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POSTHARVEST LOSSES ASSOCIATED WITH EXPORTS OF VEGETABLES FROM INDONESIA TO SINGAPORE

by

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POSTHARVEST LOSSES ASSOCIATED WITH EXPORTS OF VEGETABLES FROM INDONESIA TO SINGAPORE

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by

NASRUN HASIBUAN

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ABSTRACT

Indonesian vegetable exports from North Sumatra province depend heavily upon the market demand in Singapore. Postharvest activities, including transportation are major elements to maintain quality, which with price determines how Indonesian exports can compete in the world market.

This paper investigates the reasons for declining vegetable exports, specifically the vegetable marketing system, postharvest handling, and the potential for Indonesian vegetable exports. The analysis includes a suggestion for a conceptual economic model to assess losses and economic efficiency through improved postharvest techniques. The research shows that marketing techniques can be improved, but attention to economic means to reduce losses is likewise important.

The policy of restricting food imports categorized as "luxury items" is thought to contribute to the decline of vegetable exports to Singapore.

1. INTRODUCTION

Indonesia is a large developing country whose economy is based primarily on smallholder agriculture, export-oriented estate agriculture and mineral and oil exploitation. More than half of the GNP comes from agriculture and about 60 percent of Indonesia's labor force is employed in smallholder agriculture. Government policy recognizes the importance of international agricultural trade for enhancement of the well-being of Indonesia.

Production for distant markets has long been a feature of Indonesian agriculture. In the first year of independence (1945), agricultural products accounted for over 80 per cent of total exports. By mid-1960 the export share had declined rapidly to 60 per cent. By 1972, the rapidly rising income from oil exports had pushed this share to below 20 per cent and projections for 1974 predicted that no more than 10 per cent of Indonesian foreign exchange would come from traditional agricultural exports. But the trend toward a diminishing role of agricultural exports in the national economy is reversing. Recent events have caused a change: government policy is now placing more emphasis on agriculture for future growth (Papanek,1980).

According to The Central Bureau of Statistics of Indonesia, most of agricultural products are exported through the Singapore market. Even though commodities such as corn, beans, palm oil, and tapioca are exported directly to Japan, Holland, and other European countries, most of them pass through the Singapore market. Therefore, since the end of Indonesia's confrontation with Singapore and Malaysia (1967), the role of the Singapore market for

Indonesian agricultural products, especially vegetables and fruits, has grown in importance.

Bilateral trade flows between Singapore and Indonesia are motivated by political, social, and economic issues. Although the reasons are complex, the flow of agricultural commodities from Indonesia to Singapore rests upon the principle of comparative advantage. Indonesia has extensive natural resources and an abundant agricultural labor force. On the other hand, agriculture in Singapore is small: cultivated land has declined drastically due to the rapid pace of urbanization and industrialization. Production of most agricultural commodities in Singapore is less efficient and far more costly than in Indonesia.

On the one hand, Singapore's trade consists largely of importing from the neighbouring countries raw materials such as rubber, petroleum products, pepper, coffee, copra, vegetables/fruits, timber, etc., which are re-exported usually after processing, sorting or grading. On the other hand, Singapore exports manufactured goods, such as processed foodstuffs, machinery and textile products, to other countries in Southeast Asia.

In recent years, Indonesia has experienced a deterioration in a comparative advantage in perishable crops. While Indonesia retains its labor and land factor advantages and close proximity to the Singapore market, the marketing system for perishable commodities has failed to keep pace with a market requirement of high quality perishable products in Singapore. In this context, Indonesia's advantage in Singapore can be realized only if the quality of perishable products can compete with other potential suppliers.

1.1. Overview of the Research Area

The National Plan of 1979/1984 identified several areas as major production locations for perishable crops: North Sumatra, West Java, Central Java, East Java, and South Sulawesi. Although these five regions are responsible for 69% of vegetable production in Indonesia, North Sumatra is one of the provinces with the most serious problems with perishable crops[1]. The problems concern the marketing distribution system, postharvest losses, and potential for exporting vegetables. The importance of vegetable production in these five provinces is presented in Table 1.

Table 1. Vegetable Production of selected provinces in Indonesia, 1981 (in metric ton).

Provinces	Production	Percentage (m.tons) of total
West Java	578,403	29.22%
Central Java	357,647	18.07%
North Sumatra	201,500	10.18%
East Java	137,018	6.92%
South Sulawesi	94,065	4.75%
Total	1,368,633	69.1
Indonesia	1,979,433	100.00%

Source: Central Bureau of Statistic of Indonesia

1 The vegetables produced in West Java, Central Java, East Java, and South Sulawesi are consumed domestically. Exporting is incidental and not significant.

Indonesia has supplied vegetables to Singapore for more than 50 years. Many of the people in North Sumatra are engaged in vegetable production, marketing, and related activities. This export trade is extremely important to the farmers' income as well as to the government as a source of foreign exchange.

During this period there have been no significant changes in trade and export distribution systems to improve postharvest handling for quality enhancement in order to compete successfully with foreign suppliers from Australia, Taiwan, and the United States.

North Sumatra is located in Western Indonesia close to the Republic of Singapore and has been a major supplier of Singapore's vegetables for several years. A map of Indonesia and Singapore, which this study of vegetable exports covers, is shown in Figure 1 (also see appendix). To maintain or expand this market, one must understand Singapore consumer preferences and trade policies.

According to a survey conducted by the Department of Agriculture of Indonesia, the following vegetables are exported: cabbage, Chinese cabbage, potatoes, tomatoes, ginger, leeks, carrot, and cauliflower. Since 1980 annual vegetable exports from this country have decreased for most of these commodities. Shipments of the rest of the commodities decreased drastically for reasons such as low quality of the commodity and government policy[2].

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2 The latest report from the Indonesian Embassy in Singapore shows that only two commodities, cabbage and ginger, were able to dominate the market in Singapore in 1984.

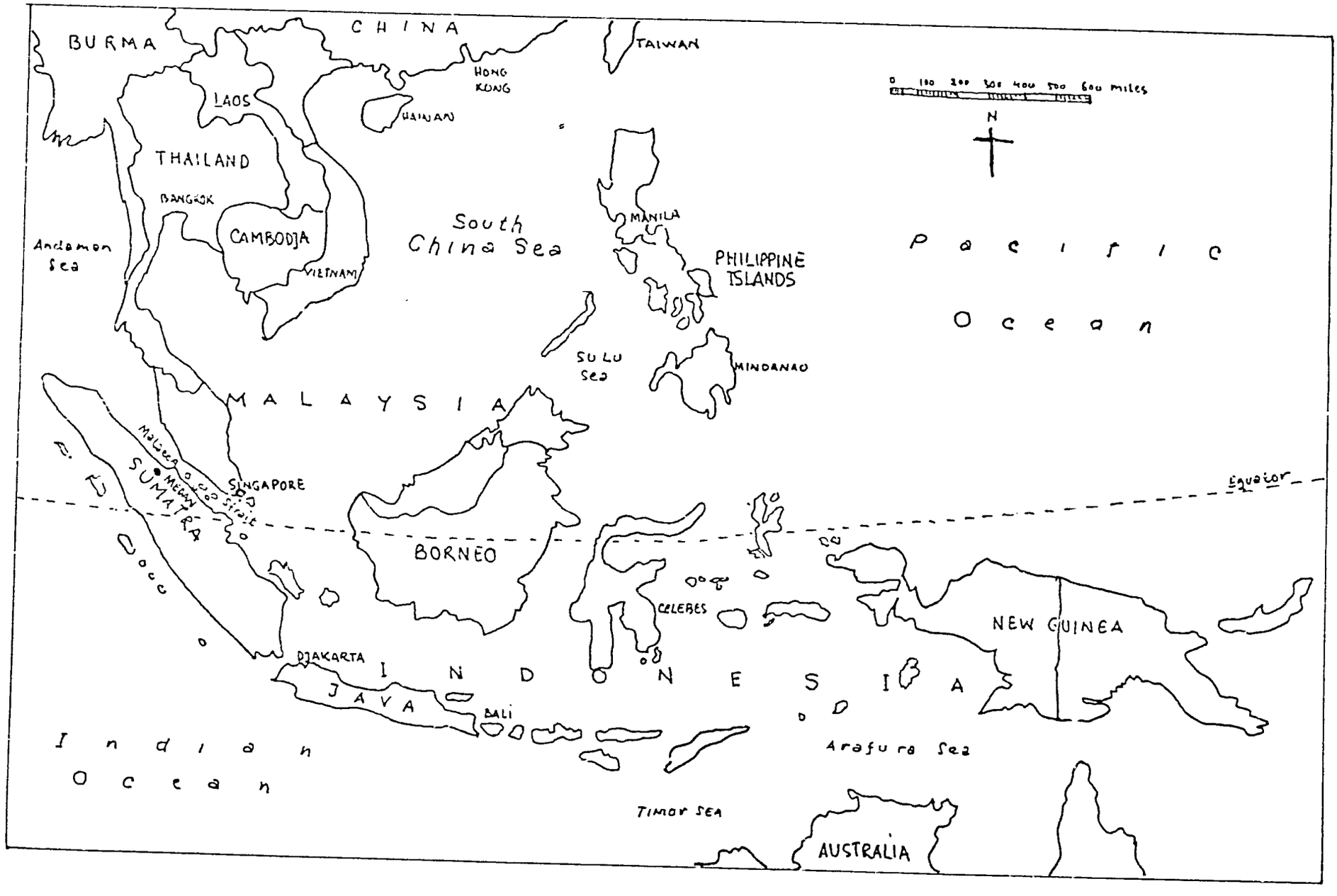

Figure 1. Map of Indonesia and Singapore

Problem Statement

Even though Indonesia has supplied vegetables to Singapore for an extended period, the trade system has not changed significanty. Based on economic theory, Indonesia should be better off from this trade because of its relative proximity to Singapore. Tomek and Robinson postulate that;

> "Transfer costs, which include loading or handling as well as transportation charges, are often high in relation to the farm value of agricultural commodities, especially perishable products. Hence, farm prices differ depending on whether the production area is near or far from the principal market areas."

Three major problems exist in exporting vegetables from Indonesia:

a). The quantity and quality of vegetables exported have tended to decrease in the last three years. Table 2 shows that from 1980 to 1981, the vegetables exported increased only 4 percent compared to the 146 percent increase from 1979 to 1980. In 1982 exports dropped precipitously. This quantity could continue declining in the future if the quality does not improve. The high labor wages for sorting and grading of vegetables in Singapore influences the decline of Indonesia's vegetables exports.

b). The farm price appears to be low. Farmers' net returns of approximately 10-34% for cabbage and 43-64% for potatoes may not be sufficient to produce high quality products. In 1983, the North Sumatra Department of Agricultural Extension conducted a thorough investigation and found that the farmers received 46.51 percent of the consumer price. Marketing margins were 53.49 percent, which consists of a marketing cost of 28.88 percent, and 24.61 percent profit for traders (presented in Table 3).

Table 2: Vegetable Exports: Indonesia to Singapore 1978 - 1982

	Commodity (m. tons)						
Year	Cabbage	Carrot	Potatoes	Tomatoes	Ginger	Others	Total
1978	6,319	786	223	68	803	967	9,166
1979	12,759	654	30	230	2,835	900	17,408
1980	33,164	1,044	556	142	6,759	1,187	42,852
1981	35,164	727	785	115	5,945	1,705	44,722
1982	16,390	90	72	25	3,120	1,255	20,952

Source : Indonesian Embassy in Singapore.

Table 3 : Average Marketing Cost and Marketing Margins of Cabbage from Producer Area (Brastagi) to Consumer in Medan.

Activities	cost Rp/kg	price Rp/kg	Per cent of retail price
Producer			
Price at the farmer level (before harvest)		65.33	46.51
Collector			
- Harvesting cost	0.96		0.68
- Sorting/grading cost	0.84		0.60
- Transportation cost to road	0.90		0.64
- Basket bamboo cost	1.84		1.31
- Handling cost	0.92		0.65
- Weighting cost	0.79		0.56
- Transportation cost to market	0.97		0.70
- Unloading/loading costs	2.43		1.73
- Market redistribution	1.33		0.94
- Profit for collector	9.40		6.70
Wholesale in the production area		85.71	
- Trader cost(?)	1.11		0.80
- Weighting cost	1.07		0.76
- Loading/unloading	2.04		1.45
- Weighting redistribution	2.75		1.95
- Basket bamboo cost	1.13		0.80
- Market redistribution	1.00		0.71
- Loss/damage	8.00		5.76
- Wholesale profit	10.17		7.24
Wholesale price in Medan		113.18	
- Trader costs	2.27		1.61
- Loading/Unloading	2.10		1.50
- Transportation to retailer market	1.35		0.96
- Market redistribution	1.73		1.23
- Loss/damage	3.41		2.42
- Weighting cost	1.41		1.12
- Wholesale profit	15.00		10.67
Marketing Margin		75.12	53.49*
Retailer prices		140.45	100.00

Source : Analysa Biaya Pemasaran Komoditi kol (kubis) di Provinsi Sumatra Utara 1983/1984. (An analysis of marketing cost for cabbage in North Sumatra 1983/1984).

*Consists of marketing costs of 28.88% and profit of 24.61%.

c). Prices received for vegetables from Indonesia in Singapore are the lowest among several countries. Table 4 shows that the average prices from Indonesia in the Singapore market were always the lowest with the exception of ginger (a product that tolerates better rough handling). The main reasons for the lower prices are low quality, no standards, and poor shipping.

1.2. Goals and Objectives

The major goal of this study will be to analyze how Indonesia can enhance its position in the Singapore market. Emphasis will be placed upon improving Indonesia's export policy and distribution system by identifying the components of an innovative marketing strategy (including reducing postharvest losses and adapting to Singapore's consumer preferences).

To accomplish these goals the following objectives are addressed:

1) to identify Singapore and Indonesian vegetables market structure;

2) to identify Indonesian institutions, agricultural trade policy, and trade barriers that limit access of vegetable exporters to Singapore;

3) to describe the quality of products and postharvest activities and associated losses in export channels;

4) to suggest a conceptual economic model to assess losses and economic efficiency through improved postharvest techniques for marketing perishable exports.

Table 4: Average Monthly Vegetable Prices Paid by Country of Origin In Singapore: September, 1983 to March, 1984.

(kg/S$)

Commodity	Month						
	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Cabbage							
Indonesia	0.29	0.36	0.45	0.37	0.33	0.43	0.30
Australia	1.05	-	-	1.0	-	-	-
PRC	-	-	1.13	0.80	0.65	-	0.60
Taiwan	-	-	-	0.76	0.62	-	0.55
Potatoes							
Indonesia	1.08	0.67	0.70	0.80	0.90	0.70	0.63
Philippines	0.80	-	-	-	-	-	-
PRC	1.05	0.75	0.62	0.76	0.90	-	0.60
Holland	1.29	0.88	0.69	1.03	1.15	-	0.85
Thailand	1.03	-	-	-	-	-	-
Taiwan	-	-	-	-	-	-	0.40
Carrot							
Indonesia	0.70	0.61	-	0.70	-	-	-
Australia	1.36	1.24	1.42	1.46	1.55	-	1.03
Ginger							
Indonesia	1.09	1.04	1.10	0.91	0.98	-	0.99
Malaysia	0.83	0.80	0.80	0.67	0.60	-	0.54
Tomatoes							
Indonesia	0.90	-	0.75	-	-	-	-
Malaysia	1.23	1.23	1.27	1.27	1.27	1.08	0.70
Taiwan	-	-	-	-	-	-	0.97
PRC	-	-	-	-	-	-	0.80

Source: Directorate Of Food Crops Economics-Dept of Agric.
(Weekly reports from Singapore, ATA, 85/86)

1.3. Literature Review.

Agricultural exports are conditioned by coordination, through markets, of production with consumption. With perishable crops, the requirements for coordination tighten, narrowing the time allowed for sellers to meet buyers.

