CGPRT NO. 34

# Market Prospects for Upland Crops in Asia

## Proceedings of a Workshop Held in Bogor, Indonesia February 25-28, 1997

The CGPRT Centre

## The CGPRT Centre

The Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

**Objectives**

In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

**Programmes**

In pursuit of its objectives, the Centre has two interlinked programmes to be carried out in the spirit of technical cooperation among developing countries:

1. Research and development which entails the preparation and implementation of projects and studies covering production, utilization and trade of CGPRT crops in the countries of Asia and the South Pacific.
2. Human resource development and collection, processing and dissemination of relevant information for use by researchers, policy makers and extension workers.

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**Edited by**
**Sotaro Inoue**
**Boonjit Titapiwatanakun**
**D.R. Stoltz**

**CGPRT Centre**
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# Foreword

The project “Market Prospects for Upland Crop Products and Policy Analysis in Selected Asian Countries” contributes evidence that upland crop products play important roles in agriculture. Upland cop products contribute significantly to the well-being of upland farmers in particular country. The workshop on the project brings together information in upland crop products and market prospect in selected countries. I believe that this collection of articles will provide good basis for follow up. I thank the Japanese Government for financial support to conduct both the research and the workshop. I also thank the CGPRT Centre staff and supporting staff for the typing, editing and printing of this manuscript.

Haruo Inagaki
Director
CGPRT Centre

# Acknowledgements

We gratefully acknowledge the assistance of all national experts of the MPUPA project. We also thank Dr. Ir. J.W.T. Bottema, Dr. Kedi Suradisastra, Ms. Rahajeng Pratiwi and Mr. Deddy Subandi of the CGPRT Centre, Bogor, Indonesia for editorial, computer and secretarial assistance in the preparation of this publication.

Bogor, Indonesia
June 1997

The Editors
Sotaro Inoue
Boonjit Titapiwatanakun
D.R. Stoltz

# Opening Remarks

*Haruo Inakagi*[*]

It is my great pleasure to be able to convene this regional workshop today entitled **Market Prospects for Upland Crops in Asia**. I heartily welcome all of you to the workshop in Bogor. On behalf of Economic and Social Commission for Asia and the Pacific and the CGPRT Centre, I would like to express my sincere appreciation for your attendance to the meeting today in spite of your heavy schedule.

We have the honor of attendance of representatives from the Embassies of India, Thailand, the Netherlands, and Papua New Guinea, all in Jakarta, and of Japan in Bangkok. Also, we have staff from ICRISAT and IRRI in Lao.

This regional workshop today is nearly the final activity of the research project ”Market Prospect of Upland Crop Products and Policy Analysis in Selected Asian Countries”, abbreviated as ”MPUPA” project, which started in November 1994. The project was supported by the government of Japan with funds and a project expert. In this regard, I would like to express my deep gratitude to the government of Japan for its generous support all through the project. At the same time, I would like to pay our heartfelt respects and thanks to Dr. Seiji Shindo, former Director of the Centre, who formulated and started this project.

I am very grateful for all of the national experts of the seven participating countries for your enthusiastic commitment and cooperation in the project. Also, I must thank those institutes and staff who surely assisted you in carrying out the country studies. Please convey my gratitude to all of them.

My special appreciation must be extended to Dr. Boonjit Titapiwatanakun, Professor of Kasetsart University of Thailand, who served as regional advisor for the project from the beginning. Your active services enabled the project to come to the final stage with a fruitful outcome. Thank you very much.

The project aimed to analyze the current status of demand and supply of selected agricultural commodities in seven countries in this region, namely, China, India, Indonesia, Pakistan, the Philippines, Thailand and Vietnam. Then, it tried to calculate the potential for trade in these commodities and to propose possible options to promote market activity in the countries. I certainly believe that the country reports, which will be presented here today and tomorrow, will provide useful information to you.

The CGPRT Centre prepared this workshop to disseminate the findings of the project for further utilization. I would like to have active discussion and further comments and advice during the four-day meeting.

As you know already, the CGPRT Centre is a subsidiary body of Economic and Social Commission for Asia and the Pacific, namely ESCAP, which is a regional organization of the United Nations. Therefore, the Centre is a non-profit coordination body of the member countries in this region. The role of the Centre is to arrange and provide opportunities to initiate, continue or hopefully expand research activities as well as human resources development programmes in member countries. The one who receives the benefit and profit from the project is not the Centre but you, the participating countries. Please bring the fruitful outcomes of the

[*] CGPRT Centre, Bogor. Indonesia.

project back to your countries, and please arrange effective ways to utilize them for further development of agriculture in your countries. This must further contribute to alleviate poverty in rural areas in the region. Poverty alleviation is the most important theme and spirit of the United Nations.

Today, we have the attendance of Dr. Masaru Kagatsume, Professor of Kyoto University of Japan, who will deliver a keynote speech entitled “International perspective of food market and agricultural development in Asia”. Thank you very much for joining us.

We have invited commentators to this workshop in addition to the national experts, two each from the seven participating countries, one from the academic sector and one from the administrative policy planning sector. Also, we have invited Dr. Nico L. Kana, regional advisor and four national experts of the ”Pulses trade study” because of the close relation between the two projects. This project was funded by UNDP through ESCAP, and four countries, namely India, Myanmar, Pakistan and Sri Lanka participated in it. I expect your active participation in discussion both from academic and administrative points of view.

Unfortunately, we are missing attendance from China. Special treatment will be arranged later in this workshop for the Chinese country report.

We have scheduled a preliminary meeting on the final day of this workshop, 28 February, to discuss the framework and a rough schedule of a new project entitled ”Effects of trade liberalization on agriculture in selected Asian countries with special focus on the CGPRT crops”, abbreviated as ”TradeLib”. This project is a follow-up project of the MPUPA project and it is funded by the government of Japan. Ten countries are expected to join the project, namely, Malaysia, the Republic of Korea, and Japan in addition to the seven countries participating in the MPUPA project. The members nominated as candidates for national experts of the TradeLib project are expected to participate in this preliminary meeting together with other participants of this workshop.

I really hope you will actively participate in the workshop and enjoy your stay in Bogor.

# Opening Remarks

*Suzuki Eiji*[*]

It is a great pleasure for me to say a few words on this occasion of the regional workshop **Market Prospects for Upland Crops in Asia**.

First of all, on behalf of the government of Japan, I would like to express my sincere gratitude for the efforts made by the government of Indonesia, Dr. Haruo Inagaki, Director of ESCAP CGPRT Centre and its staff members in preparing this workshop.

As all participants well know, most Asian countries have achieved self-sufficiency in their staple food. Accordingly, priority for agricultural development in the region is shifting to diversification of crops, expansion of rural employment and poverty alleviation. In this light, CGPRT crops are important in terms of farm incomes, and economic growth of the region, because CGPRT crops can be utilized not only as food, but also as animal feed and processed products. Therefore, I think CGPRT Centre can play an important role to deal with economic and social issues of CGPRT crops in Asian countries.

The government of Japan has highly appreciated the activities of the CGPRT Centre since its foundation because the Centre has been actively engaged in research, training and information gathering, and it has resulted in strengthened relationships with member countries and related international organizations.

With regard to the research project ”Market Prospects of Upland Crop Products and Policy Analysis in Selected Countries in Asia” known as MPUPA, the government of Japan has continued its support since this project started in November 1994 by contributing funds and sending experts. It is our pleasure to know that the project is now completed with great success.

The project is principally aimed at first clarifying the current supply and demand situation of selected agricultural products in seven countries in the region, and then on the basis of such analysis, indicating necessary policy options and measures for improving farm incomes and commodity systems.

In this regard, I am quite satisfied with the seven country reports compiled under the project, which describe changing patterns of food consumption and the potential of trade in these agricultural commodities in the seven countries.

I would like to thank all of the national experts of participating countries and the Centre’s staff members, and in particular, Dr Boonjit Titapiwatanakun, Professor of Kasetsart University of Thailand, who served as regional advisor to the project, for his dedicated efforts during the course of project implementation. Due to his active commitment, I believe that the project has produced a fruitful outcome for future agricultural development in the region.

At the conclusion of the project, it is very important to disseminate the output of the project through discussions and review in this workshop, not only with research staff but also with administrators for further utilization and application of the knowledge and information. I am sure that a fruitful outcome will be obtained through the discussions and review during the workshop, and it will be a good precedent for future investigations.

Now, I would like to touch upon a new project ”Effects of Trade Liberalization on Agriculture in Selected Asian Countries with Special Focus on CGPRT Crops” (TradeLib

[*] Ministry of Agriculture of Japan.

project) which starts this year and runs three years. I understand that a brief preliminary meeting on the TradeLib project will be held on the final day of this workshop. I think it is important to discuss the framework of TradeLib in light of results of the MPUPA project, because the TradeLib project is a follow-up study to the MPUPA project.

Finally, I would like to express my sincere thanks again to all participants from various countries, and I congratulate you, in advance, for a successful workshop.

# Opening Remarks

*Faisal Kasryno*[*]

On behalf of the government of Indonesia and of the Agency for Agricultural Research and Development (AARD) allow me to welcome all participants to the rainy city of Bogor and to the workshop on **Market Prospects for Upland Crops in Asia**. I would like also to express appreciation to the ESCAP CGPRT Centre for conducting this important workshop. The topic, development of upland agriculture, is one of the central issues addressed everywhere in Asia. In Indonesia, AARD is strongly involved in studies on ways to improve upland agriculture.

Permit me to make some observations on positive achievements of the CGPRT Centre in relation to upland agriculture in particular and to agriculture in general. AARD and its institutes are most supportive of what has been done by the Centre and national experts from participating countries. In particular, the connection between markets and development is drawn out very well in the studies. If we think about enhancing upland crop production and marketing, we can raise an intriguing question: what progress have we made since we started research on marketing and market prospects of upland crops and agriculture? If there has been progress, how did it - does it - affect upland agriculture in general? We also realize that the studies to be discussed at this workshop raise several issues that remain cloudy and await answers. And today we are gathered here to discuss one of the most important issues related to upland agriculture: marketing and market prospects of upland crops.

This is the time to put the subject into perspective and to conduct an analytical overview of the process and progress of upland crop marketing in the region. We expect this workshop to have three primary functions:

- to present the results of research related to upland crop marketing in the participating countries;
- to provide a scientific forum for exchange of experience and ideas among experts; and
- to refine future strategies for better market conditions of upland crops.

One issue demanding attention may benefit not only the countries in the region, but also the farmers as the primary actors of the production process of upland crop products. The goal of research is to enhance productivity and production as well as farmers' income and welfare. This goal can be achieved through better and stronger cooperation and collaboration among participating countries in the region. Some of the goals may also be accomplished by encouraging farmers and the private sector to play a major role in scaling up and verifying results of upland agriculture research to strengthen the market value of upland crop products.

AARD institutes collaborate with many networks and international and national agencies, for example FAO TLCG net/FAO APAN, etc., but benefits of shared learning could be greater. Encouraging cooperation and networking is important for the future development of upland agriculture in the region. Research related to market prospects of upland crop products indicates that marketing has a strong relation to the development of upland agriculture, not only in economic terms but also in technical and social aspects as well. Better market access and processing may stimulate upland farmers to adopt proper technology. On the other hand, it also affects farmers' attitudes and appreciation of commercial upland crops.

[*] Agency for Agricultural Research and Development, Ministry of Agriculture, Jakarta, Indonesia.

I would like to devote a few words to the position and development of upland agriculture in this country. Indonesia possesses a large area of potential upland, particularly in the eastern part of the country. However, uneven distribution of markets and appropriate technology has hampered the rapid production of particular upland agricultural commodities. We believe that technological and market improvement of upland agriculture may provide better income in the near future for many farmers. We also believe that market access and proper distribution of appropriate technology may speed up and sustain the development of upland agriculture in the country. Over the long term, upland farmers have evolved from a subsistence hand-to-mouth existence to more economic oriented farming with the help of technology, based on the marketing process. The integration of technology into market studies as well as the inclusion of social and sociological investigations will, we hope, greatly increase the prospect of solving many of the current market and production problems of upland crop products and agriculture.

As to the most important goal of market research, we believe that it is essentially similar to the ultimate goal of development: to generate prosperity and well-being of the people. The concept of development includes all aspects of people as partners in development. One of the mandates of our National Guidelines for Development is a shift in emphasis to increase farmers' income with equity and poverty alleviation, in addition to supporting productivity growth. According to official data, about 17% of the population in the nation is still living under the poverty line. The areas in which upland agriculture research may benefit and improve small farmers' income should be identified and pursued with appropriate research and development programs.

Finally, allow me to close by wishing you well in your deliberations. I also believe that all discussion sessions in this workshop will be conducted with the expectation of yielding tangible results to facilitate our collaborative programs. Ladies and gentlemen, I take pleasure in declaring the workshop on **Market Prospects for Upland Crops in Asia** now officially open.

# The International Perspective of Food Markets and Agricultural Development in Asia

*Masaru Kagatsume*[*]

## Overview of world agriculture

First of all, before discussing food market prospects and agricultural development in Asia, it is meaningful to survey the situation of world agriculture.

The malnutrition problem in developing countries has been serious while the world market situation of agricultural commodities is tightening. So, international collaboration becomes more important for attaining food self sufficiency and economic development for developing countries. Recently, international collaboration in agriculture, forestry and fisheries has changed in the following two ways: (i) the subject of international cooperation has been changing from increasing the production of staple food crops to diversifying the production of upland crops, animal products and processing and marketing stages; and (ii) the area where international collaboration is focused has shifted and expanded from Asia to Middle and South America and Africa. Furthermore, following the recent growing concern for global environmental issues, it is necessary to promote environmental friendly sustainable cooperation in agriculture, forestry and fisheries.

In the USA, the decreased production of wheat in 1996/97 and feed grain and soybean in 1995/1996 caused supply shortages and their prices increased sharply. The agricultural improvement and reformation law was implemented in 1996. Under this law, the price support policy and set-aside policy, which have been adopted for about 60 years, were abolished and a direct payment scheme for income compensation was introduced. In this process the market oriented agricultural policy was intensified.

In South East Asia, feed grain import has increased as animal product consumption increased following the high economic expansion and population growth. Thailand became a net importer of maize. In Vietnam, rice production has increased and the rice export has continued to expand. India became a large scale exporter of rice, exporting 5 million tons of rice in 1994/95 and now, India is the second largest exporter of rice in the world.

In the EU, the application term for agricultural reform has ended and so, policy prices of grain, beef, etc. have been lowered. Too much grain from the EU was exported because the international grain price had increased. Then, a measure to prohibit exporting was introduced. The revenues of grain producers have increased because of grain price increases and the direct payments to grain producers under the agricultural reform. The mad cow disease problem occurred in March 1996 in the United Kingdom but a compromise in trade conditions was achieved between the EU and United Kingdom.

Agricultural production in east and middle Europe has been in recovering. Grain production in the whole region started to increase. However, production levels of grain and meat are still lower than those in the pre-reform period. Agricultural reform in Russia has

[*] Department of Agricultural Economics, Kyoto University, Japan.

stagnated. Grain production in 1995 was recorded the lowest for the past 30 years and meat production has continued to decrease. The production decrease was due to damage by a severe drought.

The beef industry in Australia in 1995 to lost its shares in the major export markets due to drought, industrial relations at the meat packers and price decrease, etc.

The demand for grains in Central and South America has expanded to an unexpectedly high level. Soybean production in Argentina and Brazil in 1995/96 was at record levels.

Food aid has decreased, effected by high prices in world grain markets. In particular, countries in Sub Sahara Africa need an increase in food aid.

## Current situation and prospect of food issues

*Prospects of world food markets*

As for the mid term or long term prospects for the world food market, predictions have been made by various international organizations, etc., such as the World Bank, FAO, IFPRI, MAFF (Japanese Ministry of Agriculture, Forestry and Fisheries) and Dr. Restor Brown. According to "The World Food Outlook" published by World Bank in 1993, food production will exceed consumption and the real price of grain will decline in 2010. IFPRI announced the "Global Food Projection to 2020" in 1995, and in this report, it is predicted that if investments for agricultural research and irrigation are maintained, per capita food availability will increase and real prices of grain will decline in 2020. On the other hand, Restor Brown announced "Full House" in 1994, where he predicts that due to the lack of new agricultural technology, limitation of grazing land and water shortage, production will approach the upper limit and per capita grain supply will decrease to 240 kg in 2030 (from 330 kg in 1990) and the food market will be tight. MAFF announced "Predictions by the World Food Market Model" in 1995, where it is predicted that the international real price of grain, etc. (crops) will keep constant or slightly increase under the scenario that current growth of yield will be maintained (current situation scenario), but will increase to a higher level by two times under the scenario that production growth will be slowed due to constraints from environmental issues and stagnation of agricultural basic structure improvement (Table 1).

Thus, with respect to the long term prospects for world food markets, there is a big difference between the optimistic outlook and the pessimistic view among international organizations or researchers.

**Table 1 Forecasts on prices of crops.**

| | Standard Year | Target Year | Wheat | Maize | Rice | Soybean |
|---|---|---|---|---|---|---|
| MOFF (real, Basic Case) | 1992=100 | 2010 | 111 | 118 | 118 | 110 |
| MOFF (real, Restricted Prod.) | 1992=100 | 2010 | 212 | 195 | 205 | 181 |
| FAO | Not open to the public | | | | | |
| World Bank (real) | 1990=100 | 2010 | 67 | 79 | 69 | NA |
| IFPRI (real) | 1990=100 | 2020 | 85 | 77 | 78 | 90 |
| R. Brown | There is no forecast on prices | | | | | |

Source: MAFF, FAO, World Bank, IFPRI, R. Brown.

Concerning grain trade between developed countries and developing countries, the World Bank predicts that the net import of developing countries will be 210 million tons in 2010, FAO predicts 160 million tons, while MAFF predicts 130 million tons under the scenario of continuing the current situation and 210 million tons under the scenario of production

constraints. These predictions agree that developing countries will become more dependent on advanced countries such as the USA for their grain imports.

Recently, international grain prices increased due to irregular weather in the USA. In the future, if specified regions such as the USA expand their export share of food and importing countries become more dependent on import from those countries, international markets may become more unstable, depending on situations of yield fluctuation, supply potential and their stability in the exporting countries.

### *The prospect of food markets in the Asian region*

Currently, 60% of the world population is in Asia where food demand is growing rapidly according to diversification of food consumption, and Asia's dependence on the exporting countries such as the USA, etc. will increase. As for the grain net import into Asia, the World Bank predicts 90 million tons in 2010, and IFPRI predicts 80 million tons in 2020, which is more than 40% of net imports in the developing countries. On the other hand, FAO predicts it will be 50 million tons in 2010, and about 30% of net import of the developing countries. There are big differences in the predictions by organizations and researchers about food market prospects in Asia. However, no one denies that the future trend in Asia will have a big impact on the world food market.

In the Asian region, China has 20% of the world population and it is predicted to increase its grain net imports; the World Bank predicts 20 million tons in 2010 and IFPRI 20 million tons in 2020. On the other hand, OECF predicts that consumption will exceed production by 130 million tons in 2010 and Restor Brown predicts this gap will be 220 million tons in 2030. According to the white paper "Food problem in China" published in October, 1996, the Chinese government predicts a total food demand of 640 million tons in 2030 and it tries to keep the self-sufficient rate at 95% and the net import at 5%.

Clearly, the future trend in the Chinese food market will have a big impact on the world grain market. In order for China to maintain the self-sufficiency rate of 95%, a substantial increase of agricultural investment will be essential. On the other hand, if China cannot maintain the self-sufficiency rate of 95%, the world food market will tend to be more vulnerable.

Currently India has the second largest population after China and the population in India is predicted to exceed China's population in the 21$^{st}$ century. Thus, the food market situation in India will also be a key point. According to predictions by various international organizations, IFPRI assumes that India will remain a grain net exporter by 2 million tons in 2020. While the World Bank predicts that India will turn into a net importer of 14 million tons in 2010, Restor Brown predicts that consumption will exceed production by 45 million tons in 2030.

India became a grain net exporter in the 1990s. For India to maintain this position, technical progress has to be attained in the long run and efforts must be made to improve international competitiveness. On the other hand, if India turns back to being a net importer, the world food market will be affected seriously.

### *Important target factors in predicting the food market: demand side*

World food demand in the future is commonly forecast to steadily increase due to population growth in the developing countries and income growth mainly in Asia. In particular, it is considered that population growth, economic growth and change of food consumption pattern in Asian countries have big impacts on the expansion of world food demand.

The demand for animal products in the future will increase sharply as the speed of economic growth in the Asian region becomes rapid (Table 2). Accordingly, the import of feed grain may increase rapidly.

Especially, in China, etc., where the income and consumption gap between rural areas and urban areas is wide and the share of beef in food consumption is still low, demand for animal products such as meat, etc. may increase if the consumption levels are equalized in the future. Similarly, the import of feed grain may increase sharply.

**Table 2 Per capita per year food consumption.**

| | World | | | USA | | | Japan | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1980 kg | 1992 kg | 1980=100 | 1980 kg | 1992 kg | 1980=100 | 1980 kg | 1992 kg | 1980=100 |
| Cereal | 158.3 | 171.1 | 108.1 | 88.3 | 114.0 | 129.1 | 148.8 | 138.1 | 92.8 |
| (rice) | 63.9 | 71.2 | 111.4 | 4.6 | 8.6 | 187.0 | 85.2 | 74.1 | 87.0 |
| Meat | 28.3 | 31.9 | 112.7 | 109.0 | 120.2 | 110.3 | 29.9 | 39.1 | 130.8 |
| Dairy products | 69.1 | 70.2 | 101.6 | 235.3 | 263.2 | 111.9 | 56.1 | 68.0 | 121.2 |
| Oil & fat | 7.2 | 9.3 | 129.2 | 17.2 | 20.7 | 120.3 | 9.7 | 11.2 | 115.5 |
| Vegetable | 64.3 | 68.9 | 107.2 | 97.1 | 107.7 | 110.9 | 112.4 | 105.2 | 93.6 |
| Seafood | 10.6 | 12.7 | 119.8 | 15.1 | 22.2 | 147.0 | 64.4 | 75.2 | 116.8 |
| | Korea Rep. | | | China | | | Thailand | | |
| | 1980 kg | 1992 kg | 1980=100 | 1980 kg | 1992 kg | 1980=100 | 1980 kg | 1992 kg | 1980=100 |
| Cereal | 218.6 | 194.3 | 88.9 | 201.4 | 228.0 | 113.2 | 173.8 | 170.0 | 97.8 |
| (rice) | 158.0 | 125.6 | 79.5 | 98.5 | 112.4 | 114.1 | 168.3 | 159.9 | 95.0 |
| Meat | 12.5 | 29.9 | 239.2 | 15.3 | 30.4 | 198.7 | 17.3 | 20.7 | 119.7 |
| Dairy products | 10.7 | 19.5 | 182.2 | 2.9 | 6.9 | 237.9 | 7.3 | 16.4 | 224.7 |
| Oil & fat | 3.3 | 10.4 | 315.2 | 3.0 | 4.8 | 160.0 | 2.5 | 5.0 | 200.0 |
| Vegetable | 182.3 | 178.4 | 97.8 | 70.1 | 85.7 | 122.3 | 40.8 | 30.6 | 75.0 |
| Seafood | 40.2 | 58.1 | 144.5 | 4.8 | 10.2 | 212.5 | 18.0 | 24.8 | 137.8 |
| | Indonesia | | | Malaysia | | | Philippines | | |
| | 1980 kg | 1992 kg | 1980=100 | 1980 kg | 1992 kg | 1980=100 | 1980 kg | 1992 kg | 1980=100 |
| Cereal | 188.8 | 206.4 | 109.3 | 163.8 | 153.8 | 93.9 | 148.1 | 153.9 | 103.9 |
| (rice) | 155.3 | 167.4 | 107.8 | 123.5 | 114.3 | 92.6 | 110.1 | 106.5 | 96.7 |
| Meat | 4.1 | 7.7 | 187.8 | 23.3 | 36.0 | 154.5 | 16.4 | 18.6 | 113.4 |
| Dairy products | 6.9 | 5.1 | 73.9 | 21.3 | 25.1 | 117.8 | 19.2 | 17.2 | 89.6 |
| Oil & fat | 5.0 | 8.1 | 162.0 | 14.5 | 20.9 | 144.1 | 5.0 | 4.5 | 90.0 |
| Vegetable | 15.9 | 22.3 | 140.3 | 20.3 | 28.1 | 138.4 | 63.4 | 61.5 | 97.0 |
| Seafood | 11.7 | 14.3 | 122.2 | 42.3 | 24.0 | 56.7 | 31.1 | 31.8 | 102.3 |
| | India | | | Bangladesh | | | | | |
| | 1980 kg | 1992 kg | 1980=100 | 1980 kg | 1992 kg | 1980=100 | | | |
| Cereal | 150.3 | 179.7 | 119.6 | 185.1 | 197.1 | 106.5 | | | |
| (rice) | 70.1 | 86.2 | 123.0 | 157.7 | 176.2 | 111.7 | | | |
| Meat | 3.8 | 4.3 | 113.2 | 2.4 | 2.7 | 112.5 | | | |
| Dairy products | 38.6 | 59.9 | 155.2 | 11.7 | 12.7 | 108.5 | | | |
| Oil & fat | 5.1 | 7.2 | 141.2 | 1.9 | 4.2 | 221.1 | | | |
| Vegetable | 56.2 | 60.2 | 107.1 | 10.0 | 9.8 | 98.0 | | | |
| Seafood | 3.1 | 4.0 | 129.0 | 7.2 | 7.8 | 108.3 | | | |

Source: FAO FAOSTAT. PC.

In India, etc. per capita GNP is still low at the moment. Animal product consumption may rapidly increase if economic growth accelerates.

In the Asian region, unlike Europe and the USA, food habits are based on rice. As for China, considerable amounts of meat are already consumed in the coastal zone and so there is a prediction that meat consumption will not increase so much. As for India, from the religious point of view, beef consumption will not increase. Thus, even if incomes increase, the consumption of animal products such as meat may not increase so much.

*Supply side*

It is most important to know how much food production will increase in order to predict the food market at the beginning of the 21st century and it is also important how we think about the increase in arable land (or harvested area), yield and the new constraints such as environmental issues. Production trends in the Asian region, which contains more than 60% of the world population and where high economic growth continues, greatly affect world food issues (Table 3).

**Table 3 Forecast of major crop yields in developing countries.**

| | Ton/ha | | | Annual Increase Rate (%) | |
|---|---|---|---|---|---|
| | 1969/1971 | 1988/1990 | 2010 | 1970-1990 | 1988/1990-2010 |
| Wheat | 1.2 | 1.9 | 2.7 | 2.8 | 1.6 |
| Paddy | 1.9 | 2.8 | 3.8 | 2.3 | 1.5 |
| Maize | 1.3 | 1.8 | 2.5 | 1.8 | 1.5 |
| Barley | 1.1 | 1.3 | 1.8 | 1.0 | 1.8 |
| Millet | 0.6 | 0.7 | 0.8 | 1.0 | 1.0 |
| Sorghum | 0.7 | 1.0 | 1.2 | 1.5 | 1.1 |
| Whole cereals | 1.3 | 1.9 | 2.6 | 2.2 | 1.4 |

Source: FAO.

Arable land area has been almost constant in advanced countries. Harvested area has a decreasing trend for the whole world: it turned to a declining trend since the 1980s due to the implementation of the set-aside policy in advanced countries, while it has a tendency to increase slowly owing to improvement in the degree of land utilization and expansion of arable land area in developing countries.

In developing countries such as Asia, because of rapid urbanization and constraints of environmental issues, it may be difficult to expand arable land area and in certain cases it could decrease. There are possibilities to expand harvested area partly due to intensification of land utilization and improvement of the fundamental infrastructure for agricultural land but in case agricultural investment is not increased, it is unlikely to expand.

World food supply has increased at a higher speed than population growth since the early 1970s. The major factor responsible is the fact that yield has increased sharply owing to the diffusion of modern high yielding varieties through the Green Revolution as well as increased fertilizer input and introduction of irrigation equipment. However, recent growth of yield is slow due to a decline in production increasing effects of fertilizer input, through diminished investment for irrigation facilities and decreased fertilizer inputs since the 1980s. In order to utilize modern varieties, research for adapting them to the production conditions such as climate and soil of each region are necessary. As for the modern varieties introduced through the Green Revolution, it has been pointed out that they were very susceptible to attack by pests. New types of pests tolerate new pesticides, and so, in order to cope with the prevalence of new strains of pests, successive research and development and technology diffusion are necessary. Therefore, it is important to secure the necessary capital inputs, but agricultural investment has stagnated at a low level recently.

In the USA, a new farm law was enacted in April 1996 to adopt a more market oriented policy and cut government expenditures. In the EU, since 1993, in order to curtail budget and decrease the surplus stock, the Common Agricultural Policy (CAP) reform has been enforced and moved from the former production stimulating policy to an income support policy with set aside measures. In the future, a second CAP reform is planned and the further price reduction and emphasis on environmental policy, i.e. a so-called non-production-stimulating policy, will be promoted.

In the USA, in the end of the 1970s, environmental issues such as soil erosion, water quality, etc. became serious. Thus, in the 1985 agricultural law, a soil conservation reservation scheme was introduced. Under this scheme, farmland which faced soil erosion was to be converted into grassland. This scheme has been kept in the 1996 agricultural law. Recently environmental policy has been emphasized. The water use problems were pointed out. As for depletion of water resources, demand competition between the industrial sector and the individual life sector became serious. In addition, regulations for the protection of wildlife have been more strict, mainly in the south-west region.

In the EU, environmental issues, such as underground water contamination, soil erosion and decrease of wildlife habitats due to the intensification of agricultural cultivation, became serious in 1980s. So, various environmental policies, such as the promotion of environmental friendly agriculture, reforestation of farmland, regulations for fertilizer input, and regulation of livestock density, have been adopted. It is predicted that environmental policies will be strengthened as national interests for the environment become strong.

In most developing countries typical of the Asian region, environmental issues such as erosion, salinity, depletion of water resources have begun to be serious. In particular, the contamination of surface water and ground water (i.e. quality deterioration of drinking water) by fertilizer application in the agricultural sector has become a controversial matter. Thus, consideration for environmental problems will be more and more important in the future in the process of increasing production. Also, deforestation and shifting cultivation are common due to poverty, and decrease of forest area affects global warming and diversity of wildlife.

As for the global warming issue, the second report of IPCC (Intergovernmental Panel for Climate Change) points out that global warming will not affect food production for the whole world but the risk of famine will increase in the poorest areas. Also, other research indicates that suitable areas for growing crops will shift and production will be affected indirectly due to global warming.

The grain price in the Chicago market increased due to the irregular weather in the mid-west in 1995. In the last 15 years, the USA has faced abnormal weather such as the drought and flood every five years and each time the grain price has increased sharply. In developing countries, the effects of floods or droughts on production are magnified due to delay in introducing irrigation facilities (Table 4).

As for expansion of food production, areas of arable land and harvested area cannot be expected to increase due to environmental constraints and so it is necessary to realize improvement of yield. If agricultural investment for research and development or irrigation facilities is increased, significant improvement in yield can be attained and it will be possible to expand agricultural production enough to meet the food demand in the first half of the 21$^{st}$ century.

However, if the recent stagnated trend of agricultural investment continues, yield will not increase dramatically and per capita food production will stagnate.

### *Shortage in the food market and its impact on the economy.*

In order to decrease the possibility of shortage in the food market in the next century, it is fundamentally important to expand food production steadily. For this objective, it is necessary to conduct research and development and technology diffusion to solve the new constraints such as environmental issues, and also it is necessary to maintain and increase agricultural investment for the improvement of irrigation facilities and infrastructure.

