

FRUIT AND VEGETABLE DEVELOPMENT PROGRAM FOR HUMAN HEALTH IN INDONESIA¹

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INTRODUCTION

Indonesia is an agro-based country with tropical climate suitable for growing various horticultural crops including tropical fruits and vegetables. They are cultivated in different business scales and cultivation systems. In Indonesia, each farmer mostly possesses a small scale farm unit in house yard or in the farm. The crops may also be grown either on the ground or in the pots.

Horticulture has multiple functions, since it has a high economic value, rich in nutritional elements needed for human's health, and gives positive physiological and psychological effects. Furthermore, it has tremendous prospects as growing "back to nature" trend of the modern society wherein consumption of healthy food is increasing. Growing tourism industry has also triggered the demand for fresh fruits and vegetables. This is hastened by increasing demand for tropical fruits and vegetables in the international market as the awareness of the society is also growing. Consequently, consumer's preference for good quality and healthy produces both in domestic and foreign markets is also increasing.

Growing economy has changed people's life style. In the global tight competition, people get busier and they are more likely to consume unhealthy food, with unbalanced nutrition. This has caused increasing trend of the non-communicable diseases, such as heart disorder, kidney failure, liver malfunction, high cholesterols, diabetes, etc. On the other hand, many people live under the wealthy standard and it is difficult for them to fulfill their nutritional need. Therefore, malnutrition is commonly happening in this society. To alleviate this problem, Indonesian government through the Ministry of Health proclaimed the Healthy Indonesia 2010 Program. The Ministry of Agriculture through the Directorate General of Horticulture, supports the program by formulating various national programs in developing fruit and vegetable industries to fulfill the consumer's need.

There are various tropical fruits and vegetables available throughout the year or seasonally. Banana, pineapple, papaya, citrus, star fruit, snake fruit, melon, and watermelon, are among tropical fruits available all year round; whereas, durian, mango, mangosteen, and lansium are among tropical fruits seasonally available.

THE BENEFITS OF FRUITS AND VEGETABLES FOR HUMAN HEALTH

The main advantages of fruits and vegetables for human health are as sources of vitamins, minerals, fiber, fat and carbohydrates. The essential vitamins are Vitamin A, C,

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and B. The important minerals for human health include calcium, magnesium, potassium, phosphorous and zinc. The contents of essential substances in several fruits is described in Table 1, 2 and 3.

Table 1. Content of vitamins in 100 g of fruit

Fruits	Vitamin A	Vit. B1 (mg)	Vit. B2 (mg)	Vit. C (mg)	Niacin (mg)
Aple	24.00 RE	0.04	0.03	5.00	0.10
Grapes	66.00 SI	0.05	0.02	3.00	200.00
Avocado	70.00 RE	0.05	0.06	13.00	0.90
Star Fruits	18.00 RE	0.03	0.02	33.00	400.00
Longan	-	0.05	-	9.00	-
Durian	890.00 SI	0.50	0.20	40.40	-
Guava	4.00 RE	0.05	0.04	87.00	1100.00
Carambola	-	-	-	5.00	-
Pamello	30.00 RE	0.50	0.02	44.00	200.00
Mandarin	160.00 RE	0.60	0.03	29.00	300.00
Mango	185.00 RE	0.90	0.07	46.00	800.00
Mangosteen (sirup)	-	0.05	0.05	2.90	0.29
Melon	640.00 SI	0.30	0.02	34.00	800.00
Pineapple	20.00 RE	0.08	0.04	20.00	200.00
Jack fruit	51.00 RE	0.07	0.09	7.00	700.00
Papaya	56.00 RE	0.30	0.04	74.00	500.00
Banana	45.00 RE	0.04	0.04	3.00	0.60
Rambutan	1200 SI	0.08	-	58.00	-
Snake fruit	-	0.04	-	2.00	-
Sapodilla	9.00 RE	0.01	-	21.00	-
Water melon	50.00 SI	0.20	0.03	7.00	200.00
Soursop	1.00 RE	0.07	0.04	20.00	700.00
Annona	0.60 RE	0.08	0.04	22.00	200.00

