi area during the winter-spring season and year-round in the Da Lat highlands has attracted foreign investment.

Japanese companies (JAVIDEC International – a consulting firm – and a joint venture between Japan and the National Institute for Agricultural Planning and Projections, NOZAKI) are introducing seeds of Japanese vegetable species in an effort to promote export of Vietnamese vegetables produced in the Red River Delta and in the Central Highlands. These species are cabbage, onion, carrot, taro, snow-peas, lady's finger, asparagus, and Shiitake mushroom.

The export of processed vegetables, such as salted mushrooms, canned baby corn, cucumber pickles, and spices, has grown fast in recent years. The Vegetable and Fruit Export Import Company No. 1 in Hanoi procures and processes vegetables for export. In the Mekong Delta, a joint venture between a Hong Kong-based company and Agroproduct Export Company of Can Tho, MEKO company, is boosting the production of rice straw mushrooms and baby corn by contracting with farmers at assured prices. The company then processes and exports the produce. Although foreign counterparts

receive a major part of the profit, they play an important role in transferring technology and know-how to local entrepreneurs.

Trading of vegetables and fruits, especially for the export market, was consolidated by the establishment of the Vegetable and Fruit Export Corporation (VEGETEXCO) in 1988. This corporation is vested with three main functions (i) production of fruits and vegetables on 28 state farms totaling 30,000 ha (ii) processing of fruits and vegetables from 15 processing plants, mainly for export, and (iii) conducting research on production and processing of fruits and vegetables.

Before 1990, almost all exported produce went to the former Union of Soviet Socialist Republics (USSR) and other communist countries in Eastern Europe. Much of this produce has since been diverted, quite successfully, to markets in other countries in Southeast Asia, as well as to Japan and Europe. Shipments to Association of South East Asian Nations (ASEAN) markets currently account for 45% of agriculture exports (excluding rice and fishery products), to the former USSR and Eastern Europe 25%; and to EC countries 20%.

Good prices in foreign markets for "clean" fresh vegetables grown under conditions of minimum chemical application has prompted the investment in biological pest control and organic farming in Da Lat and Hanoi. Bio-Organic Company in Da Lat, a Dutch commercial vegetable production joint venture, has begun exporting high-value vegetable species, such as broccoli, English cabbage of Iceberg variety, Brussels sprouts, and parsley, all grown using minimum chemical input. Besides renting about 20 ha of land, this company contracts with individual vegetable growers in Da Lat. The company provides technological assistance, seeds or seedlings, and markets the products. Contracted farmers sell the produce to the company at an agreed price, the company then processes the produce and exports it to Hong Kong and Singapore markets.

Export quantity has varied greatly from year to year. The highest level of fresh exported vegetables was recorded in 1986 (Table 5).

Table 5. Vegetable exports (t), 1981-91

Year	Export	Year	Export
1981	2209	1987	9202
1982	5650	1988	9645
1983	8400	1989	9535
1984	13,387	1990	2959
1985	2872	1991	450
1986	18,700		

Source: Official data from Research Institute of Vegetables and Fruits, Hanoi.

Supply and Demand

Per Capita Availability

Average annual per capita availability of vegetables in 1996 was 55 kg (151 g per day). Although production increased from about 3 million t in 1985 to 4.07 million t in 1996, per capita availability increased only marginally (and that increase occurred just during the last two years) because of the high population increase (Table 6).

Table 6. Trends in per capita availability, 1981-96

Year	Population (million people)	Total supply (000 t) (production+imports-exports)	Per capita availability	
			kg per year	g per day
1981	53.7	2218.9	41.3	113
1982	55.9	2418.6	44.0	121
1983	56.3	2621.6	46.7	128
1984	57.4	2522.5	43.9	120
1985	58.7	2970.9	50.6	139
1986	59.9	2686.9	44.9	123
1987	61.1	3033.4	49.6	136
1988	62.5	3000.1	48.0	132
1989	63.7	3004.2	47.1	129
1990	64.4	3237.5	50.3	138
1991	66.2	3319.2	50.1	137
1992	67.8	3308.7	48.8	134
1993	69.3	3397.5	49.0	134
1994	71.0	3590.4	50.5	139
1995	72.5	3915.0	54.0	148
1996	73.7	4069.0	55.2	151

Note: Total production includes pulses.