**Table 4 Global unusual weather and cereal market.**

| Year | USA | Others | Cereal Market |
|---|---|---|---|
| 1970 | | Y | |
| 1971 | | | |
| 1972 | | X, Serious drought (USSR, India and China) | Serious poor harvest (USSR) |
| 1973 | | | Chicago soybean 12.9 US $ (highest price in history) |
| 1974 | Drought in Midwest | | |
| 1975 | | Y, Drought (USSR) | Serious poor harvest (USSR) |
| 1976 | Drought in Midwest | X | Chicago cereal sudden rise |
| 1977 | | | |
| 1978 | | Drought (China) | US embarago on the export of cereals to USSR |
| 1979 | | | |
| 1980 | Heat wave and drought in South, Volcano eruption | X | US serious decrease in cereal production |
| 1981 | | Drought (USSR) | Serious poor harvest (USSR) |
| 1982 | | X, Most serious El Nin~o phenomenon in history | |
| 1983 | Heat wave and serious drought in Midwest | | US serious decrease in cereal production, prices jump |
| 1984 | | Y | |
| 1985 | | | |
| 1986 | | X | |
| 1987 | | | |
| 1988 | Most serious drought in 20th Century in Midwest | Y | US serious decrease in cereal production, prices jump |
| 1989 | | | |
| 1990 | | | |
| 1991 | | X | |
| 1992 | | | |
| 1993 | Serious flood of the Mississippi | X, Record cool summer (Japan) | US serious decrease in cereal production, prices jump |
| 1994 | | | US best cereal harvest in history |
| 1995 | Long rain, heat wave and cold wave | Drought (Australia, China, South Africa, etc.) | Tight supply and demand in world wheat and US cereal |

Source: MAINICHI Shinbun Economist.
X: El Nino Phenomenon, Y: La Nina Phenomenon.

If the food market is tight in the first half of the 21st century, world economic development will be affected. The degree of impact is different between exporters, such as the USA, and the countries that have increased their degree of dependence on import, such as developing importing countries.

It appears to be hard to expand food production to meet food import demand due to constraints such as environmental issues, etc. In South America, although production expansion is expected as there is a large area of potential arable land, there are constraints due to environmental issues. If it is hard to expand production in the exporting countries, a tight situation persists and development of the world economy may be seriously affected. If production is increased by ignoring sustainability, environmental issues may deteriorate further, and additional social costs might be incurred.

Even if food prices increase, this may not cause serious effects on macro economic growth in economically powerful advanced countries as long as the price increase does not last long at high levels. However, if the quality of the dietary pattern has to be lowered, this

situation itself may be a major concern to consumers in advanced importing countries. Moreover, if instability of the food supply continues, the national economy may be affected psychologically and socially, and this situation may cause serious anxieties for consumers. If advanced importing countries try to import foods using their economic power, this adversely affects developing countries which have generally suffered from deficits of foreign currency and poor economic conditions, causing deterioration of the food situation and an increase in malnutrition. In this sense, advanced importing countries may be blamed internationally.

In developing importing countries, a food price increase may deteriorate the terms of trade for the industrial sector through increase of living costs and this may hamper economic growth. In the developing countries that have less economic power than developed countries, food demand cannot be met and the proportion of the population suffering malnutrition will increase. This situation may hamper economic growth and destabilize society and politics.

In East Asia which has achieved high economic growth, like developed importing countries, if the quality of the dietary pattern has to be lowered due to the world food market situation, this may be big problem for consumers.

If domestic food production is increased without consideration of sustainability and resource conservation, environmental factors such as erosion, soil contamination, water shortage and deforestation, may deteriorate.

The Asian region, with its high economic growth, is expected to be the center of the world's economic development in the first half of the 21st century. However, if this high economic growth is hampered by deterioration of the food situation, the effect may spread over the world economy, too.

### *Future targets*

In order to avoid a tight situation in the food market in the first half of the 21st century, it is necessary to promote research and development and its diffusion to adjust for food production expansion and the new constraints such as environmental issues and to maintain and increase agricultural investment for improvement of the infrastructure such as irrigation facilities. In the action plan at the World Food Summit held in Rome recently, the promotion of optimal allocation and use of public and private investment was pointed out in order to reinforce human resources, sustainable food/rural industry systems and agricultural development. However, in developing countries that try to realize high economic growth, there is tendency to put higher priority on investment in the industrial (manufacturing) sector. Thus, it is necessary to reconsider economic growth and agricultural investment and how to develop agriculture and balance growth between rural and urban areas.

According to FAO, there were 800 million malnourished people all over the world in 1988/90. Many developing countries suffer from serious social problems. There will be more than 600 million malnourished people in the world in 2010 (about 300 million in Asia, and 300 million in Sub-Sahara Africa). Thus, economic cooperation by developed countries is indispensable. What is the role to be played by the advanced countries like Japan? In the action plan reported at the recent Food Summit, the mobilization of technical and financial resources and the optimization of their usage including assistance for debts were pointed out and the action plan set the level of assistance at 0.7% of GDP as the target to be achieved.

However, recently, expenditure by the Development Assistance Committee as a whole has not increased steadily. And the proportion of aid for agriculture in the total amount of bilateral ODA aid has declined since the 1980s. In this situation, the ODA payment of Japan as the world biggest donor has increased steadily and the share of rural industry in it is also high.

In the Asian region, agriculture has developed mainly as rice farming with sustainability measures, such as flood prevention, water conservation, soil erosion prevention, etc. under the Asian monsoon climate. The rice demand is almost self supplied within the region. However, as the economy grows, demand has shifted from rice to wheat and its processed foods. Moreover, demand for livestock products, for which grains are consumed indirectly as feed grain, has been increasing. There is a trend of decreasing area of paddy fields and increasing grain imports.

## Market factor analysis

### *RCA analysis*

In the first part of this article, trends of the world food market and agricultural development in Asia were reviewed by a descriptive approach. In this section, an empirical approach to world food markets is adopted in order to clarify the factors which affect movement of the world food market. For this purpose, the concept of revealed comparative advantage (RCA) is well known as an empirical indicator of comparative advantage or international competitiveness.

The RCA index is defined as the ratio of the share of the export quantity of the commodity k in the total export in a specified region over the share of export quantity of commodity k in the total world export quantity.

$$\text{RCA} = \frac{X^{ik} / X^{i}}{X^{wk} / X^{w}} \qquad (1)$$

If this index is larger than 1, the importance of commodity k in the total export of this region i is greater than the importance of commodity k in the total world export. Thus, this region has a relative comparative advantage for commodity k compared to the world. Table 5 shows trends of RCA. According to this table, the Asean region has been losing its comparative advantage for agriculture while it has gradually gained comparative advantage for the labor intensive industrial sector. In the case of NIES, this tendency is more typical. Their comparative advantage for both agriculture and the labor intensive industrial sector has declined and their comparative advantage has gradually become higher for the capital intensive industrial sector. However, the situation is just the opposite for Australia and New Zealand and even the USA. In the case of China, RCA has increased just for the labor intensive industrial sector.

### *Trade linkage index analysis*

Table 6 shows that trade linkage index of Australia with other countries. Here, trade the linkage index ($I_{ij}$) is defined as follows: the ratio of the two shares, i.e., the share of Australia's export to its trade partner ($M_{ij}$) in Australia's total export ($M_i$) and the share of total import of Australia's trade partner ($M_j$) in the world import ($M_w$). That is to say, this index indicates whether Australia' trade partner is more important in terms of the export market share for Australia than for the world as a whole.

**Table 5 Revealed comparative advantage (RCA).**

| Country/ Region | Year | Agricultural Products | Mineral Products, Energy | Metal | Labour-Intensive Industrial Products | Other Industrial Products |
|---|---|---|---|---|---|---|
| Australia | 1962 | 2.7 | 0.5 | 0.9 | 0.1 | 0.5 |
| | 1970 | 2.4 | 1.5 | 1.7 | 0.1 | 0.3 |
| | 1981 | 2.8 | 1.2 | 2.5 | 0.2 | 0.4 |
| | 1990 | 2.4 | 1.4 | 3.2 | 0.1 | 0.4 |
| Japan | 1962 | 0.4 | 0.2 | 0.3 | 3.5 | 1.2 |
| | 1970 | 0.3 | 0.1 | 0.5 | 2.2 | 1.4 |
| | 1981 | 0.1 | 0.1 | 0.7 | 1.1 | 1.8 |
| | 1990 | 0.1 | 0.04 | 1.0 | 0.9 | 1.8 |
| China | 1962 | 1.5 | 0.4 | 2.4 | 2.2 | 0.4 |
| | 1970 | 2.3 | 0.4 | 0.2 | 2.5 | 0.3 |
| | 1981 | 1.5 | 1.1 | 0.9 | 3.0 | 0.3 |
| | 1990 | 1.1 | 1.4 | 1.8 | 2.8 | 0.3 |
| Other Northeast | 1962 | 0.7 | 0.3 | 0.1 | 5.5 | 0.3 |
| Asia | 1970 | 0.7 | 0.2 | 0.1 | 5.3 | 0.4 |
| | 1981 | 0.6 | 0.1 | 0.5 | 4.8 | 0.8 |
| | 1990 | 0.4 | 0.05 | 0.3 | 3.9 | 1.0 |
| Asean | 1962 | 2.1 | 1.6 | 1.3 | 0.2 | 0.2 |
| | 1970 | 2.7 | 1.7 | 1.4 | 0.2 | 0.1 |
| | 1981 | 1.7 | 2.0 | 1.3 | 0.7 | 0.3 |
| | 1990 | 1.4 | 1.8 | 0.9 | 1.2 | 0.4 |
| North America | 1962 | 1.0 | 0.7 | 1.1 | 0.6 | 1.2 |
| | 1970 | 1.0 | 0.7 | 1.0 | 0.4 | 1.2 |
| | 1981 | 1.5 | 0.4 | 0.9 | 0.4 | 1.2 |
| | 1990 | 1.4 | 0.4 | 0.6 | 0.4 | 1.3 |
| New Zealand, etc. | 1962 | 3.0 | 0.2 | 0.3 | 0.0 | 0.1 |
| | 1970 | 3.5 | 0.6 | 1.0 | 0.2 | 0.2 |
| | 1981 | 4.5 | 0.1 | 2.9 | 0.4 | 0.3 |
| | 1990 | 4.3 | 0.3 | 2.9 | 0.3 | 0.4 |

$$I_{ij} = \frac{M_{ij} / M_{i\bullet}}{M_{\bullet j} / M_{w}} \tag{2}$$

If this index is larger than one, Australia's trade partner is more important for Australia than for the world as a whole.

**Table 6 Trade linkage index of Australia with other markets (all commodities).**

| | Export | | | | Import | | | |
|---|---|---|---|---|---|---|---|---|
| | 1960 | 1970 | 1980 | 1990 | 1960 | 1970 | 1980 | 1990 |
| Japan | 3.0 | 4.2 | 4.9 | 3.2 | 1.2 | 2.0 | 2.7 | 2.8 |
| NE Asia | 0.5 | 1.1 | 1.3 | 2.2 | 0.1 | 0.7 | 1.5 | 1.6 |
| Asean | 0.9 | 2.9 | 2.6 | 2.2 | 1.6 | 1.6 | 1.8 | 1.7 |
| N. America | 0.5 | 0.9 | 0.8 | 0.7 | 0.7 | 1.5 | 1.6 | 1.5 |
| New Zealand | 5.7 | 13.2 | 17.9 | 17.1 | 1.1 | 4.1 | 11.4 | 10.4 |
| UK | 3.8 | 2.0 | 0.8 | 0.8 | 5.2 | 3.5 | 2.1 | 1.4 |
| Other Europe | 0.7 | 0.3 | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 |
| Middle East | 0.3 | 0.8 | 0.9 | 0.9 | 1.3 | 1.4 | 1.0 | 1.8 |
| South Asia | 1.5 | 1.6 | 1.8 | 1.3 | 1.9 | 1.3 | 1.1 | 1.3 |
| Africa | 0.4 | 0.7 | 0.7 | 0.9 | 0.5 | 0.3 | 0.3 | 0.3 |
| Latin America | 0.1 | 0.3 | 0.2 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 |

**Table 7 Complementary index and bias index of Australia.**

| | Complementary Index | | | Bias Index | | |
|---|---|---|---|---|---|---|
| | 1970 | 1980 | 1990 | 1970 | 1980 | 1990 |
| Japan (export) | 1.8 | 2.3 | 1.8 | 2.0 | 2.1 | 1.7 |
| (import) | 0.9 | 1.2 | 1.3 | 1.6 | 1.8 | 1.7 |
| N E Asia (export) | 0.8 | 0.9 | 1.2 | 1.5 | 1.7 | 1.9 |
| (import) | 1.1 | 1.1 | 1.2 | 1.1 | 1.5 | 2.3 |
| Asean (export) | 0.5 | 0.6 | 0.8 | 2.7 | 3.9 | 2.4 |
| (import) | 0.8 | 0.8 | 0.8 | 2.2 | 1.7 | 1.9 |
| N. America (export) | 0.8 | 0.8 | 0.7 | 1.0 | 1.1 | 0.6 |
| (import) | 0.8 | 1.0 | 1.0 | 1.4 | 1.3 | 1.4 |
| New Zealand (export) | 1.5 | 0.7 | 0.8 | 8.2 | 20.5 | 22.8 |
| (import) | 0.6 | 0.5 | 0.6 | 5.5 | 14.5 | 14.3 |
| UK (export) | 1.7 | 1.4 | 1.0 | 1.1 | 1.0 | 0.5 |
| (import) | 0.9 | 1.2 | 1.1 | 3.9 | 2.6 | 1.1 |

**Table 8 Trade matrix (cereals*, 1981, million US $).**

| | To | Exports and Imports | | | | | | | | | | | | Imports Only | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EC | OtEup | Cand | USA | AusNZ | Afr | CSAm | Asia | China | E. Eup | USSR | Err | Intra | S Afr | Jpn | M Est | Oce | Sb Ttl | Extotal |
| From | | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) | (13) | (14) | (15) | (16) | (17) | (18) | (19) |
| EC | (1) | 3,591 | 365 | 1 | 3 | 0 | 781 | 71 | 105 | 206 | 798 | 288 | 2 | 6211 | 2 | 1 | 524 | 0 | 527 | 6,738 |
| Other Europe | (2) | 42 | 44 | 0 | 1 | 0 | 28 | 3 | 13 | 2 | 200 | 225 | 4 | 562 | 0 | 0 | 14 | 0 | 14 | 576 |
| Canada | (3) | 534 | 37 | 0 | 36 | 0 | 230 | 428 | 46 | 586 | 269 | 1,367 | 24 | 3,557 | 0 | 473 | 74 | 0 | 547 | 4,104 |
| USA | (4) | 1,675 | 1,295 | 134 | 0 | 3 | 1,716 | 3,006 | 2,465 | 1,331 | 991 | 1,554 | 964 | 15,134 | 111 | 2868 | 775 | 6 | 3,760 | 18,894 |
| Aus. NZ | (5) | 6 | 9 | 0 | 0 | 11 | 349 | 27 | 382 | 257 | 0 | 350 | 4 | 1,395 | 5 | 321 | 504 | 66 | 896 | 2,291 |
| Africa | (6) | 7 | 15 | 0 | 0 | 0 | 36 | 0 | 22 | 0 | 3 | 6 | -1 | 88 | 0 | 0 | 62 | 0 | 62 | 150 |
| C S Am | (7) | 200 | 90 | 0 | 5 | 0 | 65 | 336 | 24 | 22 | 13 | 2,283 | 1 | 3,039 | 8 | 14 | 98 | 0 | 120 | 3,159 |
| Asia | (8) | 88 | 21 | 1 | 6 | 1 | 467 | 64 | 833 | 187 | 84 | 352 | 28 | 2,132 | 0 | 38 | 828 | 5 | 871 | 3,003 |
| China | (9) | 2 | 6 | 0 | 0 | 0 | 8 | 3 | 146 | 0 | 69 | 62 | -2 | 294 | 0 | 9 | 23 | 0 | 32 | 326 |
| E. Eup | (10) | 15 | 27 | 0 | 4 | 0 | 8 | 12 | 0 | 3 | 153 | 206 | 2 | 430 | 0 | 0 | 31 | 0 | 31 | 461 |
| USSR | (11) | 1 | 2 | 0 | 0 | 0 | 0 | 224 | 14 | 130 | 67 | 0 | 0 | 438 | 0 | 0 | 0 | 0 | 0 | 438 |
| Error | (12) | 64 | 5 | 0 | 1 | 1 | 81 | 1 | 364 | 1 | 9 | 1 | 1 | 529 | 0 | 218 | 108 | 0 | 326 | 855 |
| IMtotl | (13) | 6,225 | 1,916 | 136 | 56 | 16 | 3,769 | 4,175 | 4,414 | 2,725 | 2,656 | 6,694 | 1,027 | 33,809 | 126 | 3942 | 3,041 | 77 | 7,186 | 40,995 |
| EX-IM | (14) | 513 | -1,340 | 3,968 | 18,838 | 2,275 | -3,619 | -1,016 | -1,411 | -2,399 | -2,195 | -6,256 | -172 | 7,186 | 0 | 0 | 0 | 0 | 0 | 0 |
| Extotl | (15) | 6,738 | 576 | 4,104 | 18,894 | 2,291 | 150 | 3,159 | 3,003 | 326 | 461 | 438 | 855 | 40,995 | 0 | 0 | 0 | 0 | 0 | 0 |

*SITC041-045

(17) Oce shows Ocean Countries except for Australia and New Zealand.

Countries which export less than 150 million US $ are included in Imports Only.

**Table 9 Trade coefficient matrix a (i, j), 1981.**

| To: / From | EC | OtEup | Canada | USA | AusNZ | Afr | CSAm | Asia | China | E. Eup | USSR | err |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EC | 0.533 | 0.634 | 0.000 | 0.000 | 0.000 | 5.07 | 0.022 | 0.035 | 0.632 | 1.731 | 0.658 | 0.002 |
| Other Europe | 0.006 | 0.076 | 0.000 | 0.002 | 0.000 | 0.187 | 0.001 | 0.004 | 0.006 | 0.434 | 0.514 | 0.005 |
| Canada | 0.079 | 0.064 | 0.000 | 0.000 | 0.000 | 1.553 | 0.135 | 0.015 | 1.798 | 0.584 | 3.121 | 0.028 |
| USA | 0.249 | 20248 | 0.033 | 0.000 | 0.001 | 11.440 | 0.952 | 0.821 | 4.083 | 2.150 | 3.548 | 1.127 |
| Australia NZ | 0.001 | 0.016 | 0.000 | 0.000 | 0.005 | 2.327 | 0.009 | 0.127 | 0.788 | 0.000 | 0.799 | 0.005 |
| Africa | 0.001 | 0.026 | 0.000 | 0.000 | 0.000 | 0.240 | 0.000 | 0.007 | 0.000 | 0.007 | 0.014 | -0.001 |
| C.S. America | 0.030 | 0.156 | 0.000 | 0.000 | 0.000 | 0.433 | 0.106 | 0.008 | 0.067 | 0.028 | 5.212 | 0.001 |
| Asia | 0.013 | 0.036 | 0.000 | 0.000 | 0.000 | 3.113 | 0.020 | 0.277 | 0.574 | 0.182 | 0.804 | 0.033 |
| China | 0.000 | 0.010 | 0.000 | 0.000 | 0.000 | 0.053 | 0.001 | 0.049 | 0.000 | 0.150 | 0.142 | -0.002 |
| East Europe | 0.002 | 0.047 | 0.000 | 0.000 | 0.000 | 0.053 | 0.004 | 0.000 | 0.009 | 0.332 | 0.470 | 0.002 |
| USSR | 0.000 | 0.003 | 0.000 | 0.000 | 0.000 | 0.000 | 0.071 | 0.005 | 0.399 | 0.145 | 0.000 | 0.000 |
| error | 0.009 | 0.009 | 0.000 | 0.000 | 0.000 | 0.540 | 0.000 | 0.121 | 0.003 | 0.002 | 0.002 | 0.001 |

According to Table 6 the Asian region has become more and more important to Australia and the UK or "other Europe" has become less and less important to Australia in terms of total commodity trade. This situation will also be applicable to agricultural trade as the Asian region becomes industrialized in the future.

The trade linkage index can be explained by the product of two indices. i.e. the complementary index and the bias index. The former index concerns the degree of complementary of industrial structures between the two countries. The latter index shows non-economic factors such as the similarity of political systems or the geographical distance between the two countries.

Table 7 shows that trade relations between Asia and Australia have been more and more strong mainly due to the degree of the complementary between their industrial structures rather than for geographical or political reasons.

*The structure of the world grain market and the trade flow matrix model*

The international market balance can be shown with the trade coefficient matrix (Tables 8 and 9):

$$[A][X] + [F] = [X]$$
$$[X] = (I - [A])^{-1}[F]$$
$$= [B][F] \quad (3)$$

where, [ A ] = trade coefficient matrix

[ X ] = export amount vector

[ F ] = import demand vector of pure importers

[ B ] = $\{(I - [A])^{-1}\}$, Leontief's inverse matrix.

Table 10 shows estimation of Leontief's inverse matrix $\{(I - [A])^{-1}\}$. Like the ordinary input-output analysis, the (i, j) factor means the necessary export amount from exporter i in order for exporter i to meet the import demand of all importers and pure importers directly and indirectly when the import demand for exporter j increases by $ 1.

Table 11 shows the sensitivity coefficients and influence coefficients. Sensitivity coefficients are defined as follows: for each exporter, the necessary export amount of exporter i is: $\sum_{j=1}^{n} b_{ij}$ that is to say, the sum of $i_{th}$ row when the import demands from all exporters are

increased by $1. The sensitivity coefficients are defined as the values derived by dividing this by the average of sum of each row:

$$\text{the sensitivity coefficient; } S_i = \frac{\sum_{j=1}^{n} b_{ij}}{\frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{n} b_{ij}} \quad (4)$$

**Table 10 Inverse matrix, B = (I-A)$^{-1}$, 1981.**

| To: / From | EC | OthEurp | Canada | USA | AusNZ | Afr | CSAm | Asia | China | E. Eup | USSR | err |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EC | 2.652 | 4.776 | 0.001 | 0.007 | 0.001 | 31.759 | 2.984 | 1.903 | 17.048 | 22.229 | 34.640 | 0.077 |
| Other Europe | 0.070 | 1.442 | 0.000 | 0.001 | 0.000 | 2.246 | 0.378 | 0.207 | 2.014 | 2.643 | 4.487 | 0.014 |
| Canada | 0.503 | 2.213 | 1.001 | 0.006 | 0.001 | 14.865 | 2.353 | 1.343 | 13.655 | 13.006 | 26.209 | 0.074 |
| USA | 1.879 | 10.711 | 0.035 | 1.015 | 0.005 | 68.071 | 8.752 | 6.017 | 46.220 | 47.973 | 90.946 | 1.334 |
| Australia NZ | 0.108 | 0.692 | 0.000 | 0.001 | 1.005 | 7.422 | 0.637 | 0.608 | 4.256 | 3.569 | 7.427 | 0.020 |
| Africa | 0.009 | 0.073 | 0.000 | 0.000 | 0.000 | 1.580 | 0.035 | 0.033 | 0.192 | 0.229 | 0.407 | 0.000 |
| C.S. America | 0.375 | 2.036 | 0.001 | 0.004 | 0.001 | 11.609 | 3.379 | 1.187 | 12.112 | 11.509 | 27.159 | 0.043 |
| Asia | 0.187 | 1.055 | 0.001 | 0.002 | 0.001 | 11.013 | 0.917 | 1.977 | 5.579 | 5.404 | 10.527 | 0.060 |
| China | 0.025 | 0.160 | 0.000 | 0.000 | 0.000 | 1.119 | 0.150 | 0.150 | 1.825 | 1.019 | 1.757 | 0.003 |
| East Europe | 0.050 | 0.329 | 0.000 | 0.001 | 0.000 | 1.604 | 0.311 | 0.160 | 1.635 | 3.075 | 3.653 | 0.010 |
| USSR | 0.045 | 0.266 | 0.000 | 0.001 | 0.000 | 1.567 | 0.351 | 0.178 | 1.860 | 1.707 | 4.227 | 0.006 |
| error | 0.055 | 0.235 | 0.000 | 0.000 | 0.001 | 2.561 | 0..171 | 0.283 | 1.010 | 1.089 | 1.969 | 1.010 |

Countries with $S_i$ larger than 1 are more sensitive than the average for the impact from an import demand increase in the world.

On the other hand, when the import demand of the jth trading country increases by $ 1, the necessary export amount of all exporters is the sum of the $j_{th}$ column of the inverse matrix. The influence coefficient for exporter j is defined by dividing this sum by the average of sum of each column:

$$\text{the influence coefficient: } I_j = \frac{\sum_{i=1}^{n} b_{ij}}{\frac{1}{n}\sum_{j=1}^{n}\sum_{i=1}^{n} b_{ij}} \quad (5)$$

The trade activities of countries with $I_j$ larger than 1 have more impact than average on the world market.

**Table 11 Influence coefficients and sensitivity coefficients.**

| | Influence Coefficient | | Sensitivity Coefficient | |
|---|---|---|---|---|
| | 1976 | 1981 | 1976 | 1981 |
| EC | 0.747 | 0.108 | 2.445 | 2.148 |
| Other Europe | 1.535 | 0.436 | 0.239 | 0.245 |
| Canada | 0.023 | 0.018 | 1.273 | 1.368 |
| USA | 0.022 | 0.018 | 5.233 | 5.145 |
| Australia/NZ | 0.022 | 0.018 | 0.594 | 0.468 |
| Africa | 2.955 | 2.826 | 0.106 | 0.046 |
| M & S America | 0.330 | 0.371 | 0.947 | 1.262 |
| Asia | 0.515 | 0.255 | 0.305 | 0.667 |
| China | 0.788 | 1.953 | 0.127 | 0.112 |
| East Europe | 2.159 | 2.064 | 0.378 | 0.196 |
| USSR | 2.747 | 3.880 | 0.158 | 0.185 |

According to Table 11, the influence coefficient of the Asian region declined from 1976 to 1981. On the other hand, the sensitivity coefficient increased sharply. This shows that the

Asian region became more dependent on movements of the world food market and less influential to the global grain trade situation. It seems to me that this is partly due to the declining share of the agricultural sector in GDP as a result of rapid industrialization in these areas, in addition to the declining share of these areas in the world grain market.

*Factor analysis of trade growth process*

Trade growth from the base year (1976) to the comparison year (1981) is decomposed in the following way:

$$\begin{aligned} X' X &= B' F' - B \bullet F \\ &= (B+\Delta B)(F+\Delta F) - B \bullet F \\ &= B \bullet \Delta F + \Delta B \bullet F + \Delta B \bullet \Delta F \end{aligned} \qquad (6)$$

where, B = Leontief's inverse matrix $\{(I-A)^{-1}\}$.
A = trade coefficient matrix in trade flow matrix.
F = import demand vector from pure importing countries.
X = export vector from each country or regions.

The first term on the right hand side of equation (6) is the export increase due to increase of import demand of the pure importer without any change in relative competitiveness among exporters. The second term in the right hand side of equation (6) is the export increase due to change in the relative competitiveness among exporters without any change in import demand. The third term is the mixed effect of both terms. Table 12 shows the rate of contribution of each effect on export growth derived from the estimation results.

According to this table, for the Asian region, 78.5% of the export growth (total of these three effects) is derived from increase of import demand and only 14.3% is derived from increase of relative competitiveness of the exporting countries. About -7.0% of the total effect is derived from the mixed effect. The effect of the mixed term is negative, and so, 82.8% of the total effect contributed to increase of total export. By the way, in this period, the growth of import demand for the EC, USA, Canada and Australia was 61.7%, 65.7%, 64.9 and 58.5% respectively. So, the demand growth was biggest for the Asian region, and also the relative competitiveness was higher for Asia than the other areas.

**Table 12 Factors of export growth.**

| | Import Demand Effect (B.dF) % | Export Competitiveness Effect (dB.F) % | Mixed Effects (dB.dF) % | Sum of Absolute Values of Each Effect % | Export Increase 1976-1981 Million US $ |
|---|---|---|---|---|---|
| EC | 61.763 | -4.150 | -34.087 | 100.000 | 3,109.0 |
| Other Europe | 57.902 | -4.740 | -37.357 | 100.000 | 193.0 |
| Canada | 64.948 | 0.516 | -34.536 | 100.000 | 1,699.0 |
| USA | 65.774 | -2.242 | -31.985 | 100.000 | 8,357.0 |
| Australia NZ | 58.591 | -10.609 | -30.800 | 100.000 | 617.0 |
| Africa | 50.409 | -15.589 | -34.002 | 100.000 | 4.0 |
| C.S. America | 60.823 | 9.008 | -30.169 | 100.000 | 1,637.0 |
| Asia | 78.531 | 14.375 | -7.094 | 100.000 | 1,875.0 |
| China | 54.026 | -11.917 | -34.058 | 100.000 | 55.0 |
| East Europe | -48.786 | 13.904 | 37.310 | 100.000 | -42.0 |
| USSR | 63.116 | 7.017 | -29.867 | 100.000 | 220.0 |
| error | 78.436 | 6.314 | -15.250 | 100.000 | 517.0 |

*CMS analysis*

The structure of the world grain market is shown by the trade matrix. The purpose of this section is to investigate the export growth of grains in the major countries. For this purpose, the CMS analysis has often been adopted as the tool for factor analysis of export growth.

The basic idea of CMS analysis is to decompose the actual export growth into two parts, i.e. the part which is attributed to growth of the related market and the part which is attributed to expansion of share in that market. Here, the export growth of country i in the market j from the base year to comparison year can be shown as follows.

$$V_{ij}^{1} - V_{ij}^{0} = \left(\sum_i V_{ij}^{1} - \sum_i V_{ij}^{0}\right) \frac{V_{ij}^{0}}{\sum_i V_{ij}^{0}} \quad V_{ij}^{1} - \frac{V_{ij}^{0}}{\sum_i V_{ij}^{0}} \bullet \sum_i V_{ij}^{1}$$

$$= (V_{\bullet j}^{1} - V_{\bullet j}^{0}) S_{ij}^{0} + (V_{ij}^{1} - S_{ij}^{0} \bullet V_{\bullet j}^{1}) \qquad (7)$$

Here, $V_{ij}$ means the export amount from country i to country j. V.j= $\sum_i V_{ij}$

$S_{ij}$ shows the share of country i in market j. The superscript 0 shows the base year and 1 shows the comparison year.

The first term on the right hand side of equation (7) shows export growth in the case that the export of country i grows at the same rate as the growth of the market j without any change of share in the market j. Therefore, this part is considered to be the export trend of country i derived from growth of the market j. So, this first term of the equation (7) shows "market effects in export growth."

The second term on the right hand side of equation (7) shows the gap between actual export and export where constant share is assumed, and if this grows at the same pace as market growth this part is canceled out. In this sense, this shows the export growth derived by change of market share and can be considered as the result of the export effort in each country. Thus, this second term on the right side of equation (7) shows "the share effects".

Based on equation (7), export growth of the major grain exporters can be decomposed into market effects and share effects. As shown in the preceding part of this article, the demand for animal products and thus feed grain will become more important in the future. Therefore, maize export data are used for the following analysis.

First, the importers of the world are classified into 10 regions as shown in the tables in the next section: Japan, EC, the other developed countries, Africa, Latin America, Mid- and Near East, Far-East, USSR and East Europe, China and other socialist countries in Asia. The exporters, because of constraints of data availability, were classified into Argentina, USA, EC, Asean and other. In order to get rid of biased effects from irregular fluctuations, the trade flow matrix was made based on 3 year moving average data.

Table 13 shows results of this calculation. We can see that in the case of maize, the market effects are more significant and trade expansion of maize in this period was mainly due to the market effects. This situation is highly related to the trend that demand for animal products and so for feed grain has been steadily growing. Thus, the total market has expanded. Above all, Asean (in particular, Thailand) has focused on high growth markets. According to the trade matrix analysis in the preceding part of this article, this means Asean focused on Japan

and Far-East markets. However, as far as the share effects are concerned, the Asean region has been losing its relative share in the world market.