Because Singapore is the major country for Indonesia's vegetables export, a thorough understanding of Singapore's market and trade policies in Indonesia is necessary. Because of their perishability, vegetables are risky crops for farmers. Hence, the coordination of production with market demand is extremely important[3].

Quality improvement

In general, quality cannot be improved after harvest. Maturity of product at the time of harvest is directly related to transit and marketing life and quality of the product. For any given product there is a maturity best-suited for the expected domestic or export transit period.

The relationship of the quality of vegetables and the value of the commodity in the Singapore market was briefly described by Lee Song Kheun (1985), who stated that although these relationships are recognized, it is difficult to express in objective terms other than the decrease or increase in value.

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3 Practically, production-marketing contracts are not applied in Indonesia yet. Prices of vegetables are permitted to fluctuate with supply and demand.

The most important prerequisite for the maintenance of good quality produce is the avoidance of mechanical injury, which not only affects the visual quality but also increases the respiration rate and shortens the shelf-life of the produce (Mohd. Salleh Punan, et al. 1985). Punan (1982) also found that trial shipments of some types of vegetables from Cameron Highlands, Malaysia to Singapore suffer about a 25% loss in weight. This loss occurred mainly due to mechanical/physical damage and rotting.

Lee, et al. (1981) conducted an investigation that showed a loss of about one-third of weight in shipment of cabbage from Indonesia to Singapore using traditional packaging and shipping methods[4]. The loss was attributed mainly to rotting and physical damage.

Chow (1984) stipulated that the important quality attributes are ability to maintain appearance and nutritive value. All of these requirements are determined by postharvest handling activities. In other words, the correct stages of postharvest handling of vegetables affects their quality and marketability and therefore their price.

---

4 In this experiment, basket bamboo has been used with 30kg, 60kg, and 120kg in weight, respectively.

Transportation

Transportation is a key element of any commodity distribution system. Inappropriate transportation and design can be the main cause of loss whether in terms of quantity or quality. However, some studies have pointed out that inadequate transportation and storage facilities are not wholly to blame for losses or spoilage. Human factors are also important in handling perishables.

Selection of the lowest cost and the best mode of transportation from point of origin to destination is the most crucial decision. It is very important to view refrigerated transport as a chain and to plan for the speediest transfer to the consumer. Yet, Finne (1970) briefly indicated that from a technological standpoint the cold chain of refrigerated transport requires a highly organized marketing system to make it economically feasible. Crow (1970) stated that it is not economically feasible to improve production in a country without devoting adequate attention to both production and distribution.

Trade and Policy

From 1969 the government of Singapore declared a free trade zone for transshipment and re-export of goods to neighboring countries. A feature of Singapore's trade is the official recognition of barter, which survives from Singapore's earliest days and which mainly concerns trade with Indonesia (Backhouse S, 1972).

On the other hand, Barnard (1983) analyzed that Indonesian traders would face competition from Australia, the United States, Taiwan, Malaysia, and some European countries. Any marketing improvement in Indonesia will cause head to head competition with these countries. However, Indonesia has two advantages over this competition: first, relative closeness to the market and second, low cost rate to the Singapore market. A question to raise is how does the country use this opportunity.

Rhodes (1983) stated that government policy plays a much more important role in various phases of markets. On the one hand, government erects barriers to trade especially for imports and occasionally for exports. On the other hand, governmental agencies often attempt to encourage and develop markets abroad.

A study by the U.S. General Accounting Office (1983) described how general policies established by the government pertaining to health and safety, the environment, transportation, and the economy affect the overall marketing system. Some of the policies have increased marketing cost. Others have stimulated innovations in rate making and in transportation modes and movements which may well produce increased efficiencies within the system.

According to Myint (1975), assuming the value of the nonfood agricultural exports to be given and constant, exchange contribution is to cut down food import. As a matter of fact, since resources are assumed to be fully employed and non-specific, domestic food production can be increased

only by reducing exports. But Myint, on the other hand, stated that one of the ways to promote economic development is to increase the foreign exchange earned by agricultural exports. This notion is recognized as introducing an external trading relationship between the domestic economy and the rest of the world and bringing the analysis into an open-economy setting.

Kruger (1983), in her study of the effects of trade strategies on growth of ten developing countries, concluded that export oriented strategies have generally resulted in higher growth rates than have import substitution. In other words, protection policy for import-competing sectors automatically discriminates against all other sectors, including potential exporting ones.

Pitt (1983), on studying alternative trade strategies and employment in Indonesia, also emphasized that the government has increased quantitative restrictions on imports and stated publicly that it believes imports should not be permitted unless domestic production is fully used.

Free trade permits participants to take advantages of the possibilities of international specialization. Protection devices such as tariffs, quotas, and other restrictions reduce or limit the gain from trade. In most cases, the government receives no revenue.

2. INDONESIAN AND SINGAPORE'S VEGETABLE MARKETS

This chapter examines supply in the production area and demand for vegetables in the Singapore market. The marketing channel, postharvest activities and consumer's preferences are described with emphasis on the export market.

2.1. Vegetable Production in Indonesia

Agriculture will continue to have a high priority in Indonesia's Fourth Five-Year Plan 1984-1989 (called REPELITA IV). The main goals of agricultural development are to raise farmers' income, to increase food crops production and to diversify exports[5].

The Indonesian vegetable production plan can potentially contribute to the health of Indonesian consumers and to the gross national product. Seventy-six percent of the nutritional needs for consumption per capita in 1984 in accordance with the National standard has been achieved, and by 1989 the level is targetted to be 90 percent (see Table 5). The vegetable industry is important to the regional income, employment, and future prospects of Indonesia.

---

5 Five years Plan (Repelita IV)-Indonesia. Specifically, the main objectives of this plan for horticulture are to increase production, decrease a cost of production,and improve the quality and marketing efficiency of selected horticultural products.

The harvested area of vegetables was 655,785 hectares in 1981. According to the Directorate General of Food Crops of the Department of Agriculture of Indonesia, during 1981 total production amounted to 1,979,433 metric tons. During the last five years (1977-1981) vegetable production reached a peak in 1980. Five major areas producing vegetables are West Java, East Java, Central Java, North Sumatra, and South Sulawesi (see appendix for production of vegetables in Indonesia by province). The major categories of vegetables produced are cabbage, chinese cabbage, carrot, potatoes, onions, radishes, cucumber, beans, ginger, and spinach.

Table 5: Percentage of Nutrition Needs Achieved Per Capita/Year in Indonesia (in %)

Commodity	National Nutrition Standard*				
	1968	1974	1979	1984	1989
A. CARBOHYDRATE					
1. Rice	77	80	83	86	91
2. Corn	8	9	11	13	16
3. Cassava/Tapioca & Sweet Potatoes	18	18	18	18	18
B. PROTEIN					
4. Peanut, green beans and soybeans	11	13	16	19	23
5. Peanut, green beans and soybeans (fermented)	51	56	63	72	84
C. VEGETABLES	46	55	64	76	90
D. FRUITS	14	19	24	31	49

Source: Survey of Agricultural Economics (SAE), 1983.

*According to National Nutrition Standards (Department of Health), these figures will be achieved. For example, in 1985, rice will contribute carbohydrates of 91 percent out of 100 percent, therefore, in 1989, Indonesia approximately still deficit from rice. On the other hand, cassava/tapioca and sweet potatoes produce approximately 18 percent. In other words, no increase in production of cassava.

Table 6 : Production of selected vegetables in Indonesia 1977-1981 (in 1000 metric tons)

Year	Commodity						
	Cabbage	Chinese Cabbage	Carrot	Potatoes	Tomatoes	Others	Total
1977	264.8	99.3	14.8	248.2	115.0	1,090.9	1,832.9
1978	345.9	124.0	46.0	233.3	116.5	1,165.3	2,031.1
1979	330.2	92.3	36.7	208.7	97.7	1,193.4	1,958.9
1980	323.4	104.0	42.8	230.4	100.6	1,326.1	2,127.0
1981	296.4	121.1	23.8	195.4	107.3	1,235.4	1,979.4

Source : Ditjentan, Dept. of Agric. Indonesia

Although vegetable production is widespread over Indonesia, North Sumatra province contributed 201,500 out of the 1,979,433 metric tons or 10.2 percent of total production in Indonesia in 1981. North Sumatra production consist of 15.9 percent of commodity cabbage, 7.6 percent of carrot, 12.8 percent of potatoes, and 19.4 percent of tomatoes. For example, cabbage production of North Sumatra is illustrated in Table 7.

Table 7: Production and distribution for cabbage in North Sumatra in 1981.

Regions	Harvesting area (Ha)	Production (m.tons)	Total Indonesia	Per cent exported
1. Medan	-	-		
2. Langkat	-	-		
3. Deli serdang	-	-		
4. Simalungun	1,507	22,953		
5. Tanah Karo	539	13,456		
6. Asahan	-	-		
7. North Tapanuli	508	10,204		
8. Labuhan Batu	-	-		
9. Central Tapanuli	-	-		
10.South Tapanuli	73	584		
11.Dairy	-	-		
12.Nias	-	-		
Total of North Sumatra	2,634	47,233 (15.9%)	296,350	35,445 (75%)

Source : North Sumatra Agriculture office 1983.

2.2. Vegetable Marketing in Indonesia and Singapore

The marketing chain for selected vegetables needs to be studied in detail in order to learn who the key participants in the system are and where in the chain the important transactions take place. This information serves as an organizing framework for understanding the processes between production and consumption of vegetables. The sequence of markets through which vegetables pass between grower and consumer can vary greatly.

Farmers' or producers' decisions, especially those on the timing of planting, harvesting, and selling, are central in the first stages of marketing. The market environment for vegetables is essentially one of free market competition. There are four conditions under which a perfectly competitive market arises in the theory, namely, homogeneity of product, unfettered resource mobility, large numbers of buyers and sellers, and perfect information (Miller LR. Intermediate Microeconomic, Theory, Issues and Applications). Individual producers or firms cannot influence the market price since output represents a small portion of total production. Prices received by producers are based on the supply and demand situation for vegetables in the market. Product price increases are necessary to stimulate increased production.

Seventy five per cent of the vegetable growers are smallholders who operate on a small scale and are forced to sell their crops after harvest whether the price is attractive or not. Farmers located in areas where farm to market roads are poor may have to wait several days for a merchant's truck.

The most obvious vegetable marketing task is the movement of commodities from one location to another, technically termed the transformation over space. Vegetables have to move from farmers' fields to processing plans or storehouses and into the distribution network to the domestic or foreign retail market where consumers can readily purchase them.

The second stage of the marketing channel involves traders or middlemen who purchase most of the vegetables in the field . These vegetables are then shipped by truck to storehouses where they remain several days before transportation to port. Traders or processors clean, split, grade, and package the products. There are approximately 30 storehouses in North Sumatra, and most of them are in Brastagi (production area). Activities in the storehouse are shown in Figure 2.

The third stage of the marketing channel involves exporters. In 1983 there were 14 exporters in North Sumatra, including three cooperatives. The name and type of these exporters are given in Table 8. Most exporters have agents in Singapore and the production area who work on a commission basis (usually two to five per cent of the price).

Other exporters are organized into cooperatives called Koperasi Unit Desa (KUD). They have quality enhancement programs for vegetables and provide foreign market information. These cooperatives are heavily involved with an overseas market promotion program[6].

Usually, fresh vegetables flow through two kinds of marketing channels: One for domestic market or local consumption and another for the export market. Figure 3 shows the marketing channel for domestic consumers.

In domestic marketing channels, farmers may sell direct top local retailers, but more often go through middlemen. On the export side, farmers sell the products to collectors who are mostly agents in

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6 Some trials have been done by the Department of Agriculture and Cooperative and the government of Singapore under ASEAN Food Handling Bureau Project, 1981.

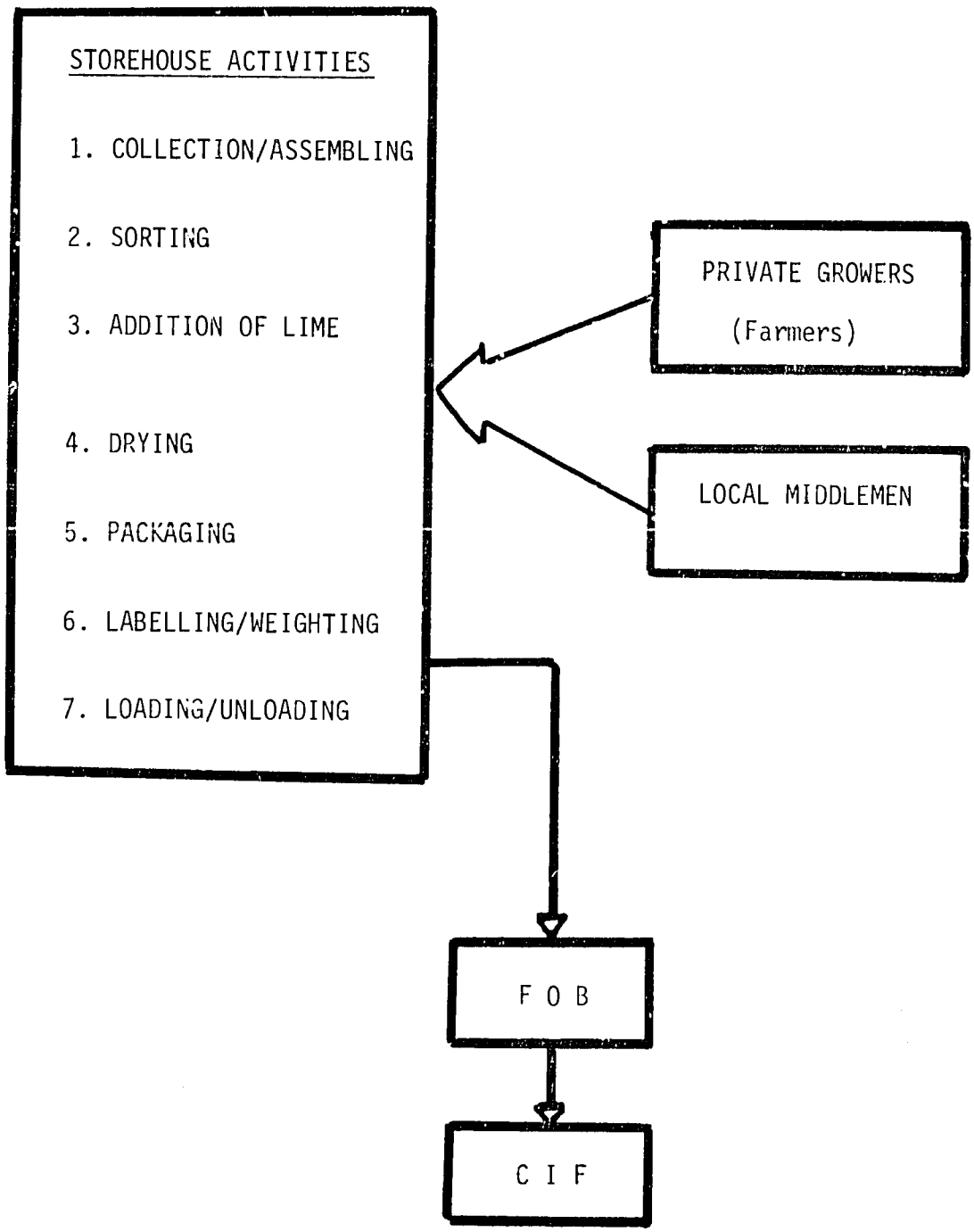

Figure 2 : Postharvest Activities in a Storehouse
(especially for Cabbage)

Table 8 : Distribution of Exports by Destination and Private Firms, Jan, 1983.