Source: Population was obtained from General Statistics Office, various issues, total supply from the data used in Table 3, and exports from Table 5.

Consumption

Average consumption of vegetables in 1987-89 was 125 g per day, which about matches the availability figures, although this allows for relatively low losses from farm to household. The average daily intake varies greatly across regions (Table 7 and Table 8).

Table 7. Average vegetable consumption, 1987-89 (g per capita per day)

Ecoregion	Sample size	Pulses	Vegetables	Vegetable tubers
North Mountain and Midland	2134	3.47	170.4	61.3
Red River Delta	5180	0.74	166.3	54.1
North Central Coast	1015	2.54	155.8	35.9
South Central Coast	1015	0.40	72.1	22.2
Central Highlands	199	0.00	144.4	22.8
Eastern Mekong Delta	1032	1.19	121.6	56.0
Mekong Delta	1077	5.40	64.3	50.0
Hanoi & Ho Chi Minh Cities	989	3.59	135.5	48.0
Vietnam (average)	12641	2.79	124.8	46.5

Source: National Institute of Nutrition Research (1992).

Table 8. Average per capita per day vegetable consumption (g) by ecoregion, 1978-89

Ecoregion	Upland	Lowland
Northern region	136	155
Southern region	120	90

Source: Same as Table 7.

Vegetable consumption patterns differ significantly between urban and rural areas. Unlike in other countries, the consumption of fruits and vegetables in Vietnam is lower in urban areas than in rural areas. This might be because of poor transport infrastructure and absence of formal marketing institutions. However, urban people compensate for the low fruit and vegetable consumption with higher consumption of livestock and fish products (Table 9).

Table 9. Food consumption by region (g per capita per day)

Foodstuff	Urban n = 1655	Rural n = 9153	Mountainous n = 1634	Overall Vietnam n=12442
Rice	421.3 (53.5)	457.1 (57.1)	497.8 (57.1)	457.7 (56.7)
Other cereals	14.2 (1.8)	3.7 (0.5)	7.4 (0.9)	5.6 (0.7)
Tubers	11.8 (1.5)	47.4 (5.9)	38.8 (4.5)	41.5 (5.1)
Beans & peas	2.4 (0.3)	1.6 (0.2)	4.0 (0.5)	2.0 (0.3)
Tofu	16.5 (2.1)	4.9 (0.6)	8.7 (1.0)	6.9 (0.9)
Nut & sesame	4.2 (0.5)	3.0 (0.4)	9.4 (1.1)	4.0 (0.5)
Vegetable leaves	108.5 (13.8)	145.2 (18.1)	169.0 (19.4)	143.4 (17.8)
Vegetable tubers	39.4 (5.0)	49.4 (6.2)	68.4 (7.9)	50.6 (6.2)
Fruits	10.2 (1.3)	1.2 (0.2)	0.2 (0.0)	2.3 (0.3)
Sugar	1.8 (0.2)	0.3 (0.0)	0.1 (0.0)	0.5 (0.1)
Sauces	22.3 (2.8)	30.2 (3.8)	23.5 (2.7)	28.3 (3.5)
Oil & fat	6.4 (0.8)	2.6 (0.3)	2.7 (0.3)	3.1 (0.4)
Meats	49.3 (6.3)	13.7 (1.7)	28.5 (3.3)	20.4 (2.5)
Eggs & milk	9.6 (1.2)	1.4 (0.2)	2.0 (0.2)	2.6 (0.3)
Fish	62.2 (7.9)	29.3 (3.7)	8.1 (0.9)	30.9 (3.8)
Other aquatics	7.8 (1.0)	8.8 (1.1)	1.8 (0.2)	7.7 (0.9)
Total	787.9 (100.0)	799.8 (100.0)	870.4 (100.0)	807.5 (100.0)

Source: Same as Table 7.

Numbers in parentheses are the percentage shares of the total food consumed.

Vegetable consumption increases with increase in income. For example, average annual per capita consumption is 53 kg for the lowest income group and 147 kg for the highest income group (Table 10).

Table 10. Vegetable consumption by income group

Monthly income (x1000 dong/month)	Per capita vegetable consumption	
	g/day	kg/year
< 300	144	53
300 - 600	239	87
600 - 900	376	137
900 - 1200	327	119
1200- 1500	367	134
> 1500	402	147

Source: Khiem (1996).