**Table 13 Components of grain export growth.**

| 1961-1991 | Export Growth | Share Effects | Market Effects |
|---|---|---|---|
| Argentina | 84.4 | -96.9 | 181.4 |
| USA | 184.9 | 32.2 | 153.6 |
| EU | 897.7 | 775.6 | 122.1 |
| Asean | 230.4 | -124.9 | 355.3 |
| Other | 89.4 | -82.5 | 172.0 |

Now, let's turn to share effects by the market and the competition effects among exporters. Here, the share effects of the second term in equation (7) can be shown by considering that the market growth rate is the weighted average of growth rate in the market with the weight of share in the base year.

$$
\begin{aligned}
G_{ij} &= V_{ij}^{1} - \left(\frac{V_{ij}^{0}}{V_{\bullet j}^{0}}\right) V_{\bullet j}^{1} \\
&= V_{ij}^{0}\frac{V_{ij}^{1}}{V_{ij}^{0}} - V_{ij}^{0}\left(\sum_{k}\frac{V_{kj}^{0}}{V_{\bullet j}^{0}}\bullet\frac{V_{kj}^{1}}{V_{kj}^{0}}\right) \\
&= \sum_{k}\left(V_{ij}^{0}\frac{V_{ij}^{1}}{V_{ij}^{0}}\bullet\frac{V_{kj}^{0}}{V_{\bullet j}^{0}} - V_{ij}^{0}\frac{V_{kj}^{0}}{X_{\bullet j}^{0}}\bullet\frac{V_{kj}^{1}}{V_{kj}^{0}}\right) \\
&= \sum_{k}\frac{V_{ij}^{0}\bullet V_{kj}^{0}}{V_{\bullet j}^{0}}\left(\frac{V_{ij}^{1}}{V_{ij}^{0}} - \frac{V_{kj}^{1}}{V_{kj}^{0}}\right)
\end{aligned}
\qquad (8)
$$

Here, $G_{ij}$ shows the share effects of country i in market j, and $V_{ij}$, $V_{kj}$ are the export amounts of countries I, k respectively to the market j. $V.j = \sum_{i} V_{ij}$ Superscript 0 shows the base year, and 1 shows the comparison year.

Equation (8) shows that the share effects in certain markets can be attributed to relative relation to other exporters in the market. That is to say, equation (8) evaluates the export change of that country on the basis of the weighted average of the gap in export growth from rival countries with the weight of the rival countries' share.

So, the share effects of country i in market j to country k, $G_{ijk}$, is called the "competition effect" among exporters.

$$
G_{ijk} = \frac{V_{ij}^{0}\bullet V_{kj}^{0}}{V_{\bullet j}^{0}}\left(\frac{V_{ij}^{1}}{V_{ij}^{0}} - \frac{V_{kj}^{1}}{V_{kj}^{0}}\right) \qquad (9)
$$

Here, if aggregate on k, this becomes the "share effect in market j" which is already shown in equation (7). And if aggregate on j, this becomes the competitive effect among the rival exporters in the world. And if aggregate on both k and j, this becomes the "share effect in the world", which has already been discussed in the preceding table.

Table 14 shows what was aggregated on k in equation (9). This means the growth of the grain trade except the part of market growth in each market. Table 14 reflects the strength of

trade relations and is useful for predicting the effects of trade growth between two specified countries (or regions) on world trade growth.

For maize, Argentina lost its share especially in the EC and Japan in this period. USA expanded its share in Japan, the former USSR and East Europe and also in the EC. The Asean region lost much of its share in Japan and the Far East, especially in the 1960s. This reflects the rapid expansion of the US share in Japan due to general economic and political relations between them.

**Table 14 Maize share effects by market ('000 tons).**

| 1960-1990 | Argentina | USA | EU | Asean | Other |
|---|---|---|---|---|---|
| Japan | -10,329 | 19,694 | -5 | -5,979 | -3,380 |
| EU | -21,140 | 7,972 | 26,887 | -138 | -13,580 |
| Other Developed | 10,587 | -22,428 | 1,971 | 0 | 10,308 |
| Africa | 5 | -212 | 252 | 91 | -135 |
| Latin Amercia | 1,918 | 2,388 | -77 | 28 | -4,258 |
| Mid/Near East | 170 | -957 | -2 | 573 | 214 |
| Far East | 601 | 2,350 | 0 | -2,819 | -135 |
| USSR East Eur. | 77 | 10,442 | -387 | 145 | -10,277 |
| China etc. | -5,153 | 3,566 | 0 | 1,767 | -179 |

Note: Each row = market; each column = exporter.

Table 15 is what was aggregated on j in equation (9). The element $a_{ik}$ of the matrix in this table indicates change in competitiveness of country k to country i in the world.

For maize, Argentina decreased its share in competition among exporters after the mid 1960s because of expansion by USA and the EU. USA lost part of its share which was eroded by the EU, but it won its share back from Argentina. The EU has shown positive competition effects for all exporters. Needless to say, this was attained by the CAP strategy in the EU. The Asean region shares have been eroded greatly by the USA in this period.

**Table 15 Competition effects among exporters in the world (tons).**

| 1961-19901 | Argentina | USA | EU | Asean | Other |
|---|---|---|---|---|---|
| Argentina | 0 | 14,780 | 9,772 | 2,623 | -3,514 |
| USA | -14,780 | 0 | 14,072 | -7,764 | -14,302 |
| EU | -9,772 | -14,072 | 0 | -2 | -4,796 |
| Asean | -2,647 | 7,764 | 2 | 0 | 1,190 |
| Other | 3,514 | 14,302 | 4,796 | -1,190 | 0 |

## Some implications

### *World food /environmental affairs and destabilization of world food market*

As mentioned previously, world food production has steadily increased although it fluctuates regionally due to the effects of abnormal weather. This growth is partly explained by increase of harvested area, but a more significant factor is steady growth in yield, that is to say, successive technical progress. Harvested area has increased from 641 million ha in 19961/62 to 699 million ha in 1991/92 at an annual increase of 0.3%. On the other hand, yield has increased from 1.26 tons/ha to 2.79 tons/ha at an annual rate of 4.04% in the same period. As a result, world grain production increased from 806 million tons to 1,952 million tons at an annual rate of 4.73% for the same period.

In this period, while the harvested area has been almost stable (variation coefficient of 0.03), yield fluctuated widely (variation coefficient of 0.15). This shows that recent irregular weather has affected and destabilized the yield.

On the other hand, total consumption and per capita consumption have increased steadily. As is well known, most grains are consumed both for food and for feed. In advanced countries, consumption for feed has sharply increased due to expansion of animal product consumption. In developing countries, consumption for food has been increasing due to population growth. Under current production techniques, 3 to 7 feed calories are necessary to produce 1 calorie of animal product. Therefore, in developed countries, per capita grain consumption for food has not increased so sharply but total consumption has increased. However, developing country demand for animal products has been increasing gradually and so total demand for grain has also been increasing at a faster rate than population growth.

The coefficient of variation for grain export is 0.28, which is much higher than that of production, consumption, harvested area and yield. This means that each country tries to manipulate its trade in order to stabilize the domestic food market. Therefore, international food markets are destabilized. There were several examples in the past: the sudden import of a huge amount of grain by the USSR, the export embargo of soybean by the USA, and the recent urgent import of rice by Japan. All of these cases caused drastic increases of international prices. Here, the most important thing is the fact that the proportion of grain stock for consumption declined sharply in the 1990s, similar to the situation in the 1970s. The reserve stock ratio was 21.6% in 1967/68, but it dipped to a low of 15% in 1973/74 when the food crisis and oil shock occurred. Since then it recovered to its highest level of 28% in 1986/87, when the world grain market faced a huge surplus and the GATT Uruguay round started. After that the grain stock decreased to 17.5% in 1991/92, which is lower than the level FAO has set as the minimum safety level. This means that the international food market will be disturbed easily by exogenous fluctuations such as climate conditions. That is to say, the ability to absorb the impact of these external fluctuations will become lower.

It should be noted that the number of exporting countries is limited. In the case of wheat, in 1990, USA (46%), Canada (17%) and Australia (12%) occupied 75% of the world trade. On the other hand, contrary to this oligopoly situation of grain exporters, importers are diversified into many regions and countries and the import quantity of each importer also fluctuates. Under this situation where the majority of grain export is occupied by a small number of exporters and the world reserve stock is at a critically low level, domestic policies in the major exporting countries can have big impacts on the world grain market. Moreover, the adverse effects are spread over a number of small scale importers including developing countries.

Food is a very necessary good. Therefore, price elasticity of demand is low, and, international prices fluctuate widely is response to small fluctuations of export supply. Moreover, as more less favored land, i.e. the marginal land, is for food production in order to meet the demand increase by population growth, the global environment will tend to be degraded and the world food market will easily be affected by climate fluctuations. The world arable land area is limited and so the major part of the food production increase should rely on increase of yield. In order to realize this, mechanization, and increased use of fertilizer and chemicals are necessary. This may cause a shift to a land degradation type of farming. That is to say, dependence on energy will increase and sensitivity to petroleum price fluctuations will become serious. Therefore, international food prices are vulnerable for the following reasons (i) the characteristic of food that price elasticity of demand is very low; (ii) abnormal weather occurs very often; and (iii) the resistance of farming to the effects of external disturbances such as abnormal weather and petroleum price fluctuation has weakened.

*Environmental issues and trade liberalization*

According to Anderson, countries which have adopted agricultural protection policies, have been using more chemicals, and thus they have caused more severe environmental degradation than before. Also, research conducted in the Netherlands shows that liberalization and growth of agricultural trade have caused an international shift in the location of food production and a tendency to accumulate nitrogen and phosphate, which are contained in imported agricultural commodities such as meat and grain as protein or in the form of fertilizer or pesticide into trading countries. So, liberalization of agricultural commodities may cause significant damage to environmental resources.

From this point of view, trade liberalization is not always the best strategy. The free trade of agricultural commodities is best only when accompanied by international agreements for global environmental conservation policies.

To avoid a tight market situation or food shortage and the resulting increase of population suffering malnutrition in the future, it is important to increase reasonable investment in the rural sector. As already mentioned, most developing countries have a tendency to invest more in the modern industrial sector to promote rapid industrialization. But if the food market becomes tight and food prices increase, the worker's living cost also increases and so profits and the resulting capital accumulation in the industrial sector will decline. So, in the long run, reasonably balanced growth in investment in both sectors is indispensable for sustainable development. To accomplish this, ODA as well as NGO level collaboration from developed countries is necessary, especially in the field of research and development. Also, in the Action Plan at the World Food Summit last year, 0.7% of GDP was set as the target for development assistance. In addition to this, international organizations will play a significant role in the diffusion process of results or new technologies, by coordinating this kind of research promotion and the international diffusion process.

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# Brief Introduction to the MPUPA Project

*Sotaro Inoue*[*]

## Background

Economic circumstances surrounding agriculture in Asian developing countries are rapidly changing. In these countries exports of agricultural products have long been a major source of foreign exchange and of farm income. However, rapid economic growth in the region as well as stagnating international commodity markets in recent years have been altering the situation.

The region's dynamic domestic markets are remarkable and they have begun to offer ample market opportunities to new products, both fresh and processed. Moreover, while exports of traditional commodities have been mostly stagnant, a number of new products have emerged in export and domestic markets.

It is obvious that analysis of the domestic and export markets of upland crop products will provide policy makers, producers, and traders with useful guidance to identify the prospects of upland agriculture in the region.

## Objectives

The direct objectives of the project are as follows:

- analysis of changes in food demand;
- characterization of market prospects of upland crop products; and
- examination of the possibilities of improving market prospects including exports.

## Duration and participation

The MPUPA project started in November 1994 and terminates in March 1997. Seven countries are participating. In 1995, four countries, India, Indonesia, Philippines and Thailand conducted country studies. In 1996 the remaining three countries, China, Pakistan and Vietnam carried out their country studies. Dr Boonjit Titapiwatanakun, Kasetsart University, Thailand, has been participating in the project as the regional advisor. At the Centre, under the overall supervision of the Director and direct supervision of the Program Leader of Research and Development, Mr Sotaro Inoue, Project Expert, and Mr Klaus Zambra, Associate Expert, who has already left the Centre, have been working on this project.

[*] CGPRT Centre, Bogor, Indonesia.

## Scope of the study

The project consists of three main components. The first one is the implementation of seven country studies. The second is the integration of the country study findings. The last component is this regional workshop for disseminating the knowledge acquired and discussing the findings with researchers and policy makers and others in the region.

The MPUPA project tried to obtain information as practical as possible so that policy makers, producers, and traders could benefit directly from this collaborative research. With limited resources, the project did not try to develop any world-wide commodity market model nor apply complicated mathematical approaches. In order to enable us to make international comparisons, generalize findings across countries and draw common lessons, all the national experts applied a relatively simple but identical approach and research framework to tackle the subject.

The country studies consist of two analytical parts and a concluding part, namely the domestic demand study, the market potential study, and prospects and strategies.

The domestic demand study attempts to highlight the passive aspect of food demand. National experts analyzed where, to what extent, and in which commodity form the demand of upland crop products expands without particular efforts or policies. The study includes review and analysis on (i) dietary pattern changes, (ii) demand composition, and (iii) demand projection of major upland crops, namely maize, soybean, cassava and one country specific crop such as rice or potato. Policy impacts on these major crops are also surveyed.

Simple econometric approaches were applied in making demand projections. The country studies carried out demand projections using the growth rate approach where the growth rate of the quantity demanded (D) is assumed to be the sum of the growth rate of population (R) and income elasticity of demand (N) multiplied by growth rate of income per capita (Y).

$W = R + NY$

Where it was difficult to obtain appropriate elasticity figures, demand projection were made by utilizing the time trend of demanded quantity itself.

The market potential study tries to focus on the active aspect of demand by discerning where and how market prospects could improve with particular efforts or policies. In order to draw as many practical suggestions as possible for improving market prospects including export, the study investigates: (i) domestic markets and processing systems and trade performance of major upland crops, (ii) a survey on new emerging products and/or markets, and (iii) case-studies on the success and failure of marketing attempts for selected commodities.

The case studies investigate why some cases of export or domestic market promotion succeeded while other cases failed. The investigation covers: (i) production aspects, such as contract farming, technologies, and farmers' attitudes, (ii) marketing and processing aspects, such as stable supply, quality control, market integration and so on, and (iii) policy measures, such as foreign exchange control, concessional loans, state trading, etc. Case studies are expected to provide policy makers, producers and traders with practical knowledge and clear messages for successful export or domestic market promotion. A number of commodities were studied. They are mainly vegetables and fruit, such as onion, potato, mango, apple, pineapple, and mangosteen.

In the concluding part, the country reports provide summarized views on the respective study and implications for possible effective strategies and policies to improve market prospects including export prospects.

## Work schedule

In February 1995 the planning meeting for the first country group was held. In order to facilitate the country study implementation, in June and July of that year, interim missions to those countries were conducted by Dr Boonjit, Mr Inoue and Mr Zambra. During the missions the interim reports were discussed, and interviews with farmers, traders and policy planners were carried out. In September 1995, the draft report meeting was held, where national experts presented their draft final reports. After the meeting, national experts included necessary refinements in their reports and submitted them to the Centre.

The second group followed almost the same schedule as the first group. The planning meeting was held in December 1995. Interim missions to Pakistan and China were carried out in May and June respectively. The mission to Vietnam was canceled due to the country's tightened visa control in June 1996. In July - August the draft report meeting was held, and the final reports were submitted from November 1996 to January 1997.

At the CGPRT Centre, the integration of the country reports is being carried out by the project expert under the direction of the regional advisor. At this workshop major findings will be distributed for discussion.

Six country reports have already been published in the Centre's working paper series. The remaining Vietnamese report is scheduled for publication soon. The integrated report and the proceedings of this workshop will also published due course.

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# Market Prospects for Upland Crops in China

*Guoqiang Cheng*[*]

## Introduction

China is a large agricultural country, and the rural population constitutes about 80% of the total population. The issue of food for the people has always been a matter of prime importance confronting the government. Therefore, agriculture has always been regarded as the foundation of China's economic development and social stability. However, China's agriculture is facing great challenges, such as the growing population, the continuously raising income, the increasing demand of agricultural products, the continuous shrinkage of farmland and the decreasing agricultural resources. Therefore, upland crop products (UCPs) in China such as rice, maize, soybean, tubers and roots as major grain crops besides wheat will continue to play an important role in China's food security in the future. This study provides information on domestic demand, market potential and prospects of UCPs and suggests strategies for improving their marketing and trade. The study covers major UCPs (soybean, maize, sweet potato and potato), the major staple foodgrain (rice), fresh fruits (apple, citrus), fresh vegetables, edible fungi, processed fruit and vegetables and cotton. Complete results of the study have been published (Guoqiang Cheng 1997).

## Dietary patterns

As shown in Table 1, great changes have been taking place in the eating habits of Chinese consumers since the start of the reforms. Grain consumption of urban consumers dropped from 145.4 kg in 1981 to 97.8 kg in 1993. However, the consumption of pork, beef and mutton grew from 18.6 kg to 20.8 kg and poultry meat from 1.9 kg to 3.7 kg. The grain consumption of rural consumers increased from 248 kg in 1978 to 266.0 kg in 1993, pork, beef and mutton consumption grew from 6.1 kg to 13.3 kg, and poultry consumption from 0.3 kg to 1.6 kg.

Rural consumption of both grain and animal products increased. In 1993, for example, the per capita grain consumption of rural consumers was 266 kg (raw grain), 18 kg higher than that in 1978; in this period, meat consumption increased 7.2 kg, eggs 2 kg and fish 17 kg.

### *Budget shares by commodity group*

Table 2 shows that differences exist in food expenditure between urban and rural areas. In 1988, rural consumers spent 53.41% of their total expenditure on food items compared to 51.36% spent by urban consumers. Considering the expenditure structure in the four income groups, the expenditure share of food items in both urban and rural areas declined with increase in income level.

[*] Centre for International Agricultural Trade, Institute of Agricultural Economics, Chinese Academy of Agricultural Sciences, Beijing, China.

In urban areas, the share of meat (30.03%) dominated the per capita food expenditure; next was grain (13.34% ) and vegetables (12.47%); the combined share of eggs and fish was 11.84%; and the combined share of edible oil and sugar was less than 4.33%. However, except for the above mentioned items, other foods (e.g. wine, soft drink, condiment and eating-out, etc.) accounted for larger shares (22.67%) in the urban food expenditure and increased with increase of income level.

**Table 1 Annual per capita food consumption (kg) in China.**

| | 1978 | 1983 | 1985 | 1987 | 1989 | 1991 | 1993 |
|---|---|---|---|---|---|---|---|
| Rural | | | | | | | |
| Foodgrain | 247.8 | 260 | 257.5 | 259 | 262 | 255.6 | 266.0 |
| Meat | 6.1 | 10.6 | 11.9 | 12.9 | 12.4 | 13.5 | 13.3 |
| Eggs | 0.8 | 1.6 | 2.0 | 2.3 | 2.4 | 2.7 | 2.8 |
| Vegetables | 142.0 | 131.0 | 131.1 | 130.0 | 133.0 | 126.9 | 107.4 |
| Sugar | 0.7 | 1.3 | 1.5 | 1.7 | 1.5 | 1.4 | 1.4 |
| Fish | 0.8 | 1.6 | 1.6 | 2.0 | 2.1 | 2.2 | 2.5 |
| Urban | | | | | | | |
| Foodgrain | 145.4 | 144.5 | 134.8 | 133.9 | 133.9 | 127.9 | 97.8 |
| Meat | 20.5 | 22.5 | 21.9 | 25.3 | 24.0 | 26.6 | 24.5 |
| Eggs | 5.2 | 6.9 | 6.8 | 6.6 | 7.1 | 8.3 | 8.9 |
| Vegetables | 152.3 | 165.0 | 144.4 | 142.6 | 144.6 | 132.2 | 120.6 |
| Sugar | 2.9 | 2.8 | 2.5 | 2.5 | 2.4 | 1.8 | 1.8 |
| Fish | 7.3 | 8.1 | 7.1 | 7.9 | 7.6 | 8.0 | 8.0 |

Source: SSB, Statistical Yearbook of China, China Statistical Publishing House, various issues.

Note: The per capita food consumption data of urban areas in 1978 was replaced by the data in 1981, because of insufficient data. Grain in China includes rice, wheat, maize, barley, sorghum, millet, and other coarse cereals, pulses, as well as soybeans. Sweet potatoes and potatoes are also included but their actual weight is divided by five to turn them into grain equivalents.

Grain consumption (36.55%) dominated the per capita food expenditure of rural consumers. It was followed by meat and eggs which accounted for 16.83% and 11.59% respectively. This demonstrated that grain and vegetables were still the major expenditure of farmers. The consumption of animal products remained on the low side, in which meat and eggs held 20.5%; fish was even lower and only accounted for 2.49%. Edible oil accounted for 7.19% in the rural consumers' expenditure and its consumption level was higher than that in urban areas. Sugar consumption was rather low and only made up 1.05%. The expenditure of other foods for rural areas included wine, tea and condiment, etc. The proportion of other foods reached 18.26%, of which the major portion was for alcoholic beverages.

### *Structural change in consumption*

As shown in Tables 1, 2 and 3, tremendous changes took place in Chinese residents' consumption structure from the early 1980s to the 1990s. The proportion of food expenditure in the total expenditure of urban consumers (Engel coefficient) dropped from 56.7% in 1981 to 51.4% in 1988. It is evident, thus, that the non-food expenditure increased notably, showing that urban residents started to pay much more attention to housing, daily expenses and other consumption, while less emphasis was put on food consumption.

The Engel coefficient of rural consumers dropped from 61.8% in 1980 to 53.4% in 1988. Food consumption still accounted for a larger share in their expenditure compared to urban consumers. The rural population was at the stage of subsistence and had a strong demand for food. Therefore, other consumption was secondary.

Tables 1 and 3 indicate the changes in the consumption of major foods by Chinese households. As represented in Table 3, the per capita grain consumption in urban areas dropped by 32.7% (47.6 kg) from 1978 to 1993. This decrease came mainly from the increase of other food consumption, for example, meat consumption which increased by 19.5% (4.0 kg) during this period. The decrease of vegetable consumption in this period was, to some extent, related to the adjustment of vegetable varieties and the increase of fruit consumption. Therefore, the changes in the consumption of urban areas are characterized by a decrease of grain and vegetable consumption and a stable increase in consumption of other food.

**Table 2 Structural change in consumption of food in China.**

| | | 1980 | 1988 |
|---|---|---|---|
| Consumption expenditure (yuan/year) | Rural | 157.95 | 476.66 |
| | Urban | 456.84 | 1,103.98 |
| Food expenditure (yuan/year) | Rural | 100.19 | 254.57 |
| | Urban | 258.84 | 567.01 |
| Engel coefficient (%) | Rural | 61.8 | 53.4 |
| | Urban | 56.7 | 51.4 |

Source: SSB, Statistical Yearbook of China, China Statistical Publishing House, various issues.
Note: The per capita food consumption data of urban areas in 1980 was replaced by the data in 1981, because of data insufficiency.

From 1978 to 1993, per capita grain consumption in rural areas increased most (18.2 kg) by 7.3%; although the absolute increase of animal product consumption was relatively slow (7.2 kg), the proportion charge was 118%. The cases of eggs (250%) and fish (212.5%) are especially outstanding. Only vegetable consumption dropped 34.6 kg. In sum, food consumption of rural areas featured an overall increase of all kinds of food demands except vegetables.

**Table 3 Annual per capita food consumption (kg) in China.**

| | 1978 | 1993 | Change |
|---|---|---|---|
| Rural | | | |
| Foodgrain | 247.8 | 266.0 | +18.2 |
| Meat | 6.1 | 13.3 | +7.2 |
| Eggs | 0.8 | 2.8 | +2.0 |
| Vegetables | 142.0 | 107.4 | -34.6 |
| Sugar | 0.7 | 1.4 | +0.7 |
| Fish | 0.8 | 2.5 | +1.7 |
| Urban | | | |
| Foodgrain | 145.4 | 97.8 | -47.8 |
| Meat | 20.5 | 24.5 | +4.0 |
| Eggs | 5.2 | 8.9 | +3.7 |
| Vegetables | 152.3 | 120.6 | -31.7 |
| Sugar | 2.9 | 1.8 | -1.1 |
| Fish | 7.3 | 8.0 | +0.7 |

Source: SSB, Statistical Yearbook of China, China Statistical Publishing House, various issues.
Note: The per capita food consumption data of urban areas in 1978 was replaced by the data in 1981, because of data insufficiency.

## Demand analysis

The elasticity data in Table 4, which were computed based on the cross sectional data from the National Survey of Income and Expenditure in 1991, were used in projecting with demand system approach.

**Table 4 Income elasticity of food consumption, China.**

| Commodity | Mean | Rural | Urban |
|---|---|---|---|
| Maize | -0.35 | -0.47 | -0.03 |
| Beans | 0.38 | 0.45 | 0.30 |
| Rice | 0.23 | 0.28 | 0.09 |
| Sweet potato and potato | -0.14 | -0.10 | -0.20 |
| Milk | 0.18 | -0.11 | 1.00 |
| Edible oils | 0.35 | 0.34 | 0.36 |
| Vegetables | 0.25 | 0.24 | 0.27 |
| Pork | 0.49 | 0.48 | 0.52 |
| Beef and mutton | 0.27 | 0.12 | 0.69 |
| Poultry | 0.86 | 0.85 | 0.87 |
| Eggs | 0.57 | 0.56 | 0.59 |

Note: The elasticity data of beans, sweet potato and potato are available from the World Bank (1991). Other elasticities were computed based on the cross sectional data from the National Survey of Income and Expenditure (SSB 1991).

### *Growth in demand for food*

Income growth and population growth will remain important determinants of food balance in the future. Population growth peaked in China in the late 1960s and early 1970s. Since then, fertility rates and the natural rate of population growth have begun to fall. Relying on the United Nation's demographic predictions, the growth rate during the projection period is assumed to be 1.283% per annum (UN 1993). The per capita income growth rate in the late 1980s and early 1990s was around 6-7%. Therefore, the consumer demand elasticity for China was used in projecting the growth in demand for food under the assumptions that per capita income grows at 6.0% per annum and population grows at 1.283%.

**Table 5 Projected growth in demand for food.**

| Commodity | Expenditure Elasticity | Growth in Demand (%) |
|---|---|---|
| Maize | -0.35 | -0.817 |
| Soybean | 0.38 | 3.563 |
| Rice | 0.23 | 2.663 |
| Sweet potato and potato | -0.14 | 0.443 |
| Milk | 0.18 | 2.363 |
| Edible oils | 0.35 | 3.383 |
| Vegetables | 0.25 | 2.783 |
| Pork | 0.49 | 4.223 |
| Beef and mutton | 0.27 | 2.903 |
| Poultry | 0.86 | 6.443 |
| Eggs | 0.57 | 4.703 |

### *Demand for livestock products*

The livestock and poultry sector is the major consumer of feedgrains and oilcakes as feed. For projecting the requirement of feed, reliable demand projections for livestock products

(milk, pork, beef, mutton, poultry and eggs) are required. In this section, the demand for milk, meat (pork, beef, mutton and poultry) and eggs in the year 2000 is analyzed.

Since the early 1980s, the production of meat, eggs and milk in China all increased at a high rate (as indicated in Table 6). The production of livestock grew much faster than the population, which has resulted in higher per capita availability of meat, eggs and milk.

**Table 6 Production of milk, meat and eggs in million tons, China.**

| Year | Pork | Beef | Mutton | Poultry | Eggs | Milk |
|---|---|---|---|---|---|---|
| 1980 | 11.34 | 0.27 | 0.45 | NA | 2.57 | 1.37 |
| 1981 | 11.88 | 0.25 | 0.48 | NA | 2.69 | 1.55 |
| 1982 | 12.72 | 0.27 | 0.52 | NA | 2.81 | 1.96 |
| 1983 | 13.16 | 0.32 | 0.55 | NA | 3.32 | 2.22 |
| 1984 | 14.45 | 0.37 | 0.59 | 1.49 | 4.32 | 2.60 |
| 1985 | 16.55 | 0.47 | 0.59 | 1.60 | 5.35 | 2.89 |
| 1986 | 17.96 | 0.59 | 0.62 | 1.88 | 5.55 | 3.33 |
| 1987 | 18.35 | 0.79 | 0.72 | 2.19 | 5.90 | 3.79 |
| 1988 | 20.18 | 0.96 | 0.80 | 2.74 | 6.96 | 4.19 |
| 1989 | 21.23 | 1.07 | 0.96 | 2.82 | 7.19 | 4.36 |
| 1990 | 22.81 | 1.26 | 1.07 | 3.23 | 7.95 | 4.75 |
| 1991 | 24.52 | 1.54 | 1.18 | 3.95 | 9.22 | 5.24 |
| 1992 | 26.35 | 1.80 | 1.25 | 4.54 | 10.20 | 5.64 |
| Growth (%) | 7.28 | 17.13 | 9.09 | 16.07 | 12.17 | 12.52 |

Source: SSB, Statistical Yearbook of China, China Statistical Publishing House, various issues.

The demand for milk, meat and eggs was projected using trend projection as well as demand system approaches. As almost no milk, meat or eggs are imported, the demand equals the production minus the export, with the average level between 1990-1992 being the projection base. The trend projection approach is based on the assumption that the recent past trend will continue in the future. The demand projection following the consumer demand system is based on the assumption that per capita income grows at 6.0% per annum and population grows at 1.283% per annum during 1991-2000. The projected demand for milk, meat and eggs in the year 2000 is presented in Table 7.

**Table 7 Demand for milk, meat and eggs in million tons, China.**

| Item | Average 1990 to 1992 | 2000 | Annual Growth (%) |
|---|---|---|---|
| *Trend Projection Approach* * | | | |
| Milk | 5.21 | 14.37 | 11.93 |
| Pork | 24.56 | 36.13 | 4.38 |
| Beef | 1.53 | 2.09 | 3.53 |
| Mutton | 1.17 | 1.70 | 4.24 |
| Poultry | 3.91 | 7.23 | 7.10 |
| Eggs | 9.12 | 24.90 | 11.81 |
| *Consumer Demand System Approach*** | | | |
| Milk | 5.21 | 6.43 | 2.36 |
| Pork | 24.56 | 35.64 | 4.22 |
| Beef | 1.53 | 1.98 | 2.90 |
| Mutton | 1.17 | 1.51 | 2.90 |
| Poultry | 3.91 | 6.86 | 6.44 |
| Eggs | 9.12 | 13.79 | 4.70 |

* The projections are based on the data in Table 6.
** The projections are based on the data in Table 5.

Since the reforms in the late 1970s, China's economy has been in transition to a market-oriented economy. All demand parameters changed frequently in this developing market. For

example, the supply of meat, milk and eggs in urban areas all enjoyed government subsidies, which are certain to be canceled during the marketization process in China. Therefore, projection of the demand into the future is rather difficult.

The results of demand projection through the trend projection approach and the consumer demand system approach are similar, except for the fact that the projected demand for eggs and milk based on trend lines seems to be on the high side. The demand projections based on the consumer demand system look more realistic.

## Supply of and demand for feed

### *Supply of feed*

In China, feed is conventionally divided into three types: feedgrains, oilcakes and bran. Feedgrain includes maize which is the major part, rice, tubers and roots. Tubers and roots in China refer to field crops including potato and sweet potato, but taro, cassava, and other tubers and roots used as vegetables and grown in the suburbs are excluded. Generally, five kilograms of potato and sweet potato is converted into one kilogram grain (grain equivalent for tubers and roots). In the text, the grain equivalent for sweet potato and potato is used for analysis instead of data for fresh potato and sweet potato.

Because of the difficulty in accessing statistical data directly, the total level of feedgrain availability is generally judged based on its share in the output of grain. In 1990, feedgrain accounted for about 25% of the grain production compared to about 15-20% before the reforms and opening up to the outside world (Table 8). In 1994, this proportion reached more than 30%.

**Table 8 Total grain and feedgrain in China.**

| Year | Total Grain | Feedgrain | Feedgrain (% of total grain) |
|---|---|---|---|
| | (million tons) | | |
| 1980 | 320.56 | 59.39 | 18.53 |
| 1985 | 379.11 | 84.57 | 22.31 |
| 1990 | 446.24 | 108.94 | 24.41 |
| 1991 | 435.29 | 114.78 | 26.37 |
| 1992 | 442.66 | 120.93 | 27.32 |
| 1993 | 456.49 | 127.41 | 27.91 |
| 1994 | 445.10 | 134.24 | 30.16 |
| Growth (%) | 2.37 | 6.00 | |

Source: Institute of Agricultural Resource and Regional Planning, A study on feed production and livestock and poultry structure in 2000, in Chinese, Chinese Agricultural Science and Technology Publishing House; SSB, Statistical Yearbook of China, China Statistical Publishing House, various issues.