Tabel 2. Content of minerals in 100 g of fruit

Fruits	Calcium	Magnesium	Potassium	Phosphor	Zinc
Aple	6.00			10.00	1.3
Grapes	6.00			24.40	0.40
Avocado	16.00			24.00	0.80
Star Fruits	8.00			22.00	0.80
Longan	18.00			9.00	0.90
Durian	21.10			44.30	1.10
Guava	14.00			28.00	1.10
Carambola	7.50			9.00	1.1
Pamello	26.00			16.00	0.70
Mandarin	18.00			10.00	0.10
Mango	10.00			19.00	0.60
Mangosteen (sirup)	12.00	13.00	48.00	8.00	0.30
Melon	15.00			25.00	0.50
Pineapple	19.00			9.00	0.20
Jack fruit	20.00			19.00	0.90
Papaya	34.00	10.00	204.00	11.00	1.00
Banana	8.00	29.00	393.00	28.00	0.80
Rambutan	16.00	10.00	140.00	16.00	0.80
Snake fruit	28.00			18.00	4.20
Sapodilla	25.00			12.00	1.00
Water melon	8.00			7.00	0.20
Soursop	14.00		293.00	27.00	0.60
Annona	27.00			20.00	0.80

Tabel 3. Content of carbohydrates, fibers and fat in 100 g of fruit

Fruits	Energy (calorie)	Carbohydrates (gram)	Fiber (gram)	Protein (gram)	Fat (gram)
Aple	58.00	14.90	0.70	0.30	0.40
Grapes	75.00	19.70	1.70	0.40	0.36
Avocado	93.00	10.50	1.40	0.90	6.20
Star Fruits	35.00	7.70	0.90	0.50	0.70
Longan	63.00	16.10	?	1.00	0.20
Durian	140.50	26.50	1.60	2.70	3.10
Guava	49.00	12.20	5.60	0.90	0.30
Carambola	46.00	11.80	?	0.60	0.20
Pamello	46.00	10.10	0.40	0.80	0.80
Mandarin	28.00	7.20	0.20	0.50	0.10
Mango	63.00	16.40	0.40	0.60	0.20
Mangosteen (sirup)	73	17.91	1.80	0.41	0.58
Melon	21.00	5.10	0.30	0.60	0.10
Pineapple	50.00	13.00	0.40	0.40	0.20
Jack fruit	106.00	27.60	0.90	1.20	0.30
Papaya	48.00	12.10	0.70	0.50	0.30
Banana	99.00	25.80	0.60	1.20	0.20
Rambutan	?	18.10	?	1.00	0.30
Snake fruit	77.00	20.90	?	0.40	0.00
Sapodilla	92.00	22.40	?	0.50	1.10
Water melon	28.00	7.20	0.50	0.10	0.20
Soursop	65.00	16.30	2.00	1.00	0.30
Annona	101.00	35.20	0.70	1.70	0.60

OBJECTIVES OF THE PROGRAM

The objectives of the fruit and vegetable development program for health are:

1. Increasing the supply of fruits and vegetables to consumers by establishing additional production centers and improvement of the existing production centers
2. Increasing grower's income
3. Improving product quality by implementing the Good Agricultural Practices (GAP) and the Standard Operational Procedure (SOP) in supplying safe products for consumers
4. Widening the market for tropical fruits and vegetables
5. Increasing the awareness of consumers on nutritional and healthy foods by promoting the consumption of fruits and vegetables

PROBLEMS TO BE SOLVED

The following problems are encountered in developing fruits and vegetables for human health

1. Low quality products
2. Low consumption rate
3. Expensive price
4. Lack of public awareness on nutritional benefits of fruits and vegetables

STRATEGIC PLAN OF ACTIONS

Development of the horticultural agribusiness is part of the national economic development. It is aimed at fulfilling the local and export markets, for fresh consumption and raw materials for industries, in order to improve the welfare of the growers, traders and consumers.

The main fruits are banana, citrus (for domestic markets), durian, mango and mangosteen (for domestic and export markets), whereas the main vegetables are shallot, chilies, potato, cabbage and tomato. The production centers of tropical fruits and vegetables are located throughout the country. The fruit and vegetable production is increasing (Table 4). Fruit production increased from 8.9 million tons in 2001 to 14.3 million tons in 2004. On the same period of time, the vegetable production increased from 794,033 tons in 2001 to 977,552 tons in 2004.

Table 4. Fruit and vegetable production in Indonesia from 2001 to 2004
(ton)

Year \ Commodity	2001	2002	2003	2004
Fruit	8,959,032	11,663,517	13,551,435	14,348,458
Vegetable	794,033	824,361	913,445	977,552

Source: Directorate General of Horticulture, 2006

1. Poor maintenance causes low quality produce

Most Indonesian farmers have small scale farming units, in their house yard or in the farm nearby. Lack of capital owned by the farmers and limited knowledge cause limited technology input and poor maintenance of their crops. In fact, some fruit crops, such as durian, pineapple, bananas and mangosteen, are grown for years, without any necessary maintenance. These have caused low quality horticultural produces. For example, farmers do not give the necessary fertilizers, rarely prune their fruit trees, and they do not cover the fruits. Consequently, their crops have low productivity, small fruit size and unattractive appearance. This is even worsen by poor post harvest handling.