Seasonality in Prices

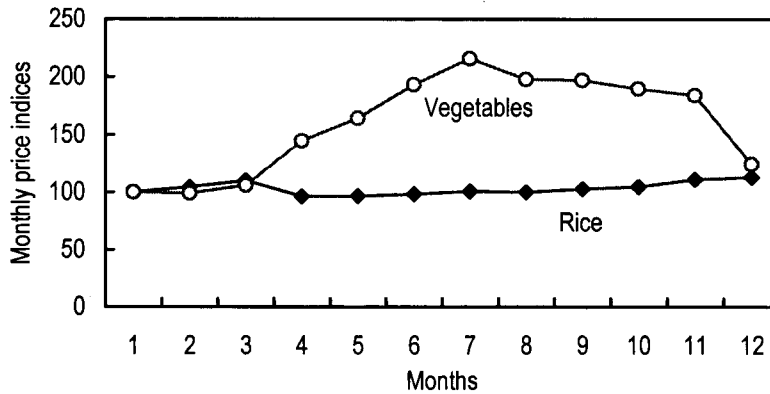
As noted earlier, vegetables are abundant in winter, and are in short supply during summer. The seasonal nature of vegetable production combined with short shelf life leads to seasonal fluctuation in vegetable prices. Vegetable prices in Hanoi are generally low in January-February, except for lettuce, which is cheapest in September. The prices are generally high during the summer months, except for eggplant, which is most expensive in November (Table 11).

Table 11. Seasonality in selected vegetable prices in Hanoi (average of 1990-93)

Vegetables	Months of		Seasonality
	Maximum price	Minimum price	
Cabbage	June	January	111
Cauliflower	July	January	86
Chinese cabbage	September	January	229
Eggplant	November	February	66
Lettuce	May	September	224
Mustard	September	January	111
Tomato	July	January	111
Overall vegetables	July	January	107
Rice	November	January	46

Source: Estimated from data obtained from official file of Central Price Commission, Hanoi.

Prices of vegetables taken as a group, are more seasonal than cereal crops such as rice (Fig. 4). The high seasonality of vegetable prices affects supply, and thus has serious implications for the consumption of vegetables and micro-nutrient supply.

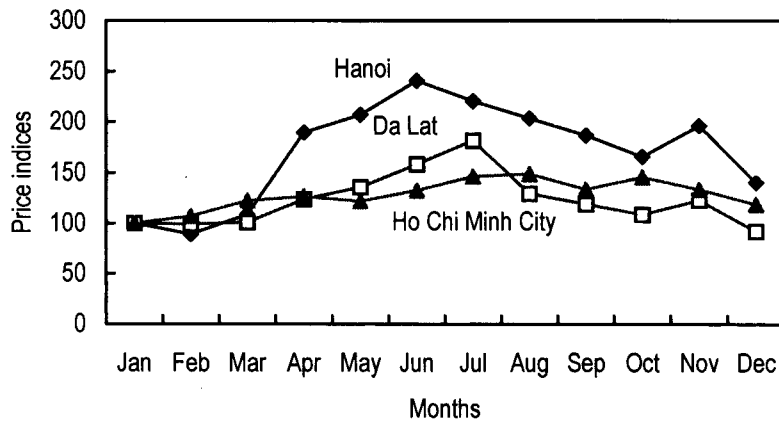


Source: Estimated from data obtained from official files of Central Price Commission, Hanoi.

Fig. 4. Monthly seasonal prices of vegetables (as a group), and rice in Hanoi market (average 1990-93)

The extent and incidence of seasonality varies across regions in Vietnam (Fig. 5). For example, the prices of vegetables in Hanoi show the largest variation, reflecting strong seasonality in production in the region. On the other hand, price seasonality is less pronounced in peri-urban areas of Ho Chi Minh City, because of the more widely spread cropping seasons and availability of vegetables from adjacent upland areas, such as Da Lat.

The highest vegetable prices are in June in Hanoi, in August in Ho Chi Minh City, and in July in Da Lat (Fig. 5). Thus, there is some possibility of reducing seasonality in prices through regional trade. However, careful analysis of the seasonal price trend of individual vegetables in each region would be required.



Source: Estimated from data obtained from official files of Central Price Commission, Hanoi.