From the limited statistical data, we can not get details of the feedgrain constitution. Calculations based on related available data indicate the following: feedgrain makes up the largest share, about 70%, oilcakes 8% and bran 20%. Maize, rice and tubers and roots account for the major proportion of feedgrain output. Some recent research demonstrated that about 58 million tons of maize output and the 13.32 million tons of rice were used for feed, but these estimates may be somewhat on the low side. Table 9 presents the availability of feed constituents.

**Table 9 Availability of feed by source in 1993.**

| Feed/Component | Million tons | % |
|---|---|---|
| Total Feed | 178.41 | 100.0 |
| 1. Feedgrain | 127.41 | 71.4 |
| Rice | 20.00 | 11.2 |
| Maize | 80.00 | 44.8 |
| Grain equivalent for sweet potato and potato | 15.00 | 8.4 |
| Others | 12.41 | 6.9 |
| 2. Oilcake | 15.00 | 8.4 |
| Soybean meal | 4.70 | 2.6 |
| Cottonseed meal | 5.23 | 2.9 |
| Groundnut meal | 4.88 | 2.7 |
| Others | 0.19 | 0.1 |
| 3. Bran | 36.00 | 20.2 |

Source: Institute of Feed, Development and utilization of source of feed and its industrialized production, 1995.

In addition, formulated feed is also an important product which improves feed usage as well as animal nutrition. The feed industry came into being in China in the 1980s and began to take off since that time. In 1994, the national output of formulated feed reached 42.32 million tons (Table 10). Although the output of industrial feeds rose at a rate of 10% each year, the demand still cannot be satisfied. It is important to note that the additives used in concentrates and premix feed have to be imported (National Feed Industry Office 1995).

**Table 10 Output of formulated feed in China.**

| Year | Million tons |
|---|---|
| 1978 | 0.60 |
| 1980 | 1.50 |
| 1985 | 15.00 |
| 1990 | 31.22 |
| 1991 | 34.94 |
| 1992 | 36.38 |
| 1993 | 37.04 |
| 1994 | 42.32 |

Source: National Feed Office 1995.

### *Demand for feed*

Based on the above demand projection for livestock products, the requirement for feed was projected for the year 2000 (Table 11). There is a big variation in the feed requirement by the year 2000 obtained by the trend projection and demand system methods. The trend line method projected the demand for feed at about 302.47 million tons in the year 2000 with annual compound growth of 7.39%. On the other hand, the consumer demand system projected the feed demand at 231.74 million tons in the year 2000 with a growth of 4.26% per annum. Looking at the actual growth rate in availability of feed during 1980 to 1992 (6.1%), the demand projections derived from demand system approach appear to be more realistic. Thus, China should plan to meet an annual domestic demand for feed of about 231.74 million tons in the year 2000.

**Table 11 Domestic demand for feed in China.**

| Item | Feeding Ratio | 1990-1992 | 2000 | |
|---|---|---|---|---|
| | | | Trend Projection | Demand System |
| Domestic demand for livestock products | | | | |
| Pork | 3.50 | 24.56 | 36.13 | 35.64 |
| Beef | 3.20 | 1.53 | 2.09 | 1.98 |
| Mutton | 3.20 | 1.17 | 1.70 | 1.51 |
| Poultry | 2.10 | 3.91 | 7.23 | 6.86 |
| Egg | 3.00 | 9.12 | 24.90 | 13.79 |
| Milk | 1.84 | 5.21 | 14.37 | 6.43 |
| Domestic demand for feed | | | | |
| Feed demand for pork | | 85.96 | 126.46 | 124.74 |
| Feed demand for beef | | 5.36 | 7.32 | 6.93 |
| Feed demand for mutton | | 4.10 | 5.95 | 5.29 |
| Feed demand for poultry | | 13.69 | 25.31 | 24.01 |
| Feed demand for eggs | | 31.92 | 87.15 | 48.27 |
| Feed demand for milk | | 18.24 | 50.30 | 22.51 |
| Total domestic demand for feed | | 159.25 | 302.47 | 231.74 |
| Annual growth rate (%) | | | 7.39 | 4.26 |

### *Domestic demand for commodities as animal feed*

Assuming the feed composition in 1993 given in Table 9 will continue in the future, feed demand for maize, soybean meal, rice and tubers and roots can be estimated as the share of feed composition. As shown in Table 12, in the year 2000, the demand as animal feed in the year 2000 will be about 103.82 million tons of maize, 6.03 million tons for soybean meal, 25.95 million tons for rice, 19.47 million tons for grain equivalent for sweet potato and potato. Thus, these products together would meet about 67% of the projected total feed demand (231.74 million tons) for the year 2000. The other share of future feed demand has to be met from other traditional feed items like oilcakes, cotton seed, pulses, other cereals, etc.

**Table 12 Demand for commodities as animal feed, China.**

| Commodity | Demand for Animal Feed in the Year 2000 | % |
|---|---|---|
| | million tons | |
| Total feed demand | 231.74 | 100 |
| Maize | 103.82 | 44.80 |
| Soybean meal | 6.03 | 2.60 |
| Rice | 25.95 | 11.20 |
| Grain equivalent for sweet potato and potato | 19.47 | 8.40 |

### *Domestic demand and market potential of major UCPs*

The main upland grain crops cultivated in China include rice, maize, soybean, tubers and roots which include potato and sweet potato, accounting for 63.75% of total grain acreage cultivated, but contributing 72.74% of total grain output. These are the four largest grain products besides wheat.

### *Maize*

Maize is one of the major grain crops in China, accounting for about one quarter of the total grain production in China. At present, the production, marketing and export of maize are

still controlled by the government to a great extent. Maize in China is used as food, animal feed, and for processing. Maize was a staple food of rural households when China was at a lower level of food consumption before the reforms. However, in 1994, only 20% of maize (about 20 million tons) was used as food but 64% was used as feed and 16% as seed, processed products and other uses (Table 13). Maize is used two ways as feed, in the production of mixed feed and for direct feeding to animals. China has more than 4,000 feed manufacturers which consume 25 million tons annually of maize to produce over 40 million tons of mixed feed. Feeding animals directly is estimated to consume 40 million tons of maize per year (Tan 1995). Processed products of maize include starch, alcohol and other products, which annually consume 2.50, 1 and 1 million tons of maize, respectively, so the processing consumption of maize is about 5 million tons. At present, the proportion of maize exported from China in the world market is 7%, mainly exported to Hong Kong, Japan, South Korea, and Malaysia.

The domestic demand for maize in the year 2000 is projected at about 110.25 million tons (annual growth of 2.95%) by the trend projection method, with about 22.05 million tons as food, 70.56 million tons as animal feed and 17.64 million tons for seed, processed products and wastage (Table 14).

**Table 13 Demand composition for maize in 1994, China**

| Demand Composition | Million tons | % |
|---|---|---|
| Food | 20.00 | 20.0 |
| Animal feed | 65.00 | 64.0 |
| Seed, processing, other uses & wastage | 14.28 | 16.0 |
| Total | 99.28 | 100 |

Source: Tan 1995.

**Table 14 Demand projection for maize in the year 2000 by the trend projection method.**

| Demand Composition | Million tons |
|---|---|
| Total Domestic Demand | 110.25 |
| Food | 22.05 |
| Feed | 70.56 |
| Seed, processing, other uses & wastage | 17.64 |

*Soybean*

Soybean has been produced for more than two thousand years in China. It has received increasing attention by producers and consumers with the change of consumers' views and adjustment of the food structure of households. In 1994, soybean was grown on 9.22 million hectares, accounting for 8.4% of total grain acreage and the output was 16 million tons, accounting for 3.6% of total grain production.

Soybean in China is mainly used as food (49%) and for oil extraction (43%). Most of the soybean meal is utilized domestically (89%), with a small proportion used for export (10%). As shown in Table 15, it is projected that by the year 2000, the demand of soybean in China will be 15.32 million tons, of which 6.57 million tons will be used as food and 7.54 million tons for oil extraction. Direct consumption of soybean (such as processed into bean curd, soybean sprouts, soybean milk, etc.) will still be the major form of soybean utilization in China. Due to an ever increasing domestic demand, the export of soybean in the future will not increase.

**Table 15 Demand for soybean in the year 2000, China.**

| Demand Composition | Million tons | % |
|---|---|---|
| Food | 6.57 | 42.81 |
| Soybean crushed | 7.54 | 49.30 |
| Soybean meal | 6.03 | |
| Domestic use | 6.03 | |
| Export | 0.00 | |
| Soybean oil | 1.09 | |
| Seed, other uses & wastage | 1.21 | 7.91 |
| Total demand | 15.32 | 100 |

*Rice*

The origin of rice is China, and China's rice cultivation has a history of about 7,000 years. Rice is grown mainly in southern China, where its acreage takes up 90% of the total. There are three categories in terms of rice production: early rice, intermediate rice and late rice, and their planting areas account for 30%, 33% and 31% of the total rice area respectively. With the development of farming techniques, especially the extension of hybrid rice production techniques, China's paddy rice production has developed further. In 1994, the area of paddy rice reached 30.17 million hectares, with a production of 175.9 million tons, both ranking first in the world. Forty-two to 45% of the grain output was rice.

Rice in China is mainly used as direct staple food, in brewing and food processing industries, animal feed and seed, etc. About 80% of the production of rice is used as food, and 20% is used for other purposes. In China, rice is consumed as a staple food by 60% of the population (about 72 million people). As shown in Table 16, the utilization pattern of rice in China can be generated using USDA's database. In 1993, rice consumption totaled 179.90 million tons; 143 million tons were used for staple food, 20 million tons for feed, and the remaining 16.90 million tons for seed, processing and other uses.

**Table 16 Demand composition of rice in 1993, China.**

| Demand Composition | Million tons | % |
|---|---|---|
| Food | 143.00 | 79.50 |
| Animal feed | 20.00 | 11.10 |
| Seed, processing, other uses & wastage | 16.90 | 9.40 |
| Total | 179.90 | 100 |

Source: USDA, Database of China-CPPA Model, 1995.

It is projected that by the year 2000, China must produce 189.04 million tons of rice in order to meet the domestic demand. Of this, rice consumed as food will be 145.32 million tons, the demand of rice used as livestock feed will be 25.95 million tons, and the demand of rice for seed and for processing will be 17.77 million tons (Table 17). The export of rice from China has had a declining trend since the 1980s although some increases took place in recent years. However, due to the influence of population growth, rice quality and other factors, export of rice from China will not increase in the future.

**Table 17 Demand projection of rice in the year 2000 by the demand system approach.**

| Demand Composition | Million tons |
|---|---|
| Food | 145.32 |
| Animal feed | 25.95 |
| Seed, processed products, other uses and wastage | 17.77 |
| Total domestic demand | 189.04 |

*Tubers and roots (potato and sweet potato)*

Tuber and root crops in China refer mainly to sweet potato and potato. They are the fourth major crop in China besides rice, wheat and maize, accounting for 7% of the total grain production. The major consumption forms of tuber and root crops in China include the use as human food and the use as livestock feed. Forty percent of the grain equivalent for tubers and roots is used as food for rural inhabitants, 50% is used as feed and about 10% is used for processing, with alcohol and starch as the major processed products from tubers and roots.

It is projected that by the year 2000, the domestic demand of potato and sweet potato in China will be 31.54 million tons in grain equivalent, of which 12.84 million tons in grain equivalent will be used as food, accounting for 40.71% of the total potato and sweet potato demand, and 19.47 million tons in grain equivalent will be used as livestock feed, accounting for about 50% of the total demand, (Table 18). China exports very small quantities of tubers and roots. In general, only small quantities of dried sweet potato are exported from China in addition to small quantities of potato exported as a vegetable.

**Table 18 Demand projection of potato and sweet potato in the year 2000.**

| Demand composition | Million tons |
|---|---|
| Food | 12.84 |
| Animal feed | 19.47 |
| Seed, processed products, other uses and wastage | 3.59 |
| Total domestic demand | 35.90 |

## Emerging markets of fruits and vegetables in China

Since the early 1980s, when the government gave up the agricultural policy of “grasping grain production as the key link” and implemented the production responsibility system (PRS), vegetable and fruit production has developed rapidly in China. Along with economic growth, increase of income levels and population growth, the vegetable and fruit market in China will expand further.

*Fruits*

Various fruits of tropical, subtropical and temperate areas can be grown in China, which has such a vast territory. During the period 1980 to 1994, fruit production increased rapidly (at an average annual growth rate of 11%). Almost all areas across China are exploiting fruits in accord with their respective resource advantages. The important fruits planted in China are apples, oranges, pears, grapes and bananas (Table 19).

In 1994, the total fresh fruit export was 392,000 tons, which was only 1.1% of the total production (Table 20). This shows that most of the fruit was absorbed by the growing domestic

market. It can be predicted that the growth trend will continue for a long period along with the growth of China's economy and population as well as changes of consumption patterns.

Citrus is one of the major fruits of China and China's production accounts for about 10% of the world citrus output, but the export of citrus is less than 2% of the world's citrus export. In recent years, some citrus producing regions (such as Guangdong province) have reduced the acreage of citrus plantation so as to develop other fruits. Other citrus producing regions (such as Hubei, Sichuan, Fujian, etc.) have expanded the acreage of citrus plantation. It is projected that by the year 2000, the citrus output of China will reach 12 million tons. The export of Chinese citrus will still be restricted by factors such as fruit quality and the export volume of citrus from China will not achieve a significant breakthrough. However, along with the citrus variety structure adjustment, the competitiveness of Chinese citrus in the international market will be enhanced to a certain extent.

**Table 19 Fruit output of China (in million tons).**

| | Fruit | Apple | Citrus | Pear | Grapes | Banana | Other Fruits |
|---|---|---|---|---|---|---|---|
| 1980 | 6.79 | 2.36 | 0.71 | 1.47 | 0.11 | 0.06 | 2.08 |
| 1985 | 11.64 | 3.51 | 1.81 | 1.47 | 0.36 | 0.63 | 3.86 |
| 1986 | 13.48 | 3.34 | 2.55 | 2.35 | 0.44 | 1.25 | 3.55 |
| 1987 | 16.68 | 4.26 | 3.22 | 2.49 | 0.64 | 2.03 | 4.03 |
| 1988 | 16.66 | 4.34 | 2.56 | 2.72 | 0.79 | 1.87 | 4.37 |
| 1989 | 18.32 | 4.50 | 4.56 | 2.56 | 0.87 | 1.40 | 4.42 |
| 1990 | 18.74 | 4.32 | 4.85 | 2.35 | 0.86 | 1.46 | 4.90 |
| 1991 | 21.76 | 4.54 | 6.33 | 2.50 | 0.92 | 1.98 | 5.49 |
| 1992 | 24.40 | 6.56 | 5.16 | 2.85 | 1.13 | 2.45 | 6.26 |
| 1993 | 30.11 | 9.07 | 6.56 | 3.22 | 1.35 | 2.70 | 7.21 |
| 1994 | 35.00 | 11.13 | 6.81 | 4.04 | 1.52 | 2.90 | 8.60 |

Source: SSB, Statistical Yearbook of China, various issues.

**Table 20 Fresh fruits exports from China.**

| | Quantity (tons) | Value ('000 US $) | Unit Value (US $/ton) |
|---|---|---|---|
| 1986 | 223,859 | 86,260 | 390 |
| 1987 | 243,792 | 101,360 | 420 |
| 1988 | 280,853 | 125,720 | 450 |
| 1989 | 252,167 | 108,550 | 430 |
| 1990 | 226,382 | 102,860 | 450 |
| 1991 | 159,756 | 75,510 | 470 |
| 1992 | 145,602 | 78,670 | 540 |
| 1993 | 319,723 | 135,800 | 420 |
| 1994 | 392,021 | 165,180 | 420 |

Source: SSB, Statistical Yearbook of China, various issues.

Although China's apple output accounts for 24% of the total world output, the share of apples exported from China accounts for less than 3% of the world market and accounts for less than 1% of the domestic output. The major reason for the lack of competitiveness of apple exported by China is its fairly poor fruit quality.

### *Vegetables*

The large and inexpensive agricultural labor resources and varied climate conditions provide favorable conditions for developing vegetable production in China. The market-

oriented reforms and the Vegetable Basket Programme of the government have further promoted the development of vegetable production in China.

The major vegetable categories for export include fresh vegetables, quick-frozen vegetables, dehydrated vegetables, canned vegetables, etc. Table 21 presents Chinese exports of fresh vegetables. As shown in this table, China's largest fresh vegetable export by value continues to be mushrooms, worth US $ 106.1 million in 1994, a 244% increase since 1992. Most of these shipments went to Japan, which imported US $ 99.0 million of Chinese mushrooms in 1994. Other major vegetable exports in 1994 were garlic, worth US $ 75.6 million, up 12% in value since 1992; onions and shallots, worth US $ 17.7 million and increasing 434% in value since 1992; leeks and other alliaceous vegetables, worth US $ 10.4 million and increasing 24% in value since 1992; edible roots, worth US $ 8.6 million and increasing 263% in value since 1992; and carrots and turnips, worth US $ 7.6 million and increasing 55% in value since 1992.

Russia, Hong Kong, and Japan are China's most important markets for fresh vegetables. In 1994, Russia was the largest importer of Chinese potatoes, onions, tomatoes, and Brussels sprouts. Hong Kong and Japan were the largest importers of China's major vegetables.

**Table 21 Chinese exports of fresh vegetables, 1992-1994.**

| Product | 1992 | | 1993 | | 1994 | | Major Destinations |
|---|---|---|---|---|---|---|---|
| | Tons | '000 US $ | Ton | '000 US $ | Tons | '000 US $ | |
| Seed potatoes | 486 | 149 | 768 | 148 | 1,250 | 267 | Russia (44%), Hong Kong (21%) |
| Other potatoes | 69,159 | 6,960 | 23,580 | 3,640 | 40,750 | 6,438 | Russia (43%), Hong Kong (26%) |
| Tomatoes | 9,252 | 2,476 | 8,937 | 2,159 | 12,217 | 3,841 | Russia (47%), Hong Kong (46%) |
| Onions and shallots | 11,288 | 3,324 | 31,956 | 7,639 | 58,757 | 17,749 | Russia (48%), Hong Kong (22%), Korea (17%), Indonesia (15%) |
| Garlic | 128,200 | 67,260 | 320,064 | 110,637 | 168,544 | 75,616 | UAG (10%) |
| Leeks and other alliaceous vegetables | 12,280 | 8,369 | 15,690 | 8,620 | 17,940 | 10,389 | Japan (38%), Hong Kong (29%) |
| Cauliflower and broccoli | 2,933 | 812 | 4,876 | 1,270 | 11,361 | 2,719 | Hong Kong (49%), Russia (44%) |
| Brussels sprouts | 1,744 | 251 | 1,795 | 229 | 4,532 | 892 | Russia (62%) |
| Cabbage lettuce | 6,078 | 1,381 | 10,490 | 2,274 | 15,567 | 3,062 | Hong Kong (61%) |
| Other lettuce | 759 | 196 | 214 | 134 | 650 | 212 | Hong Kong (82%) |
| Carrots and turnips | 16,173 | 4,889 | 15,316 | 5,051 | 25,215 | 7,572 | Hong Kong (39%), Japan (28%) |
| Salad beetroot, salsify, Radishes, and similar edible roots | 3,444 | 2,373 | 7,074 | 4,611 | 15,752 | 8,620 | Japan (82%) |
| Cucumbers, gherkins | 5,011 | 1,253 | 8,961 | 1,770 | 5,058 | 1,289 | Japan (72%) |
| Peas | 1,513 | 768 | 3,599 | 1,380 | 5,724 | 3,872 | Japan (89%) |
| Beans | 2,809 | 790 | 3,794 | 794 | 2,076 | 733 | Japan (67%) |
| Other leguminous vegetables | 9,906 | 4,955 | 11,611 | 5,382 | 8,142 | 4,584 | Japan (52%), Hong Kong (28%) |
| Asparagus | 1,151 | 2,235 | 1,627 | 2,813 | 2,654 | 5,359 | Japan (44%) |
| Aubergines | 5,042 | 1,257 | 7,596 | 1,687 | 8,008 | 1,841 | Hong Kong (88%) |
| Celery and celeriac | 1,461 | 404 | 1,528 | 357 | 3,006 | 626 | Hong Kong (99%) |
| Mushrooms | 9,169 | 30,819 | 18,321 | 76,709 | 28,234 | 106,066 | Japan (72%) |
| Truffles | 1,204 | 3,795 | 2,875 | 9,269 | 1,799 | 6,126 | Japan (81%) |
| Peppers | 4,341 | 1,414 | 7,883 | 2,015 | 5,475 | 1,615 | Hong Kong (76%) |
| Spinach | 7,576 | 1,892 | 14,232 | 2,946 | 5,673 | 1,588 | Hong Kong (71%) |
| Bamboo shoots | | | 4,020 | 5,769 | 4,488 | 5,547 | Japan (72%) |
| Other | 200,530 | 55,118 | 239,987 | 55,652 | 326,447 | 84,301 | Hong Kong (80%) |
| Total | 511,510 | 203,140 | 766,795 | 312,995 | 779,590 | 360,924 | |

Source: China Customs Statistics Yearbook.

China ranks first both in the total output and export volume of edible fungi in the world, accounting for 65% and 50%, respectively. The share of edible fungi export income in the total export income of vegetables from China is as high as 46.4%.

Along with the increase of edible fungi production, exports have also continuously increased. In 1993 the export of major edible fungus products was 193,075 tons, accounting for 47.5% of the world trade. In 1994 exports achieved a further increase, reaching 247,000 tons accounting for over 50% of the world market. The major species of edible fungi exported and from China include double-spore mushroom (*Agaricus bisporus* including salt solution mushroom, canned mushroom, dried mushroom chips, etc.), *Lentinus edodes*, black fungi (*Auricularia auricula*), and *Volvariella volvacea* (Table 22).

**Table 22 Export of major edible fungi from China.**

| | *Agaricus campestris* | | | | *Lentinus edodes* | | *Auricularia auricula* | | Dried *Volvariella volvacea* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | salt solution | | canned | | | | | | | |
| | Tons | US $ '000 | Tons | US $ '000 | Tons | US $ '000 | Tons | US $ '000 | Tons | US $ '000 |
| 1982 | 6,786 | 6,370 | 98,773 | 115,660 | 302 | 2,110 | 918 | 8,940 | 246 | 110 |
| 1983 | 5,824 | 6,050 | 91,653 | 102,510 | 952 | 10,370 | 1,272 | 12,730 | 51 | 130 |
| 1985 | 29,704 | 28,080 | 118,060 | 125,820 | 1,011 | 7,310 | 1,344 | 9,790 | 104 | 790 |
| 1986 | 33,949 | 27,910 | 129,810 | 124,170 | 1,391 | 10,340 | 1411 | 9,530 | 58 | 70 |
| 1987 | 24,874 | 21,640 | 129,602 | 130,560 | 3,545 | 28,480 | 893 | 8,000 | 228 | 240 |
| 1988 | 26,987 | 31,860 | 112,314 | 152,980 | 6,004 | 48,970 | 1,239 | 10,630 | 911 | 1,620 |
| 1989 | 35,467 | 43,990 | 133,553 | 185,700 | 5,413 | 39,610 | 1,246 | 9,560 | 849 | 1,050 |
| 1990 | 30,885 | 33,760 | 108,837 | 138,160 | 6,698 | 47,930 | 1,733 | 8,430 | 2,047 | 2,820 |
| 1991 | 28,178 | 31,510 | 118,041 | 144,980 | 7,596 | 42,910 | 1,625 | 9,280 | 1,521 | 2,560 |
| 1992 | 35,054 | 34,000 | 121,372 | 138,330 | 13,089 | 41,570 | 1,772 | 12,560 | 793 | 2,790 |
| 1993 | 37,688 | 38,210 | 138,106 | 133,760 | 16,786 | 81,990 | 3,587 | 15,740 | 1,978 | 3,950 |
| 1994 | 41,677 | 51,370 | 166,346 | 174,360 | 21,876 | 110,850 | 4,238 | 24,210 | *NA* | *NA* |

Source: Ministry of Foreign Economic and Trade, Foreign Economics and Trade Yearbook of China, 1982-1994, China Society Publishing House.

Since the early 1980s, while reforming the planned economic system, China has strengthened the construction of the vegetable and fruit market system, developed processing, storage, transportation and fresh preservation techniques and enhanced construction of the export infrastructure. In addition, China has attached great importance to the cultivation and breeding techniques of good quality and highly efficient varieties of vegetables and fruits. This is the essential reason for the rapid development of vegetable and fruit production in China in recent years.

With respect to institutional arrangements, the government has attached enough importance to the guarantee of farmland used for vegetable production, credit, techniques, and marketing through the Vegetable Basket Programme, which has promoted the development of vegetable production and improved vegetable supply capability.

However, the backward techniques of transportation, cold-storage and fresh preservation and low processing skills will remain to be major issues which restrict the export of vegetables and fruits produced by China and the domestic supply of vegetables and fruits.

## Recommendations

For the major upland crop products, such as maize, soybean, potato and sweet potato, which play an important role in China's food security, a number of specific recommendations merit consideration by policy makers, research scientists, traders, processors and farmers. They are outlined briefly below.

- Increase investment in the construction of the agricultural infrastructure to improve production conditions. The investments in irrigation development, road building, research and extension for grains need be increased.

- Research and extension services for upland crops should be improved. Speed up scientific and technological research into breeding, crop cultivation, and prevention and control of plant diseases. More attention should be paid to processing, storage and preservation of agricultural products.
- Create favorable conditions and promote the development of the feed industry with food demand as the real guide. The high income elasticities for livestock and feedgrains imply that demand for these products will increase faster than that for rice. Therefore, the growth of grain demand in the future is a result of the growth of feed grain demand. The future strategy for feedgrain development should include the breaking up of regional trade partitions, the cessation of regional agricultural protectionism and the implementation of preferential policies for the development of the feed industry to bring into full play the regional production superiority and a more efficient utilization of resources. Optimization of the production structure and efficient distribution of resources should bear the whole country in mind. There should be an increase of investment in irrigation development for yield augmentation of feedgrains such as maize in dryland areas.
- Because the shortage of grain in China is a shortage of feed grain, the state could consider a strategic policy of partially changing direct grain import (feed grain) into partial import of animal products.
- Further reform the agricultural marketing system and strengthen linkages between production, processing and exports. Speed up the progress of commercialization of the grain trade and speed up investment in port facilities to cope with a possible increasing demand of grain import. This will be beneficial not only in alleviating the gap of output deficit but also in reducing the time and cost of grain imports.

For vegetables and fruits, the future strategy should be as follows:

- Increase investment in the construction of infrastructure of vegetable and fruit markets, and strengthen the construction of marketing systems.
- Strengthen the construction of market information systems, establish market information networks in vegetable and fruit producing regions and marketing areas, and release production, marketing and price information of vegetables and fruit by utilizing advanced communication media.
- Improve the technical level of vegetable and fruit processing and fresh preservation.
- Improve the storage and transportation facilities for vegetables and fruit so as to reduce post-harvest losses.
- Strengthen the administration of quality control and monitoring for vegetables and fruit.
- Improve the technical level of vegetable and fruit packing, which is an important aspect for the promotion of agricultural product export.

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# Comments on the Chinese Country Report

*Ms. Xiong Cunkai*[*]

In general, I would like to say that the Chinese country report provided by Dr. Cheng is very good and impressive. Dr. Cheng and his research group have done very meaningful work. This report thoroughly, systematically and realistically recommends general agricultural policies for China and policies for major upland crops. It describes the present performance of crop production and circulation and the achievements and problems in international trade. It also analyzes in detail rural and urban patterns of food consumption and expenditures of different income groups.

In this report there is sufficient information and data to support analysis of market demand and supply for upland crops, maize, soybean, rice, tubers and roots, in China. This report is quite believable and it is very constructive for China's further development and agricultural reform. Also, it will be helpful for further research on agricultural trade liberalization.

Since China is now changing from a planned economy to a socialist market one, and the Chinese economy is developing rapidly, many economic factors which affect production and marketing are fluctuating. Government policies are often changing and collecting statistical data is difficult in China. Thus, this report is all the more commendable.

A very interesting part of this report is the analysis of market potential of fruits and vegetables in China. Actually, in recent years successful reforms made in production and marketing of fruits and vegetables in China have resulted in great changes. The obvious achievements of the reform are the enriched people's vegetable baskets and at the same time the enhanced international and domestic markets. Undoubtedly, market demand for fruits and vegetables will continuously increase with economic growth. However, these crops compete in land utilization with grain, including upland crops. It is expected that along with rapid economic development in China and variation of comparative advantages among different products, competition among different crops in land utilization will become more acute. Therefore, two issues require further study: how can the government regulate and guide the coordinated growth of grain, fruits and vegetables, and what kind of land utilization structure is economically rational.

The discussion of case studies is also very interesting. Although we have had great success in the market-orientation reform of fruits and vegetables, problems still exist. Some of the problems are still seriously affecting agricultural production and marketing. So the case studies draw very useful lessons for us. It would be better if some grain products were selected for case studies rather than just fruits and vegetables, because this research is focused on upland crops.

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* Centre for International Agricultural Trade, Institute of Agricultural Economics (IAE), Chinese Academy of Agricultural Sciences (CAAS).

Another issue related to upland crops concerns feed grain and animal production. As stated in the report, in the future the most rapid growth in grain demand will be the growth of demand for feed grain, and the shortage of grain in China is almost entirely a shortage of feed grain. So it is vital for China to properly solve the issue of increasing demand for feed grains. The suggestion put forward by the report is that China can change trade strategy from importing feed grain into partially importing animal products directly. I think it would be more helpful to discuss this issue and carefully consider if it is suitable for China to change from importing feed grain to importing animal products directly. In my opinion, since China is a country with a huge amount of cheap labor and animal husbandry is labor-intensive, China has an obvious comparative advantage in animal production rather than in crop production which needs more land and less labor. Although China's future demand for food of animal origin is projected to grow, it can be met primarily by increased domestic animal production. Compared with direct import of animal products, the strategy of importing a certain amount of feed grain to produce more animal products domestically can extend the production chain and absorb more farm labor than the alternative case.

Meanwhile, since the future demand for animal products will increase rapidly in urban and rural areas, it will inevitably stimulate animal husbandry production in China. Thus it seems worth while to study feed grain continuously and more deeply especially the production structure, infrastructure construction, appropriate technology extension, pricing and marketing system, distribution system, transportation costs, and economic costs and benefits of industrial operations, so as to work out a more efficient strategy for the development of feed grain and agriculture in China.

# Market Prospects for Upland Crops in India

*Praduman Kumar*[*]

## Introduction

Agriculture occupies an important place in India as it contributes nearly one-third of the gross domestic product. Two-thirds of the population are still engaged in it. The diverse agro-climatic conditions in India are conducive to growing tropical, subtropical and temperate crops. Upland crops comprising coarse grains, pulses, root and tuber (CGPRT) crops dominated the Indian agriculture in terms of both area and production till the mid-sixties. With the introduction of new seed-fertilizer based technology favoring wheat and rice in the mid-sixties, the production of upland crops underwent a continuous decline as all the research and development efforts were directed towards tapping the potential of this new technology. The ongoing economic reforms in India, international trade reforms and attempts to integrate the Indian economy with the global economy are likely to result in structural changes in India's farm economy. Upland crops and their products are likely to become important in increasing farm income and in attaining balanced regional development. This study contains an overview of policy measures implemented in Indian agriculture and provides information on the domestic demand, market potential and prospects of upland crop products (UCPs) and suggests strategies for improving their marketing and trade. The specific objectives of the study are (i) to examine dietary patterns and their relationships with income and urbanization; (ii) to analyze changes in the domestic demand for major upland crop products; (iii) to study the external trade performance for major upland crop products; (iv) to arrive at the medium term demand projections for the major upland crop products; and (v) to review/analyze domestic marketing systems, policies, export promotion efforts and suggest strategies for improving domestic market prospects and exports of upland crop products. The study covers the major UCPs (soybean, maize and cassava), the major staple foodgrain crop (rice), fresh fruits (mango, grape and apple), a fresh tuber crop (onion), processed fruit (mango pulp) and a vegetable (mushrooms) and cut flowers.