Name of Company	Amount of exports (metric tons)	
	Singapore	Malaysia
1. Perintis Tani, Ltd.	571	485
2. Karya Tani, Ltd.	509	495
3. Harapan Tani (Coop.)	471	441
4. Nina Deli, Fa.	469	414
5. Ginting & CO, Fa.	351	351
6. Puskopad II, Coop.	348	214
7. Fresh V.e.g, Ltd.	302	243
8. Tani Makmur Daya, Ltd.	251	251
9. Toserna Pusat, Ltd.	179	120
10.Inkopad, Coop.	135	135
11.Yasanda, Ltd.	79	-
12.Job Interprise, Ltd.	-	-
13.Dharsa Putra, Ltd.	-	-
14.Amal Gahana, Ltd.	-	-
Total	3,139	3,668

Source. Kakawildag, Dept of Trade, North Sumatra , 1983.

production areas for exporters[7]. Collectors who also work for exporters do some treatments to the vegetables (these postharvest activities will be discussed in the next section). Finally, from the storehouses, vegetables are shipped out to importers in Singapore. Export marketing channels from production points to Singapore can be seen in Figure 4.

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7 Some collectors have been financed by importer from Singapore, and these collectors have contracts with a number of farmers in the production area.

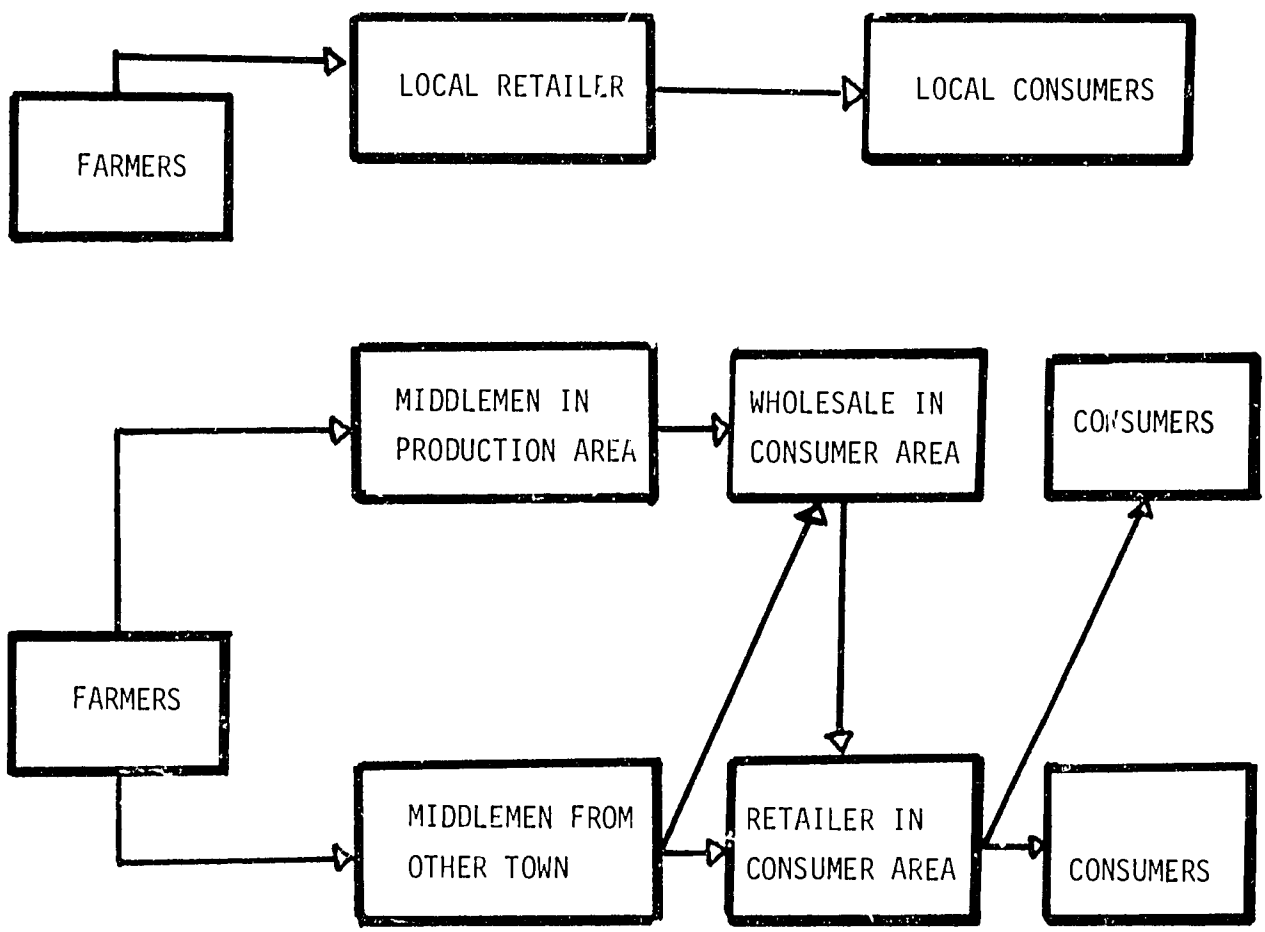

Figure 3: Marketing Channels in Domestic Markets

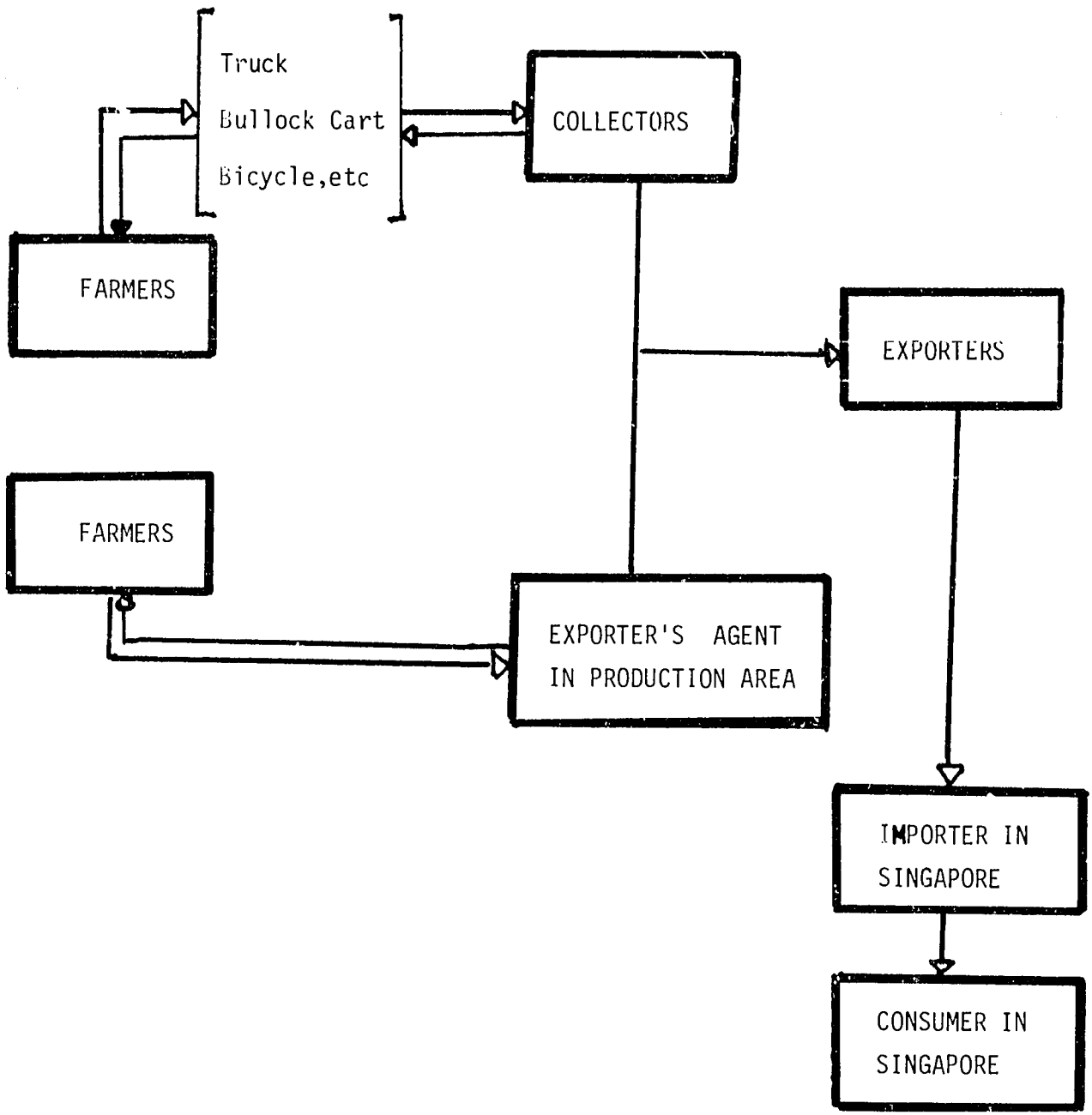

Figure 4: Vegetable Exports Marketing Channels.

2.3. Vegetable Postharvest Activities

Because vegetables are perishable (moisture content is high), losses can occur anytime and in various stages of marketing chains from harvesting until the food is consumed. The factors that amount for most of the losses are temperature, relative humidity (RH), pH, and postharvest handling activities.

Temperatures in Indonesia are relatively stable throughout the year, Varying more by elevation than by season. The annual average temperatures are between 26 and 27 degrees centigrade (79 F to 81 F). The annual average rainfall ranges from 1,285 to 4,511 millimeters. Humidity usually averages about 83 to 84 percent during the rainy season and drops to about 75 percent during the dry season.

Because of high temperatures and humidity, fresh horticultural produce is vulnerable when left unprotected. Deterioration of vegetables by microorganisms can occur rapidly. For example, vegetables are generally high in moisture content and excessively exposed to unsanitary environments. Traditional fresh handling of vegetables is economically appropriate to extend a short shelf life, but it does not prevent high losses for long storage or transportation (Pantastico ER.B.1975).

Most efforts in Indonesia to increase the amount of food available have been directed more to cereals, particularly rice and secondary crops[8]. Vegetables are more complex than cereals, and there has been much less concerted government support for studies on horticultural crops in the last few years. Limited case studies on losses of fruits and vegetables in the central market in Jakarta, for example, indicate high losses varying up to 75% (Soekarto, and Sjaifullah, Central Research Institute for Horticulture, Indonesia 1985).

One of the main objectives of the Fourth Five-Year Plan for Horticulture (1985-1989) is to improve the quality and marketing efficiency of selected horticultural products. Other objectives are (1) to increase production and (2) to minimize cost. The plan emphasizes that vegetable production and quality improvement are to be concentrated in Java and North Sumatra.

Most postharvest activities including harvesting, collecting/assembling, sorting,drying, packaging, loading/unloading, storing, and transporting are organized in the storehouses for exports to Singapore[9].

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8 Crash program of horticulture in national level for reducing loss sponsored by Directorate General of Agriculture was proposed in 1983.

9 Exporters' agents usually carry out all of postharvest activities in the storehouse in accordance with the exporter needs. There is no special control for quality from the government.

a) Harvesting

As quality can not be improved after harvest, harvesting is considered a critical time in vegetable marketing. As vegetables are grown predominantly by small farmers, mechanical harvesting is not practiced in Indonesia, but is carried out by the farmers (usually for local consumption) or by experienced harvesters (for export consumption) who work for a middlemen. For example, cabbages are cut from their stalks, potatoes are dug up from the ground and tomatoes are carefully picked from their tree. Despite the fact weather conditions are carefully considered for good harvesting, some farmers ripen their crops earlier because of a higher market price. On the other hand, if the price falls, they may leave the commodities in the fields while waiting for the price to go up again. In other words, they may ignore favorable weather conditions for harvesting.

b) Collecting/Assembling

Vegetables produced for export are usually collected by agents of exporters in production areas. They work particularly during harvesting time. Collectors pay the farmers by cash, credit, or pre-harvest down payment[10]. Truck merchants typically owned by exporters, play a

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10 Collectors and farmers sign sales contracts before harvest when the farmers consider prices high. At harvest time the collector comes to take the vegetables and pay cash. Such contracts give the farmer prices and sales security even though he sometimes does not receive a better net return.

central role in the collection of vegetables. They go directly to farms and buy vegetables from farmers, then transport the produce to storehouses. An estimated 75 percent of the produce is collected this way. Small farmers may also transport vegetables themselves by donkey or horse/bicycle for sale to local retail merchants.

c) Sorting and Grading

Traditional grading is based on varietal name, but form, size, and colors are also considered. For domestic as well as export marketing, sorting and grading are carried out in storehouses in production areas by traders, employing their own labor force and own grading standards. For example, export cabbage has three or four of the outer leaves removed and tomatoes are sorted according to size and ripeness[11]. The export quality produce is packed and the remainder is sold on the local market. The Department of Agriculture and Trade establishes the minimum standard[12].

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11 Cabbage and Chinese cabbage are needed to be cut before the lime is added to draw water from the vegetables so that they retain their freshness.

12 Both departments still do not play an important role in quality control of vegetables.

d) Packaging

Packaging is an important role in postharvest handling activities to protect vegetables during marketing, especially during transportation. Once the vegetables are ready for export, they are carefully placed in the basket. In other words, packaging should be carefully exercised, otherwise it will do more harm to the packed products. Shape, construction, and materials for packages vary for different commodities and destinations.

Damage occurs when the size of the package is too large or when the material is not strong enough. Improper packaging causes mechanical damage or respirational deterioration, particularly when the packaged commodities are not immediately shipped. Singapore receivers prefer smaller than traditional packages because of storage space and ease of handling. Table 9 illustrates the type of packages used in exporting vegetables from Indonesia to Singapore and the type of packaging required in the Singapore market.

Table 9 : Packaging Practices and Export Requirements for Selected Vegetables.

Commodity	Traditional system Type	weight (kg)	Singapore requirements Type	Weight (kg)
Cabbage	bamboo basket	60-65	modified bamboo basket or carton box	20-30
Carrot	wooden box	80-85	carton box	30-40
Tomatoes	bamboo basket	80-85	carton box	15-20
Potatoes	bamboo basket	70-80	jute bags	20-25
Ginger	bamboo basket	90-100	jute bags	no spec.

Source: based on interview in Pasir Panjang (Wholesale market in Singapore) and exporters in Indonesia 1984.

e) Transportation

Transportation is a critical problem in the vegetable distribution system in Indonesia. Vegetables are transported from the field to storehouses, to port, and finally to the overseas buyer. Vegetables are still transported in bamboo baskets rather than in modern containers. This transportation will be discussed in Chapter 4.

2.4. Vegetable Consumption in Singapore

With an area of 581 km2, Singapore is the smallest country in Southeast Asia. The island lacks natural resources, including arable land. Important advantages are formed in its skilled population, harbour and location.

Because of these features, the economy was based almost entirely on entreport trade and international finance. Despite its size, Singapore continues to serve as a trans-shipment point for many regional consumer and capital goods, and it also processes raw materials and produces industrial and consumer goods. Thus, the economy is diversifying with industrial action, complementing its traditional service function to less developed neighbors.

Lacking sufficient arable land, the island will remain a food importer, additionally, Singapore's industrial growth will remain dependent on raw and semi-processed imports. This role has direct bearing on agriculture in Indonesia and the success of its efforts to encourage vegetable exports.