Fig. 5. Seasonality in overall vegetable prices by region (average of 1990-93)

Inter-regional Comparison of Vegetable Cultivation

Given the availability of data and importance of commercial vegetable production, the two peri-urban vegetable production systems around Hanoi and Ho Chi Minh City are analyzed in this section. A summary of a rapid survey in Da Lat done by the senior author, intensive surveys conducted in the Mekong Delta by Can Tho University and in Ho Chi Minh City by AVRDC are the basis of this analysis. As these surveys were done almost at the same time, the information generated by these surveys also provides an interesting inter-region comparison.

Farming Practices

Ho Chi Minh City. Characterization of peri-urban vegetable cultivation near Ho Chi Minh City was done by AVRDC in collaboration with the University of Agriculture and Forestry of Ho Chi Minh City (Jansen et al. 1995). The study found that a total of 26 different vegetable species were grown by the sample farmers. A majority of them grew 2-3 varieties. Cabbage, common bean, cauliflower, and tomato were the most commonly grown vegetables in the area. The distinct wet and dry seasons create seasonality in the availability of vegetables.

Mekong Delta. Commercial vegetable areas in Tien Giang province supply vegetables to Ho Chi Minh City. These traditional vegetable areas have high cropping intensity, grow 5-6 crops per year, and have access to good irrigation.

About 2,000 ha of cabbage are planted yearly in the Mekong Delta. KK Cross and Newtop, both hybrids, are the dominant varieties. Cabbage is harvested throughout most of the year (except for August-October because of high rainfall). The main crops of cabbage, however, are planted during November-January and harvested during January-April.

More than half of the tomato-sown area in the Mekong Delta (about 2,000 ha) is concentrated in Tien Giang province. Different local varieties of tomato are used for making salad, sauce, and ketchup.

About 2.78 t of radish seed is imported to the Mekong Delta annually (from Hong Kong and Thailand), for a planted area of 1,500 ha, of which 600 ha is in Tien Giang province. Yield of sample farms averaged 42.7 t/ha. The main season for radish in the Mekong Delta is October-March.

The most popular cucurbit grown in the Mekong Delta is cucumber, which is planted on about 1,500 ha, giving annual output of about 30,000 t. Tien Giang has the largest area share (500 ha).

Input Use

Ho Chi Minh City. Vegetable farmers in Ho Chi Minh City apply 4-82 t/ha of organic material, consisting of animal manure and compost. In addition, the average quantity of chemical fertilizers applied is as high as 1.8 t/ha, or more than 900 kg of soil nutrients (Table 12). Leafy vegetables receive a much lower dose of chemical fertilizer. Pesticide use is largely limited to insecticides; herbicides are not used. Insecticides of the organophosphate group (methamidophos, methylparathion, monocrotophos, phentoate, zolone, diazinon, profenophos), pyrethroids (cypermethrine, decamethrine, fenvelerate, esfenvalerate), and bacterine (*bacillus thuringiensis*) are most commonly used.

Table 12. Input quantities (unit/ha) used in major vegetables and rice in Vietnam, 1992

Crop	Labor ¹ (days)	Fertilizer (kg nutrient)				Manure (t)	Pesticide (000 dong)	Reference
		N	P	K	Total			
Angled loofah	242	370	21	88	479	34.8	35	Jansen et al.
Bottle gourd	326	379	18	6	403	54.2	60	(1995)/
Bitter gourd	462	189	80	23	292	31.4	123	Ho Chi Minh
Cabbage	470	212	75	90	377	40.7	240	
Cauliflower	417	235	66	55	356	49.8	186	
Common bean	440	156	48	68	272	29.8	104	
Cucumber	256	120	58	53	231	25.4	69	
Eggplant	231	654	98	178	930	82.1	276	
Garland chrys.	503	76	-	-	76	21.9	51	
Indian cabbage	517	66	-	-	66	13.3	9	
Indian spinach	588	83	42	14	139	18.5	13	
Lady's finger	620	269	64	30	363	15.5	137	
Leafy amaranth	505	140	-	-	140	14.8	9	
Lettuce	519	73	-	-	73	16.6	21	
Mustard	537	61	42	14	117	12.0	13	
Radish	374	96	32	13	141	4.1	59	
Tomato	403	211	56	48	315	39.2	140	
Yard-long bean	575	126	24	36	186	25.9	107	
Cabbage	408	-	-	-	850	2.0	73	Can Tho University
Coriander	484	-	-	-	192	-	3	(1995)/Mekong
Cucumber	333	-	-	-	800	1.0	52	Delta
F. mustard	298	-	-	-	214	1.8	27	
Garland chrys.	549	-	-	-	366	-	61	
Lettuce	304	-	-	-	200	1.0	10	
Pechay	303	-	-	-	350	1.5	65	
Radish	421	-	-	-	582	2.0	29	
Tomato	399	-	-	-	450	2.0	60	
Watermelon	326	-	-	-	644	-	92	
Rice	48	-	-	-	210	2.8	-	IRRI (1995)

- implies that data are not available.