## Policy measures implemented in Indian agriculture

The government began to play a key role in the transformation of the agricultural economy in the Post-Independence era which has led to a series interventions by the state in diverse activities such as provision of subsidies of different kinds, procurement of a large proportion of farm products, supply of inputs and credit, promotion of agronomic research and regulation of agricultural imports and exports. Input subsidies have been extended to fertilizer, credit, irrigation, electricity, pesticides/insecticides and machinery used in agriculture. On the output front, there is a guaranteed minimum support price policy covering about 21 commodities to ensure remunerative prices to producers.

[*] Indian Agricultural Research Institute, New Delhi, India.

Although state interventions in Indian agriculture have brought many laudable achievements, strong pleas have been made in recent years to reformulate and restructure the agricultural policy in tune with the changing socio-economic and trade milieu. Accordingly, steps have been initiated to rationalize input subsidies, to extend the benefits of new technology and government interventions to backward and under-developed areas, and to withdraw restrictions on agricultural exports. A brief summary of policy measures implemented on maize, soybean, cassava and rice is presented in Table 1.

This table structures the policies by commodity and by market level. It distinguishes policies operative at farm level, marketing and processing level, and finally, at the international trade level. It should be well understood that policies are virtually always specific for states.

**Table 1 Policy measures implemented on each commodity.**

| Measures | Commodity | | | |
|---|---|---|---|---|
| | Maize | Soybean | Cassava | Rice |
| Farm Level | | | | |
| 1. Input subsidies | | | | |
| Fertilizer | + | + | + | + |
| Seed | - | - | - | - |
| Cheap credit for inputs | + | + | + | + |
| 2. Investment grants | | | | |
| Machinery | - | - | - | - |
| Irrigation systems | + | + | + | + |
| Land development | + | + | + | + |
| 3. Production/acreage controls | - | - | - | - |
| 4. Compulsory food requisition | - | - | - | + |
| 5. Production subsidy: a fixed or proportionate subsidy per unit of output | - | - | - | - |
| 6. Deficiency payment | - | - | - | - |
| 7. Guaranteed Price | + | + | - | + |
| Marketing and Processing Level | | | | |
| 1. Parastatal trading/ Marketing Boards | + | + | - | + |
| 2. Intervention buying or price support programme | + | + | - | + |
| 3. Food subsidies to consumers | - | - | - | + |
| 4. Excise taxes | - | - | - | - |
| 5. Grants to industry | | | | |
| Investment grants | - | - | - | - |
| Special tax concession | - | + | - | - |
| 6. Public investment: research, training and extension | + | + | + | + |
| International Trade | | | | |
| 1. Import tariff or surcharge | + | + | + | + |
| 2. Import/export quota | + | + | + | + |
| 3. Export subsidies or tax | - | - | - | - |
| 4. Non-tariff barriers | + | + | + | + |

## Dietary patterns

Cereals dominate food expenditures in India. Rice ranks first followed by wheat and coarse grains. Annual per capita consumption of cereals was 180 kg in rural areas in 1987-88 and 140 kg in urban areas, accounting for 73% of total calorie intake in rural areas and 62% in urban areas. The cereal consumption declined to 163 kg in rural areas and to 129 kg in urban

areas in 1993-94. The low cereal consumption in urban areas was compensated by higher consumption of milk, vegetables, fruits, meat and edible oils. The declining trend in cereal consumption can largely be attributed to a shift in tastes and preferences resulting from the increasing availability of a greater variety of food items as well as the information explosion as a result of breakthroughs in communication technology. During the nineties, the rural population has been exposed to new consumable food items as well as durable goods. This has brought changes to their living and consumption patterns and, therefore, the rural masses are coming much closer to the urban food consumption patterns over time.

**Table 2 Change in consumption of food in India.**

| Item | Rural | | | Urban | | |
|---|---|---|---|---|---|---|
| | 1977 | 1987 | Change (%) | 1977 | 1987 | Change (%) |
| Annual Per Capita Food Consumption (kg) | | | | | | |
| Rice | 86.5 | 88.1 | +1.6 | 67.6 | 68.1 | +0.5 |
| Wheat | 49.4 | 61.6 | +12.2 | 64.6 | 60.4 | -4.2 |
| Coarse cereals | 56.7 | 29.8 | -26.9 | 14.8 | 10.6 | -4.2 |
| Cereals | 192.6 | 179.5 | -13.1 | 147.0 | 139.1 | -7.9 |
| Pulses | 8.7 | 11.5 | +2.8 | 11.7 | 12.2 | +0.5 |
| Milk | 24.6 | 58.0 | +33.4 | 39.7 | 64.9 | +25.2 |
| Edible oil | 2.7 | 4.3 | +1.6 | 4.8 | 6.8 | +2.0 |
| Vegetables | 24.7 | 50.8 | +26.1 | 39.7 | 66.4 | +26.7 |
| Fruits | 2.6 | 10.3 | +7.7 | 5.9 | 18.8 | +12.9 |
| Meat, fish & eggs | 2.7 | 3.3 | +0.6 | 4.8 | 4.9 | +0.1 |
| Sugar | 13.5 | 11.0 | -2.5 | 17.1 | 12.3 | -4.8 |
| Percent of Total Calorie Intake by Source | | | | | | |
| Cereal | 81.0 | 73.6 | -7.4 | 68.6 | 63.2 | -5.4 |
| Pulses | 3.7 | 4.8 | +1.1 | 5.5 | 5.6 | +0.1 |
| Milk | 2.5 | 5.7 | +3.2 | 4.5 | 7.1 | +2.6 |
| Edible oil | 2.9 | 4.6 | +1.7 | 5.8 | 8.1 | +2.3 |
| Vegetables | 2.2 | 4.4 | +2.2 | 3.9 | 6.4 | +2.5 |
| Fruits | 0.3 | 1.0 | +0.7 | 0.6 | 1.9 | +1.3 |
| Meat, fish & eggs | 0.4 | 0.5 | +0.1 | 0.9 | 0.9 | +0.0 |
| Sugar | 6.4 | 5.1 | -1.3 | 9.1 | 6.3 | -2.8 |
| Other food | 0.5 | 0.3 | - 0.2 | 1.1 | 0.5 | -0.6 |
| Percent of Total Food Expenditure | | | | | | |
| Cereals | 50.8 | 39.8 | -11.0 | 34.6 | 26.6 | -8.0 |
| Pulses | 6.3 | 6.4 | +0.1 | 6.6 | 6.1 | -0.5 |
| Milk | 13.0 | 14.3 | +1.3 | 16.3 | 17.1 | +0.8 |
| Edible oil | 5.5 | 8.0 | +2.5 | 7.8 | 9.5 | +1.7 |
| Vegetables | 5.8 | 8.0 | +2.2 | 7.3 | 9.0 | +1.7 |
| Fruits | 1.7 | 2.6 | +1.5 | 3.0 | 4.4 | +1.4 |
| Meat, fish & eggs | 4.1 | 5.2 | +1.1 | 5.6 | 6.6 | +1.0 |
| Sugar | 4.2 | 4.5 | +0.3 | 4.4 | 4.2 | -0.2 |
| Other food | 8.7 | 11.2 | +2.5 | 14.4 | 16.5 | +2.1 |
| Percent of Total Expenditure | | | | | | |
| Food | 65.4 | 62.8 | -2.6 | 60.7 | 55.4 | -5.3 |
| Non-food | 34.6 | 37.2 | +2.6 | 39.3 | 44.6 | +5.3 |
| Annual Expenditure (Rs per capita) | 850 | 2,070 | +1,220 | 1,166 | 3,126 | +1,960 |
| Total Calorie Intake per Day | | | | | | |
| Per capita | 2,238 | 2,298 | +60 | 2,022 | 2,078 | +56 |
| Per adult unit | 2,820 | 2,849 | +29 | 2,487 | 2,514 | +27 |

The per capita consumption of cereals as food has declined, while that of fruits, vegetables, meat, fish, eggs and dairy products has increased over the past three decades. The

consumption pattern at two points of time clearly illustrates a shift in the consumption pattern in favor of non-staple food for each income group for the rural and urban population. The shift is quite significant even in rural areas. Between 1977 and 1987, the per capita annual consumption of cereals declined from 193 kg to 180 kg in the rural areas and from 147 kg to 139 kg in the urban areas (Table 2). A declining trend in sugar consumption is also observed both in the rural and urban population. During the decade, the per capita annual consumption of fruits and vegetables increased from 27 kg to 61 kg in rural areas and from 46 kg to 84 kg in urban areas. The annual consumption of milk increased from 25 kg to 58 kg in rural areas and from 40 kg to 65 kg in urban areas. The consumption of meat, fish and eggs has also shown an increasing trend, but the per capita annual consumption still remained at a low level (3.3 kg in the rural population and 4.9 kg in the urban population), because the majority of the Indian population is vegetarian and derives the major share of protein from pulses and milk. The share of non-food items in the total expenditure increased by 2.5% in the rural areas and 5% in urban areas between 1977-78 and 1987-88, while per capita calorie intake increased marginally (less than 3%). Consumers are not meeting their additional energy requirements from additional consumption of cereals but from the non-cereal and non-crop commodities. This is true for all income groups in the rural as well as in the urban areas. During the period 1977-87, the cereal budget share declined by 11% in the rural areas and 8% in the urban areas. This budget has been diverted to high value commodities. Thus, a diversified food basket is exhibited both in rural and urban areas with significantly higher levels of per capita consumption of milk and milk products, fruits and vegetables, and meat. The increasing demand for livestock products (milk, meat and eggs) will drive up the demand for feed. The empirical estimates presented in this section support the hypothesis that, in addition to income and urbanization, structural changes in food demand can constitute significant factors in causing rapid changes in dietary patterns.

The growth of demand for cereals is mainly due to population growth. The demand for meat, fish and eggs will increase about 5.8% per annum, while the demands for pulses, edible oils, vegetables, fruits and milk are projected to increase at 3.3 to 4.1% (Table 3). Structural changes in consumption patterns, growth in the economy as well as sizable additions to population will increase the demand for livestock products which, in turn, will push up the demand for feed.

**Table 3 Projected growth in demand for food.**

| Commodity | Expenditure Elasticity | Growth in Demand (%) |
|---|---|---|
| Rice | 0.049 | 2.15 |
| Wheat | -0.075 | 1.54 |
| Coarse cereals | -0.137 | 1.23 |
| Pulses | 0.283 | 3.33 |
| Milk | 0.435 | 4.09 |
| Edible oils | 0.337 | 3.60 |
| Vegetables | 0.345 | 3.64 |
| Fruits | 0.412 | 3.97 |
| Meat, fish & eggs | 0.777 | 5.80 |
| Sugar | 0.115 | 2.49 |

## Feed

The supply of feed is derived from foodgrains, oilseeds and root crops. As shown in Table 4, the availability of feed was 10.5 million tons in the year 1980 and it was about 19 million tons by 1992, registering an average annual growth rate of 4.7%. During this period, the export of feed (oilcakes) increased four-fold from 0.89 million tons in 1980 to 3.68 million tons in 1992 with a growth rate of 13.8% per annum. The net availability of feed for domestic use increased from 9.6 million tons in 1980 to 15 million tons in 1992 at an annual compound growth rate of about 3.4%. The livestock output units (LOU: determined by adding the production of meat and eggs, assuming an average weight of 50 gram per egg, and one-tenth of milk production on weight basis) rose from 4.6 million units in 1980 to 10 million units in 1990. The feed conversion ratio (the quantity of feed used to produce one LOU) was 2.1 in 1980, and it declined to 1.5 in 1990. This declining ratio indicates that Indian livestock are poorly fed, which is a matter of serious concern in light of the increasing demand for livestock products. The feeding ratio is negatively associated with the export of oilcakes. In light of the increasing demand for milk, meat and eggs, increased modernization and commercialization of livestock production and declining availability of crop residues, there is a dire need to increase the feeding ratio in the future. During the last decade or so, the supply of foodgrains has been growing faster than its demand, leading to foodgrain stocks of about 31 million tons by 1995. That part of the old stock which is not fit for human consumption can be used as animal feed, which would also help in accelerating the export of oilcakes.

**Table 4 Domestic requirement, export and net availability of feed, India.**

| Year | Feed (million tons) | | | LOU | Feed Conversion |
|---|---|---|---|---|---|
| | Availability | Export | Net Availability | (million) | Ratio |
| 1980 | 10.45 | 0.89 | 9.56 | 4.6 | 2.1 |
| 1981 | 12.32 | 0.82 | 11.50 | 4.8 | 2.3 |
| 1982 | 11.14 | 1.12 | 10.02 | 5.1 | 2.0 |
| 1983 | 12.61 | 0.98 | 11.63 | 5.5 | 2.1 |
| 1984 | 13.13 | 0.83 | 12.30 | 6.0 | 2.1 |
| 1985 | 12.14 | 0.81 | 11.33 | 6.4 | 1.8 |
| 1986 | 11.53 | 1.04 | 10.49 | 6.7 | 1.6 |
| 1987 | 12.05 | 0.68 | 11.37 | 6.9 | 1.6 |
| 1988 | 16.89 | 1.61 | 15.28 | 7.5 | 2.0 |
| 1989 | 16.69 | 2.84 | 13.85 | 9.2 | 1.5 |
| 1990 | 17.41 | 2.45 | 14.96 | 9.7 | 1.5 |
| 1991 | 17.11 | 3.65 | 13.46 | 10.0 | 1.3 |
| 1992 | 18.86 | 3.68 | 15.00 | 10.1 | 1.5 |
| Growth (%) | 4.67 | 13.76 | 3.38 | 7.36 | |

Source: Department of Animal Husbandry and Dairying, Ministry of Agriculture, Government of India.
Note: Production of meat includes beef, buffalo, sheep, goat, pig and poultry products (excluding eggs).

Oilcakes are a major source of feed constituting around 80% of total feed, while the foodgrains form around 19% of the total feed. Nearly 82% of the available feed is domestically utilized, while 18% (mainly soya meal) is exported (Table 5).

The supply of feed is estimated at 21 million tons in 1995 and projected at 26 million tons by 2000 AD. The domestic demand for feed is expected to be on the order of 22 million tons by the year 2000 (Table 6). By this time, India is also likely to have an exportable surplus of 4.6 million tons. In the nineties, exports of feed from India are estimated to grow at 3.61% per annum.

**Table 5 Trends in availability of feed by source in India.**

| | TE 1982 | TE 1987 | TE 1992 |
|---|---|---|---|
| Total feed (million tons) | 11.3 | 11.9 | 17.8 |
| Share in total feed (%): | | | |
| Foodgrains | 23.8 | 23.5 | 18.8 |
| Rice | 1.7 | 2.2 | 2.0 |
| Maize | 1.1 | 1.1 | 1.0 |
| Others | 21.0 | 20.2 | 15.8 |
| Oilcake | 73.7 | 74.6 | 80.1 |
| Soy meal | 2.8 | 5.5 | 10.3 |
| Others | 70.9 | 69.1 | 69.8 |
| Cassava | 2.5 | 1.9 | 1.1 |
| Domestic use | 91.6 | 92.9 | 81.7 |
| Export | 8.4 | 7.1 | 18.3 |

**Table 6 Net trade of feed in million tons, India.**

| Year | Supply | Demand | Export |
|---|---|---|---|
| TE 1992 | 17.79 | 14.47 | 3.32 |
| 1995 | 21.35 | 17.54 | 3.81 |
| 2000 | 26.83 | 22.26 | 4.57 |

Currently the use of processed feed is quite low in India, particularly on marginal and small farms which form a high proportion of the total holdings, and livestock rearing is a supplementary activity on these farms. However, these farms cannot afford processed feed which is generally very expensive. The rising demand for livestock products will make livestock rearing a commercial activity and the use of processed feed is likely to increase.

## Domestic demand and market potential of UCPs

The upland crops, namely rice, soybean, maize and cassava constitute an important source of feed and staple food. Of these, soybean, maize and cassava are mostly used as feed and they constitute the major share in feed ingredients for dairy cattle, poultry and pigs in the world. However, in India, the share of these UCPs in total animal feed is only 12.4%, comprising 10.3% of soy meal, 1.1% of cassava and 1% of maize. The reasons for the lower share of these crops in animal feed in India vis-a-vis the rest of the world are: (i) maize and cassava are primarily grown by subsistence farmers who use them as staple food, (ii) most of the soy meal produced in India is exported, and (iii) the major components of animal feed in India are other UCPs. In light of the global importance as feed and staple food, these commodities are selected for detailed analysis of domestic demand and market potential. This section presents the production and utilization pattern, and domestic demand for these commodities. Most of the upland crops have been traditionally grown by subsistence farmers and therefore their products are directly used as human food. Some part of the produce is also fed to animals. This utilization pattern might have changed over time because of developments in crop technology and generation of a market surplus. Precise information on various uses of UCPs is, however, not readily available. Using FAO Food Balance Sheet data and other published information, we have generated utilization patterns of selected UCPs. In addition to this, marketing/processing and external trade performance of these commodities are also analyzed.

*Soybean*

Although soybean came to be commercially exploited in the mid-sixties, the lack of processing facilities severely constrained its production growth by depressing soybean prices which in turn adversely affected its area and production. Processing facilities were developed only in the eighties consequent to the introduction of various incentive schemes. While large scale processing results in economies of scale on account of higher oil recovery and lower per unit processing costs, processing of black soybean is still a problem. In this variety, the soy meal recovery is low and it also fetches a low price a in the international market because of poor product acceptance with the consequential adverse effect on profitability of the industry. However, farmers still grow this variety because of its lower working capital requirement. Small quantities of soybean are retained by the producers as seed, food and feed and part of it is used as soy food (soya milk, nutrella, etc.). Some is lost in the process of handling. The remaining part is processed for oil and meal. While soy oil is chiefly used domestically, soy meal is largely exported with a mere 10% of it consumed domestically, as the price of soy meal is higher than those of its substitutes. The price of soy meal in the world market is high and exports have grown at an annual rate of around 26%.

**Table 7 Demand composition of soybean, India.**

| Demand Composition | Demand (million tons) TE 1992 | 2000 | Share in Total (%) |
|---|---|---|---|
| Soybean for crushing | 2.103 | 2.987 | 76.56 |
| Soy meal | 1.745 | 2.478 | 63.53 |
| Domestic use | 0.227 | 0.348 | 8.26 |
| Export | 1.518 | 2.130 | 55.26 |
| Soy oil | 0.358 | 0.509 | 13.03 |
| Seed, food & wastage | 0.644 | 0.914 | 23.44 |
| Total | 2.747 | 3.901 | 100 |

About 77% of the production is demanded by the crushing industry to produce soy meal and oil, while seed, feed and soya food together account for 19% and the wastage amounts to around 4%. By the year 2000 AD, the total demand for soy meal will be around 2.5 million tons which in turn will require about 3 million tons of soybean. Since only 77% of the production is available for crushing, the demand for soybean will be on the order of about 3.9 million tons by 2000 AD (Table 7). The demand for animal feed is expected to grow in the future and the use of soy cake as animal feed may increase if the prices are favorable (low). Exports of soy cake and soy meal have grown over time and are likely to grow in the future also. Since India enjoys a comparative advantage in Asian markets compared to European and Latin American markets on account of lower freight charges, much of our exports have been confined to these markets. A large export market exists in Europe where India faces stiff competition from American countries. Research and extension efforts aimed at improving productivity, reducing the real cost of production, and developing suitable varieties for processing are essential to exploit this export potential. The future soybean development strategy should aim at strengthening linkages between production, processing and exports.

*Maize*

Although maize is an important crop in India, the country does not occupy an important position in the world as a maize producer. Although a large number of private seed companies in the country are now producing hybrid maize seed, a large number of farmers continue to

grow local varieties. Maize still remains a subsistence crop on account of the lack of demand for its non-food uses, despite the fact that maize is included in the government price support policy and the market prices for maize have generally been higher than its procurement prices. The processing industry is not well developed mainly due to uncertainty in the supplies of raw products of desired quality and their high prices. Manufactured feeds are also not very popular in India. Only 19% of the maize production is used for seed and processed products, while around 79% of the production is consumed as staple food and 2% as feed. By the year 2000, the demand for maize is expected to be around 10 million tons. Exports of maize have been quite erratic and confined mostly to the neighboring countries, Malaysia, Sri Lanka and Iran.

### *Cassava*

The area under cassava has shown a decline during the last decade but this has been offset by increases in its productivity. The production of cassava has, therefore, been stagnant. Cassava markets are not well developed in the country and a major proportion of the produce is retained by the producers for self consumption. The feed manufacturers also do not use cassava as a main ingredient in feeds although producers use dried cassava chips as cattle and poultry feed. However, cassava is processed to produce products such as starch, sag, glucose and dextrine. Some 44% of the production is used by the processing industry, 40% as food, 9% as animal feed and the wastage is around 7%. The demand for cassava by 2000 AD will be around 5.4 million tons (Table 8).

**Table 8 Demand for cassava in million tons in India.**

| Demand Composition | TE 1992 | 2000 | Share in Total (%) |
|---|---|---|---|
| Food | 2.132 | 2.379 | 40.1 |
| Industrial use | 2.343 | 2.191 | 44.0 |
| Animal feed | 0.484 | 0.464 | 9.1 |
| Wastage | 0.363 | 0.368 | 6.8 |
| Total demand | 5.322 | 5.402 | 100 |

### *Rice*

Rice is a major foodgrain of India constituting about 40% of the foodgrain production. India ranks first in the area under rice and second in production in the world but the productivity levels are very low. India is a major producer of the aromatic super fine basmati rice variety which commands a premium price in the international market. Although a fairly strong formal market for rice has been developed in India, a significant quantity of rice is still traded in informal village markets in several parts of the country. Recent efforts at globalization of the Indian economy have led to the abolition of quantitative restrictions on exports, minimum export prices and export licensing, thus giving a big boost to rice exports, especially to the super fine basmati varieties. Significant improvements are required to modernize rice milling to cash in on the world markets. While the manufactured use of rice is negligible in India, rice processing, especially of rice bran, is an important activity and the processed products are used as animal feed, edible oil and as raw material for industrial products.

**Table 9 Demand for rice in million tons in India.**

| Demand composition | TE 1992 | 2000 | Share in Total (%) |
|---|---|---|---|
| Food | 63.54 | 76.98 | 86.7 |
| Animal feed | 0.35 | 0.50 | 0.5 |
| Seed, other uses & wastage | 9.38 | 11.37 | 12.8 |
| Total Domestic demand | 73.27 | 88.85 | 100 |

In Table 9, the utilization pattern of rice reveals that around 87% of the production is used as food, around 12% as seed, other uses and wastage, while only 0.5% is used as animal feed. By the year 2000, the domestic demand for rice is expected to grow to 88.8 million tons. During the period 1980-81 to 1992-93, the export of rice increased at a rate of 9.9% cent per annum in value terms but remained stagnant in quantity terms. The year 1993-94, however, witnessed a sharp increase in rice exports. Given the high degree of export competitiveness of Indian rice, exports are expected to improve significantly in the post-GATT era. Indian basmati rice exports have so far been confined mainly to Saudi Arabia, the United Kingdom, UAE and Kuwait, while the non-basmati varieties are exported to a large number of countries. It is estimated that the exportable surplus of rice from India is around 1.3 million tons per year. Infrastructural developments for efficient trade flows and quality improvements are important prerequisites for exploiting the vast potential of export markets.

## Emerging markets of fruits and vegetables

India is a major producer of fruits and vegetables. Both the area and production of these crops have been steadily increasing since 1950. Rapid urbanization, changing lifestyles, increasing incomes and population and growing export demand potential have all raised the demand for horticultural products significantly. The domestic demand for fruits and vegetables during 1995 to 2000 AD is expected to grow at average annual rates of 3.97 and 3.64%, respectively. India is gradually emerging as an important domestic consumer and exporter of fruits and vegetables. There has been, in the recent years, a sudden spurt in the exports of fresh and processed fruits and vegetables, the environment for which has been made conducive by the recent trade policy liberalization and increased investments on horticultural development. However, the export commodity mix of fruits and vegetables is narrow with emphasis mainly on mango, grapes, onions, and mango pulp, all of which are highly export competitive.

### *Mango*

India is the largest producer of mango in the world, with a 59% share in total world production. World trade in fresh mango forms an insignificant proportion of the world production (only 0.6%). India's share in the world mango market is less than 15%, but mango accounts for around 39% of the total fruit exports from India. Indian mango is moderately export competitive and in the last decade the quantity of mango exports has grown at an average rate of 7.8% per annum. In the near future, mango exports from India are likely to grow annually at a rate of 6.1 to 7.8%, and by the year 2000 the export of fresh mango is projected to reach 38 to 43 thousand tons. Around 95% of India's mango exports are routed to the Middle East countries. Given the strong consumer preference for Indian mango, well planned export

and commodity promotion programs can help the country to achieve a dominant position in the world market.

### *Grapes*

Grapes occupy an important position in the exports of fresh fruits from India after mango. In the recent past, the quantity of grape exports has witnessed an annual growth rate of over 23%. Indian grapes are highly export competitive and India has been able to achieve a good market penetration with grapes currently being exported to about 30 markets. It is projected that by 2000 AD India will be exporting over 68 thousand tons of grapes. Currently, the Middle East, UK and South Asian countries are the main importers of Indian grapes with the UK and Bangladesh markets growing rapidly.

### *Apple*

With 1.17 million tons of output, India accounts for about 2.7% of the world apple production. However, owing to the existence of a very large domestic market, India has not been very successful in exports of apples and its contribution to the world trade in apples is only about 0.15%. Although India exports apples to nearly 13 markets, major exports go to the neighboring countries, Bangladesh and Sri Lanka. These two countries together account for 99% of India's apple exports. It is expected that India will not be exporting more than 12 thousand tons of apples by the year 2000 A.D.

### *Onion*

Onion is one of the most important horticultural products of India, forming 87% of the country's export of fresh vegetables and 33% of the export of horticultural products. India is the world's second largest exporter of onions with a market share of 13.6% in 1992-93. Since 1980, India's onion exports have grown at an annual rate of 4.9%. By the year 2000, onion exports are expected to reach 490 thousand tons. India's exports have been mainly confined to the neighboring South East Asian countries and a few Middle East nations. The UAE, Bangladesh, Malaysia and Sri Lanka are the major importers of Indian onions together accounting for around 75% of the country's onion exports. There is considerable scope for increasing the exports of dehydrated onions from India, the demand for which is growing at a rate of 7% per annum, into EC markets. India should take advantage of this by strengthening its processing facilities.

### *Mango pulp*

The quantity of mango pulp marketed in the world market is estimated at 40 thousand tons and India is a major supplier of mango pulp, constituting about 10% of the total exports of horticultural products from India. Between 1982 and 1993, there was a phenomenal increase in the export of mango pulp from India due mainly to high acceptability and preference for Indian mango pulp in the international market. Future exports are projected to grow at an annual rate of 6.6% and by 2000 A.D. the exports are likely to reach 44 thousand tons. The exports are routed mainly to the Gulf countries with Saudi Arabia, Yemen Republic, UAE and Kuwait being the major importers. In Europe, the UK is the major market for Indian mango pulp. India is currently facing stiff competition from several countries in the world market which underscores the need for reducing the high cost of this product by selecting appropriate raw materials for processing and by increasing the processing capacity.

*Mushroom*

Mushrooms are a relatively new entry in India's export basket of horticultural products. The international trade in mushrooms is mainly in the canned form. Exports of mushrooms from India began to pick up only after 1990 with the setting up of export-oriented integrated projects for the production and export of mushrooms. India mainly exports preserved canned mushrooms of the white button variety. The USA and Canada are the major buyers which together account for about 99% of our exports. Indian mushrooms are highly export competitive. India has the advantage of cheap labour as mushroom production is highly labour intensive and the country has conducive agro-climatic conditions for mushroom production. India must diversify its markets and take a serious look at the world markets in order to benefit more from its comparative advantage.

*Constraints to export of fruits and vegetables*

India has relatively well developed markets and well established marketing systems for fruits and vegetables. Even the export marketing systems are generally well developed and free from government restrictions and regulations. To increase the income of producers and to augment the exports of fresh and processed fruits and vegetables, India must attempt to reduce post-harvest losses through efficient processing and packaging, develop infrastructure facilities for quick handling and treatment of export consignments, and undertake research and development to produce large quantities of high quality products.

Poor infrastructure (in terms of storage, transport, cargo space, facilities at air/sea ports, vapour heat treatment, etc.), insufficient institutional support (credit arrangement, promotion of Indian fruits & vegetables overseas) and low research and development efforts (in terms of quality and productivity comparable to those in other producing and exporting countries) are the major constraints to the export of fresh fruits and vegetables.

The institutional arrangements for (i) widening the production base for exports, (ii) efficient post-harvest processing/handling and product promotion technology, (iii) supply of raw materials at reasonable costs, (iv) provision of adequate and timely credit, (v) creation of strong infrastructure, including uninterrupted power and water supplies, and efficient transportation system, and the provision of technical support and conducive labour legislation are prerequisites for high export performance and marketing.

## Successful and failed marketing attempts

Some case studies relating to both successful and unsuccessful domestic and export marketing experiences were undertaken for selected commodities. The relevant qualitative as well as quantitative information was obtained through field surveys by interviewing a cross section of representative farmers, traders, exporters, bankers, and policy makers. Based on results derived from these case studies and other market studies, efforts were made to identify the marketing constraints and comparative advantages and to develop appropriate strategies and policy packages to improve their market prospects. The case studies cover floriculture products (chiefly cut flowers), grapes, apples, onions, and also fresh and processed fruits and vegetables. Cut flowers, grapes and onions are commodities that India exports successfully. In the case of apples, India has not been very successful on the export front but has been quite successful in domestic marketing, while in the case of processed fruits and vegetables products, India has succeeded neither in their export nor in their domestic markets.

### *Floriculture*

India produces a variety of flowers including roses and gladioli which are currently in great demand in the international market. The agro-climatic conditions are very suitable for the cultivation of high quality flowers in India. Relatively cheap and abundant labour availability favours India with a distinct competitive advantage in terms of price. The rapidly growing world markets for flowers are holding out adequate inducement for India to expand her production and exports of flowers. Moreover, India is an important source of supply of cut flowers for the European market in the winter months when the supplies of flowers from Holland and Germany are considerably reduced. These factors, coupled with the government's favorable policies in recent years have contributed to the success of India's cut flower exports. Exports are likely to grow to the tune of five billion rupees by 2000 AD.

### *Grapes*

Various development programmes launched by the state/central governments have helped to increase the production and supply of grapes in India. Several varieties of grapes which are currently in demand in international markets are produced and exported from India. The entry of cooperatives such as MAHAGRAPE and NAFED, which have strived hard to establish a considerable infrastructure for exports, has helped to increase our exports and has also enabled the export of good quality products. Many growers are now growing grapes solely for the export market. The entry of cooperatives into grape exports and the cultivation of grapes solely for the export market are the factors largely responsible for the success of grape exports from India.

### *Onion*

Onion exports from India are channeled through NAFED, a national level cooperative organization. NAFED has been able to establish markets for Indian onions abroad as it takes sufficient care to ensure export of good quality produce. The storage and grading facilities created by NAFED have helped to promote and ensure quality. Realizing the need for quick handling of export orders, NAFED has established large scale facilities for grading and packaging in order to quickly handle the consignments. Since NAFED is both a channeling agency and an exporter, it has an information advantage.