To overcome this problem, Indonesian government has developed the Good Agricultural Practices called Indo-GAP. Through the implementation of GAP, hopefully farmers will improve their cultivation system to produce good, safe, and healthy horticultural produces. This GAP has been harmonized with the ASEAN-GAP and is being harmonized with Eurep-GAP, so that we can supply tropical fruits and vegetables for both domestic and export markets. Another approach is to improve the Indonesian National Standard (SNI) in accordance with the International standards such as CODEX Alemantarius. Strategic programs to improve quality of tropical fruits and vegetables are follows:

a. Improvement of quality (on-farm)

Improvement of the product quality is achieved by implementing the Good Agricultural Practices (GAP) and the Standard Operational Procedures (SOP). Through these programs, good quality and safe produces will be produced using environmentally friendly technologies and considering the workers health and wellbeing. At this moment, the Indo-GAP has been socialized and 40 location-and crop-specific SOPs have been formulated, verified and implemented especially for banana, mandarin, clementine, mangosteen, mango, snake fruit, star fruit, papaya, melon, watermelon, rambutan, pineapple, pamello, avocado and durian.

Table 5. The comparison of productivity of some fruit commodities from the farm which is GAP and non GAP implemented

Commodity	Productivity*)	
	GAP (ton/ha)	Non GAP (ton/ha)
Citrus	25.6	13
Mango	9.61	5
Mangosteen	12.7	6
Durian	8.45	4

*) Survey was conducted in 2005

b. Improvement of harvest and post-harvest handling

Harvesting should be done at the correct time, to avoid deterioration of products when they are reaching consumers. Furthermore, determination of the optimum harvesting time is based on the targeted us of the harvested product either for

fresh consumption or for processing. Generally, growers do not give a special post harvest handling, so that the losses are high during transportation and distribution. Only recently, some fruit growers have done the post harvest activities, such as washing, grading, labeling and packaging. Banana growers in Lumajang (East Java), Mango growers in Situbondo, Probolinggo, Pasuruan (East Java) and Indramayu (West Java), Mangosteen growers in Purwakarta (West Java), Citrus growers in Pontianak (West Kalimantan) are the examples.

c. Improvement of processing

In the high season, when horticultural produces are abundant, these produces should be processed to prolong their shelf life. Processing horticultural products is also aimed at increasing food diversity and added values. Generally fruits are processed into juices, syrups, sweets, chips, crisps, jam, puree, and cocktails. Therefore, this is also a good challenge for the industry and requires strong technological and managerial supports.

The processing industry may be established as small scale processing units located in the production sites or as large scale processing factories. Home industries may open better job opportunities for the rural areas and better improve farmer's income.

d. Implementation of supply chain management

The concept of supply chain management has been introduced since 2003. More efficient and effective supply chains of horticultural produces require six important prerequisites, namely: (1) Understanding customers' and consumers' needs, (2) Getting the product right, (3) Creating and sharing added values, (4) Effective logistics and distribution systems, (5) Information and communication and (6) Effective relationships among members of the chain (Woods et al 2000). Figure 1 illustrates the comparison of the traditional supply chain and the improved one. In the traditional supply chain, growers usually sell their produce in bulk without any post harvest treatments. The produce is packed in simple containers and without grading. In the process the produce passes through long and complex chains from growers to consumers. Therefore, loss is high leaving only 55-60% good quality produce.

On the other hand, with improved supply chain, growers sell their produce to the grower association, who has partnership with the traders who will sell the produces to the modern markets. The benefits of this improved supply chain are: 1) modern market's standards are imposed to the growers through the intermediaries encouraging growers to practice SOPs for good quality produces as demanded by consumer's and 2) improved supply chain has shorter marketing channels and thus reducing losses about 30%. As a result, more good quality produces can be supplied to consumers.