Fresh vegetable exports to Singapore from North Sumatra averaged 12,200 metric tons between 1967 and 1971. Between 1978 and 1982, the average tonnage increased to 27,020 metric tons (Ginting, 1974). It is estimated that 40 percent of these vegetables are re-exported from the Singapore market[13].

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13 It is difficult to estimate the vegetable consumption in Singapore due to lack of data.

3. INDONESIAN AGRICULTURAL TRADE POLICY

3.1. Indonesian Vegetable Exports: Potential and Constraints

a). Vegetable Exports

Indonesia has long been an important supplier of vegetables to Singapore. These exports can play a major role in shaping the rate and impact of exports for North Sumatra as well as of Indonesia.

Hechschen-Ohlin theory postulates that the ratios between the production costs of a series of commodities in one country are different from the same ratios in another country because of different factor endowments among countries and factor intensities of production.

Because of these cost differences a country will hold a comparative advantage in certain goods which it can export and import those goods in which it has a comparative disadvantage.

Indonesia has a comparative advantage in vegetable products relative to Singapore, as is simply illustrated in Figure 5.

Evidence for Singapore's comparative disadvantage in vegetable production is given by Leong Pow Chow, 1985, who estimates that approximately 75 per cent of vegetables and 97.5 per cent of fruits in Singapore are imported.

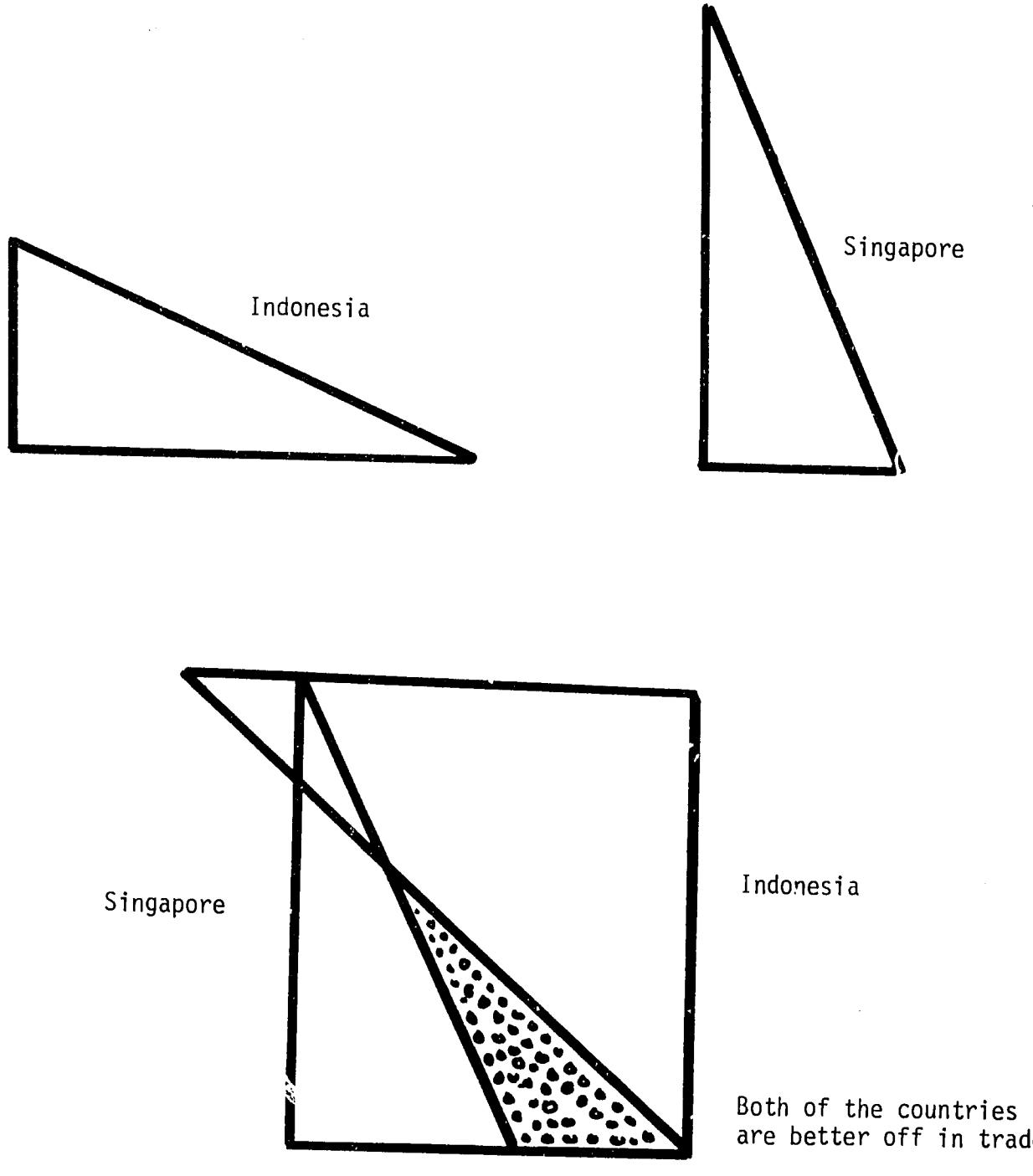

Figure 5: A Graphic Representation the Key to Comparative adventage

The actual size and composition of trade flows and the equilibrium of international prices also depend upon demand conditions in trading nations. Demand is shaped by national income and distribution, population, tastes,and preferences of consumers. Changes in demand can alter international trade just as well as changes in comparative advantage patterns.

Further, it is useful to discuss how the major market for Indonesian vegetables works in this economy. Output and price equilibrium of vegetable exports depend on the demand of the Singapore market and on the relevant export duty. Since Indonesia now is a relatively small supplier of vegetables in Singapore, the demand curve facing suppliers is elastic over the relevant range: that is, Indonesia can sell any amount at the going Singapore price. Furthermore, no significant domestic demand for these exports exists.

Figure 6 illustrates the resulting equilibrium: DwDw represents the Singapore demand curve, drawn flat to indicate the smallness of the Indonesian vegetable supplies to the Singapore market; below it the parallel line, Dw'Dw', shows net revenue to Indonesia exporters when they sell in the Singapore market; the difference between the two represents export taxes and port charges. DD is the domestic demand for the export vegetable concerned. SS represents the domestic supply schedule and reflects existing technology and domestic cost conditions.

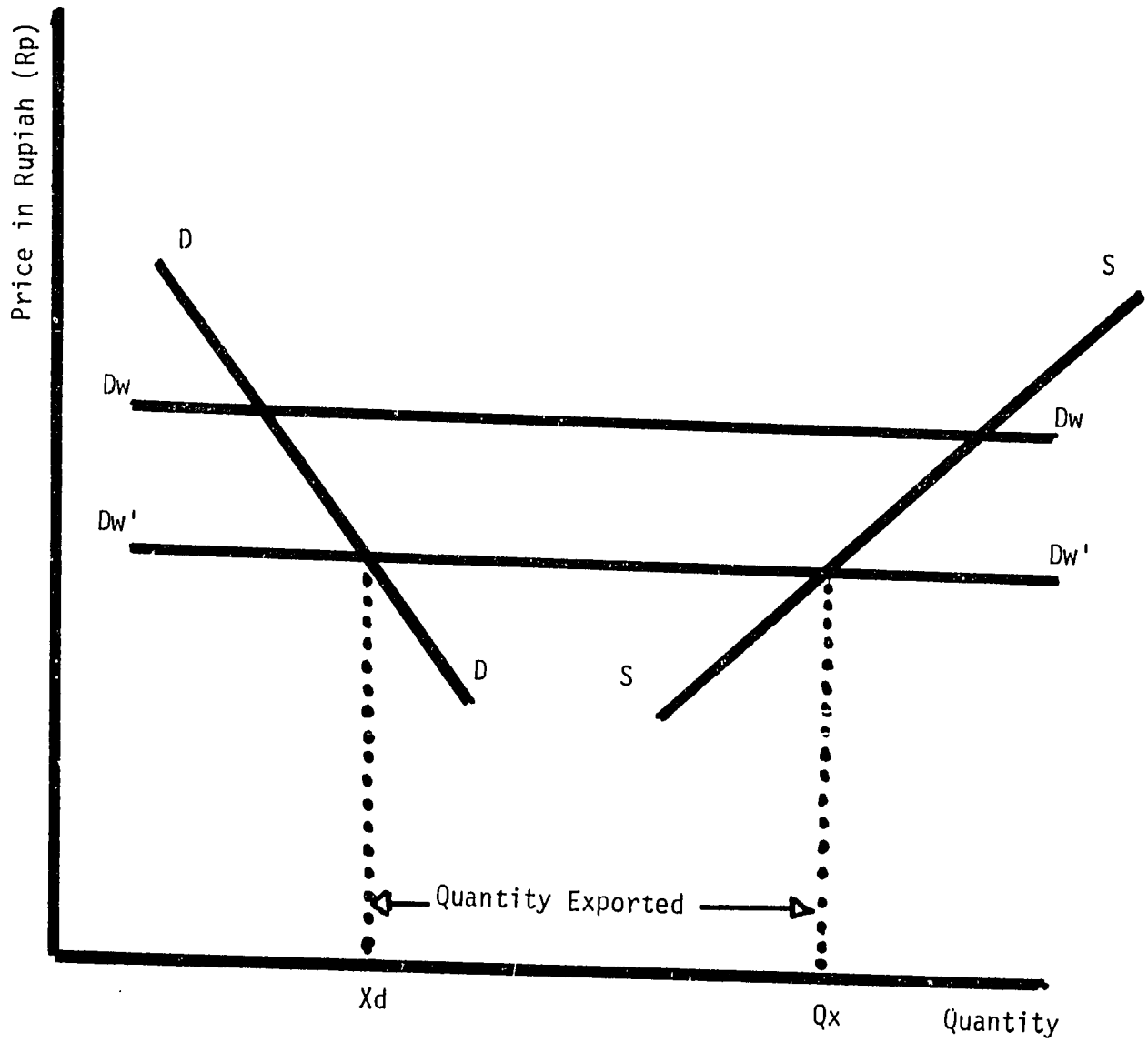

Figure 6 : The Domestic Market For Export Vegetables In Indonesia.

Equilibrium takes place with an output, Qx, determined by the interaction of the supply curve and the curve representing the Singapore demand market less export taxes. Domestic use is given by the intersection of the domestic demand curve DD and Dw'Dw' curve reflecting the Singapore demand less export taxes. The domestically consumed quantity is Xd, and the quantity exported is the difference between Qx and Xd. Therefore, the following fundamental conclusions emerge from this analysis:

1. The level of exports is the difference between total output of export vegetables and domestic demand for these vegetables costs.

2. The Indonesian wholesale price for export vegetables is the Singapore price less existing export taxes, port charges, and transportation.

3. The domestic retail price is equal to the Singapore price, less export taxes and port charges (which equals domestic wholesale price), plus domestic retailing and transportation costs.

The government of Indonesia is becoming more aware of the potential benefits that could result from the promotion of vegetable exports. The question is whether trade restrictions on exports can be reduced to help expand exports or whether restriction on imports can enhance exports. Alberto and Barbara (1979) observed that about half of the countries had

suffered a decline in the world market share of their principal agricultural export commodities. External demand than, is not the only constraint operating against export expansion; domestic policies are also an important factor.

b). Potential of Indonesian Vegetable Exports

This study will illustrate the potential of Indonesia's exports for vegetables abroad. The possibility of extending the vegetable market and of potential development of vegetable shippers from Indonesia will be discussed in the next chapter.

The restoration of stability and domestic reforms to provide incentives for export and domestic production are essential for growth. Export performance is particularly crucial in view of the historical relationships between export expansion and domestic growth in Indonesia's economy.

Vegetable transportation costs are important help determine prices received at the farm level and paid at the foreign consumer level. High transportation costs to foreign markets make Indonesia's vegetables less competitive. The development of container on-barge services to Belawan port can affect the vegetable exports and potential for exports.

c). Constraints to vegetable exports

To estimate the potential for vegetable exports, the following components should be considered: (1) trade regulations of the exporting country; (2) imports which limit market access; (3) market size, special requirement,and growth; and (4) competition and price, including costs of placing the products in the purchasing country.

Export trade regulations can block or hinder exports to all or particular countries. Exporters may be required to follow elaborate and time-consuming procedures, including the preparation of numerous documents, such as those involved in obtaining an export licence or foreign exchange allocations. Such regulations may make it virtually impossible to export, even if legal.

In the importing country, trade regulations can take several forms. First, trade regulations can be a tariff or quota which affect the competitiveness of the product against a product made within the market as well as against those supplied from other countries. Second, it can be an internal tax which plays an important part in the cost/price buildup for a product, and thus affect its market prospects. Third, country's trade regulations might be currency restrictions, health/safety regulations, or political factors.

The potential of a particular product such as vegetables in the Singapore market can be indicated by the size of the market open to the product. In 1980, for example, the amount of vegetable products imported to Singapore was 42,852 metric tons. The re-exported from Singapore in the same year was 43,534 metric tons (see appendix). This figure indicates that only a small percentage of the population of Singapore used a vegetable product.

Vegetable products from Indonesia face competition in the Singapore market. The strength of this competition direct or indirect is a key factor to estimate the potential of the vegetable exports. A direct competitor, such as Malaysia or Taiwan, may sell similar products. An indirect competitor sells a product which is substantially different but competes for the same buyer and usage for example, the USA and The Netherlands. The reasons for the competition success are likely to be found among the following; (1) high product quality;. (2) competitive pricing; (3) cost advantages; and (4) domination of the distribution channel. This means that Indonesia should be able to enhance its position in this international market by addressing these requirements.

In order for Indonesia to exploit its market potential, some basic questions should be addressed. They are (1) what is the quality of product consumers are willing to buy; (2) how should the product be changed to meet buyer preference; (3) how much will the consumer pay now and in the future; (4) how much money can the government invest to support the exports; and (5) what investment decisions may be required if the product is modified to make it suitable for the market.

3.2. Trade Barriers and Policy

It is necessary to distinguish between free trade and protection in a market economy. Free international trade implies an unrestricted flow of goods across national frontiers, whereas protection means that imports are subject to tariffs, levies or physical restrictions in order to reduce their competition with home products. The traditional form of protection is import tariffs. Quotas, variable import levies, and subsidies have increasingly been employed to exclude foreign competition far more drastically than have tariffs. All have one thing in common. They make it more difficult or impossible for foreign sellers to compete with domestic sellers.

Such barriers for trade call for government sponsored protection on behalf of whoever desires them. There are reasons for government sponsored to be advanced such as: to protect a new industry, national security or national health; to retaliate against unfair foreign trade policies; to improve the balance of payments; to change international terms of trade; and so on. The major goals of government policy generally are (1) to maintain the maximum number of persons engaged in agriculture, (2) to maintain a certain degree of self-sufficiency in food and (3) to maintain the incomes of the farming community and improve the efficiency of agricultural production and marketing (Graham Hallet, 1981).

As far as Indonesia's exports of vegetables are concerned, the major goals of the government policy toward international trade and finance are to prevent the deterioration of the balance of payment and to benefit Indonesian producers as much as possible. For example, the Indonesian government decree of December 27, 1982, curtailing imports of foods, beverages, and fruits categorized as luxury items, was due to a foreign reserve problem. However, the government's strategy to protect domestic horticulture producers from foreign competition by restricting imports has tended to promote capital-intensive rather than labor-intensive enterprises. The policies seem to weaken links between the modern and the traditional sectors.