### *Apple*

India has not made much headway in the export of apples as its apple industry is not export-competitive and the efforts were largely concentrated in expanding the domestic market. Moreover, India lacks suitable varieties of apple for export markets and the proper quality control measures as well. India has not been able to do well in the export of apple despite achieving a large production of apples in the country. The main reason for this poor performance in export marketing is the existence of a large domestic market for apples. Aside from HPMC, there is no other organized cooperative marketing organization involved in the export of apples. This is particularly necessary as most of the orchard owners are small and are not in a position to export individually. Coupled with this, the absence of suitable varieties of apples for exports and the lack of proper quality control measures have hampered the growth exports from India.

*Processed fruits and vegetables*

Despite being the second largest producer of fruits and vegetables in the world, India has not, in general, done well in the export as well as in domestic marketing of processed fruits and vegetables. One important reason for this is that commercial processing of these commodities is highly limited and costly. This leads to considerable wastage of these commodities. The absence of exportable varieties of many of the potential products is another reason. The country has concentrated more on the exports of traditional processed products like pickles and chutneys and much less on the exports of pulps and juices which are currently in great demand in the international market. Most of the processing units are concentrated in the home, cottage and small scale sectors. Very few processing units fall under the category of large scale units. The location of processing units at long distances from the producing centres is an important factor contributing to the high cost of the finished products. Even in terms of export markets, the country has concentrated on a few neighboring countries and the Middle East at the expense of European and other western markets which can yield better unit values. Perhaps the main reasons for this failure are the lack of promotional efforts for our products in the world markets and the high cost of processed products in the domestic market.

## Policy implications

- Export quotas and the system of minimum export prices should be abolished. Exports and imports of rice and coarse cereals should be dechannelled. The Essential Commodities Act should be amended to allow the trader/exporter to hold larger quantities of grains. The rice milling industry should be delicensed and removed from the reserved list of small scale industries. Bulk storage and handling facilities should be developed/improved at procurement centres, rail heads and ports by encouraging private investment.
- Given the negative income elasticity of demand for coarse cereals for direct human consumption, the higher demand for them will have to come from the industrial and livestock sectors. Maize has greater potential as an export commodity and poultry feed among the coarse cereals. Investment in irrigation development and research and extension efforts should be increased to augment the maize yield in dryland areas.
- The high domestic soy prices, coupled with inadequate research and product promotion efforts are the factors underlying poor acceptance of soybean products as food and animal feed in the country. Therefore, the future strategy for soybean development should aim at strengthening the linkages between production, processing and exports.
- There is an urgent need for planned development of horticulture in the country. Land use and credit policies should be oriented to encourage the growth of fruit and vegetable commodities by inducing large scale cultivation and processing operations as well.
- Since there is currently limited scope for increasing the area under cultivation, it is essential to promote improved cultural and management practices to increase productivity levels.
- Many existing orchards are in a state of neglect and need to be rejuvenated through scientific methods and management.
- To augment the supply of vegetables, there is a need to promote the cultivation of off-season vegetables. Suitable areas need to be identified and both research and extension efforts should be intensified for this purpose.

- Adequate marketing support should be provided. Cheap and efficient transportation and storage facilities, including cold storage chains, must be made available. Increased availability of institutional credit will support both domestic and export marketing.
- Co-operatives should strive hard to enhance the bargaining power of producers and they can be a viable and potential alternative to private trade in both the domestic and export sectors. Co-operatives must encourage producers to become members through flexible policies which should allow procuring of produce without prior indent. Cooperatives need to locate more purchasing centres at the main wholesale markets and give wide publicity to their programmes.
- Direct contact between producers and processing factories should be encouraged. Such direct contacts between producers and processors can ensure better prices for producers.
- The cost of transportation of raw materials (fruits and vegetables) to the processing units has been found to be high. There are also considerable losses during transit. Location of processing centres in the producing areas will help to reduce transportation costs and transit losses, consequently making the processed products cheaper and more competitive in domestic and export markets.
- For exports, especially of perishable fresh fruits and vegetables, special facilities for handling and despatch of the produce at air and sea ports need to be created. Quick handling of the products will help them reach their destinations in good quality. Both public and private sectors should be involved, but the government has to generate a suitable environment through its policy support.
- The product characteristics demanded for the export markets are quite different from those demanded for the domestic markets. Also the export markets demand high quality products. Hence there is a need to undertake research and development not only to increase productivity levels but also to develop varieties with product characteristics which are suitable for export marketing and processing.
- Packaging is one area which requires considerable attention. Proper packaging will reduce transit losses and help to maintain the quality of the product that reaches the consumer. This will also help to cut down costs.
- Buying habits in the markets of the developed countries are different from those in India. Branded products are preferred as brand names are associated with particular quality characteristics. Thus, proper branding of products, including fresh fruits and vegetables, especially for the export markets, needs to be encouraged.
- Post harvest losses in fruits and vegetables are very high because of the perishable nature and short shelf life of these products. However, with the help of certain pre and post-harvest operations, which can be easily undertaken at the farm, the magnitude of these losses can be minimized.
- Grading and sorting should be done at the production site. Quite often, proper packing and sorting of the produce is not done at the production site, which necessitates regarding and repacking during transit or at the terminal market. This results in repeated handling and in the process it causes damage to the commodity. These operations ultimately imply higher prices for the consumer and delay both in transit and despatch.
- India has a narrow product mix for the export market as the bulk of Indian exports consist of mango, onions and mango pulp. Concerted efforts must be made to promote export of other commodities and products and to expand the export product mix. Exporting a large number of diversified products rather than relying on a few

commodities will enhance export potential and hold on to the world market throughout the year.

- Geographically, India's export markets are rather limited. Major importers of Indian fresh fruits and vegetables are the Middle East countries, with only small quantities of these commodities being imported by the UK, Bangladesh and the former USSR. Similarly, the market for processed fruits is largely confined to the former USSR and to some extent to Gulf countries. Barring a few exceptions, most of the European and ASEAN markets do not figure in the list of importing markets of India's horticultural products. A larger number of export markets could provide sustained growth for India's exports besides yielding higher unit values. Hence efforts must be made to tap a large number of international markets in the bid to expand and diversify India's export markets.
- Export promotion is weak and should be undertaken by the private sector. In a competitive marketing environment, sales promotion efforts constitute an essential requirement for expanding India's markets and market shares.
- Adequate availability of quality planting material is essential for increasing production. The new seed policy of the government has allowed easy import of seeds, especially of vegetables and flowers, by including them in the OGL and doing away with the tedious post-entry quarantine procedures. While many incentives have been provided to develop the domestic seed industry, efforts are required to encourage speedy multiplication and distribution of good quality seeds and planting materials.

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# Comments on the Indian Country Report

*Mruthyunjaya*[*]

The report is an excellent attempt to try to rediscover the market prospects for a group of crops which have not received the needed attention in the past. The study makes use of all the available information to explore the domestic demand and market potential of upland crops (soybean, maize and cassava), besides rice, selected fruits and vegetables (fresh as well as processed) and cut flowers.

Since the study is about upland crops, the inclusion of other crops (as stated above) needs to be explained. It may be necessary to highlight how the market prospects of upland crops are influenced by developments in the other crops. For example, developments in other crops, including market and infrastructure development, may further improve their profitability thus becoming a potential threat to production of upland crops. If upland crops have to compete with the other crops, the whole outlook and priority given to upland crops need to be significantly changed. Further, it should to be remembered that the upland crops have to contribute to balanced regional development and household food and nutrition security.

The technological scenario favouring better market prospects of upland crops needs to be critically assessed and stated in the report, because market prospects become enduring if they are based on strong technological possibilities. Besides technological assessment, the study of strengths and weakness of the agrarian system where market prospects are to be realized becomes important.

The case study approach followed in the report to gain insight into success and failures of attempts towards organization and trade of some commodities is commendable. The Indian experience particularly in the fruit and vegetable industry is worth noting. The initial attempts, particularly by the private sector, raised some hopes in this regard. However, of late, it is being realized that not enough homework was done before venturing into huge investments. Non-tariff barriers, quality considerations, undependable supply, uncertainty of government policies, etc., are emerging as threats to the future prospects of this industry.

Soybean is a crop to watch in India. However, its prospects depend upon capturing not only Asean markets but also markets of European countries (supermarkets) and USA where unit values realized are much higher. This is true for other upland crops also.

In light of interesting results provided in the keynote paper by Prof. Kagatsume, it may be necessary to determine whether India will be more dependent on movement of the food market and less influential to the global trade situation. This is particularly so in the case of upland crops which have a direct bearing on food security, balanced regional development, etc.

In the executive summary of the report, it is stated that upland crops and their products are likely to become important in increasing farm incomes and attaining balanced regional development. However, the study has not addressed this objective in any significant way.

[*] Indian Council of Agricultural Research, Krishi Bavan, New Delhi, India.

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# Comments on the Indian Country Report

*Dayanatha Jha*[*]

This is a very comprehensive and scholarly work and I compliment Dr. Kumar and his colleagues for an excellent job. My comments cover issues which are also relevant for the synthesis paper.

First, I would like to make the point that the large countries, China and India, belong to a different category just on account of the size of their markets and food security needs. Entry into export/import markets by these countries leads to big stocks in the world market. Similarly, the absolute magnitude of their investment needs is also phenomenal. In the international financial market, these countries carry a heavier weight.

Second, I would like to highlight some issues which fall outside the mandate of this study, but are very important when we try to understand the study from a comparative perspective. To begin with, market prospects or performance are determined by the structure of production. Coarse grains, for example, are small farm enterprises; fruits are grown by larger farms. Subsistence needs and market orientation vary depending on this factor. So, there is the issue of organizing small producers to take advantage of market prospects in traditional as well as new enterprises. In addition, the equity aspects of market access, participation and benefits need to be related. In this context, as we talk about non-food crops, it is important to keep food security in focus. I think these concerns must be kept in focus in the synthesis paper.

Third, in relation to of the paper under consideration, I have four observations:

- There is no analysis of price structure. Thus, there is no empirical basis to comment on market efficiency. However, the paper contends that markets for fruits and vegetables are well developed. At several places in the report itself, evidence is provided that marketing constraints are severe for these products.
- A host of investments have been indicated to promote upland crop products. It would be useful to distinguish between investments which are appropriate for public and private sectors. In this respect, the issue of international transfer of rootcrop harvest/processing technology and its relevance to the national context, needs to be addressed.
- In exports, apart from the constraints identified in the report, one also needs to examine non-tariff barriers.
- In agricultural research, quality factors will become more important. This would be necessary not only to support exports but also for processing.

[*] National Centre for Agricultural Economic and Policy Research, New Delhi, India.

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# Market Prospects for Upland Crops in Thailand

*Kajonwan Itharattana*[*]

## Objectives of the study

This study on market prospects for upland crops in Thailand has four objectives:

- to analyze dietary patterns and determine how changes in consumption patterns are related to income and urbanization;
- to analyze changes in the domestic demand and external trade performance of maize, soybean, cassava and rice;
- to make demand projections for maize, soybean, cassava and rice; and
- to review and analyze domestic market/processing systems, policies, export promotion efforts and make practical suggestions for improving market prospects and exports of selected commodities.

## Market demand prospects

The major conclusions concerning those parts of the study on dietary pattern and market demand prospects are summarized below:

- The study on the Thai dietary pattern shows that the Thai people have changed their consumption behavior. They are switching from rice and cereals and fish to meat products, vegetables and fruit.
- The consumption of meat products is expected to increase further in the future due to the increase in population and income. Urban people, who have higher incomes than rural people, will have a higher consumption rate.
- The study on the dietary pattern illustrates that upland crop products retain good domestic market demand prospects, because they are transformed into animal feed to become meat products.
- Maize and soybeans in particular have good domestic demand market prospects due to expansion of the animal industry. Both commodities are expected to be imported in response to domestic demand.
- Vegetables and fruit also have good market demand prospects because the Thai people have increased their consumption remarkably. Urban people consume more fruit than the rural poor. Thus, domestic market demand for these commodities is expected to rise.
- Rice continues to have a stable demand outlook for the domestic market. The superior grade of rice is expected to have a better foreign market outlook than the inferior grade.

[*] Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, Bangkok, Thailand.

- For cassava, the study found a good prospect in terms of starch. However, it is difficult for Thailand to expand its already very large foreign market share for the commodity. Attempts to bolster starch production for domestic utilization have a reasonable prospect but, unless starch derivatives are exported, such attempts cannot really reduce the export dependency of casssava.
- Vegetable oil consumption also grew quite quickly although less than fat consumption. Urban people usually consume twice as much vegetable oil as the rural group.

## Emerging non-traditional commodities

The objective of this part of the study is to explore non-traditional commodities which will have potential for production and marketing both domestically and internationally. This section presents briefly the results of a study on four commodities, namely longan, durian, mangosteen and babycorn, which are expect to have good market potential.

*Longan*

Longan is a popular fruit locally consumed both in fresh and processed form. The fruit has domestic production potential because of the suitable topography and climate coupled with farmers' long experience in cultivating longan. Thailand has exported longan to Asian markets for a long time. Presently, exports are gaining ground in European markets. Thus, longan is considered to have great marketing potential.

The existing data indicate that 62% of fresh longan production was consumed domestically and the rest (38%) exported in 1990. The major export items of longan products are classified as fresh, canned, dried and chilled longan. In 1994, the total export of longan products in fresh longan equivalent was approximately 86,722 tons worth 1,326 million baht. Additionally, there were exports without official record. The export of longan products in fresh equivalent grew significantly during the period of 1990 to 1994.

The major foreign markets are neighboring countries, namely Hong Kong, Singapore, Malaysia and Indonesia which account for 80% of total export. However, Europe especially England and France is a new potential market. Canada also poses a new market prospect because its import is increasing.

The major markets for canned longan are Singapore, Malaysia and the US. During the period of 1990 to 1994, the export of canned longan expanded at a rate of 7.42% which is much less than the expansion of export of fresh longan.

The major markets for dried longan are the existing markets of Hong Kong, South Korea, Singapore and new markets, such as the Republic of China. Export expanded at a rate of 31.63% over 1990-1994.

The major markets for chilled longan are the US and Japan, which do not allow import of fresh fruits. Exports have a decreasing trend of 11.63%, but the data show significant year to year variation.

Based on analysis of the data of past export performance coupled with interview of producers in Chiangmai and Lampoom provinces, processing factories and major exporters of canned fruit (Malee Sampran factory, General Food Company, Limited), and a seminar, the trade expansion of longan and its products has good prospects in both Asian and European countries. However, market expansion should be supported by the government and the private

sector could follow to support further expansion. On the production side, when farmers have good varieties, technologies of production and harvesting can be developed.

### *Durian*

As fruits gain both the public and private sectors' interest in development of commercialized production and marketing, durian emerges as a promising fresh and processed fruit.

Durian planted area, production and yield for 1988-1994 show a rising trend at rates of 5.7%, 11% and 6.4%, respectively. More than 90% of the durian production is locally consumed in both fresh as well as, in some cases, sweetened state. The rest is designated for export in the form of chilled, fresh durian and sweetened durian paste. The quantity and value of export show rising trends over the last 7 years, 1988-1994.

Processed durian is serving high value markets. While processing helps to remedy the durian price depression that normally occurs right after harvest, some types of processing prolong the life of durian products with little change in quality. The typical processed durian products are durian paste, chilled and crispy fried durian.

The volume and value of the fresh durian export continue to grow with rates of growth of 17% year. The major import markets include Hong Kong, Malaysia and Taiwan.

Chilled durian exports and their value climbed significantly over the 1988-1994 period. Most of the chilled durian was exported to the USA, Canada and Australia. In comparison, export of the sweetened durian paste has been insignificant, but it has increased over the last four years.

Because of the suitable agro-climatic conditions, including the soil structure and texture, and the very long cultivation experience, Thai farmers are capable of producing durian of good quality, popular both locally and overseas. The durian export is currently 5% of the output, primarily to Asian markets where the taste and scent are well liked. In the European and American markets, Asian residents comprise the initial target group. As the durian fragrance is new and strong for both Europeans and Americans, it will take some time for them to get used to it. However, interviews with such prominent durian exporters as Thai Hong Fruits Co., and Fah Charoenporn Inter. Co., indicate that the future durian export trend will depend on price and quality. A reasonable export price range of 20-25 baht per kg is thought by the major exporter to induce a good export outlook. Furthermore, the foreign market expects a durian fruit of quality, well ripened with meat of a specific consistency. Only when these requirements are met, will a bright export market be found.

### *Mangosteen*

Mangosteen is an exotic tropical fruit grown in the southern and eastern regions of Thailand where the weather is humid and hot. In the past five years (1989-1993), the planted area and production of mangosteen increased about 12.13% and 5.4% per year, respectively but yield remained stable. In 1994, production is expected to reach about 108,000 tons.

The major area of production of the mangosteen is Chantaburi province in the east, with 27% of the total planted area and 33% of the total production. Other producing provinces are Trad, Rayong, Chumporn, Nakhon Sri Thammarat, Narathiwat, Ranong, Surat Thani, Phangnga, and Trung.

Most of the production of mangosteen is consumed domestically. The domestic demand for mangosteen is 97% of the production and the rest is exported. Thailand exports the mangosteen in both fresh and chilled forms. The fresh mangosteen export is 64% of the total

and the rest (36%) is chilled mangosteen. The quantity of mangosteen export is minimal, compared with the production. However, the export has been increasing since 1989. The quantity and value of the exports increased 4.5 and 5.1% per year, respectively .

Normally Thailand exports mangosteen to Taiwan, Hong Kong, Japan and America. More specifically most of the fresh mangosteen is currently exported to Taiwan (1994), while 98% of the chilled mangosteen is exported to Japan (1995).

Mangosteen is attractively scented and sweet tasting and the physical feature of the fruit makes it suitable for transport overseas. These facts imply that mangosteen has market potential. The figures show that the quantities and value of mangosteen exports have been increasing since 1989.

The government promotes mangosteen production because the fruit has export potential. The strategies related to mangosteen production and marketing are to allocate government budget to concerned agencies for their programs of research on varieties of mangosteen, for postharvest technologies and for a program of promoting farmers to produce mangosteen for export.

Promotional campaigns in importing countries about the delicacy of mangosteen are also suggested. However, cooperation between the private sector and government agencies is necessary.

### *Baby corn*

Baby corn is a commodity which provides about 500 million baht income annually to farmers. In addition, it is also the source of foreign exchange of 1,000 million baht. According to export data for 1988-1994, the volume and value of the export of baby corn, especially canned baby corn, have increasing trends at rates of 9.06 and 10.64%, respectively. Fresh baby corn is popular in both domestic and foreign markets. During 1988-1994, the planted area of baby corn expanded remarkably, increasing from 9,340 hectares in 1988 to 16,860 hectares in 1994. Farmers, in addition to selling fresh baby corn at high prices, also add to their income by selling the husk, silk, panicle and stem of the plant after harvesting as by-products to dairy cattle farmers.

The planted area and production of baby corn in the past seven years (1988-1994) have expanded significantly while yield has not. Marketing channels of baby corn can be classified into: (i) canning factories, (ii) the domestic market for fresh baby corn, and (iii) the export market for fresh and chilled baby corn. Canning factories are the main market of baby corn accounting for 70-80% of the total production. Some factories purchase the product directly from farmers or purchase from collecting traders who gather baby corn with husk from farmers and hire labourers to dehusk it before selling to factories.

The quantities and prices of fresh baby corn purchased and consumed domestically are uncertain. The quality of the product is inferior to that of the product sold to factories. The collecting traders sell about 10-20% of the total production in the domestic market. The export market for fresh and chilled baby corn is for high quality baby corn. However, the quantities entering into this market are less than 5% of the total production.

The baby corn canning industry has expanded remarkably. Most of the factories originally canned vegetables or fruits and later included production of canned baby corn.

Canned baby corn exports have increased from 33,323 tons worth 710.9 million baht in 1989 to 46,187 tons worth 963.7 million baht in 1994. The major export markets for canned Thai baby corn are the US, Japan, and West Germany. Aside from canned baby corn export, there is also export of fresh and chilled baby corn. The major markets ranked by their export

value in 1994 include England, Japan and Malaysia with a total export of 2,522 tons worth 36.7 million baht.

## Sucessful and unsuccessful attempts to stimulate production and marketing

These case studies investigate the demand prospects, both domestic and export. They analyze past performance and lessons learned from successful and unsuccessful attempts to stimulate production and marketing of upland crops or products. Broilers, tomato and onion were selected as successful attempts and mango, cashew nut and cotton were selected as failed attempts.

### *Broilers*

The broiler industry of Thailand is a very advanced and integrated enterprise that continues to regularly supply meat which is steadily gaining the favor of domestic consumers. In the past, broilers were more expensive locally than beef and pork, but currently they have become more competitive. The Thai broiler industry has emerged as a major export income earner, gaining annually. Moreover, the industry continues to have a bright outlook for market development and expansion. The advancement has generated several linkage industries such as the feed industry, breeder stock farming and hatching, veterinary drug and vitamin manufacture and administration, and slaughtering and processing of meat and by-products.

The greatly expanding commercialization of the industry is mainly due to the development effort for broiler products which suit the market requirement. However, an important part of the success of the industry is certainly due to the public-private sector coordination which is involved in broiler production and processing. Industry operations, however, have occasionally encountered problems and obstacles requiring solution.

The success in marketing broilers is judged to be quite high. The success story is based on, among the other factors, the helping hand of the government which sets forth agri-business policies on the one hand and implements its functions on the other hand. The government co-ordinates with the private producers as follows:

- Private companies have good management controlling the supply of broilers. The government, on the other hand, supports disease control.
- The Ministry of Commerce keeps a constant watch and, when necessary, launches price stabilization programs on some feedstuffs, fixing maximum-minimum prices to suit the circumstances. In other events, it permits liberal import of maize and fishmeal in order to keep down the production cost. Only when the price levels for locally produced maize and fishmeal go below the minimum prices is a special levy imposed. The arrangement of international trade funds is also aimed to enhance the export capacity of local exporters.
- The Bank of Thailand offers financial assistance to livestock operators by discounting their reliable promissory notes 50% of the face value through banks, the Industrial Finance Corporation of Thailand and the Bank for Agriculture and Agricultural Cooperatives, with as low as 5% interest charges. Those iinstitutions lend out the remaining 50% of the face value at a maximum of 10% interest.
- Export promotional measures have been put into effect.

### *Tomato*

Tomato is an important economic crop of Thailand. It is consumed in the form of fresh tomato which can be cooked in many foods. Moreover, it is used as a raw material in processing industries, for example, to produce canned fish and tomato juice.

Tomato can be grown as a second crop after rice in the northern and northeastern regions where farm income per capita has been low compared with other regions. The planted area increased modestly by 1.25% per annum and the production grew faster at 10.43% per annum.

The domestic market can be divided into two markets, namely the market for fresh tomato and the market for industrial tomato. The demand for industrial tomatoes is in winter because there is a good supply of tomato and the prices are often low. In general, entrepreneurs collect tomatoes from local merchants for manufacturing. The marketing contract between farmers and factories is a forward market type where the factories determine a forwarding quantity and price of the tomato. However, large factories usually have their own tomato farms in addition to the contract farms.

Past development of the regional marketing contract has indicated a major problem of raw material supply arrangement and cooperation between farmers and processors. Moreover, those interested groups of the Bank for Agriculture and Agricultural Cooperatives (BAAC), government agencies, processors and farmers alike involved in the agro-business have experienced difficulties and, in many cases, business failures. Although technological advancements are utilized, at times there are problems of farm surplus, inadequate supply, irregular supply and substandard quality or a product not meeting the requirement.

To solve these problems, a contract marketing project has been attempted not only for production and marketing management but also for enhancement of farm income. The Kaset Esan Company established a project on contract marketing to ensure adequate and regular tomato supplies for processing. The Bank for Agriculture and Agricultural Cooperatives (BAAC) provides credit to the farmers for purchasing inputs under the project

Following introduction of the contract marketing project, close cooperation developed between farmers and entrepreneurs, leading to success in production and marketing management. There are many factors that facilitated the success, as listed below:

- The appropriate technologies of production have been transfered to the participating farmers.
- High yielding varieties of tomato are provided by the company.
- Suitable, fertile planting area of tomato is selected.
- The farmers are able to produce tomato in accordance with the factory demand and they receive a fair price as stated in the marketing contract.
- BAAC provides farm credit efficiently.

### *Onion*

Production of onion in Thailand has not coped with domestic demand from 1989 to 1994. Thus, there was import of onion in the range of 600 to 5,000 tons annually. Farm gate prices for local onion have varied depending on production. Farmers faced a very low price in some years due to the production in different llocations flowing to market at the same time because there are no concerted production plans and the growers do not have bargaining power in pricing. In addition, growers have little knowledge concerning production and storage. Therefore, the Ministry of Agriculture and Cooperatives set forth a policy to manage onion. With the approval of the Policy and Agricultural Development Committee, there are now policy measures to manage production of onion to meet the demand by controlling the import quantity

of onion seeds. This tool is used to determine annual onion production and the Office of Agricultural Economics is currently in charge of this matter.

Production management measures include:

- control import of onion seeds for each producing area;
- control planted area in each location by determining agro-economic zones for onion;
- onion seeds can only be imported by registered farmers' organizations;
- production targets of onion have to be set annually by projecting demand for onion before importing the seeds; and
- establish farmers' cooperatives and a Thai federation of onion growers cooperatives to support the above measures.

Measures for stabilizing farm prices include:

- provide incentives for onion exports at the beginning of the season;
- support farmers to plant onion in the onion agro-economic zones and to form more farmer groups;
- support greater coordination of farmer groups in the producing areas;
- support and promote research on techniques of growing onion off-season; and
- support private businesses, farmer's organizations and individual farmers to store onions collected at the beginning of the harvest season in order to sell them for a better price.

Promotion of onion production and marketing is a successful project of the Ministry of Agriculture and Cooperatives. It assists farmers to sell their products at stabilized prices. In addition, onion is produced to meet the domestic demand and also for export. Production targets are set, and the planning mechanism involves coordination between government agencies and farmer organizations to prevent a surplus supply and low price.

. Factors which contributed to the success of the onion enterprizes are:

- establishment of onion farmers' cooperatives and a federation of onion growers cooperatives that focus on production and marketing plans and consistent management;
- controlled import of onion seeds;
- controlled planted area; and
- production targets of onion set annually by projecting demand for onions before importing seeds.

*Mango*

Mango is an exotic fruit which is popular in both fresh and processed forms in domestic and foreign markets; it is regarded as a substantial export income source. Thailand is climatologically suitable for growing mango. In the Fifth and Sixth Plans (1982-1991), the government set out development and promotion policies for fruit such as mango, which resulted in expansion of the area planted to mango. Presently, its planted area ranks first among the fruit trees, and farmers themselves have developed and adopted new technologies to improve their mango production. However, there are some difficulties for exporting which restrain production.

Thailand has expanded export of mango to Japan. However, before 1987, Thailand could not export mango to Japan because Japan exercised restrictions on the import of mango. The mangoes have to be treated to get rid of oriental fruit fly and melon fly by vapor heat treatment at an inner mango temperature of 46.5°C for 10 minutes. Thus, the Thai government made a request to the Japanese government for a joint research project to get rid of the fruit flies. The Department of Agriculture obtained a budget to build its first vapor heat treatment building at

Bang Khen. The private sector has rented the treatment building to treat its products. Since 1989 up to 1991. Japan has allowed import of three more varieties of Thai mango, namely Nam Dok Mai, Keaw Sawuey and Rad. Since the start of the vapor heat treatment in 1989 up to 1994, Thailand has been able to export only a small volume (208 tons) of mango to Japan.

The volume and value of mango export to Japan have not increased much during the past five years (1989-1994). This indicates that Thailand has not succeed in exporting the fruit to this country. Causes of the export failure are:

- Japan puts serious restriction on mango imports both in quality and size.
- Varieties of mango which are favored by the Japanese are not the same as those favored by Thais. Thus, farmers are not interested in growing the different varieties, because, if the products are not permitted to enter Japan, farmers will not be able to sell them in country either.
- The implementation of vapor heat treatment is costly so that the fruit products from Thailand are more expensive, and thus, not competitive with Mexican and Philippine mangoes.
- Most Thai mangoes get black mold, which is unattractive to the Japanese. This is due to incorrect post harvesting methods.

### *Cashew nut*

The producing areas of cashews are mainly scattered in the southern provinces of Thailand. Thailand has exported cashew nut and earned foreign exchange of about 50 to 100 million baht. During the past decade, the government began to reduce cassava planted area and cashew is one of the crops selected to replace cassava.

The government, namely the Ministry of Agriculture and Cooperatives, in coordination with the private sector and financial institutions, set up a promotion project for substituting cashews for cassava under the Public-Private Coordination Program for Agricultural and Agro-Industrial Development. The target areas are concentrated in the northeastern region. Under the program, the planted area of cashew has expanded remarkably.

During project implementation, there were many problems that kept lowering the output of cashew nut below the expected target. More than half of the participating farmers wanted to quit producing cashews. Most of them made requests for substantial financial assistance to improve their production or to invest in other crops. This illustrates the failure of the project.

The project to promote cashew cultivation did not succeed because the participating farmers ran into farm difficulties. Consequently, production did not reach the expected target. In 1988, the farmers obtained an output of 18% of the target, and their income was only 37% of the target. In 1989, the output and income were 30 and 57% of the targets, respectively. In 1991, however, the output and income decreased to 26.7 and 21.4% of the targets. Therefore, the farmers did not earn adequate income for their subsistence and repayment of their loans. Subsequently, about 60% of the participating farmers quit the project. About 85% of the farmers who want to continue growing cashews need more investment loans.

The situation caused losses in return to resource investment. It wasted time of the farmers because the cashews should be in the productive stage yielding good returns. On the contrary, the farmers had to go out of business.

*Cotton*

Cotton has been a promoted economic crop since 1961 due to a very rapid expansion of the textile industry and the agencies concerned have carried out research on variety improvement, farm practices and technology transfer.

Although the policy for cotton promotion has been in place for a long time, problems of cotton production and marketing still exist, especially pest and disease infestation, quality of the cotton lints, low yield and unstable prices. In addition, cotton farmers often lack investment funds. Production of cotton is insufficient to cope with the textile industry's demand. Consequently, cotton lint valued at more than ten billion baht is imported annually. It is expected that imports will continue to increase.

To solve these problems, the government has attempted to accelerate research and development, to increase production and improve the quality of cotton products to cope with market demand. However, limitations of the government budget have caused discontinuation of the implementation of these prolicies and declining cotton production.

Policies and related measures include:

- In the fourth development plan (1977-1981), the government set up a promotion policy on cotton production to substitute for imports. To achieve the objectives, price support measures and an aerial spray pilot project were set up.
- In the fifth development plan (1982-1986), the government continued the import substitution policy for cotton with the following supporting measures: (i) a production increase and cost reduction program; (ii) a crop insurance project; and (iii) determination of cotton economic zones.
- In the sixth development plan (1987-1991), the government concluded that cotton locally had low potential of production. Thus, it formulated no special support measures although domestic demand was high and the import tended to increase over time.

Although cotton is a crop for which the government set forth policy and measures to promote the production to substitute for imports since 1977, production still did not meet the demand and the import of cotton increased over time. The causes are as follows:

- Implementation of the projects did not have continuity due to limitations of the government budget.
- Cotton is a crop that often faces infestation of pests and disease. It needs regular application of many kinds of pesticides.
- Cotton prices were uncertain and did not provide sufficient incentive to farmers.
- There was a lack of coordination among the agencies concerned. Market prices have long been determined by traders and the farmers have had no bargaining power.

*Conclusions derived from case studies*

The results of case studies on successful attempts, i.e, broilers, tomato and onion show that the major factors contributing to the success of these enterprises are the close cooperation between private and public sectors and advance planning of production and marketing. The private sector includes farmers, entrepreneurs and banking institutions providing financial assistance. The production and marketing plans were formulated in advance with coordination among all interested parties. Understanding their functions in implementation of the businesses helped all players to achieve consistent management in their pursuit of success.

On the contrary, studies of the failed attempts, i.e, mango, cashew nut and cotton show that the major factor contributing to the failure is the lack of farm management skills and

investment funds for the participants of the newly introduced businesses, indicating insufficiency in the transfer of technical know-how to operate their businesses. At times, the operation of the businesses concentracted mainly on production, leaving marketing considerations and arrangements aside. Moreover, it seems that lack of close coordination among the responsible initiating agencies resulted in only partial support of each other and, thus, the eventual business failure.