¹Includes family labor.

Dependence on imported seeds is high for some vegetable species. KK cross (Takii, Japan) and Newport dominate the cabbage market. Radish and mustard seeds from Choi Hing Lee Seed Co., Wong Yuan Shing, and Chan Man Hop (Hong Kong) are popular among growers.

Most vegetable crops require 200-600 labor days per ha compared to only 48 labor days for rice. Therefore, vegetable cultivation can generate substantial additional employment important for growing economies, such as Vietnam, although the negative environmental and resource sustainability consequences of high chemical use should be carefully watched.

Da Lat. The vegetable production system in Da Lat is the most intensive in the country. Informal diagnostic survey suggests that average labor use per ha is in the range of 300-800 person days. Farmers apply 500-1100 kg/ha of chemical fertilizers, and 2-4 t/ha of animal manure. Besides chemical fertilizer and manure, farmers also use large amounts of fish manure – a byproduct of fish sauce – which has a high salt content. After two or three crops, salt accumulation seriously deteriorates the soil productivity. Thus, the topsoil of vegetable beds must be replaced after about two years, which is a costly proposition.

Mekong Delta. A total of 300-400 person days per ha, made up of family and hired labor, are used on various vegetables, while per hectare fertilizer use ranges from 200 kg for lettuce to 850 kg for cabbage. In addition, farmers apply 1-2 t of farm manure. The use of farm manure is relatively low, while chemical fertilizer use is relatively high in the Mekong Delta compared to Ho Chi Minh City. Pesticide use in the Mekong Delta is also relatively low (Table 12).

Yields

Average yield of vegetables in the peri-urban areas of Ho Chi Minh City ranges from 10 to 21 t/ha, except for cabbage, radish, and eggplant (the average yields of these range from 30 to 65 t/ha) (Table 13). The yields of leafy vegetables are higher in Ho Chi Minh City, while temperate vegetables, such as tomato, cucumber, and radish, produce higher yield in the Mekong Delta.

Costs and Returns

Vegetable cost per hectare range from 4 to 11 million dong, compared to 2 million dong for rice. As noted before, input use in the Mekong Delta is lower than in the Ho Chi Minh City area, leading to lower per hectare cost of vegetable production in the former than in the latter place (Table 13).

Because of their proximity to market, farmers in the Ho Chi Minh City area have better access to price information and therefore are generally able to earn a higher price for a vegetable than are farmers in the Mekong Delta. The price difference can also be due to the difference in time of the year when vegetables are supplied from each area. However, farmers in the Mekong Delta generally can produce vegetables at a lower per unit cost than can farmers in the Ho Chi Minh City area. Except for lettuce, garland chrysanthemum, and radish, the benefit-cost ratios for vegetables are higher in the Mekong Delta than in the Ho Chi Minh City area (Table 13).

The benefit-cost ratios for vegetables are positive (yard-long beans being the only exception). The benefit is less than 25%, normally considered to be low, in many vegetables in Ho Chi Minh City.

Based on per unit cost of production, common beans, bitter melon, yard-long bean, and coriander have relatively high per unit cost of production.