Indonesia's curtailing of imports has resulted in dramatic decrease in the quantity of vegetables exported in the last three years. The import restriction raised domestic price above world levels, but this policy is only weighted incentives in favor of the domestic market, while discouraging exports (Paauw Douglas S, The Indonesian Economy in the 1980s). In other words, even though the government has been concerned with protecting domestic enterpreneurs, the policy has indirectly affected Irdonesian exports to Singapore.

4. METHODOLOGY & FINDINGS

4.1. Quality Improvement And A Conceptual Model For Reducing Postharvest Loss

One of the general steps to be taken in diagnosing and analysing postharvest losses of vegetable products is a study of the marketing system. The objective of such a study is the reduction of postharvest losses where economically feasible, improvement of quality, and the enhanced efficiency of the marketing system.

4.1.1. Quality Improvement

Postharvest losses can be significant, but the measurement of such loss is difficult[14]. A problem in evaluating or measuring postharvest loss is how to analyse in economic terms individual processes or activities designed to reduce losses by increasing quality (e.g. handling, storage, and packaging). Willis (1985) pointed out that even though many research projects were perfectly executed and produced excellent techniques for eliminating problems, the techniques were never introduced commercially because minimal or no benefits were gained by alteration of the traditional method of handling. Such techniques can reduce loss but are not economical.

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14 Lee Song Kheun. Paper presented at the workshop on Postharvest loss assessment of horticultural produce, Manila, The Philippines 11-13, Feb. 1985.

Quality is lost in exporting vegetables from Indonesia to Singapore because of is changes in appearance, taste, or texture. These changes make the vegetables less desirable aesthetically so that consumers are not willing to pay as much for the produce. Such changes may result in total loss where the item is unfit for sale or result in a lower sale price[15].

A starting point to analyze how to reduce loss is to identify the expected shelf life of the vegetable in each phase of marketing and estimate a deterioration charge much in the same manner that depreciation is charged to a capital asset. The depreciation of the value of the product reflects the share of its total value that has expired during the marketing period. Consumers usually know the quality of vegetables when they buy them, but they find it difficult to express quality in objective and tangible terms. Expressing a marketing loss in value terms provides information that can be use as a basis for action to reduce or minimize the rate of loss in economic terms.

Loss assessment studies are also important in determining policies to formulate, such as regulatory policies in grading and standardization, policies to promote price stability, and policies to enhance marketing efficiency. Establishing and enforcing grades for vegetables is necessary as the export of vegetables expands. Producers sell to traders who in turn sell to exporters and sort their produce according to whether the vegetables are of excellent, good, fair or poor quality.

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15 Any deterioration of the quality of horticulture from harvest to the consumer is a loss.

A good assessment of postharvest losses will furnish information important in determining locations and identifying the type of activities which may reduce losses. The information may show that the problem does not call for technological solutions. It may show that the highest weight loss occurs where there are high trimming losses due to rotting and physical damage, such as is the case of cabbage shipped from North Sumatra to Singapore where the transportation facility itself is one of the major causes of loss[16]. The losses would not be as great if the ship had better ventilation, if the number of ships were not limited, and if there were an incentive for the owner to improve his ships[17].

Finally, it is important to ensure that loss assessment does not become an end in itself (Willis R, 1985). An improved technique is of value only if it is used to improve the supply of vegetables to a wider range of consumers and to provide a better return to the farmers. In other words, the expected benefits from loss assessment should exceed the cost.

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16 Lee Song Kheun. Trimming losses of cabbage from North Sumatra were measured monthly over a 12-month period and found to average about 30%.

17 O.Felia K.Bautista. Relevance of postharvest loss assessment to postharvest planning. Paper presented during the loss assessment workshop, Manila, The Philippines, 11-13 Feb. 1985.

4.1.2. A Conceptual Model for Reducing Loss

The reduction of postharvest losses is a process which needs integrated planning. It has to be commenced from the production site through to the consumers. The motto "Technically a model is feasible and economically profitable" should be applied to this issue.

Economics plays the all important role of establishing the direction and guidelines which minimize or eliminate losses. Private enterprise (farmer) is not going to initiate a practice that will cost more than revenue (at least over the long run) if the system is to continue to function. In an economic sense, profit generated from a given commodity is the difference between the Total Cost (TC) of producing, processing and marketing, and the Total Revenue (TR) received for a product by producers. Hence, the TR received for that product must, in the long run, exceed the TC of producing, processing, and marketing the product to the final consumer for production and distribution to be profitable.

The Cost side

Generally, total cost determination is a more complex problem than costing of a single process, such as determining the cost of shipping vegetables. Total cost is concerned with the cost of vegetable loss or eliminating vegetables loss. In other words, the calculation must include the total delivered cost when all factors concerned with vegetables losses are considered. More precisely, one can classify losses four ways in order

to try to isolate loss reduction costs: (1) production costs; (2) processing costs (value added in industry); (3) marketing costs (collecting, handling, transporting, storage); and (4) the costs of loss reduction.

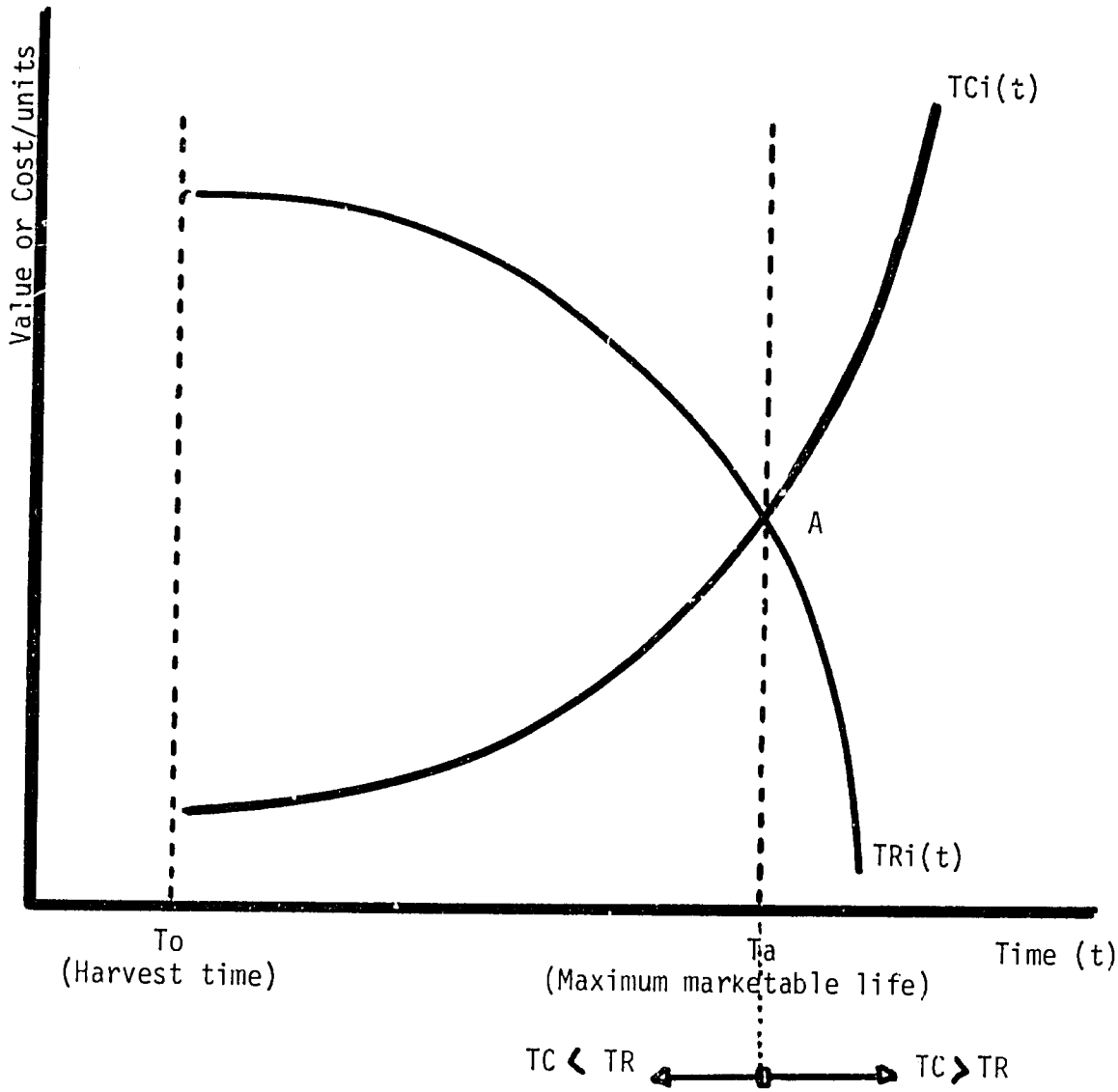
The revenue side

Total revenue is the revenue to be gained from elimination of the loss. Consideration is given to prices that might result from the larger value of roducts that would be available if vegetable loss did not occur.

Expressing a conceptual economic model helps assess how to minimize losses and maximize economic efficiency through improved postharvest technique for marketing perishable exports[18]. Conversely, then, the elimination of vegetable losses would (1) decrease the average cost of vegetable production, processing, and marketing and (2) increase the quantity and quality of products available to consumers.

Figure 7 demonstrates how the Total Cost (TC) of vegetables associates with Total Revenue (TR) in introducing a new technology to minimize loss. The vertical axis measures the value or cost for the commodity investigated. The horizontal axis measures time in some suitable unit such as hours, days, weeks, or months. Total Revenue function TRi(t) measures the value of a given lot of vegetables at points in time. This means that as time elapses the value of the vegetables decreases due to deterioration or spoilage;

18 A model based on the idea of Dr. James R. Jones. Dept. of Agricultural Economics, University of Idaho. Towards an Economic Model for Measuring Postharvest Losses.



TRi(t) = Total Revenue Function
TCi(t) = Total Costs Function
i = A current technology for marketing vegetables in question
A = Maximum marketable life point where TC=TR

Figure 7 : Marketable Life of Vegetable

therefore, the curve will decline to the right. The mathematical form of this function will be determined by the rate of revenue received associated with the commodity.

The TCi(t) function is a Total Cost function associating treatment to the shelf life of the commodity and, therefore slope upward to the right. The mathematical form of this function is determined by available technologies and their respective costs.

The conceptual model is based on a set of assumptions:

1). Location of the function is based upon a given price of the commodity, which is a function of demand and supply conditions in the market.

2). Demand is constant.

3). Price of the commodity is constant (grade A, B, C, and D are in constant pricing).

Figure 8 shows that the Total Cost (TC) shifts to the right (for example by introducing a technology) and is less than (TR). Shifting the technology from TC1 to TC2 creates a new maximum shelf life of the commodity (TC2=TR2). Based on the position of the original equilibrium, A, a change (an improvement) in technology has an economic value of either extending the shelf life of the vegetable from Ta to Tb or causing $\Delta TR > \Delta TC$.

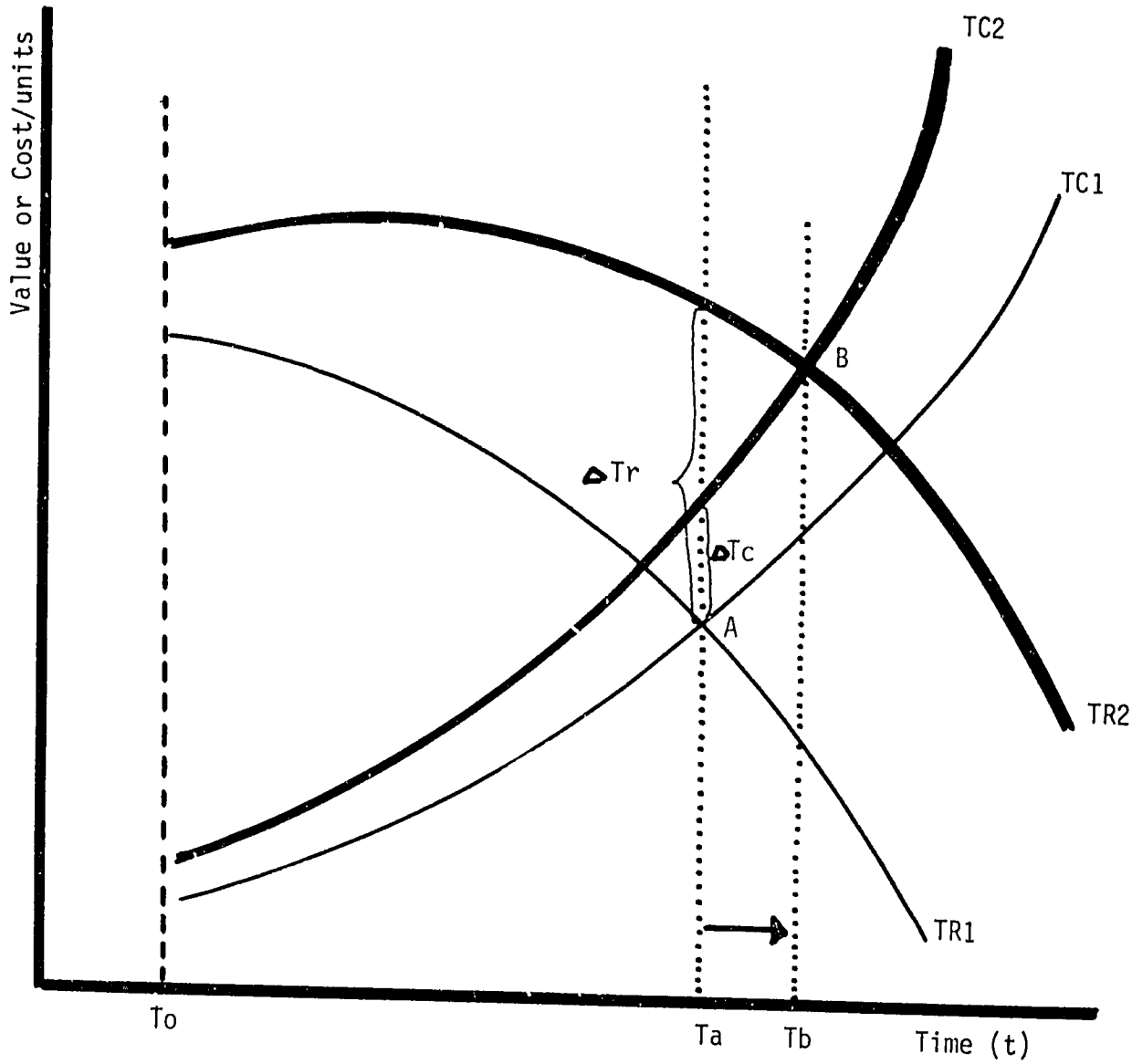


Figure 8 : Total Costs, Total Revenue, and Marketable Life of Vegetable where ΔTC < ΔTR.

On the other hand, Figure 9 shows that if the cost associated with the improved technology increases more than TR, technology shifts from TC1 to TC2. By shifting this technology, the economic shelf life is decreased to Tb. In other words, commodity has to sell at this maximum shelf life to meet TR2=TC2 and the commodity value is Y2.

Based on the position of original maximum shelf life, A, $\Delta TC > \Delta TR$. Therefore, improving technology does not guarantee increased profits. This is one reason why technical improvements that result in less deterioration of a commodity are not always accepted (James R. Jones 1983).

This conceptual model also shows why a technique may be economically viable in one society and not in another. Eliminating food losses may have adverse effects for some groups of its marketing chain and position effects for other. A question to raise at this point is a social question about who should gain and who should lose.