## Polices and measures to improve market prospects

To improve market prospects, it is necessary for Thailand to undertake a detailed study before formulating production and marketing plans, so that Thailand can take a more progressive approach to commodities for which Thailand has great demand. This study covers only selected commodities while other commodities which have substantial domestic and export market prospects should be investigated for their potential. Then, strategies for upgrading production efficiency of these commodities can be introduced so that they can be competitive even without support measures.

Within the context of competitiveness in the world market, the following developments should be taken into consideration when formulating the policies and measures to enhance market prospects of agricultural products in Thailand:

- Aspects of quality control and standardization of the commodities will have to be a major area of concern. Quality defects of some agricultural export items in the past have been harmful to both the image and marketability of the export products.
- Thailand has to switch from production of traditional cash crops which have production and marketing problems to commodities which have market potential. Instrumental to this will be technological breakthough. However, low productivity coupled with high cost of production consequently causes high prices of products. Thus, adoption of appropriate technology will not only increase productivity but also lower the cost.
- Not only do the commodities have to be produced at cost effective prices, but they have to meet the specific requirements of the markets. Furthermore, the presentation of the product has become, in effect, as important as the quality of the product itself as are brand names which can certify product quality. Efficient production itself is, therefore, no longer sufficient unless accompanied by appropriate and effective marketing campaigns.
- Investment promotion undertaken by the Board of Investment is one important measure to bolster market prospects especially in the agro-industry area. With the provision of tax incentives, an infant industry in the country can be supported during its initial period until it is competitive in the market.

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# Comments on the Thai Country Report

*Boonkerd Budhaka*[*]

Kajonwan Itharattana has reviewed and analyzed the important and complex issue of upland crops in Thailand. The relationship between food consumption pattern, demand composition and prospects for main food crops is considered as fundamental. However, the issue is more complicated when we consider the nature of joint products in some commodities, efficiency of resource use, income, international trade and domestic agricultural policy in an open economic environment. I applaud her efforts and encourage her to pursue this study further. My comments will focus first on her paper and then on what I consider important potential extensions to her work.

Since the objective of the paper is to determine the market prospects of selected upland agricultural crop products in Thailand and to provide information and suggestions on market opportunities and policy direction to increase farm income from UCPs, the empirical model employed of relating the demand for UCPs to income (real income in particular) is seen to be appropriate. In addition, the relationship between consumption pattern and expenditure for food pattern among regions and socio-economic classes is also reviewed. However, I am troubled by the analysis with somewhat poor relationship between the structural change in consumption and the demand composition and projection for UCPs in Chapter 3 (Itharattana 1996). Another limitation of analysis in Chapter 3 is that these two said patterns are not analyzed in the same period.

It should be noted that the analysis assumes implicitly that the same pattern of consumption prevails from mid 1980s through the 1990s. So the pattern of consumption and food expenditure pattern as analyzed in the mid 1980s to 1990s period show the same trends.

The analysis of demand projection and market potential of major UCPs is commendable. However, the demand projection of maize to year 2001 at about 3.9 million tons (Table 3.12) should have some conclusion as to whether or not it meets the demand of the feed industry. Domestic maize production may become less competitive than imports. This issue needs further study.

For soybean, the projected demand to year 2001 as presented in Table 3.18 was done under the assumption of soybean oil sufficiency. In reality, soybean oil is easily substituted by other vegetable oils, e.g., palm oil, but soybean meal is more important in the feed industry and there are fewer substitutes. Therefore, the domestic supply and prices of soybean grains and import prices of grains and meal are considered to be factors for decision making. I recognize the difficulty in capturing the effect of this issue empirically, but the issue should be addressed.

For cassava, Thailand is over supplied. The major proportion of the product is exported (about 85% on average) and a small part is consumed in the domestic market. This analysis indicates that the starch industry has good prospects for Thai cassava. The projected demand will increase from 3 million tons in 1996 to 4 million tons in 2001. However, there will still be a large surplus which will rely on the export market which may be unstable in the future. The

[*] Office of Agricultural Economics, Ministry of Agriculture and Cooperatives, Bangkok, Thailand.

future prospect is not good and, therefore, the study should give more emphasis on alternative uses and international markets.

Rice is considered to be the leading income earner for Thailand. The main part of the product (about 60%) is consumed domestically and the amount exported accounts for about 30% of the total production. The market prospect for rice as analyzed in the paper will not have any drastic change from the recent past. However, further study should give more emphasis on efficacy of policies, efficiency of production and competitiveness of Thai rice in the world market.

Further study should focus on the following issues:

- productive capacity of national agricultural resources, technological, and information systems in UCPs;
- competitiveness of UCPs;
- efficiency of policies in the domestic open market environment;
- resource allocation and production adjustments that may need to be considered in the future world market situation and international accord; and
- a follow-up study of UCPs to keep up with changes and to collaborate among member countries of the CGPRT Centre.

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Itharattana, K. 1996. Market Prospects for Upland Crops in Thailand. Working Paper No. 21. Bogor: CGPRT Centre.

# Comments on the Thai Country Report

*Boonterm Tiravattanaprasert*[*]

It is my great honor to be asked by the CGPRT Centre to share my personal views on the country report of Thailand which was presented by Dr. Kajonwan Itharattana, the country expert.

The objectives of the paper are to determine the market prospects of selected agricultural crops products in Thailand and to provide information and suggestions on market opportunities and policy direction to increase farm income from major upland crop products (UCPs), maize, soybean, cassava and rice, as well as various kinds of fruit and vegetables.

Dr. Kajonwan's paper is divided into two major parts. The first part is the analysis of domestic demand which includes the dietary pattern of Thai people, the demand composition of four commodities i.e. maize, soybean, cassava and rice, the policies impacting on these commodities and projected demand of the four. The second part is an analysis of market potential which consists of a review of market and processing systems, a review of the external trade performance, a study on some non-traditional commodities i.e. longan, durian, mangosteen and baby corn and many case studies on successful and unsuccessful market promotion attempts. To strengthen the study, Dr. Kajonwan has applied some economic theory and mathematical models into each specific commodity.

The results of the study indicate that all the major upland crops products in the study including fruit and vegetables have good market demand prospects due to the increase in population and income and because the consumption behavior of Thai people has changed.

Experience from the case studies shows that the major factors contributing to the successful marketing attempts are the close cooperation between private and public sectors and advance planning for both production and marketing. A study of the failed attempts shows that the major factors are the lack of farm management skills and investment funds, insufficiency in the transfer of technical know-how and the lack of close coordination among the responsible initiating agencies.

In order to increase competitiveness in the world market, Dr. Kajonwan has pointed out some major factors which the country should take into consideration when formulating policies and measures to enhance the market prospects of agricultural products in Thailand. Those important factors are product quality control and standardization, the adoption of appropriate technology with lower cost, and appropriate and effective marketing strategies and plans including investment promotion for agro-based industry.

For further study, I agree with Dr Kajonwan that Thailand should switch form production of traditional crops which have many production and marketing problems to new commodities which have greater marketing potential. A detailed study for each new commodity is necessary.

I would like to conclude that the study of Dr Kajonwan and her colleagues is a very successful and useful research guide for our agricultural development policy makers. Again, I

[*] Department of Agricultural and Resource Economics, Faculty of Economics, Kasetsart University, Bangkok, Thailand.

agree with Dr Haruo Inagaki, the Director of the CGPRT Centre, that the information in this study will be useful not only for Thai researchers and policy planners but also for our friends in the other countries in the region.

# Market Prospects for Upland Crops in Pakistan

*Muhammad Ramzan Akhtar*[*]

## Introduction

Pakistan is blessed with diverse agro-climatic conditions and one of the best irrigation systems in the world. Major crops grown in Pakistan are wheat, cotton, rice, sugarcane, gram, maize, sorghum, millet, rapeseed/mustard and tobacco. Minor crops cover pulses (chickpea, lentil, mungbean, and black gram), potato, onion, chili, garlic, etc. Upland crops (coarse grains, pulses, roots and tuber crops) occupy an important position in Pakistani agriculture. The status in terms of area, production and yield of major crops and their growth rates are portrayed in Table 1. The growth rates for wheat, sugarcane, and pulses were very modest. The growth rate for yield of rice was negative, particularly Basmati rice, which is a large foreign exchange earner for Pakistan. Also performance of pulses was not very encouraging. Cotton productivity has increased steadily from 1989-90 to 1994-95. Despite the fact that fruits and vegetables have remained at low priority in Pakistan, these crops have shown an increasing trend in area and production. However, this increase in production of almost all fruits and vegetables was due to increase in total area under these crops.

**Table 1 Area, production and yield of major crops, average of 1989-90 to 1993-94.**

| Crop | Area | | Production | | Yield | |
|---|---|---|---|---|---|---|
| | Hectare ('000) | Growth Rate (%) | Tons ('000) | Growth Rate (%) | Kg/ha | Growth Rate (%) |
| Wheat | 7,993 | 0.4 | 15,187 | 1.2 | 1,899 | 0.8 |
| Rice (all types) | 2,095 | 0.3 | 3,367 | 0.1 | 1,604 | -0.2 |
| Rice (Basmati) | 1,086 | 1.2 | 1,184 | 0.8 | 1,090 | -0.4 |
| Rice (IRRI types) | 863 | -0.1 | 1,984 | 0.1 | 2,285 | 0.2 |
| Maize | 860 | 0.5 | 1,193 | 0.7 | 1,386 | 0.3 |
| Sugarcane | 896 | 0.1 | 38,566 | 0.7 | 42,900 | 0.6 |
| Cotton | 2,747 | 1.0 | 1,636 | 3.4 | 595 | 2.4 |
| All pulses | 1,477 | 0.5 | 673 | 0.3 | - | - |
| Rapeseed/mustard | 290 | -1.2 | 217 | -0.5 | 748 | 0.7 |
| Potato | 77 | -0.03 | 886 | 6.6 | 11,560 | 6.0 |
| All vegetables | 217 | 2.2 | 2,910 | 1.4 | - | - |
| All fruits | 476 | 1.4 | 4,157 | 1.6 | - | - |

Source: Government of Pakistan 1995.

The present study examines the past trends in demand of UCPs and predicts the demand for these products like processed food and feed, and industrial uses in the near future. The study will also review the policy impacts, marketing potential and constraints, and external trade performance of UCPs. Case studies for specific new products through personal interviews from traders, exporters, policy makers, bankers, processors, etc., will help in examining major marketing constraints and policies to promote export of these products.

[*] Social Sciences Institute, National Agricultural Research Centre, Islamabad, Pakistan.

## Agricultural policy measures in Pakistan

A summary of policy measures related to rice, maize, potato and soybean is presented in Table 2.

**Table 2 Major policy measures implemented on maize, rice, soybean and potato, 1994-95.**

| Policy Measures | Commodity | | | |
|---|---|---|---|---|
| | Maize | Rice | Soybean | Potato |
| Farm Level | | | | |
| 1. Input subsidies | | | | |
| Fertilizer | - | - | - | - |
| Seed | + | + | + | + |
| Cheap credit for inputs | + | + | + | + |
| 2. Investment grants | | | | |
| Machinery | - | - | - | - |
| Irrigation system | + | + | + | + |
| Land development | + | + | + | + |
| 3. Production or acreage controls | - | - | - | - |
| 4. Compulsory food requisition | - | - | - | - |
| 5. Production subsidy: a fixed or proportionate subsidy per unit of output | - | - | - | - |
| 6. Deficiency payment | - | - | - | - |
| 7. Guaranteed price | - | + | + | + |
| Marketing and Processing Level | | | | |
| 1. Parastatal trading or Marketing boards | - | + | - | - |
| 2. Intervention buying or price support programme | - | + | + | + |
| 3. Food subsidies to consumers | - | - | - | - |
| 4. Excise taxes | - | - | - | - |
| 5. Grants to industry | | | | |
| Investment grants | - | - | - | - |
| Special tax concession | - | - | - | - |
| 6. Public investment: research training and extension | + | + | + | + |
| International Trade | | | | |
| 1. Import tariff or surcharge | + | + | + | + |
| 2. Import/export quota | + | + | + | + |
| 3. Export subsidies or tax | - | - | - | - |
| 4. Non-tariff barriers | + | + | + | + |

Source: Ministry of Food, Agriculture and Livestock and Ministry of Commerce.

## Dietary patterns

### *Consumption and expenditure patterns*

Table 3 shows estimates of annual consumption of food groups in Pakistan for rural and urban areas in 1979, 1985, 1986, 1987, 1991 and 1993. Per capita cereal consumption decreased considerably from 149 kg/year in 1979 to 140 kg/year during 1993. The low consumption of cereals was compensated by higher intake of milk, edible oils, fruits, and vegetables. However there was no change in the consumption levels of pulses and meat during the same period. Around three-quarters of the diet was made up of cereals and milk products. Consumption of fruits and vegetables increased considerably from 1979 to 1993. This significant increase in intake of fruits and vegetables, and edible oils can be associated with rising per capita income in

Pakistan: with the recent developments in communication technologies, and availability of new food products, consumption patterns of rural masses are getting closer to those of urban areas over time.

Annual per capita consumption of cereals is quite high in rural areas compared to urban areas. In 1993, the 22% cereal intake in rural areas was high compared to urban areas. On the other hand, milk consumption in rural areas was about 25% higher than in urban areas during the same period. Edible oils, meat, fish and chicken consumption, and fruit intake is significantly higher in urban areas.

Table 4 shows the distribution of monthly expenditure per household on major food items by income group during 1993. At the national level, expenditure on food items decreased with increase in income level. Among the food items, the share of cereals and milk and milk products is almost the same in the first income groups in rural and urban areas, whereas, in the case of all other income groups, the share of milk and milk products ranked first among food items. The urban population also spent a higher proportion of expenditure on meat and poultry. Thus, urban areas used a more diversified food basket compared to rural areas. In both urban and rural areas, and on the national level, significant variation existed in the share of expenditure on various food items among the income groups.

## Demand composition, market potential, trade and demand projection

*Soybean*

Many oil crops are cultivated in Pakistan and most of these crops are grown on small areas. Rapeseed/mustard, sesame, linseed and castor are traditional oil crops, and sunflower, soybean and safflower are called non-traditional oil crops in Pakistan. In Pakistan, commercial cultivation of soybean started during the early 1970s and since then planting of soybean has not made a significant contribution to the total production of all non-traditional oilseed crops. It was planted on a very small area and a declining trend was observed during the last two decades.

Soybean is planted only for research purposes, seed, and industry use (feed and edible oil) and is not used directly for human consumption. Domestic production of soybean is not sufficient and every year Pakistan loses a considerable amount of foreign exchange to import soybean oil and soybean meal. Pakistan imported 100 thousand tons of soybean meal during 1993-94.

The projected soybean area, seed, and quantity demanded by the industry for feed and edible oil are shown in Table 5. Area under soybean will increase from 4.56 thousand hectares in 1996-97 to 4.68 thousand hectares in 1999-2000 (increase of 0.87% per annum). The domestic soybean grain quantity demanded by the industry will increase by 5.82% per annum from 1996-97 to 1999-2000.

In 1999-2000 it is expected that industry will be able to provide 5.67 thousands tons of soybean meal for poultry feed (around 77% of the total quantity of soybean) and 1.33 thousand tons of edible oil (18 % of the total quantity of soybean).

**Table 3 Per capita consumption (kg per year) of major food items in Pakistan, 1979 to 1993.**

| Food Item | 1979 | 1985 | 1986 | 1987 | 1991 | 1993 |
|---|---|---|---|---|---|---|
| Rural Pakistan | | | | | | |
| Wheat | 147.49 | 139.08 | 142.56 | 138.72 | 128.88 | 133.32 |
| Rice | 16.44 | 16.08 | 15.00 | 15.48 | 15.96 | 16.68 |
| Pulses | 7.80 | 6.84 | 6.00 | 6.36 | 7.2 | 7.68 |
| Milk (fresh/boiled) | 64.32 | 76.44 | 93.12 | 79.68 | 84.84 | 93.96 |
| Edible oils | 4.92 | 6.48 | 6.36 | 6.96 | 8.04 | 9.84 |
| Mutton | 1.08 | 1.08 | 0.84 | 0.96 | 1.08 | 1.08 |
| Beef | 3.96 | 4.20 | 4.32 | 4.68 | 4.44 | 4.56 |
| Chicken | 0.48 | 0.72 | 0.72 | 0.84 | 0.84 | 0.84 |
| Fish | 0.60 | 0.60 | 0.60 | 0.60 | 0.72 | 0.60 |
| Fruits | 5.88 | 8.40 | 10.44 | 11.44 | 15.00 | 13.68 |
| Vegetables | 29.88 | 34.44 | 38.52 | 37.08 | 47.28 | 64.20 |
| Sweeteners | 14.76 | 14.16 | 15.36 | 14.76 | 15.96 | 23.28 |
| Tea | 0.84 | 0.60 | 0.72 | 0.72 | 0.60 | 0.84 |
| Urban Pakistan | | | | | | |
| Wheat | 114.60 | 104.64 | 105.36 | 104.76 | 105.24 | 102.84 |
| Rice | 12.48 | 12.60 | 13.44 | 12.48 | 13.92 | 14.28 |
| Pulses | 7.68 | 6.72 | 6.36 | 6.48 | 6.84 | 9.00 |
| Milk (fresh/boiled) | 50.76 | 62.40 | 63.84 | 65.88 | 65.04 | 70.08 |
| Edible oils | 9.12 | 9.24 | 9.24 | 9.24 | 8.88 | 13.08 |
| Mutton | 3.24 | 3.00 | 2.76 | 2.52 | 1.92 | 2.40 |
| Beef | 6.36 | 7.08 | 8.64 | 6.6 | 6.48 | 5.76 |
| Chicken | 0.60 | 0.60 | 0.84 | 0.84 | 1.32 | 1.32 |
| Fish | 0.96 | 0.96 | 0.96 | 0.84 | 1.08 | 0.96 |
| Fruits | 11.04 | 14.52 | 15.00 | 17.28 | 18.60 | 20.40 |
| Vegetables | 34.32 | 42.48 | 45.00 | 43.92 | 47.88 | 68.40 |
| Sweeteners | 14.04 | 11.76 | 13.08 | 12.60 | 12.48 | 13.32 |
| Tea | 1.08 | 0.72 | 0.72 | 0.84 | 0.72 | 0.84 |
| All Pakistan | | | | | | |
| Wheat | 134.40 | 128.88 | 131.52 | 128.04 | 121.2 | 124.56 |
| Rice | 14.88 | 15.00 | 15.36 | 14.52 | 15.36 | 16.08 |
| Pulses | 8.04 | 6.84 | 6.24 | 6.36 | 7.20 | 8.08 |
| Milk (fresh/boiled) | 59.04 | 72.24 | 75.96 | 75.36 | 78.48 | 87.28 |
| Edible oils | 4.32 | 7.32 | 7.32 | 7.80 | 8.40 | 10.8 |
| Mutton | 1.92 | 1.68 | 1.44 | 1.44 | 1.32 | 1.44 |
| Beef | 4.92 | 5.04 | 5.04 | 5.28 | 5.04 | 4.92 |
| Chicken | 0.60 | 0.60 | 0.72 | 0.84 | 0.96 | 0.96 |
| Fish | 0.72 | 0.72 | 0.72 | 0.72 | 0.84 | 0.72 |
| Fruits | 7.80 | 10.08 | 12.48 | 13.32 | 16.2 | 15.72 |
| Vegetables | 31.80 | 36.60 | 40.44 | 39.24 | 47.4 | 65.40 |
| Sweeteners | 14.52 | 13.56 | 14.86 | 14.04 | 14.88 | 17.76 |
| Tea | 0.96 | 0.72 | 0.72 | 0.72 | 0.60 | 0.72 |

**Table 4 Percent distribution of monthly expenditure per household on major food items by income group, 1993.**

| Food Item | Income Group | | | | |
|---|---|---|---|---|---|
| | I | II | III | IV | All |
| Rural Pakistan | | | | | |
| Cereals | 24.15 | 21.82 | 19.77 | 17.48 | 21.80 |
| Baked & fried products | 0.56 | 0.72 | 0.96 | 1.25 | 0.75 |
| Pulses | 3.63 | 3.24 | 3.05 | 3.33 | 3.36 |
| Milk & products | 24.70 | 27.12 | 30.98 | 30.58 | 27.44 |
| Edible oils | 7.85 | 7.05 | 5.98 | 4.90 | 6.96 |
| Meat & fish | 5.01 | 6.28 | 6.91 | 8.39 | 6.10 |
| Poultry | 1.59 | 1.59 | 2.03 | 3.08 | 1.81 |
| Fruits | 2.36 | 2.97 | 3.45 | 4.64 | 3.00 |
| Vegetables | 10.88 | 10.42 | 8.94 | 8.01 | 10.15 |
| Sweeteners | 7.11 | 6.71 | 6.36 | 6.35 | 6.74 |
| Condiments & spices | 2.99 | 2.77 | 2.52 | 2.37 | 2.77 |
| Tea | 3.60 | 3.43 | 3.14 | 3.11 | 3.38 |
| Urban Pakistan | | | | | |
| Cereals | 20.67 | 19.80 | 16.83 | 12.45 | 17.01 |
| Baked & fried products | 1.68 | 1.92 | 2.73 | 4.15 | 2.76 |
| Pulses | 3.39 | 3.51 | 3.06 | 2.33 | 3.03 |
| Milk & products | 20.15 | 20.74 | 21.82 | 21.19 | 21.08 |
| Edible oils | 8.17 | 8.42 | 7.73 | 6.35 | 7.60 |
| Meat & fish | 7.02 | 8.72 | 10.41 | 13.07 | 10.24 |
| Poultry | 1.67 | 1.86 | 2.49 | 4.27 | 2.69 |
| Fruits | 3.32 | 3.85 | 4.72 | 6.90 | 4.89 |
| Vegetables | 10.88 | 10.71 | 9.65 | 8.40 | 9.77 |
| Sweeteners | 5.99 | 5.93 | 5.52 | 4.76 | 5.50 |
| Condiments & spices | 3.03 | 3.10 | 2.99 | 2.60 | 2.93 |
| Tea | 3.59 | 3.55 | 3.82 | 3.98 | 3.76 |
| All Pakistan | | | | | |
| Cereals | 23.69 | 21.26 | 18.42 | 14.74 | 20.30 |
| Baked & fried products | 0.72 | 1.05 | 1.76 | 2.83 | 1.38 |
| Pulses | 3.61 | 3.32 | 3.03 | 2.79 | 3.26 |
| Milk & products | 24.02 | 25.37 | 27.02 | 25.48 | 25.45 |
| Edible oils | 7.92 | 7.44 | 6.76 | 5.69 | 7.16 |
| Meat & fish | 5.31 | 6.95 | 8.44 | 10.93 | 7.39 |
| Poultry | 1.61 | 1.67 | 2.24 | 3.73 | 2.08 |
| Fruits | 2.50 | 3.22 | 4.01 | 5.87 | 3.59 |
| Vegetables | 10.90 | 9.51 | 9.27 | 8.22 | 10.03 |
| Sweeteners | 6.96 | 6.49 | 5.99 | 5.48 | 6.35 |
| Condiments & spices | 3.01 | 2.87 | 2.73 | 2.50 | 2.82 |
| Tea | 3.61 | 3.46 | 3.45 | 3.58 | 3.50 |

Source: Household Income & Expenditure Survey, Federal Bureau Statistics, Islamabad.
Note: I: ≤ Rs. 2500; II: Rs. 2501 to 4000;
III: Rs. 4001 to 7000; IV: Rs. 7001 and above.

Demand for imported soybean meal for poultry feed will increase from 9.48 thousand tons in 1996-97 to 11.55 thousand tons during 1999-2000. Demand for imported soybean meal will increase by around 6.8% per annum during the same period. Around two-thirds of the required quantity of the soybean meal for poultry feed will be imported during 1999-2000 and the rest will be provided by the domestic industry.

**Table 5 Projected domestic demand for soybean in Pakistan, 1996-2000.**

| | 1996-97 | 1997-98 | 1998-99 | 1999-2000 |
|---|---|---|---|---|
| Area ('000 ha) | 4.56 | 4.60 | 4.64 | 4.68 |
| Seed ('000 tons) | 0.46 | 0.46 | 0.46 | 0.47 |
| Industrial Uses | | | | |
| Soybean ('000 tons) | 6.22 | 6.61 | 6.99 | 7.37 |
| Soybean meal ('000 tons) | 4.79 | 5.09 | 5.38 | 5.67 |
| Soybean oil ('000 tons) | 1.12 | 1.19 | 1.26 | 1.33 |
| Waste ('000 tons) | 0.31 | 0.33 | 0.35 | 0.37 |
| Imported soybean meal ('000 tons) | 9.48 | 10.17 | 10.86 | 11.55 |
| Total soybean meal ('000 tons) | 14.27 | 15.26 | 16.24 | 17.22 |

One of the most important factors in the low popularity of soybean compared to other oilseed crops in Pakistan is its inefficient marketing system. In Pakistan, soybean is planted as a cash crop and farmers keep the produce only for seed and the rest is sold to wholesalers, commission agents and also directly to private processors. These contract growers plant soybean for seed and also for commercial purposes under technical supervision of the PODB technical staff. The staff of PODB also procure at the support price and assist the farmers in marketing of their produce. The government of Pakistan also announces the support price of soybean every year to encourage farmers to increase area under this crop. All the private traders and public agencies involved in the procurement of soybean generally procure at or above the minimum support prices.

Soybean in Pakistan is mainly utilized for extraction of oil for human consumption and industrial uses. The main by-product of the soybean oilseed extraction process is soymeal which is mainly utilized for poultry feed. Despite the fact that soybean is rich in protein, soya products are not used as human food in Pakistan.

Due to the remarkable progress in the poultry sector in the country, soybean meal requirements have expanded substantially. Import of soybean meal was 4.825 thousand tons worth of Rs 21.157 thousand during 1983-84. The private feed industry imported more than one million tons worth of Rs 956.0 thousand in 1993-94 due to rapid growth in the poultry industry. Most of this soymeal was imported from India to meet the requirements of poultry feed. Before 1989-90, Pakistan mostly imported soymeal from Belgium and USA at much higher prices than those presently prevailing for this commodity from India.

### *Potato*

Potato in Pakistan is not consumed as a staple food as in many other countries in the world, but is primarily used as a vegetable. Presently potato is considered an important cash crop all over the country. Area under potato increased from 3000 hectares in 1947-48 to 79.3 thousand hectares in 1994-95. Similarly the production of potato increased from 27 thousand tons to 1,105 thousand tons during the same period. Potato cultivation in Pakistan is carried out in autumn, spring and summer over a wide range of agro-ecological zones.

In Pakistan, potatoes are consumed in a variety of ways in different parts of the country. Generally, potatoes are used in the form of curry and mixed with meat and other vegetables. Fried potatoes (chips and French fries) are a popular snack with tea in urban areas. Other common local snacks with potato as the main ingredient are *Pakora* and *Samosa*. However there is a very limited demand for dehydrated potato and potato flour in Pakistan. It is estimated

that less than 2% of total production of potato is used by the industry in Pakistan, 10% is waste and around 12% is used as seed.

Domestic demand for potato can be divided into three categories, namely, demand for direct human consumption, demand for seed, and demand by industry. The details of the demand composition of potato from 1996 to 2000 are given in Table 6. The demand of potato for human consumption will increase from 1,386 thousand tons in 1996 to 1,775.25 thousand tons during the year 2000. The projected total domestic demand for potato in Pakistan for the year 2000 will be approximately 2,336 thousand tons. Similarly the projected demand for seed and industry will also increase from 1996 to 2000. .

**Table 6 Demand projection for potato in Pakistan ('000 tons).**

| Year | Food | Seed[1] | Industry[2] | Waste[3] | Total[4] |
|---|---|---|---|---|---|
| 1996 | 1,386.06 | 218.76 | 36.47 | 182.37 | 1,823.66 |
| 1997 | 1,474.69 | 232.85 | 38.81 | 194.04 | 1,940.39 |
| 1998 | 1,569.03 | 247.74 | 41.29 | 206.45 | 2,064.51 |
| 1999 | 1,668.49 | 263.45 | 43.91 | 219.54 | 2,195.39 |
| 2000 | 1,775.25 | 280.30 | 46.72 | 233.59 | 2,335.86 |

Note: 1. Assuming 12% of total domestic demand of potato.
2. Assuming 2% of total domestic demand of potato.
3. Assuming 10% of total domestic demand of potato.
4. (Quantity demanded for food)/1-0.24.

Potato markets in Pakistan generally operate in a competitive environment due to a large number of buyers and sellers. There are many weaknesses in the system such as inadequate information on prices and grading, shortage of good quality storage facilities, post harvest losses, excessive profits made by the middlemen, low prices, high marketing costs and margins, etc. Potato producers in the Punjab usually bring their produce to commission agents (*Arties*) in the wholesale markets (*Mandies*). Growers in the hilly areas, generally sell their produce to traders from outside the region. These traders transport potato in trucks to the major wholesale markets in the Punjab and sell through the local commission agents. In these markets, sale is mainly done by auction. Both retailers and wholesalers take part in the auction. Some of the wholesalers purchase potato to be kept in cold storage and resold at a higher price at a later time. Other wholesalers transport to distant markets in other parts of the country.

Pakistan exports potato mainly to Afghanistan, Dubai, and Iran. Export of potato has remained below 7 thousand tons during the last fifteen years with the exception of 1979-80 and 1989-90 when more than 40 thousand and 20 thousand tons of potato, respectively, were exported to Iran and Middle East. The share of export in the total production of potato in Pakistan during the last two decades was not more than 1% except in 1979-80 and 1989-90. There is no regular pattern of potato export from Pakistan.

### *Maize*

After wheat and rice, maize is the third most important cereal crop in Pakistan. Maize occupied around 4.0% of the total cropped area and 2.0% of the total value of agricultural output during 1993-94 in Pakistan. In 1994-95, Pakistan produced 1.318 million tons of maize. Maize production more than doubled during the last almost thirty years, from 525 thousand tons in 1966-67 to 1.3 million tons in 1994-95. During this time, growth in maize production was mainly due to increase in area rather than yield.

Around 75% of the total available quantity of maize in Pakistan is utilized for human consumption, and the rest is used by industry to produce starch and poultry feed mixes. In another study, it was estimated that 70% of total maize produce is consumed on the farm, 10% is marketed locally (payment to landlords, charity, local sales), and 20% is sold to grain traders in the nearby grain market. The consumption of maize in Pakistan as human food is probably decreasing and its use in poultry and industrial sector is increasing.

Total domestic demand for maize in the year 2000 is projected at 1.4 million tons. The maize demand for human consumption will increase to 841 thousand tons in the year 2000. Industry and feed demand for maize is expected to be 508 thousand tons and around 65 thousand tons will be required for seed, wastage and other uses.

Small maize growers generally sell their surplus maize to local grain traders or to wholesalers (commission agents) in the nearby grain markets. Big farmers or contract growers sell maize either directly to the food and feed industry or to commission agents. Usually food and feed industries have permanent contacts with commission agents in various big grain markets. These agents purchase maize from the producers for their respective industrial units and commission. Very little maize is sold in these markets for direct human consumption and seed. The industrial units sell their products and by-products through their wholesalers all over the country. The government of Pakistan does not announce a minimum support price of maize, and maize prices are generally higher than the other grains, such as wheat. However, the contract growers of Rafhan Maize Products Limited sell their produce to the company at prices predetermined at the time of planting. Presently the company purchases around 40% of its required quantity from its contract growers in the Punjab (personal communication). Maize is not a major export commodity of Pakistan and the pattern of maize exports has been very irregular in the past.

### *Rice*

Rice is the second largest staple food in Pakistan after wheat and it is also a major foreign exchange earning source. In terms of cropped area in Pakistan, rice is the third most important crop after wheat and cotton, occupying around 10% of the total cropped area and 17% of the total area under food grains. Also it contributes about 16% in food grain production and 12% of the total value added by the major crops of Pakistan. Area under rice increased from 1.71 million hectares in 1975-76 to 2.12 million hectares in 1994-95 (1.1% annually). During the same period, rice production increased at a rate of 1.5% per annum; however, yield increased at a rate of less than 1% per annum. More than 50% of the total area under rice is under Basmati type rice and about 44% area is under IRRI type rice varieties. The rest is under other rice varieties. Pakistan earns a considerable foreign exchange from the export of long grain aromatic Basmati rice. In addition to this, it also exports IRRI type rice, which is mainly cultivated in the province of Sindh.