Table 13. Per hectare economics of vegetable cultivation in Ho Chi Minh City and Mekong Delta, 1992

Vegetable	Yield (t)	Price (Dong/kg)	Gross revenue (0000 Dong)	Total cost ¹ (0000 Dong)	Net revenue (0000 Dong)	B-C ratio	Cost/kg (Dong)	Reference
Angled loofah	15.0	421	632	604	28	0.05	403	Jansen et al.
Bitter gourd	10.8	1295	1399	1205	194	0.16	1116	(1995)/
Bottle gourd	21.1	583	1230	637	593	0.93	302	Ho Chi Minh City
Cabbage	30.0	736	2208	1111	1097	0.99	370	
Cauliflower	17.5	1354	2370	956	1414	1.48	546	
Common bean	9.3	1239	1152	1024	128	0.13	1101	
Cucumber	13.3	703	935	775	160	0.21	583	
Eggplant	65.1	567	3691	1665	2026	1.22	256	
Garland Chrys.	15.7	1979	3107	966	2141	2.22	615	
Indian cabbage	14.1	729	1028	702	326	0.46	498	
Indian spinach	16.9	753	1273	912	361	0.40	540	
Lady's finger	19.3	692	1336	1102	234	0.21	571	
Leafy amaranth	13.0	796	1035	797	238	0.30	613	
Lettuce	17.6	1012	1781	800	981	1.23	455	
Mustard	13.6	789	1073	717	356	0.50	527	
Radish	36.2	297	1075	662	413	0.62	183	
Tomato	17.1	1013	1732	860	872	1.01	503	
Yard-long bean	10.1	779	787	921	-134	-0.15	912	
Cabbage	23.2	680	1578	530	1048	1.98	228	Can Tho
Coriander	6.3	1940	1222	561	662	1.18	890	University
Cucumber	19.9	646	1286	690	595	0.86	347	Survey (1995)/
Garland Chrys.	11.4	1875	2138	838	1299	1.55	735	Mekong Delta
Lettuce	10.7	434	464	384	80	0.21	359	
Mustard	13.6	600	816	417	399	0.96	307	
Pechay	17.3	380	657	465	192	0.41	269	
Radish	42.7	283	1208	774	435	0.56	181	
Tomato	22.9	1160	2656	810	1846	2.28	354	
Watermelon	22.8	601	1370	554	817	1.47	243	
Rice	3.3	3838	301	214	87	0.41	632	IRRI (1995)

¹ Total cost includes labor and nutrient import cost.

Factor Share

Labor is the most important factor in vegetable production, consuming a share ranging from one-third to three-fourths of the total cost (Table 14).

Table 14. Factor share (%) in total cost

Vegetable	Seed	Fertilizer	Insecticide	Labor ¹	Others ²	Total cost (Dong/ha)	Reference
Angled loofah	3.8	45.7	5.8	40.0	4.6	604	Jansen et al. (1995)/Ho Chi Minh City
Bitter gourd	7.8	27.5	10.2	38.3	16.2	1205	
Bottle gourd	*	37.2	9.4	51.2	2.2	637	
Cabbage	6.8	25.1	21.6	42.3	4.2	1111	
Cauliflower	5.2	24.8	19.4	43.6	6.9	956	
Common bean	3.5	31.1	10.2	45.8	9.5	1024	
Cucumber	5.3	48.8	8.9	33.0	4.0	775	
Garland chrys.	15.6	27.0	5.3	52.1	0.0	966	
Eggplant	*	33.3	16.6	36.4	13.8	1665	
Indian cabbage	*	25.1	1.3	73.7	0.0	702	
Indian spinach	6.6	27.5	1.4	64.5	0.0	912	
Lady's finger	0.8	23.7	12.4	56.3	6.8	1102	
Leafy amaranth	8.9	26.6	1.1	63.4	0.0	797	
Lettuce	4.1	28.4	2.6	64.9	0.0	800	
Mustard	*	23.3	1.8	74.9	0.0	717	
Radish	10.7	16.6	8.9	56.5	7.2	662	
Tomato	1.9	27.7	16.3	46.9	7.3	860	
Yard-long bean	2.7	19.4	11.6	62.4	3.8	921	
Cabbage	6.4	28.6	9.0	53.9	2.1	8087	
Coriander	10.9	9.5	0.5	77.0	2.1	5605	
Cucumber	4.5	31.9	7.6	53.9	2.1	6903	
Field mustard	3.9	14.1	6.4	72.6	3.0	4171	
Garland chrys.	12.3	12.0	7.3	66.6	1.8	8382	
Lettuce	6.1	12.9	2.1	75.2	3.7	3843	
Tomato	1.1	23.6	11.4	61.0	2.9	5298	
Pechay	5.5	22.1	14.1	55.6	2.8	4644	
Radish	6.7	20.7	3.8	65.7	3.2	7735	
Watermelon	3.0	32.7	16.9	44.6	2.8	5537	

¹ Includes family labor evaluated at the average wage rate in the area at the time of survey on all sample farms.