Figure 10 shows that introducing innovation or technology (whether increasing the quantity or quality) will increase total cost. Hence, it will affect the total revenue and ability of consumers to buy. In a relatively high income society, increasing the price of the commodity (say, improving the quality by introducing a new technology) will not much affect the consumer's willingness to pay. For example, although the price of Indonesian vegetables arriving in Singapore is high because of increasing quality, the consumers in Singapore are still able to pay because they have the highest

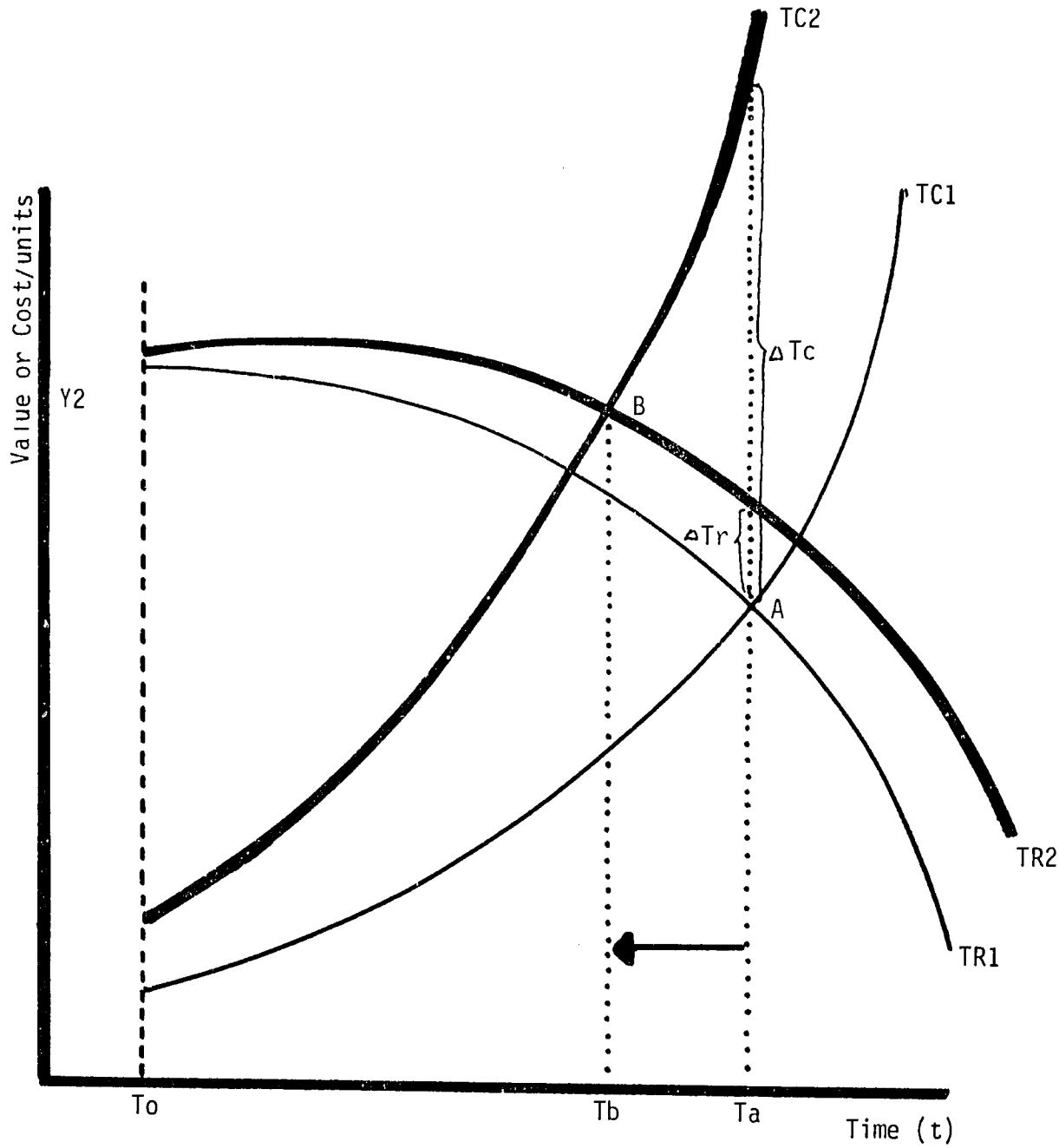


Figure 9 : Total Costs, Total Revenue, and Marketable Life of Vegetable where $\Delta TC > \Delta TR$.

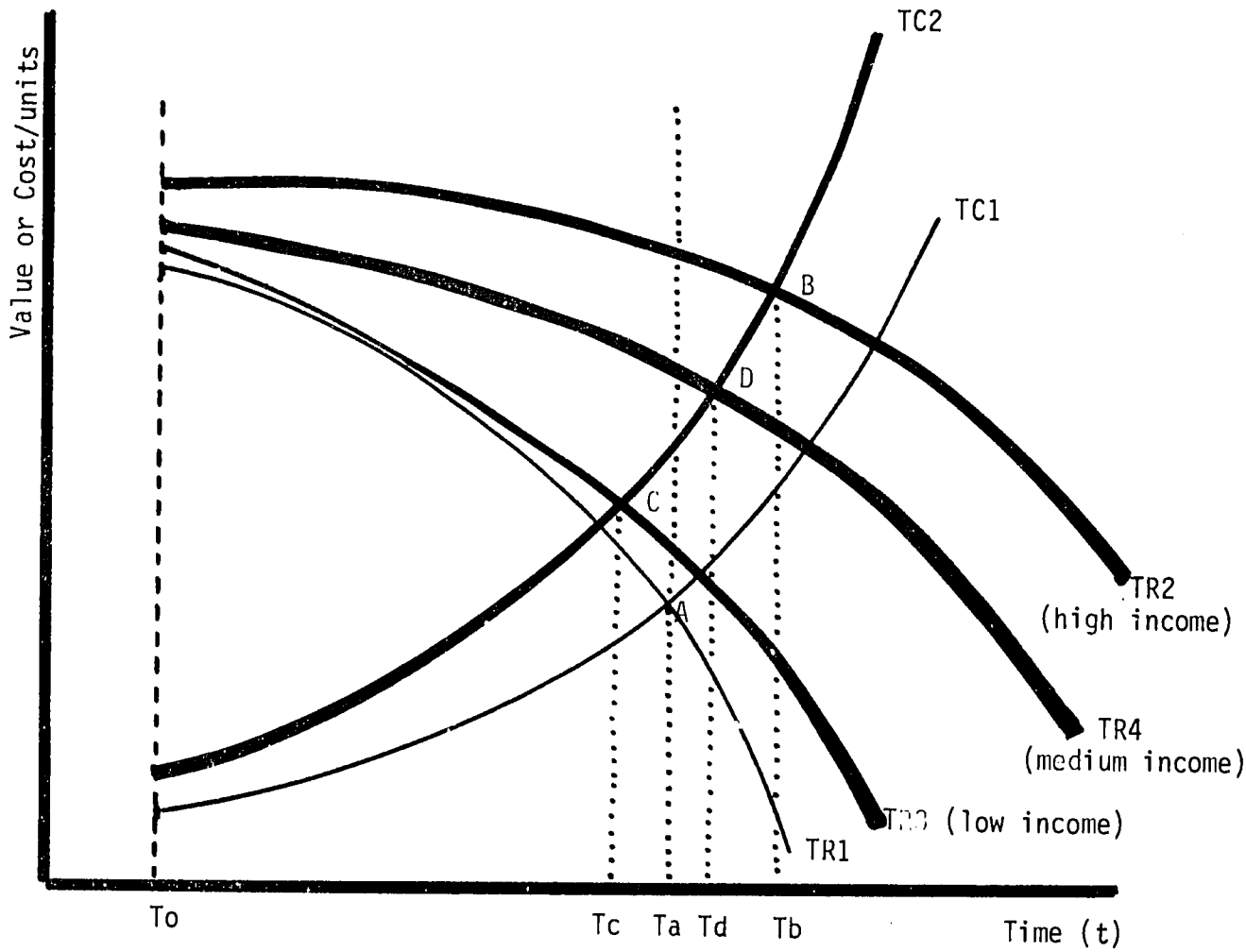


Figure 10 : Market Response to Postharvest Innovation and Marketable Life.

income in Asia after Japan. This fact can also be seen in vegetable prices in the Singapore market where imported vegetables from Australia and Taiwan are higher priced, but of better quality (see also table 4).

However, in a relatively low income society, on the same cost function, consumers are unable or unwilling to pay for a such improved quality. This group is just able to pay at TR3. The same analysis can be made to a relative medium income society.

Introducing The Average Marketing Time (Tm)

The concept of average marketing time (Tm) also shows how transit time reduces economic losses and makes it possible to shift vegetables to high value, distant markets. The average marketing time is a function of transport mode, distance, and infrastructure. If marketing is denoted by Tm, transport mode as M, distance as D and I as infrastructure, the equation is formed:

$$Tm = f\ (M,D,I)$$

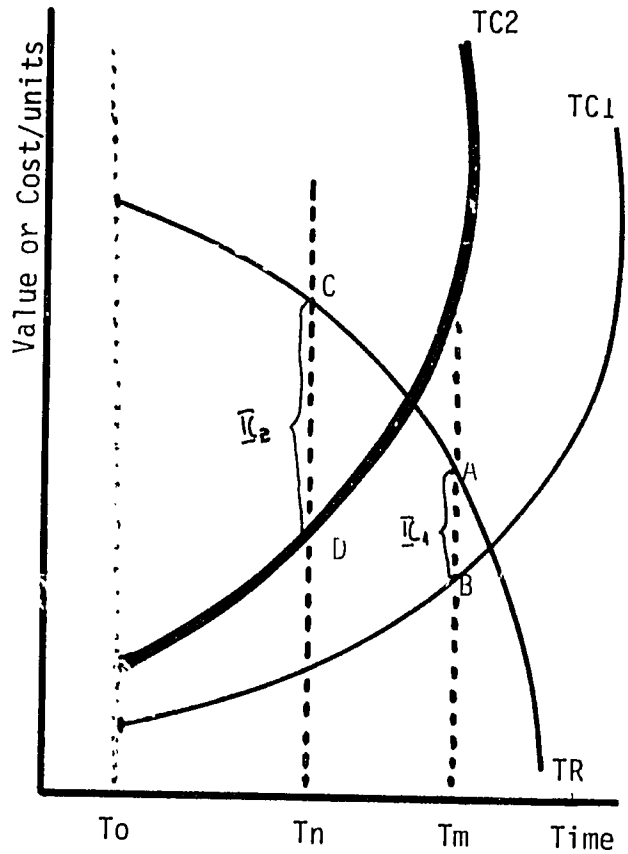
Based on the economic model mentioned above, another analysis can be made as example shown in Figure 11 and Figure 12.

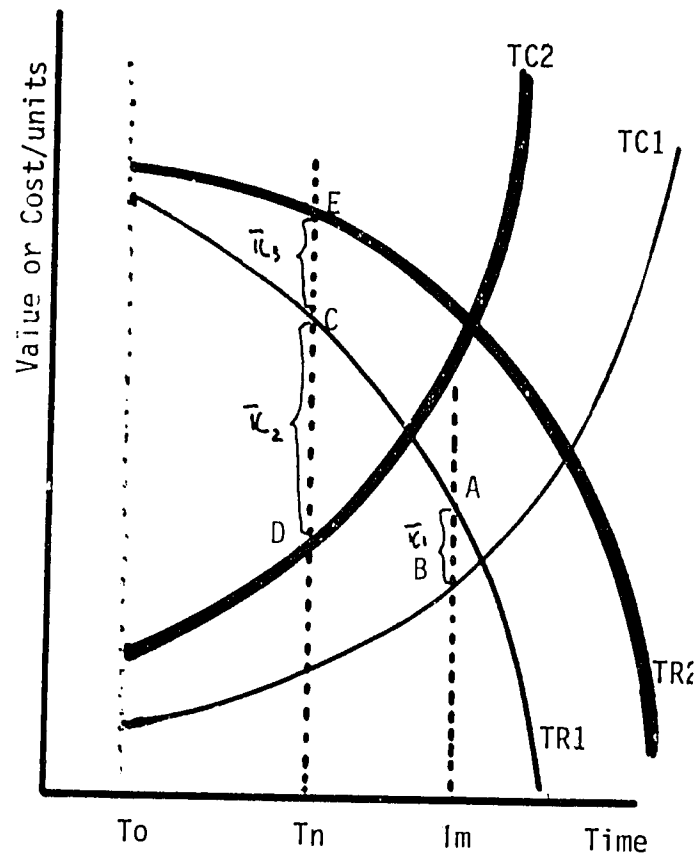
Let Tm be the average transit marketing time associated with slow transportation. Before introducing a technology one will find that profit is indicated by $\Pi 1 = TmA - TmB$. Introducing technology (cost is higher from TC1

to Tc2) with rapid shipping the average transit time is faster from Tm to Tn. Although TR holds constant, faster transit time and earlier selling of the commodity increase profit as indicated by $\mathbb{C}$ 2 = TnC -TnD, where area $\mathbb{C}$ 2 >$\mathbb{C}$ 1 (see Figure 11).

Figure 12 shows that the introducing technology results in the addition of profit X or ($\mathbb{C}$3). Therefore, the total reduction of economic losses will be ($\mathbb{C}$2 - $\mathbb{C}$1) + 3. Many alternatives of economic analysis can be derived from this basic concept.

Given these economic analyses of postharvest activities in introducing new technology for reducing losses, it is important technical and economical analysis be integrated. This means that, technically a model is feasible and economically profitable.





TR = Total Revenue Function
TC = Total Cost Function
Tm = Average Marketing Time
Tn = Transit & Marketing time Associated with rapid Shiping.

Figure 12 : Reducing Transit Time by Introducing Faster Technology (TR Shifted).

Figure 11 : Reducing Transit Time by Introducing Faster Technology, hold TR constant

4.2. A Conceptual Model for A Vegetable Transportation System to Singapore

This section will briefly discuss the qualities of efficient transportation services (particularly shipping) as a starting point to attainment of greater export value.

4.2.1. The Role of Shipping in Indonesia

Economic development in Indonesia is now shifting gradually to substantial economic development. It is reasonable to expect that the diversified and varied natural resources of Indonesia will provide the foundation for a modern and advanced country.

Development depends on providing adequate transportation and communication to link communities and satisfy their needs. One reason to examine transportation is to improve marketing efficiency through cost minimization and enhance domestic or overseas market development. By reducing transportation costs, regions may be able to specialize in the production of goods in which it has the greatest advantage and increase producer returns.

Shipping is the most important mode of transportation in Indonesia, which is made up of many thousands of islands, scattered along the equator between Australia and the Asian mainland (see Figure 1).

Indonesia covers 8,746,000 square kilometers, of which only 1,500,000 square kilometers, or 21 percent, is land, and the rest, 2,846,000 square kilometers, or 79 percent, is ocean.

Transportation costs are a large component of agricultural product prices and a major determinant of trade flows. The producer receives a price less the marketing, handling,and transportation charges to the central market or port terminal destination. Thus, trade will occur only when the difference in prices in two markets is greater than their transfer cost (Bressler & King, 1970; Tomek & Robinson, 1972; Dahl, 1977).

Transportation in Indonesia occupies a vital strategic position because of the following reasons: (1) rapid growth in population and production will increase the demand for transportation services and their facilities; (2) more than 60 percent of Indonesian land is covered by large forests which have not yet been opened up and are largely trackless, thus creating many obstacles in constructing highways; (3) few primary roads exist between the different production centers except on Java and some of the more developed parts of Sumatra. Improving the existing road network or building new roads are extremely costly and will take many years.

Shipping between the main ports of Indonesia is performed mainly by so-called "Regular Linear Service" (LSR) ships, while the smaller ports are serviced by so-called "Perahu", or sailing vessels. The combination of the LSR and Perahu form a national shipping network, which conforms with the concept of "Wawasan Nusantara", or the Archipelago Conception. The wawasan nusantara aims at integrating and coordinating Indonesia's transport requirements.