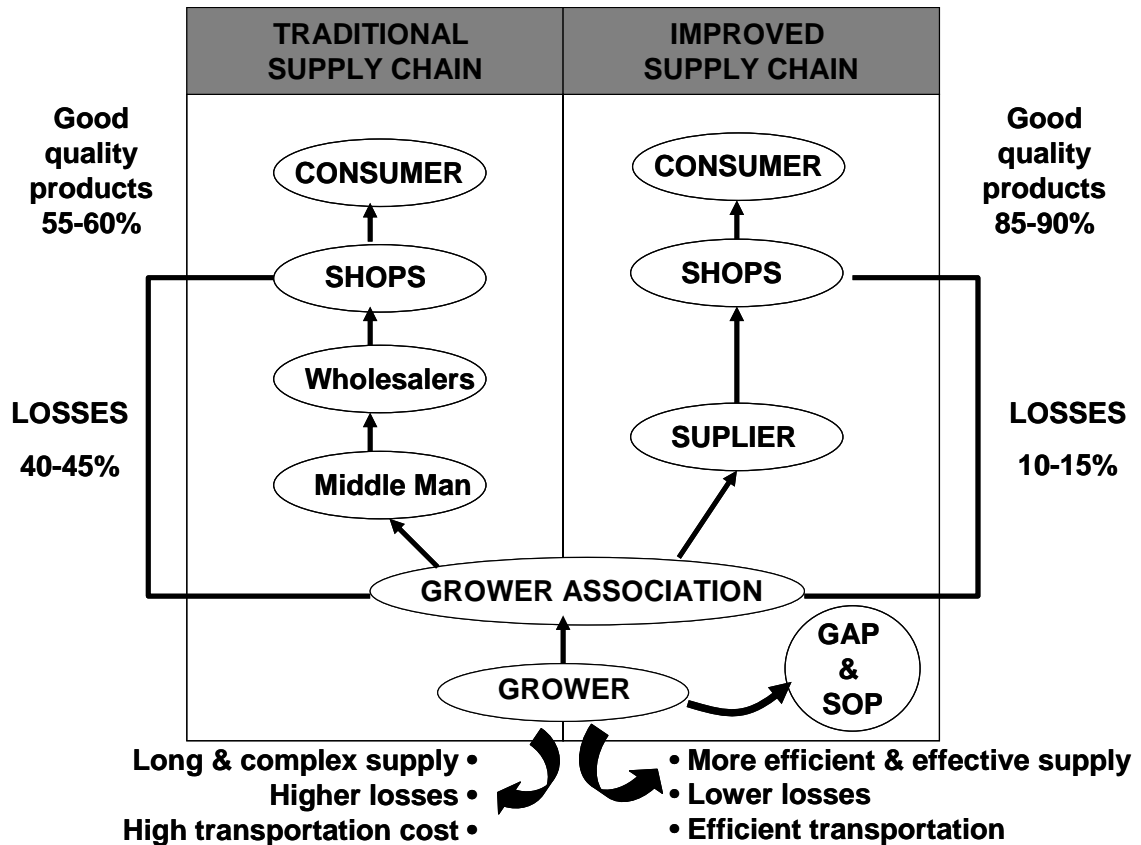


Figure 1. Comparison of the Traditional Supply Chain and the Improved Supply Chain from grower to consumer

Based on the survey in 2005, efficient supply chain of fruits has increased the additional value by reducing transportation cost about 20%, as shown in Table 3 below.

Table 3. Decrease in the transportation cost of some fruits by more efficient supply chain

Commodity	Transportation cost (IDR/kg)	
	3 chains*)	4 chains*)
Citrus	160	200
Mango	280	300
Mangosteen	150	200
Durian	325	400

*) This is an example of the transportation cost in the northern coastal area of Java Island

2. Inefficient production causes expensive price

In order to achieve high productivity, most of the time growers apply chemicals inefficiently. They apply fertilizers without considering the requirement of each crop as no soil or crop testing is accomplished to determine the nutritional status and requirement. Generally growers also depend on pesticides to control pests and diseases. These inefficient production systems, high chemicals prices and high transportation cost result in the expensive price of many horticultural produces. This has caused low purchase of horticultural produces, especially by the lower class of the society.

To overcome this problem, we have introduced the farmers' field course on the sustainable and efficient production systems. Successful field course was undertaken, among others, on apple orchard management in Malang, East Java. The curricula in the field course include pruning method and management of productive branches, organic farming, integrated pest management, organic fertilizers, bio-insecticides, bio-fungicide, multiplication of biological agents, post harvest handling, and marketing. Efficient production system has reduced the production cost up to 60%.

Efficiency in the pre and post harvest management as well as in the transportation, marketing and distribution may reduce the selling price. This can be achieved by empowering the grower's organization. At the moment, many grower organizations have been established but have not functioned as expected. Therefore, it needs more active role of the extension experts and practitioners to guide and supervise growers in starting and strengthening the partnership between growers and agro-businessmen, to help growers in negotiation, and to assist growers for accessing capital resources..