² Others include fuel charges, irrigation cost, and/or tax.

* implies no seed cost because seed was saved from the previous crop in these cases.

Fertilizer is another important input in terms of its share of total cost, ranging from 9 to 49% (more than 20% for most crops).

Insecticide accounts for 1-22% of the total cost of production. About half of the crops in Ho Chi Minh City and one-third in the Mekong Delta have pesticide factor shares measured in double digits. Technological development for prudent use of insecticide would reduce cost, help save the environment, and safeguard the health of consumers and producers.

Marketing Systems

Production and marketing systems of vegetables as well as other important crops in Vietnam during the period 1975-93 were dictated by the policy. Prior to market policy reform, marketing service was done by state companies. To secure the vegetable supply to Hanoi, the Vegetable and Fruit Company went into contract with cooperatives in surrounding areas. In return, the company ensured the supply of staple food and necessary inputs to the cooperative farmers. Vegetable supply was not generally decided by demand but by the plan of the state vegetable marketing company.

De-collectivization policy has given individuals the freedom to make decisions on crop production. The role of cooperatives and the Vegetable and Fruit Company has diminished. Small vegetable growers either directly bring their products to retail markets in Hanoi or sell to small vegetable dealers. Since most of the vegetable growing areas are close to Hanoi, bicycles are the most common means of transport. Very early in the morning, farmers bring their produce to Hanoi markets or sell as street vendors and return home in late afternoon.

Marketing systems servicing Ho Chi Minh City are more developed. Before 1975, private vegetable dealers bought fresh vegetables from growers or local dealers in Da Lat and sold them in Ho Chi Minh City. After 1975, state companies took over most of the role of private dealers and monopolized the means of transport. Market reforms in the mid 1980s again permitted the operation of private markets. Local dealers buy produce from individual growers, or vegetable growers bring their produce on three-wheel vehicles or carts to collection sites for sale to wholesalers. The wholesalers then truck the produce to wholesale markets in Ho Chi Minh City. Sorting, cleaning, and packaging are usually done at the collection sites. Da Lat supplies about 150 t of fresh vegetables to Ho Chi Minh City every day.

Besides Da Lat, there are important vegetable collection points in the surrounding provinces of Ho Chi Minh City. Tan Hiep district in Tien Giang province in the southwest, about 50 km away from Ho Chi Minh City, is a traditional vegetable collection point and wholesale market. Among the important wholesale markets in Ho Chi Minh City are Cau Ong Lanh Market for vegetables coming from Da Lat, provinces in the Mekong Delta, and surrounding districts of the city; Hoc Mon Market handles vegetables grown in the district and Cu Chi, Tay Ninh province.

Research and Development

The Fruits and Vegetables Research Institute (RIFAV) located in Hanoi and founded in 1992, coordinates the research work with three experiment stations located in different parts of the country. Vegetable breeding programs at the National Agriculture Science Institute, the Plant Breeding Institute, and the Southern Institute for Agricultural Sciences are the key institutes engaged in crop improvement. These institutes have selected 17 new varieties of which 12 varieties (4 tomato, 2 cabbage, 1 leafy cabbage, 1 cucumber, 2 tuber crops, 1 watermelon, and 1 eggplant) have been developed and released to farmers. However, adoption of these varieties is relatively limited (Chuong 1995).

RIFAV is collaborating on a multilateral vegetable research and development program with AVRDC, which pools the technical know-how and financial resources in the Mekong region. The emphasis is on integrated pest management, disease resistance, socioeconomic studies, and training. RIFAV is also engaging in another collaborative peri-urban vegetable production program with the French

government and AVRDC. Here the emphasis is on understanding the marketing and production constraints in the peri-urban areas of Hanoi, introducing off-season vegetable production technologies, and reducing pesticide use on vegetables. It is expected that these programs will bring enough technical expertise to boost the vegetable sector in the country. However, Vietnam needs to make a big investment to develop a critical mass of researchers and technicians to interact with international scientists, absorb technical know-how, and adapt new vegetable production technologies.

Luckily, Vietnam has a history of cooperative farming. And although communes have been abolished, cooperative spirit remains. With proper support from the government, this spirit could be transformed into formal cooperatives. These cooperatives could be instrumental in reaching farmers and diffusing technological innovations.