Each nation requires a comprehensive and efficient transportation system to move goods, especially within its national boundaries. Its needs will extend eventually further to include an adequate transportation system linking all nations so that the resources of the world may be available to all people. For the transportation of goods, the service should be speeding, safe, adequate, frequent, regular, responsible and, last but not least, costed acceptability.

Parallel with technological development, Indonesia must (1) develop larger and safer ships to handle high volume flows of both bulk and general cargo; (2) develop increasingly speedy, efficient, and low cost package cargo services to maintain their position in an increasingly competitive trade in consumer goods; and (3) extend modern cost reducing technology, such as containerization, to less-developed areas.

Among the attributes of transportation services, "regularity" is the most important. This means that transportation services should be available on a schedule with fixed and regular departures and arrivals. Therefore, an accumulation of stored goods can be kept at a minimum.

With adequate shipping means and facilities, agriculture and other economic sectors will also expand. By moving goods from one place to another, transportation facilities stimulate economic growth at these places and along connecting routes. Therefore, transportation can perform a role in development.

However, transportation policies have a wide impact and sometimes cause conflicts between carriers and shippers. The general goal of carriers is to increase profits. On the other hand, the shipper's goal is to have more service at less cost, that is more choice among firms and between modes.

Development can not be carried out in all regions simultaneously, but it will concentrate on several places or regions. In this connection, four main development centers have been fixed by the government of Indonesia, i.e, Jakarta, Surabaya (East Java), Medan (North Sumatra), and Ujungpandang (South Sulawesi). These cities are also main ports (both domestic and international).

4.2.2. The Possible Role of Containerization in Shipping Vegetables from Indonesia to Singapore

Prices of vegetables vary from Indonesia to Singapore. The price differs graphically because of transportation costs, the difference in supply/ demand, or trade barriers. Transportation of Indonesian vegetables to Singapore requires the selection of the fastest and most efficient mode in the best possible quality (condition) at the lowest possible cost. This is extremely important to make Indonesia vegetables more competitive in international markets.

Transportation is the link between the farmer and the consumer; technological developments in transportation and related fields have changed service capabilities and cost factors. The development of the intermodal van container was an important breakthrough in transportation technology for overseas shipment of agricultural perishables. This was especially significant because the container was suitable for movement by rail, truck, water, and air (USDA, Export Handbook for U.S. Agricultural Products, 1985).

Frequently, there are two ways of shipping fresh vegetables, by Conventional break-bulk methods and by Van-container. The former is not as efficient as the latter because the cargo may be handled more. Despite break-bulk methods, ships often cause bruising and other physical damage to the product (for example, cabbage loss shipping from

Indonesia to Singapore was 25-30% using this method, Lee, 1983). However, because the cost differences and a continued shortage of van container equipment and services, large amounts of agricultural products are still shipped in refrigerated lockers of break-bulk ships.

The shipping facilities to Singapore are far from ideal because the lack of cold storage and because the vegetables are still transported in bamboo baskets rather than in cardboard cartons. Although there is cold storage at the harbour, ocean container systems in transporting vegetables to Singapore has not been introduced yet; therefore, Indonesia should introduce this method in order to be more competitive with other vegetable exporting countries which use this method. Otherwise, consumers in the Singapore market will buy from other countries (Ginting, 1984).

Containerization represents a revolutionary change in the technology of sea transport cargo with far reaching impact on shipping, ports, and shippers. Standard metal container boxes are designed so that the cargoes can be shifted for highly mechanized transportation aboard specially designed ships and specialized land carriers. The use of container boxes or vans also requires capital-intensive charges in ship design and port infrastructure among other things. Bresseler and King (1970) pointed out that:

"more sophisticated transport system frequently involved relatively large investments and high fixed or terminal cost per ton, but much lower operating costs per ton mile for actual transportation".

Drastic changes are required in the entire transportation chain (ships, ports, roads, bridges, rails, motor vehicles, storage, and other infrastructure) and organization which now have to build and manage only for handling of cargo by what are termed conventional methods.

However, as a result of increased pressure not only from the container carriers but also from the big buyers of Indonesia's export products and the suppliers of its imports, capital, and consumer goods, containerization sooner or later will be introduced. A recent study of introducing containerization in the developing countries of India, Malaysia, The Philippines, Sri Lanka, and Thailand indicated that,

1. Container ships achieve faster turnaround time;
2. Containerized cargoes generally have shorter dwell time at the ports visited than conventional shipping; and
3. The quality of produce is in a good condition.

The developing countries and their exporters could not afford to ignore the challenges posed by containerization, which now affected their foreign exchange earnings and their ability to maintain and possibly expand their exports into the increasingly highly competitive markets of the developed countries (Economic Bulletin for Asia and the Pacific vol. XXXIII. no.1. June 1982. United Nations).

For the next decade, other developing countries like Indonesia should note (1) that their imports are increasingly being moved in container and (2) that the suppliers abroad sell their goods only in containerized shipments. Subsequently, Indonesia will begin to feel pressure from buyers abroad to containerize an increasing number of products, such as vegetables from North Sumatra. Unless these shipments are packed in containers, the buyers from the industrial countries (Singapore) will buy from sources in other areas or countries which can meet such as a requirement.

There are three main issues and problems in introducing container in shipping Indonesia's vegetables to Singapore:

1. Shipping

   The problem facing Indonesia in adapting to new technology of vegetable containerization are (1) its limited financial and technical resources and (2) its declining freight revenues, while operating costs have remained high. Considering the highly competitive international character of shipping, successful management of a shipping industry requires well-trained executives, finance and operation managers, marketing directors, a highly skilled crew, and an effective network of shipping agents and representative offices abroad.

The new sea transportation technology requires personnel who possess not only technical knowledge to operate container ships, which are a more sophisticated design than conventional vessels, but also a keen business acumen to manage the shipping enterprises of the country.

2. Port

The ability to expand Indonesia's port capacity to handle container ships and cargo is limited. Planning for development of container facilities of a port is a relatively uncomplicated task if the port is the only one in the country such as Singapore and the port of Colombo in Sri Lanka. For Indonesia, a large country with four major ports with other special geographical features the planning process becomes more complex, and more factors and alternative choices must be considered.

It seems, simpler and less expensive to build on an existing port rather than build an entirely new port or to construct a container terminal elsewhere. Ports are built to serve as exit and entry points for the country's exports and imports, which play critical roles in national development. Some ports may be better suited to specialize in handling vegetables, in which case they need not have an expensive infrastructure in the uncertain hope of attracting mainline traffic.

3. Shipper

Shippers can benefit from containerization of their cargoes through saving in packaging, safer handling (quantity and quality), reduced pilferage, and generally shorter cargo transit time.

4.2.3. Modified Conventional Break-Bulk Method for the Short Run and Introducing Van Container in the Long Run

Cabbage, carrots, tomatoes, potatoes, ginger, and other commodities are highly perishable and must be handled properly during marketing, especially when these produces are shipped. Table 10 highlights the weigh losses of a trial shipment of cabbage handled from producer to Singapore using traditional methods.

Table 10. Total Weight Loss for Cabbage during Transit: Due to Evaporation, Physical Damage and Rotting

Basket size (kg)	Grower	% of losses Without poly-ethylene	% of losses With poly-ethylene	Mean
30	1	28.1	33.1	30.6
60	2	35.4	35.4	37.2
120	3	32.9	31.3	32.1
Mean		32.1	34.4	33.3

Source: Postharvest Handling of Cabbage from North Sumatra to Singapore. ASEAN-Australia Food Handling Project 1980.

Proper handling assures that the vegetables will arrive in optimum condition and will have a reasonable shelf life. The design of the package will depend somewhat on the transportation system used. In an export shipment that takes approximately three days (see Table 11), vegetables may require heavier-weight fiber board and a better structure than the bamboo basket. In ocean transportation, the long time spent on vegetable ships without refrigeration causes part of the vegetables to rot. Therefore, some modification of the packaging or shipping is required.

Table 11: Time Required from Harvest to Auction Market in Singapore.

Postharvest activities	Time period
Cutting	1 day
Sorting and liming	1 day
Drying and Packing	1-2 days
Transportation to the port	1 day
Shipping time (Medan-Singapore)	2 days
Total	6 - 7 days

Source: Meneth Ginting, Costs, Margins and Channels for Exporting Fresh Vegetables From North Sumatra 1974.

In the short run private industry, shippers, and government agencies should provide or modify the conditions of the transportation equipment in ships. In other words, they need to pay attention to conditions prior to loading and in the transit environment. Prior to loading, the conditions should be as follows:

(1). reverse air flow and ventilation should be in good condition;

(2). inside of the van should be clean and free of odors;

(3). floor drain should be checked to make certain they are not clogged so defrost water or top ice runoff can be properly discharged;

(4). door gaskets and closing devices should be formed and the seal tightened;

(5). refrigeration system should be available and in a good condition.

While the transit environment requires the equipment to control

(1). temperature

(2). relative humidity

(3). atmosphere

(4). compatibility in mixed loads, and

(5). loading patterns and cargo bracing.

In the long run, containerization should be considered and studied further.

5. CONCLUSIONS AND IMPLICATIONS

5.1. Conclusions

The results and conclusions derived from this research represent attempts to better understand the position of Indonesian vegetable exports. Some conclusions from this investigation of Indonesia's exports of vegetables to Singapore are as follows:

1. Vegetable exports from Indonesia have come to represent an activity essential to the economy of the region as well as the nation. As an international market for exports, Singapore is the single largest customer of Indonesian vegetables.

2. Analysis of Singapore imports from Indonesia reveals that the vegetable market has shown some downturn in the past three years. This does not entirely mean, however, that the volume of imports has decreased. Part of the reasons for the downturn may be attributed to increased imports from other countries or to increased direct shipments to neighboring markets (re-exports) by passing Singapore.

3. The Indonesian share of vegetable exports in the international market from 1978-1981 has been relatively steady. In 1981, some decrease in both quality and share to the Singapore market was noted. In 1983, the quantity and market share continued to decline. Poor quality and Indonesia's curtailing imports of foods, beverages, and

fruits categorized as luxury items as policy issues in trade may be principal reasons in this decline. Quantity will continue to decline in the future if the quality does not improve.

4. Indonesia can enhance its competitive position in Singapore only by improving the vegetable quality in each step of the postharvest activities, including minimizing the cost of transportation by modified conventional bulk shipping. Farmers, traders, and government officials consider the losses to be relatively high.

5. Vegetable postharvest activities in reducing losses at the national level are still given high priority. There is an attempt to anticipate technology. Attention to an economic analysis in reducing losses should be as important as if not more important than technological improvements. Most of the vegetable postharvest activities are carried out in storehouses. Therefore, in improving the quality of vegetable exports from Indonesia the government should first develop these storehouses.

6. Introducing a postharvest technology in reducing losses should be analyzed in economic terms. Otherwise, this kind of research will never be introduced commercially because of minimal or no gain in benefits.

7. It is imperative that marketing costs be reduced. This involves the lowering of transportation costs by improving the transportation facilities from the production area and establishing a reliable shipping schedule to get vegetables to the consumers as soon as possible and thus preserve their quality.

8. Possible benefits of investment in cold-storage insulated transportation and different processing and packing techniques, need to be further evaluated. This also includes the investigation of the possibilities for shipping to an entirely different type of market, e.g., the high income group (hotel, etc.). in Singapore.

9. Finally, trade barriers, such as the curtailing of imported goods (fruits), will indirectly affect the potential of Indonesian vegetable exports. The value which the government wants to save is not greater than the lost value of exports. In other words, Indonesia's export policy needs revision in order to improve marketing strategy.

5.2. Implications

Several implications can be drawn from the findings of this research. They are as follows: An economy of many vegetable growers mostly depends upon the demand of vegetables in Singapore. Therefore, if the growers and processors are unable to improve their vegetable quality (by modifying postharvest activities including transportation and shipping procedure), it is assumed Singapore demand for Indonesian vegetables would continue decreasing.

Under the import trade barrier policy, Indonesia's wholesale vegetable quantity and prices will decrease. If this kind of policy is not revised, domestic vegetable production will also decrease.

5.3. Recommendations For Further Study

The results and conclusions derived from this research indicate the need to better understand Indonesian vegetable exports. Since time did not allow and data are not completely available, the following recommendations are made:

1. Further study should continue to develop a conceptual economic model in reducing vegetable postharvest losses for Indonesian vegetable exports to Singapore.

2. Possible benefits of investment in containerization shipping of vegetables from Indonesia to Singapore should be examined more closely, both for technical and economical feasibility.

3. Due to the limited absorption capacity of the Singapore market, it is necessary to study further the expansion of the vegetable market to other neighboring countries directly.

4. Finally, the policy of restricting, fruits imports needs to be evaluated and revised in order to reduce a trade policy reaction from other countries.