3. Low consumption rate

The availability of fruits and vegetables in the year of 2005 was higher than the previous year. The fruit availability per capita increase from 54 kg/capita/annum in year 2004 up to 63.78 kg/capita/annum in year 2005 which is equivalent to the 18.11% increase. Fruit and vegetable consumption in Indonesia is increasing, but it is lower than that of other countries. The consumption in year 2005 was about 30-35 kg/capita/annum (Table 6). This is about half of the FAO recommendation, which is 65.75 kg/capita/annum. In Asian countries such as Philippines and Malaysia the fruit consumption are 67 and 52 kg/capita/annum. On the other hand, the fruit consumption in developed countries such as the Netherlands and USA are 72 and 100 kg/capita/annum.

Table 6. Fruit and vegetable consumption per capita in Indonesia

Commodity \ Year	<i>(kg/cap/annum)</i>			
	1996	1999	2002	2005
Fruit	24.67	18.70	29.38	31.56
Vegetable	37.12	31.67	32.89	35.30

Source: BPS-Statistic Indonesia, 2004

The consumption pattern is different between the urban and the rural societies. This is illustrated by differences in their monthly expenditures. Table 1 shows that people in the urban areas spent more money for protein, while people in rural areas spent more money for carbohydrate. In both societies, people consume vegetables more than fruits, and people in rural areas consume more vegetables than in urban areas. The consumption of fruits and vegetables in year 2004 is shown in Table 7.

Table 7. Expenditure for vegetables and fruits in Indonesia in year 2004

	Urban		Rural	
	(IDR)	(%)	(IDR)	(%)
Carbohydrate *)	21,985	14.17	25,562	23.64
Protein **)	38,336	24.71	23,580	21.81
Vegetables	11,282	7.27	9,378	8.67
Fruits	8,254	5.32	4,518	4.18

*) Rice, tubers **) Fishes, meats, eggs, milk, legumes

Source: BPS-Statistic Indonesia, 2004

Table 8. The average consumption of vegetables and fruits in urban and rural areas, in year 2004

	Urban (kg)	Rural (kg)
Vegetables	39.52	44.51
Fruits	30.26	25.12

Source: BPS-Statistic Indonesia, 2004

The highest demand of vegetable in both urban and rural areas is chili, as this is the most favorable ingredient for Indonesian cuisines. The most favorable leafy vegetables are kangkong and cassava leaves, in urban and in rural areas, respectively. Meanwhile, the most favorable fruits are banana, papaya and citrus.

4. Lack of awareness of nutritional benefits of fruits and vegetables

Fruits and vegetables are the most important sources of nutrition that are good for human health, including vitamins, minerals, fibers, anti oxidant, etc. By consuming enough fruits and vegetables, it can balance the human diets. However, lack of awareness of these benefits has caused lower rate of consumption of fruits and vegetables in Indonesia.

In order to increase the consumption rate, we create programs such as exhibitions and promotions. The yearly exhibition program is ITF2 (Indonesian Tropical Fruits Festival). Through this program, we promote the variety of tropical fruits from different provinces. Moreover, public campaigns have been run for promoting consumption of fruits and vegetables by common people and school students.

The campaigns is done by distributing poster, leaflets, and booklets about varieties of the Indonesian tropical fruits and their benefits for human health. Our motto is **“Indonesian Tropical Fruits, the national asset and pride”**. Several themes of the publications are:

- I like, I love, and I eat the Indonesian tropical fruits
- 2 bananas per day = healthy body
- By consuming Indonesian Tropical Fruits, our body is healthy and our farmers are happy
- The advantages of fruits for healthy family
- Utilization of house yards to increase the vegetable production and consumption.

CONCLUSION

The issue of low consumption rate of fruits and vegetables not only deal with possible impact on human health, but also deal with the improvement of people’s awareness of the problematic situation, and increasing availability of the produce through betterment of production systems and various economic and political incentives. Comprehensive programs covering the areas of promotion of consumption, improvement of marketing efficiency, increasing production, improving quality, and providing sufficient production inputs should be accomplished in order to create a sustainable system of production, distribution and consumption of fruits and vegetables. Failure to accomplish one or more of the segments will jeopardize the whole system resulting in failure to improve health condition of the population. The whole system will require appropriate actions by different institutions in various government ministries and private sector. Coordination and synchronization of such actions are of vital importance.