Much needs to be done in crop management research. Researchers need to understand the current management practices used by farmers. The major constraints in various ecoregions need to be documented. Only then can new technologies be adapted, consistent with farmers' practices and socioeconomic environments. The comparative advantages of various vegetables in various regions need to be understood. For all this, researchers need to adopt a multidisciplinary approach, and the socioeconomic side of vegetable research needs to be strengthened.

Summary and Conclusions

Vegetable production in Vietnam has grown during the last 20 years, mainly through expansion in area. However, the trend should be carefully interpreted. Under collectivization, a large proportion of vegetables were produced on individual farms, i.e., the land that cooperatives allotted to its members for family production (e.g., about half of the vegetables planted in the northern provinces were in such plots). These farms were free from tax and other obligations to the state, and no records were kept. Therefore, increase in vegetable area seen in the post-reform period might be due to the inclusion of individual plots in the statistics.

The main concern is the stagnation in vegetable yield during the last 20 years. Varietal development of vegetables needs support from research institutions. Vegetable farmers depend on imported seed for most major commercial vegetable crops, or use locally or home produced seeds which are of inferior quality. Breeding efforts have been concentrated on cabbage and tomato, but other vegetable species are neglected. Suitable seed production areas, especially the temperate Central Highlands and the northern region in the cool dry months, need to be exploited.

Problems related to efficiency of farming practices, such as fertilizer application and pest management, especially in intensive production systems, are important technical constraints. Indiscriminate use of pesticides is a major concern of consumers. Investment in production of clean vegetables and in bio-organic farming would promote exports and protect the health of consumers. Research in efficient pest management and selection of resistant varieties, combined with extension programs, should be a priority in vegetable research. Besides the pest-related problems, soil and irrigation management are crucial issues for sustainable vegetable production, especially in commercial and suburban areas. Control of soil erosion and the negative effects of high-salt-content fish manure in the Central Highlands are major researchable issues.

Establishment of commercial production centers in peri-urban areas was principally influenced by

policy that encouraged local self-sufficiency. Liberalization has allowed individual farm households to make decisions on resource allocation, crop choice, and crop management practices. This has facilitated the diversification process (Khiem 1994). The effect of liberalization on vegetable production and diversification of production systems needs to be quantified.

The price index of vegetables increased at almost the same pace as the food crop price index during the first few years after the price system was liberalized in 1986. Afterwards, the vegetable price index increased at a faster rate. Rising real prices will put vegetables out of the reach of poor people in Vietnam.

On the other hand, the low and variable vegetable prices are an important constraint in vegetable production. Price variation was cited as a new phenomenon by farmers used to government-fixed prices. Lack of processing and postharvest facilities, and lack of market information aggravate this problem.

Priority has been given recently to expansion of production during the winter/spring season, especially in the Red River Delta and in the temperate region of the Central Highlands. The economic policy reforms have also induced foreign investment and technology transfer in vegetable production in these areas, especially for export. However, the main issue is the relative economic feasibility of upland versus lowland production systems. In the former case, investment is needed in transport facilities, such as roads, refrigeration, cold storage, etc., while in the latter case, investment in research is required to adapt temperate vegetable production technologies to the tropical environment. The evaluation of these systems should include direct costs, such as fertilizer, manure, labor, water, land, and transportation, as well as indirect costs of vegetable production, such as soil erosion, pollution of the watershed due to high pesticide use in the upland areas, and pollution due to hauling produce long distances.

Lack of processing facilities leads to high spoilage of vegetable produce and low prices to farmers during the peak season. This results in high marketing cost on one hand, and discourages farmers to engage in vegetable production on the other. Marketing institutions and organizations must improve, so must the supply of marketing information. This is particularly important as vegetable production moves toward a free market system. There is a serious lack of new market institutions to replace the old style collective institutions.

Lack of coordination among the institutions involved in vegetable research and lack of investment by the central government in these institutions are among the serious bottlenecks holding back vegetable development in the country.

The procedures for collecting data need to be updated and properly documented. Individual vegetable crop information at the regional level needs to be documented in the national statistics. Regional data on vegetable cost, farm management practices, marketing functions, and losses, etc., are missing. Resource allocation for the development of the vegetable industry, both in the private and public sectors, cannot be planned without such data regularly available.

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