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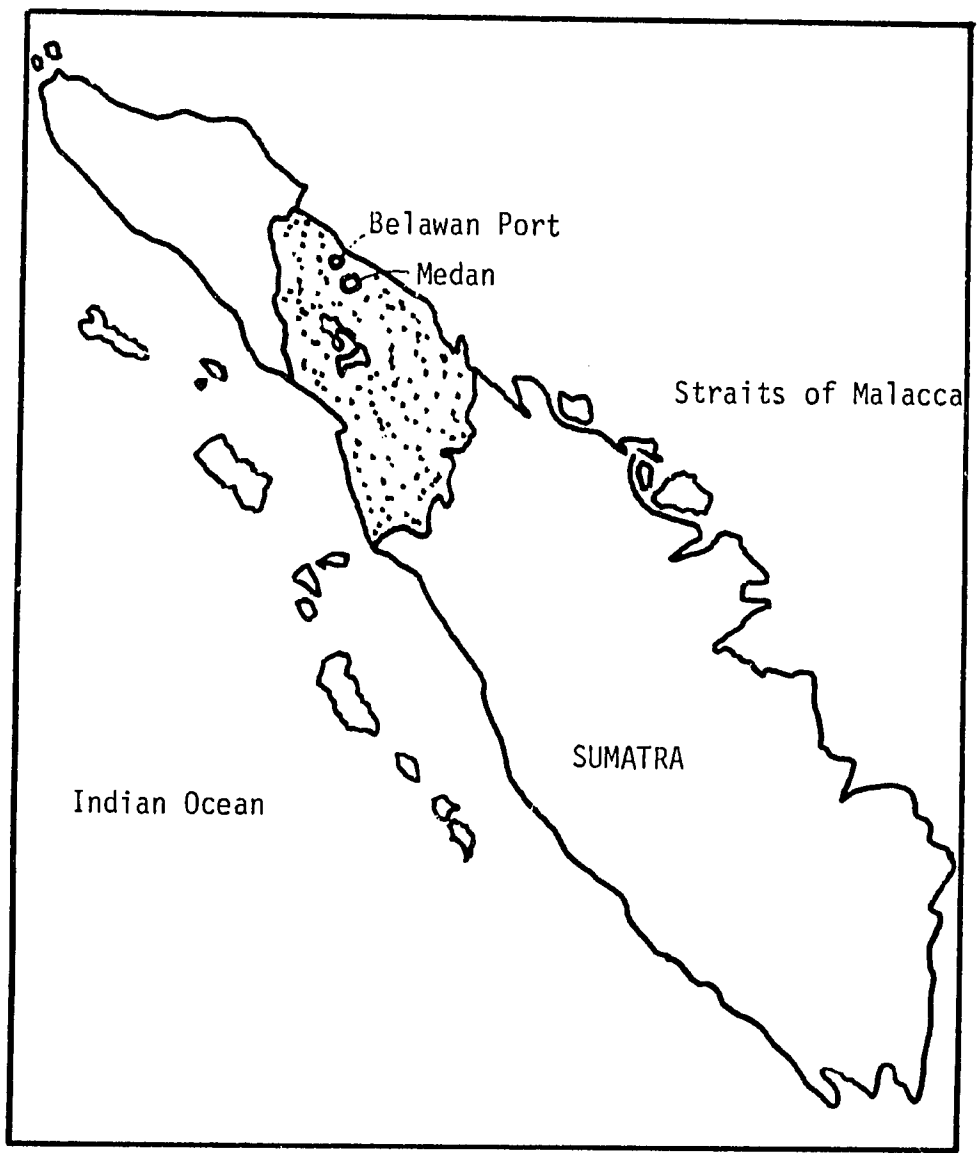
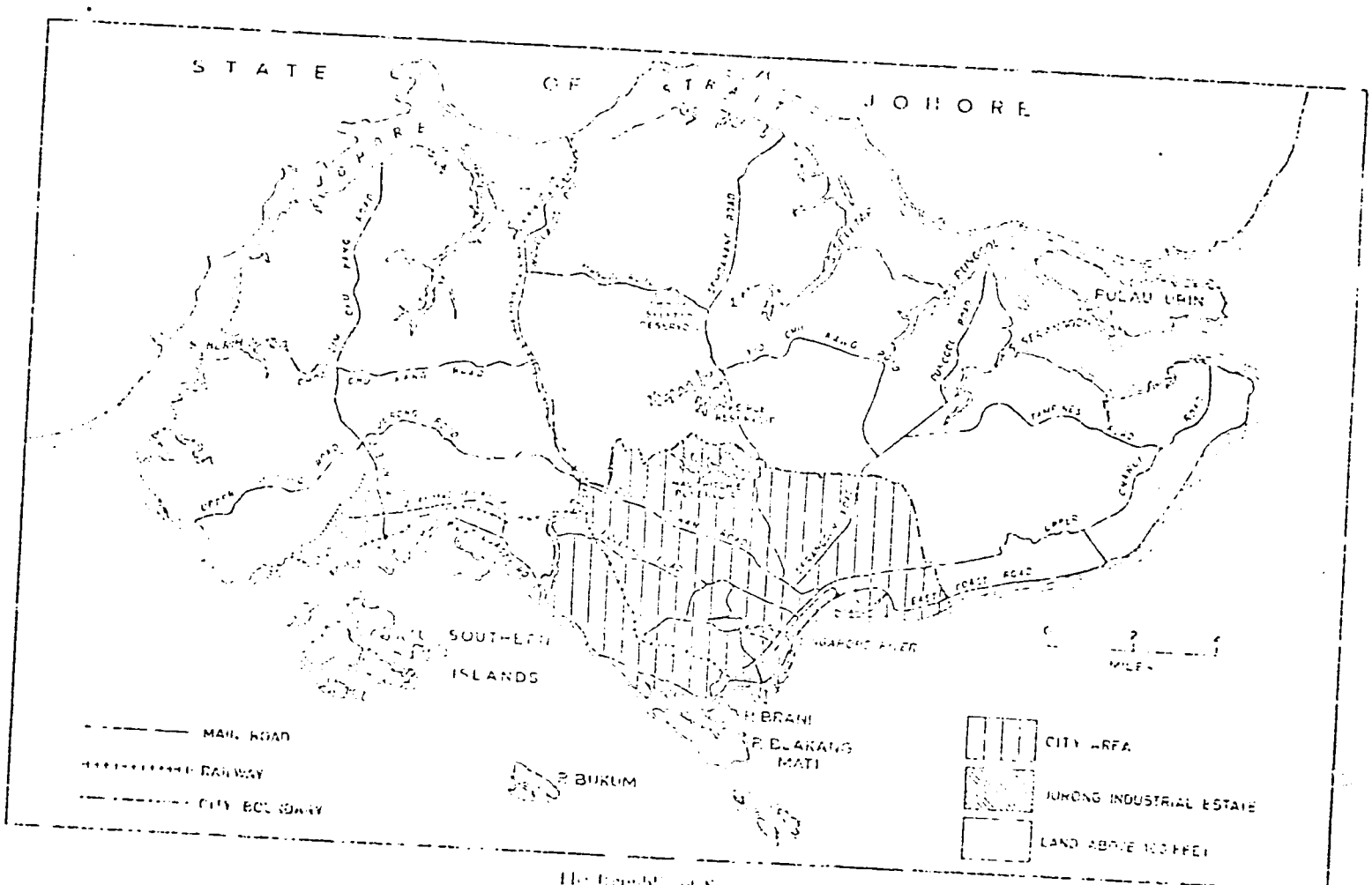
APPENDICES

Appendix 1 : Province of North Sumatra: An Investment Profile

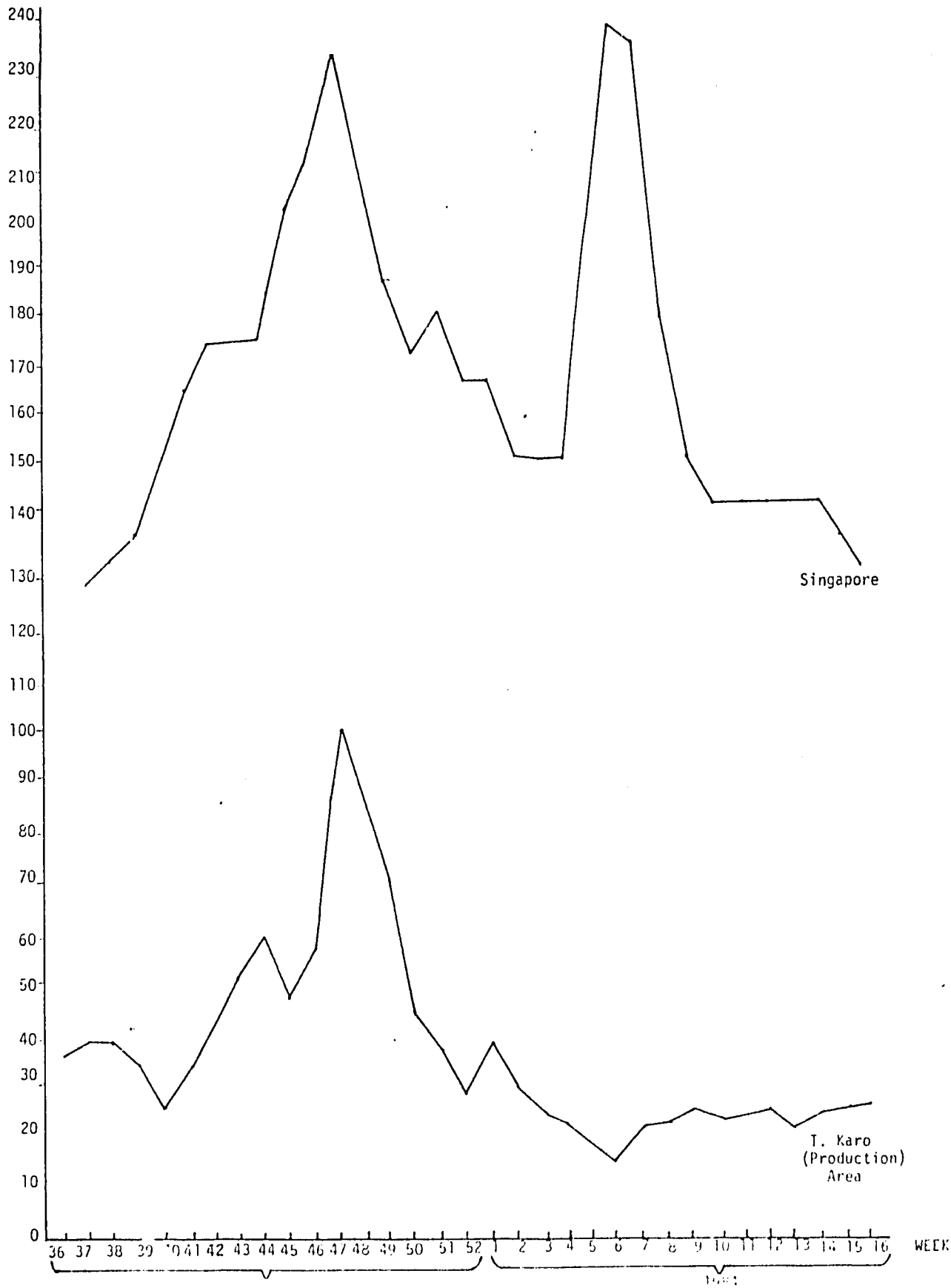


Appendix 2 : The Republic of Singapore



The Republic of Singapore

Appendix 3 : Price Fluctuation of Cabbage between Singapore and Producer Area Weekly 1983-1984.



Appendix 4. Production of Vegetables in Indonesia by Province, 1977-1981. (in metric tons)

Province	1977	1978	1979	1980	1981
1. D.I. Aceh	60,113	57,603	53,513	52,204	61,428
2. N. Sumatra	162,615	189,069	196,332	201,480	201,500*
3. W. Sumatra	51,950	55,824	44,278	61,405	72,858
4. Riau	22,155	21,269	23,162	25,223	11,134
5. Jambi	13,126	13,698	14,152	13,067	32,298
6. S. Sumatra	69,680	71,932	93,570	110,969	68,199
7. Bengkulu	24,813	39,623	32,290	27,326	20,761
8. Lampung	[illegible] 433	19,201	18,651	26,003	24,995
9. Jakarta	[illegible] 876	25,521	40,857	42,976	61,916
10. W.Java	591,015	701,053	683,660	769,856	578,403*
11. C.Java	210,155	243,270	295,739	311,971	357,647*
12. Yogjakarta	18,785	26,273	23,005	13,342	14,697
13. E.Java	221,263	275,340	168,39	159,265	137,018*
14. Bali	42,483	44,408	33,179	37,170	30,565
15. W.Nusa.T.	37,432	45,782	33,809	46,727	49,949
16. E.Nusa.T.	17,275	22,781	10,979	10,882	13,686
17. E.Timor	-	-	-	-	-
18. W.Kalimantan	5,474	6,538	4,654	4,660	4,626
19. C.Kalimantan	912	919	957	1,760	11,195
20. S.Kalimantan	6,394	18,699	22,883	16,840	13,855
21. E.Kalimantan	5,920	6,187	7,041	8,367	7,561
22. N.Sulawesi	71,882	52,061	53,303	53,967	55,698
23. C.Sulawesi	14,746	17,591	14,534	13,336	16,436
24. S.Sulawesi	47,639	56,094	66,568	79,408	94,065*
25. S.E.Sulawesi	22,022	2,273	2,295	14,744	11,322
26. Maluku	9,926	10,991	10,809	15,091	15,09[illegible]
27. Irian Jaya	3,814	7,065	10,276	8,932	12,510
INDONESIA	1,832,898	2,031,065	1,958,885	2,126,971	1,979,433

Source: Central Bureau of Statistics (BPS) - Java
Directorate General Of Agriculture - (Out of Java)

Note: *Main producer areas

Appendix 5: Re-export Vegetables from Singapore 1980

(in metric tons)

Countries destin,	Commodity						
	Cabbage	Carrot	Potatoes	Tomatoes	Ginger	Others	Total
Brunei	586	115	1,070	264	104	328	2,467
Hongkong	378	-	-	-	-	152	530
Rep. Korea	-	-	-	-	-	-	-
W.Malaysia	2,448	1,396	21,348	-	487	3,789	29,468
E.Malaysia	1,321	184	2,473	224	161	860	5,223
Pakistan	-	-	-	-	4,620	-	4,620
Middle East	-	-	-	-	691	229	920
Others	14	7	98	96	38	53	306
Total	4,747	1,702	24,989	584	6,101	5,411	43,534

Source : Indonesian Embassy in Singapore, 1983.

Especially for commodity cabbage)

Appendix 6: The Quality of Indonesia's Vegetable Exports in the Singapore Market 1978.

	Commodity				
Month :	Cabbage	Carrot	Potatoes	Tomatoes	Ginger
1	3	2	2	3	2
2	3	2	2	3	2
3	3	2	2	3	2
4	3	2	2	3	2
5	3	2	2	3	2
6	3	2	2	3	2
7	3	2	2	3	2
8	3	2	2	3	2
9	3	2	2	3	2
10	3	2	2	3	2
11	3	2	2	3	2
12	3	2	2	3	2

Specification;

1. Grade, good packing, clean, no sortage, price according to grade, and slightly damage.
2. Grade, not good in packing, and need sortage.
3. No grade, poor in packing, need sortage, bargain price and heavy damage.

Appendix 7: The Quality of Indonesia's Vegetables Exports in the Singapore Market 1979.

	Commodity				
Month :	Cabbage	Carrot	Potatoes	Tomatoes	Ginger
1	3	2	2	3	1
2	3	2	2	3	1
3	3	2	2	3	1
4	3	2	2	3	1
5	3	2	2	3	1
6	3	2	2	3	1
7	3	2	2	3	1
8	3	2	2	3	1
9	3	2	2	3	1
10	3	2	2	3	1
11	3	2	2	3	1
12	3	2	2	3	1

Specifications;

1. Grade,good in packing, clean, no sortage needed, price according to grade, and slight or no damage.
2. Grade, no good in packing, need sortage.
3. No grade, poor packing, need sortage, bargain price, and heavy damage.

Appendix 8: The Quality of Indonesia's Vegetables Exports in the Singapore Market 1980.

	Commodity				
Month :	Cabbage	Carrot	Potatoes	Tomatoes	Ginger
1	3	2	2	3	1
2	3	2	2	3	1
3	3	2	2	3	1
4	3	2	2	3	1
5	3	2	2	3	1
6	3	2	2	3	1
7	3	2	2	3	1
8	3	2	2	3	1
9	3	2	2	3	1
10	3	2	2	3	1
11	3	2	2	3	1
12	3	2	2	3	1

Specifications:

1. Grade, good packing, clean, no sortage, price according to grade, and slight or no damage.
2. Grade, not good in packing, and need sortage.
3. No grade. poor packing, need sortage, bargain price and heavy damage.

Appendix 9: The Quality of Indonesia's Vegetables in The Singapore Market 1981.

Month :	Commodity				
	Cabbage	Carrot	Potatoes	Tomatoes	Ginger
1	2	3	2	3	1
2	2	3	2	3	1
3	2	3	2	3	1
4	2	3	2	3	1
5	2	3	2	3	1
6	2	3	2	3	1
7	2	3	2	3	1
8	2	3	2	3	1
9	2	3	2	3	1
10	2	3	2	3	1
11	2	3	2	3	1
12	2	3	2	3	1

Specifications :

1. Grade, good packing, clean, no sortage needed, price according to grade, and slight or no damage.
2. Grade, not good in packing, and need sortage.
3. No grade, poor packing, need sortage, bargain price and heavy damage.

Appendix 10: The Quality of Indonesia's Vegetables in The Singapore market 1982.

Month:	Commodity				
	Cabbage	Carrot	Potatoes	Tomatoes	Ginger
1	2	3	2	3	1
2	2	3	2	3	1
3	2	3	2	3	1
4	2	3	2	3	1
5	2	3	2	3	1
6	2	3	2	3	1
7	2	3	2	3	1
8	2	3	2	3	1
9	2	3	2	3	1
10	2	3	2	3	1
11	2	3	2	3	1
12	2	3	2	3	1

Specifications:

1. Grade, good in packing, clean, no sortage, price according to grade, and slight or no damage.
2. Grade, not good in packing ,and need sortage.
3. No grade, poor packing, need sortage, bargain price and heavy damage