As the second staple food of Pakistan, rice is mainly utilized for human consumption. It is assumed that 6% of the total production is kept for seed, feed and wastage. Per capita availability of rice increased from 21.94 kg/year in 1983-84 to 22.27 kg/year in 1993-94. Net availability of total rice has increased at the per annum rate of 3.4% during this period. In 1993-94, about 69% of the total rice production was available for human consumption, 25% for export, and the rest was for seed, feed and wastage.

Domestic demand for rice can be categorized into direct human consumption, and seed, wastage and other industry uses. Demand of rice for direct human consumption will increase from 2,267 thousand tons in 1996 to 2881 thousand tons during the year 2000 (Table 7). The

projected total domestic demand for rice will be around 3,065 thousand tons in Pakistan by the year 2000. Similarly the projected demand for seed and industry will also increase from 1996 to 2000. It is estimated that the demand for rice bran will grow at a per annum rate of 0.51%.

**Table 7 Demand projection for rice in Pakistan ('000 tons).**

| Year | Rice Demand | | | Rice Bran & its Products | | |
|---|---|---|---|---|---|---|
| | Food | Other Uses | Total Demand | Rice Prod. | Bran Meal | Oil Prod. |
| 1996 | 2,266.67 | 144.68 | 2,411.35 | 144.68 | 121.53 | 20.26 |
| 1997 | 2,406.95 | 153.63 | 2,560.58 | 153.63 | 129.05 | 21.51 |
| 1998 | 2,555.98 | 163.15 | 2,719.13 | 163.15 | 137.05 | 22.84 |
| 1999 | 2,712.75 | 173.15 | 2,885.90 | 173.15 | 145.45 | 24.24 |
| 2000 | 2,880.77 | 183.88 | 3,064.65 | 183.88 | 154.46 | 25.74 |

Generally rice growers sell their produce to local traders or in nearby grain markets through commission agents and rice mills or their dealers directly purchase from the local grain markets. The Rice Export Corporation of Pakistan (RECP) also procures on its own or through its subsidiaries on a very small scale through the procurement centres established in the main rice growing areas just after the harvesting of rice starts. After milling of rice, it is sold in the domestic market freely and the surplus is sold to the RECP for export at fixed prices by the government.

Rice exports account for about 5% of total production in the country. Export earnings from rice increased from US $209.47 million in 1974-75 to US $415.68 million in 1991-92, and decreased to US $242.17 million during 1993-94. The main markets of Pakistani Basmati rice are Saudi Arabia, Kuwait, Oman, Dubai, Abu Dhabi, Qatar, Bahrain, Iran, Mauritius, Malaysia, UK, USA and Canada. The demand for IRRI type rice mainly comes from African nations and recently from Mauritius.

### *Feed*

The livestock sector is very important in the agricultural economy of Pakistan and accounts for more than 30% of agricultural GDP. Besides contributing milk and meat, livestock also have important traditional economic and social values in rural areas of Pakistan. Buffaloes, cattle, goats and sheep are the major components of the livestock sector and were 17, 15, 38 and 25% respectively of the total population of livestock in Pakistan during 1995-96. Presently in Pakistan, no reliable information on the quantity of various agricultural products diverted to feed is available. Mainly oilseed cakes and meals after extraction of oil are used as feed. Pakistan is the major producer of cotton and cottonseed provides more than 90% of total oil cake produced and it is mainly used for cattle feed. Rapeseed/mustard is the second largest source of oilcake and provides around 5% of total oil cake production. Sunflower, soybean, sesame are the other small sources of meal used in poultry.

Based on the demand projection for livestock meat, milk and eggs and estimated LOUs, the demand for feed is projected from 1997 to the year 2000 (Table 8). The projection made by the trend line procedure for feed demand in Pakistan, around 8.2 million tons for the year 2000, is lower than the consumer demand method. The demand projections for feed estimated using population growth rate, income elasticity of livestock products, and per capita real income growth, seem to be more realistic.

**Table 8 Demand projections for feed in Pakistan.**

| Items | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|
| LOUs ('000) | | | | |
| Trend projection | 4,803 | 5,059 | 5,330 | 5,617 |
| Consumer demand projection | 4,958 | 5,391 | 5,862 | 6,374 |
| Feeding Ratio | 1.46 | 1.46 | 1.46 | 1.46 |
| Feed Demand ('000 tons) | | | | |
| Trend projection | 7,012 | 7,386 | 7,782 | 8,201 |
| Consumer demand projection | 7,239 | 7,871 | 8,558 | 9,306 |

## New emerging commodities

### *Canola*

Canola is a special type of rapeseed which provides a premium quality refined edible oil. Its oil is low in erucic acid (5%) and the oil-free meal is low in glucosinolates. Low levels of glucosinolates in the meal result in a processed oil of canola with less pungency than the traditional rapeseed/mustard oils. In addition to these qualities, canola contains no cholesterol. Compared to soybean meal, canola meal is a better source of calcium, iron, manganese, phosphorus, and selenium. It also contains more choline, biotin, folic acid, riboflavin, and thiamine and has a higher content of the essential amino acid methionine but a lower content of lysine. These qualities make edible oil extracted from canola type of rapeseed varieties more popular among consumers. On the other hand, the traditional rapeseed/mustard meal has high levels of glucosinolates which can cause goiter and also adversely affect growth and reproduction in animals if fed regularly. Keeping in view all the qualities of canola, the potential exists to replace traditional rapeseed/mustard with canola varieties.

In 1990-91, area under canola type rapeseed was only 5,000 acres. During 1994, the Economic Coordination Committee of the Cabinet approved a three year development project entitled "Intensive and Extensive Development of Canola" to considerably increase the area under canola and to reduce the deficit of edible oil in Pakistan. The project was implemented during the 1995-96 season and a massive campaign was launched throughout the country by the Pakistan Oilseed Development Board (PODB) and BARD Program. The Board claimed that during 1995-96, area under canola increased to 100,000 acres in Pakistan due to their campaign through provincial extension departments, newspapers, radio, TV, etc. The project has also involved the private sector in procurement and processing. Already the private sector is procuring the canola crop and extracting edible oil for human consumption. Due to the high quality edible oil and meal, the private sector is very interested in its procurement and extraction of edible oil for human consumption. The interest and involvement of the private sector in this enterprise is a good sign for promotion of canola production in the country. It will help to improve the edible oil deficit in Pakistan and save a considerable amount of foreign exchange.

### *Strawberry*

Strawberry is a highly nutritive, soft and delicious fruit recently introduced at the farm level in Pakistan. During the 1980s, it was demonstrated at various research stations and a few years ago it was adopted by a few innovative growers around Islamabad, Lahore, and Malakand Division in NWFP. The main markets of strawberry are only Islamabad and Lahore. However, very little is known about its area, supply schedule, volumes, prices, etc.

In Pakistan, strawberry has great potential due to the diverse climatic conditions which are conducive to its growth. It can be successfully grown in central and northern Punjab, and hilly areas of NWFP province, where the plants can be sustained for two to three years. Hence, besides meeting its local demand, the fruit can be successfully exported to earn foreign exchange. For the 1995-96 strawberry crop, retail prices were Rs 40 to 70 per kg and farmers on average earned net incomes of Rs 75,000 to 110,000 per hectare in Islamabad. Farmers around Islamabad generally plant less than one hectare and get yields from 2.5 tons to 10 tons per hectare in the first year. It is observed that with the correct post harvest technology, strawberry can be easily marketed fresh throughout Pakistan and also can be exported to other countries. The introduction of new varieties that have a longer shelf life should make it possible to increase the potential of this crop.

Pakistan had only exported around 4 tons of strawberries (worth Rs 1.1) to India during 1993-94. The superior size of the European market makes it the prime potential market for Pakistani strawberry which has a sufficient seasonal edge to be a viable competitor.

The major constraint to strawberry export is the lack of post-harvest technology in packing, grading standards and cool chain distribution. Refrigerated transport for such fruit is a vital part of any successful marketing operation in the climatic conditions which prevail in Pakistan. Since this is a new commodity for Pakistani farmers, it requires a well planned training programme for farmers regarding husbandry, potential, available technology, motivation, post-harvest technology.

### *Mushroom*

In Pakistan, mushrooms can be widely observed in rural plains during the rainy season on manure heaps and damp places with a lot of humus. Also different species of mushroom can be found in fields, woods, forests, water channels, bunds, grassy grounds, etc. All these types of mushroom belong to a natural group of mushrooms found in different parts of Pakistan. In this group, the white umbrella type mushrooms *Agaricus redamine, Folare nigerians* and *Podaxis pistillaris* are most common and they are consumed by local consumers. Black morel, a wild variety, is very rarely available and only supplied for export purposes by some contractors from Kashmir and northern hilly areas. There are about 30 types of mushroom cultivated in Pakistan, but button and oyster still account for around two-thirds of the total production. The other quite successful varieties which have commercial value in Pakistan and international markets are Chinese and Shiitake varieties. However, on a commercial basis, mushroom in Pakistan is only produced on a limited scale. Almost all the mushroom produced in the organized sector in the country is of the white button type.

Mushroom cultivation is a highly profitable enterprise as discussed in many reports. In 1981-82, only 25.5 tons of mushrooms worth Rs 20 million from Pakistan were exported, but after 1985-86, export increased considerably. Mushroom export from Pakistan increased by 241% from 1981-82 to 1993-94.

Although the natural conditions in Pakistan are suitable for mushroom cultivation, the export is not as great much as it should be. This is due to the fact that mushroom production in Pakistan is still a new enterprise and its export is an even more recent development. The major importing countries of mushroom from Pakistan are France (73%), Switzerland (17%) and Germany (4%). Other countries including the Netherlands, UK, Finland, Sweden and Singapore have imported small quantities.

In addition to creation of more export opportunities, mushroom cultivation will also benefit the rural landless and small farmers, as noted below:

- improvement of present nutritional status of the poor masses, especially the rural poor;
- creation of new income and employment opportunities;
- solution to the problem of organic wastes by using as raw material in mushroom cultivation;
- efficient use of crop straws and production of organic fertilizer;
- mushroom cultivation is ecologically sustainable;
- improvement of the purchasing power of the rural poor;
- highly profitable enterprise compared to many other agricultural commodities;
- export earnings could be substantially increased.

## Successful market promotion attempts

*Mango*

Pakistan is the third largest producer of mango after India and Mexico. Among the fruits planted in Pakistan, mango occupies the second place in terms of area after citrus. During 1993-94, 16% of the total fruit area in Pakistan was under mango. Total mango area in Pakistan increased from 54.0 thousand hectares in 1975-76 to 883.7 thousand hectares in 1994-95, an increase of 2.6% per year. However, total production of mango in Pakistan increased from 595.7 thousand tons in 1975-76 to 88.3 thousand tons in 1994-95, which is an increase of 2.1% per year. The yield of mango in Pakistan is very low compared to the potential yield. Average yield has remained static at around 9.5 tons per hectare.

Reasons for success of mango marketing are listed below:

- There has been a significant increase in area and production of mango in Pakistan. However there was little increase in mango yield. The production base of mango in Pakistan clearly indicates that with a little more effort (by the Export Promotion Bureau, and other government policies), export of mango could be increased considerably.
- In Pakistan, mango is grown in a climate which is most suitable for mango cultivation. Due to the diversity of agro-climatic conditions in Pakistan, the mango harvesting season is considerably longer than in many other mango growing countries.
- There are more than 46 mango varieties which are successfully grown in various ecozones of Pakistan. These cultivars include all early, mid-season, and late varieties. Many of these cultivars are well known for their delicious flavor, fragrant aroma, good appearance, various sizes, export quality, etc., in the local and international markets.
- The quantity of export of mango is also increasing, especially to Middle East countries. Also per unit value of export of mango improved during the last few years.
- Mango can be exported by sea and air to Europe and the Middle East. Pakistan International Airlines is well established and connected with all potential importing countries. Similarly, Karachi port is also well established and can be used to export in bulk in containers, especially to the Middle East.
- Due to low labour costs, Pakistan has a competitive edge in terms of price over many other competing countries in the international market, especially in Europe.
- The private sector is well established to export mango anywhere in the world.
- Post harvest technology in the case of mango is also improving.

These factors, favourable government policies in the recent past, and the wide natural resource base in Pakistan, have contributed to the success of Pakistani mango in local and international markets.

*Citrus fruit*

Citrus is the most popular and commercial fruit of Pakistan and also Pakistan is one of the major producing countries in the world. During the last two decades, citrus has attained a very important position in the fruit industry, which has introduced many products including juices, jams, ice cream, etc. This industry and citrus production occupy a pivotal role in the development of the agricultural economy of Pakistan. Among all the fruits grown in Pakistan, citrus occupies the first place in terms of area and production. During 1994-95, 34% of the total fruit area in Pakistan was planted under citrus. The area under citrus increased from 63.1 thousand hectares in 1975-76 to 190.7 thousand hectares in 1994-95, an annual growth rate of 6% during this period. The total production of citrus during the same period increased by 188%. However the yield of citrus remained stagnant at around 10 tons/ha which is very low compared to other citrus producing countries where average yield is around 15 tons/ha.

Reasons for success of the citrus market are listed below:

- Citrus occupies the first place in terms of area and production of all fruits grown in Pakistan. More than one-third of the total fruit area in Pakistan is under citrus. Both area and production increased considerably during the last two decades. The domestic fruit industry is also growing very rapidly.
- Due to diverse climatic conditions among the provinces, the harvesting season of citrus is quite long.
- There are many cultivars of citrus successfully planted in Pakistan. Among the commercial varieties, "Kinnow" (an easy peel variety with good distinctive flavor) is mainly grown in Punjab province and is widely liked in international and domestic markets. "Kinnow" constitutes the major component of Pakistani citrus export markets, especially in the Far East, Middle East, and European countries.
- The available citrus post-harvest technology in Pakistan is better than for other fruits. During the last decade, a few big citrus exporters/producers have established waxing, grading, washing and packing plants in the major citrus growing areas of the Punjab and they provide export quality citrus. These exporters/producers also have their own cold storage. In addition to waxing plants, a few juice extraction plants have also been established in the citrus producing areas.
- Export of citrus from Pakistan has increased. A large quantity of citrus is exported in refrigerated containers by sea mainly to the Middle East. Also citrus is exported by air to both the Middle East and European countries. The production base of citrus in Pakistan shows that its export can be further increased with better export promotion efforts and government policies.

*Molasses*

Molasses is a sugar containing by-product produced during the extraction of sugar from sugarcane, sugarbeet and other sugar containing commodities. During the sugar making process, a stage is reached when further crystallization of juices into sugar is assumed uneconomical and the liquid remaining at this stage is molasses. There are different sources of molasses in the world but in Pakistan, more than 98% of the total production of molasses is obtained from sugarcane. In addition to sugarcane molasses, other minor sources include beet molasses, citrus molasses, maize sugar molasses, wood molasses, and sorghum molasses.

Despite tough competition from the sugar producing countries of Asia, Pakistan exports molasses, mainly to European countries. The total export of molasses from Pakistan has more than doubled from 1988-89 to 1994-95. The unit value of molasses has also increased from US

$ 40/ton to US $ 53/ton during this period. The Netherlands was a major importer of molasses from Pakistan followed by Spain, UK and Italy during 1994-95. Domestic consumption of molasses is around 2 million tons per year, which is less than 20% of the total production in the country and the rest is available for export.

Reasons for success of the molasses market are listed below:

- Sugar is one of Pakistan's largest industries, and it is mainly based on sugarcane. The area and production of sugarcane increased considerably during the last two decades, and thus production of molasses also increased significantly. The number of sugar mills also increased from just 44 in 1987-88 to 67 during 1994-95.
- Pakistan, being one of the leading sugar producing countries, offers a substantial surplus of molasses in the international market. So far local industry has not progressed much towards the commercial exploitation of molasses. The domestic utilization of molasses by industry is very limited (mainly as raw feed for cattle); therefore, more than 80% of the total production of in the country is exported, mainly to European countries.
- Prices in the local market are much lower than the international market prices, which is another factor stimulating exports to other countries.
- More than 80% of the total export of molasses from Pakistan goes to European countries, which is due to the fact that sugar mills in Pakistan have well maintained the export quality desired by these quality conscious countries.

## Failed market promotion attempts

*Apple*

In Pakistan, apples have been planted as commercial fruit trees in Baluchistan and NWFP provinces for a long time because of high economic returns. There are both large and small sized apple orchards in both the provinces. Pakistan produced about 533.1 thousand tons of apple from 40 thousand hectares during 1994-95. The area under apple increased by around 405% from 1975-76 to 1994-95 and production increased by more than 698% during the same period. The yield of apple also increased from 8 tons to 13 tons per hectare during the last 20 years, which is still quite low compared to other apple producing countries.

Pakistan is not a big exporter of apple compared to other competing countries. During the 1990s, Pakistan exported only a few tons of apple to Sri Lanka, the Maldives and Singapore.

Reasons for failure of apple export are listed below:

- Despite the large production base of apple in Pakistan, its export in the international market is very minimal. Pakistani exporters are unable to compete in the international market due to lack of surplus export quality apples. Prices of available export quality apples in the domestic market are high compared to the international market. Therefore, greater efforts were made to expand the domestic market.
- Due to inappropriate cold storage facilities in the apple producing areas, poor transportation services, poor post-harvest technology, etc., apples generally lose their quality during long distance transportation and are unable to meet export quality standards.
- Apple growers in Pakistan are unaware of the international market potential, still grow local varieties, and are not familiar with post harvest technology. Farmers still use simple and crude packing which badly affects apple quality.

- There is no organized private or public agency involved in promoting the export of apple from Pakistan. Even the enforcement of prescribed grades and standards is very poor.

*Onion*

After potato, onion is the second major vegetable crop of Pakistan. Onion is an essential part of every meal in Pakistan and it is used as a vegetable, a condiment and a spice. Around one-third of the total vegetable area (excluding potato) in Pakistan is grown under onion. Total area under onion increased by more than 143% from 1975-76 to 1994-95. The production of onion increased around 214% during this period and yield of onion also increased by about 29%. Average onion yields have remained static between 10 and 13 tons per hectare, comparing most unfavorably with the expected yield of over 35 tons/ha grown in major onion producing countries such as the UK and Holland.

Although area and production of onion have increased many-fold, export of onion from Pakistan is minimal. For example, Pakistan exported only 1% of the total production of onion during 1994-95. Export of onion from Pakistan fluctuated between 1,800 to 8,200 tons from 1984-85 to 1994-95.

Reasons of failure of onion exports are listed below:

- In the case of onion in the past, the government generally adopted the attitude that export should only be allowed after domestic demand had been fully satisfied, which is not a viable approach to successful export of onion. The exporters were unable to export on a consistent basis and export of onion could not improve much in spite of the large year round production base.
- The policy of exporting only the surplus resulted in a low volume of export of onion from Pakistan. This is not a viable policy because the quality of onion available in Pakistan is not necessarily equal to that required in the international market. Onion exporters are unable to make commitments for a regular supply to importers.
- There is no agency in the country that encourages farmers to grow for export purposes, provides storage and grading facilities, and looks for export markets.
- Pakistani onion is usually irregular in size, poorly-graded and packed, with a high percent of waste. Private onion exporters also lack of facilities for quick grading and packing for serving consignments on a regular basis.

*Tomato*

Tomato is one of the most popular vegetables in Pakistan, widely used in salads as well as for culinary purposes. It is also utilized as a raw material in processing industries. Tomato ketchup is the most popular product of tomato. The popularity of tomato and its products continues to rise. The area under tomato increased from 7.5 thousand hectares in 1975-76 to 25.6 thousand hectares in 1994-95 at an annual growth rate of 6.7%. Production of tomato in Pakistan increased at a per annum growth rate of 9% during the same period. However, the increase in production from 53.7 thousand tons to 275.8 thousand tons during this period is mainly due to an increase in area. Tomato yield increased from 7.1 tons per hectare in 1975-76 to 10.7 tons per hectare in 1994-95. Average yield remained static around 10 tons per hectare during the last 10 years and were much below their potential. Tomato yield increased at an annual growth rate of only 2.2%.

In spite of the fact that there are diverse agro-ecological zones in Pakistan, and tomato is available all-year-round, the quality of tomato is far below the accepted world market standard. Due to poor quality of tomato and poor infrastructure, Pakistan is unable to compete in the international market, and export of tomato is almost zero. Tomato growers are not aware of the post-harvest procedures required for high quality.

Reasons for the failure of tomato marketing are listed below:

- Area and production of tomato in Pakistan increased considerably during the last two decades. However, farmers grow generally only those varieties of tomato which have short shelf life. Seed of tomato varieties with long shelf life is not available. Also, hybrid tomato seed is not available at the farm level. Hybrid seed is only available for experimental purposes at experiment stations. There is no private, government or semi-government agency that supplies seed of the high-yielding, long shelf life varieties of tomato. A limited supply of seed is only supplied by a few experimental stations for local growers, mostly for home gardening.
- Limited research and development work has been done on tomato in Pakistan.
- Cost of production of tomato is generally very low and farmers/wholesale traders spend very little on packaging and grading. Grading for quality and size is left to the retailers who sort and grade tomato before sale. This process results in low quality tomato and significantly decreases the shelf life.
- Commercial processing of tomato is also very limited and a considerable quantity of tomato is wasted, especially during the peak season. The processing industry is mostly limited to manufacturing of tomato ketchup and very little effort is made in extraction of tomato juice. These processing units are mostly not located in the major producing areas of tomato, which results in high cost of processed tomato in the local and international markets.
- Tomato is highly perishable and due to poor post-harvest technology, and poor infrastructure, Pakistan could not make any headway in the export of tomato. Pakistan only exports a few tons of tomato to neighbouring countries like Afghanistan.

## Policy implications

- It can be concluded from the changes in food consumption patterns over time that the demand for fruits and vegetables, and livestock products will increase considerably. Therefore, efforts must be made to increase the productivity of these products through more investment in the related infrastructure, research, development, and extension on a priority basis in the country.
- Inefficient and inadequate marketing, low prices, poor research, extension, and product promotion efforts are the key factors limiting the adoption of soybean in Pakistan. Therefore future strategies to promote soybean must be made by strengthening the linkages between production, procurement and processing. The private sector must be encouraged to be involved at all stages from crop production to processing. Through a country wide campaign, the private sector must also be encouraged to introduce new uses of soybean such as soya milk, soya meat, soya nuts, and other products. This will also help in promoting the cultivation of this protein rich crop in the country.
- Given the negative income elasticity of maize demand as direct human consumption, demand for maize in industry and for poultry feed will surely increase considerably in

the future. Therefore more investment should be made in maize research, development and extension to further increase the present low yield of maize in the country.

- The yield estimation procedure for potato needs to be improved to obtain the actual production of potato in Pakistan. Provision of improved seed of export quality potato and post harvest technology of grading, packaging and storage must be improved to enhance the export of potato from Pakistan.
- To compete in the international rice market, Pakistan must improve the quality of rice by improving its present traditional milling technology. With more facilities in the private sector, and simplified procedures of rice export, this sector may considerably increase rice export from Pakistan. Presently rice is a highly competitive commodity in the export market; therefore, more research and development efforts are needed for quality improvement of Basmati and IRRI types of rice in Pakistan. Also infrastructure facilities, such as transport, ports, equipment for quality control, bulk storage and handling facilities at procurement centres and railway sheds, etc., should be improved by increasing private investment.
- The yields of almost all crops, fruits and vegetables are quite low compared to their potential in Pakistan. Therefore, efforts must be made through extension to promote improved cultural and intensive management practices to increase the present productivity levels. In addition to this, high quality seed and planting materials especially for fruits and vegetables, should also be provided to farmers.
- Export promotion of almost all commodities, especially by the private sector, is almost negligible. In the present competitive international market scenario, sales promotion efforts are very important for expanding markets and market shares of a particular product.
- The government should promote a policy of "grow for export" among the fruit and vegetable growers to increase the export of fresh fruit and vegetables from Pakistan. The production of fruits and vegetables has increased over time, but less than 3% of total production is exported. This low share is mainly due to the fact that fruits and vegetables are not grown for export purposes and quality, product type and varieties are not export standard. In addition there is high cost of transportation from producing areas. The choice of type of fruit, vegetable and variety should be market led and should be based on demand in the local and export markets. In the presence of tough competition in the international market among fruit and vegetable growing countries, the present policy of the government of exporting the surplus will totally fail. The international markets only accept produce of specified quality levels available on a consistent basis. Therefore, a public, semi-public or private organization is required to promote the export of fruit and vegetables from Pakistan according to international standards and also to integrate production, harvesting, grading, packing, and procurement for export purposes. The government should encourage private exporters to promote the export of fresh produce by providing the sector with the required facilities at ports, and other required support at all levels so that they can compete in international markets.
- To avoid unnecessary delay due the cumbersome procedures of export, a ’one window export zone’ should be established where all formalities and paper work can be completed so the exporter doesn’t have to visit many offices in different areas. This will considerably improve the standard and volume of export. Also it will help to decrease the costs of export and to provide a consistent supply to importers.

- Substantial improvements are required in research and development activities. Research in fruit and vegetables should be market oriented and should be according to the requirements of the export markets. In particular research on increasing shelf-life is required. More cost-effective technology and storage management should be introduced.
- Strong extension services are required in the promotion of post harvest technology of fruits and vegetables. Also improved planting material, seed, improved agronomic practices, irrigation practices, fertilizer application, pest and disease control are required by the farmers.
- Grading, packing and procurement systems for export purposes need to be totally improved. Only internationally accepted standards of fruits and vegetables should be allowed to help increase the per unit value of exported produce and reduce losses. Uniform grades of produce and quality control prior to export should be implemented.
- Primitive and insufficient modes of transportation need to be changed because they cause delays and wastage of vegetables during transit. Appropriate measures need to be taken to maintain the quality of the produce. These measures include the provision of cold storage and refrigerated trucks and ships.
- Airport and seaport facilities need to be improved.
- The growers of all agricultural commodities including fruits and vegetables should be encouraged through different incentives to grow for export purposes.
- Similar to the industrial export zones, fruit and vegetable and other agricultural commodity zones should be established to grow export standard produce.
- The Export Promotion Bureau should arrange exhibitions and fairs abroad in potential export markets and involve fruit and vegetable exporters, rice exporters and representatives of growers.
- The government should declare fruit and vegetables as an industry and provide all the incentives provided to other industries such as textiles. This will help in the installation of industrial units for processing, canning and packaging of fruit and vegetables. Also exporters of fruit and vegetables should be given financial support as are the exporters of other industries.
- The infrastructure in the wholesale market must be developed, including sheds for exporters, commission agents, growers, etc. Also emphasis must be given to the improvement of other facilities in the fruit and vegetable wholesale markets, such as cleaning, good drainage systems, strict phyto-sanitary inspection measures, etc.

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# Comments on the Pakistan Country Report

*A. H. Maan*[*]

The importance of conducting research studies on market prospects of upland crop products (UCPs) and policy analysis in selected Asian countries including Pakistan will prove to be a milestone for future policy planning in the fields of production, marketing and consumption, environment and future behaviour of these crops in the realm of overall national economic development. The crops covered in the study are important for domestic as well as world markets. The author of the paper has worked hard in analyzing the role of upland crops and their products in improving the overall national economy and increasing the quality of life of the farm community through income generation effects. The author has succeeded in highlighting the domestic and export market potential of UCPs in Pakistan and has provided a thought provoking analytical framework for improving the production, marketing and processing prospects of these crops in Pakistan. In the current new economic scenario, upland crops and their products have gained a new impetus in our consumption pattern. According to the current Household Income and Expenditure Survey (HIES), a new trend has been observed in the calorie share of cereals with increase in per capita expenditure in urban areas. The decline was compensated by a significant increase in calorie intake of milk and milk products, edible oils, meat, sugar, fruit and vegetables, etc. With increase in income, people have in general diversified their food consumption pattern.

Like many developing countries with relatively abundant rural labour, Pakistan also has undergone many structural adjustments. These include specifically liberalization of markets and prices. In agriculture, the changes cover elimination of export taxes, trade restrictions and many more. The government at the same time restructured trade policies and also implemented policy measures to transform the agricultural economy. The country succeeded in diversification of the agricultural sector. Without such reforms, it was not possible to establish a thriving and unfettered agricultural sector in Pakistan. As a result of these policy reforms, the sector registered a remarkable improvement of 6.7% growth in 1995/96 compared to 5.9% in 1994/95 and 5.2% in 1993/94. The economy has staged a recovery, the fiscal balance continues to improve, and external trade shows sizeable improvements.

There is no doubt that the reliance on international trade, particularly in the non-traditional crop sector, and foreign capital inflow have become crucial for Pakistan to sustain and enhance her pace of economic development in the emerging structural imbalances. Agriculture is, therefore, essential for sustainable improvement in internal and external balances. In this context, the author is right to mention that international trade has proven to be an engine of growth. Excellent export performance is one of the major reasons for rapid growth in most East Asian countries as a follow-up to liberal trade policies. Pakistan is no exception. The government undertook policies aimed at facilitating trade and as a result the export performance was noticeable. The government streamlined the institutional arrangements for facilitating investment through a Board of Investment which acted as a ”one-stop-shop” and was the focal point of contact between potential investors and government agencies. It provided

[*] Ministry of Food, Agriculture and Livestock, Islamabad, Pakistan.

necessary support to new investors. The Agri-Business Cell in MINFAL guides investors in establishing agriculture related business and industry. A number of reforms were initiated, including improving infrastructure facilities, protection of foreign investment, rural industrialization, new tariff structures besides fiscal incentives/concessions. Special facilities were made available to exporters to capture neighbouring new markets. The country was, therefore, able to maintain and improve the economic environment by further moving towards a liberalized open economy. The agro-economic and political stability made our exports more and more competitive in the world market.

As is evident from the analysis of the country report, Pakistan, on account of its geophysical conditions and location in the tropics, has the advantage of a wide agro-climatic range which facilitates cultivation and production of a variety of upland crops. The annual variation in temperature provides two distinct crop seasons viz. kharif (summer) and rabi (winter). Kharif crops are generally sown between April and June and harvested during October to December. Rabi crops are sown in October-November and harvested in April-May. The cropping system varies widely due to variation in agro-climatic and soil conditions. In each season, several crops are raised depending not only on the nature of soil and climatic conditions but on the availability of resources. On the major crops, wheat, gram, rape and mustard are the principal rabi crops while rice, maize, cotton, millet, sorghum and sugarcane are the main kharif crops. In addition, a variety of both summer and winter vegetables and fruits are grown in the country. Out of total cropped area, food grains account for 56%, cash crops 16%, pulses 7%, oil seeds 3%, and the rest is occupied by fruit, vegetables and others.

Pakistan thus has tremendous potential for development of agriculture, particularly the crop sector which contributes 63% towards agricultural GDP, followed by livestock contributing 32%, and fishery and forestry the remaining 5%. In these circumstances, one can easily conclude that the market prospects for upland crops in the country are good provided the existing constraints both financial and technological, institutional and resource based are analyzed and measures taken to deal with them on a priority basis. The author has endeavoured to highlight some of them and suggested remedial measures which should be taken care of by the government in its development programmes.

In foreign trade, it is agriculture again which dominates through exports of processed and semi-processed products. Of the total export earnings, the share of primary commodities is only 16%, whereas, together with processed and semi-processed, it contributes more than 60% in export earnings. The export of rice alone contributed 34%. The share of fruit and vegetables is 4%. On the import side, edible oils account for more than 44% of agricultural imports. The study reveals that the share of traditional exports still predominates in our export scenario; the market distribution of Pakistani exports has improved significantly and Pakistani exports have become more competitive over time. However, the positive contribution of these factors is off-set to a large extent by the concentration of export on traditional commodities for which world demand is very sluggish.

Based on findings of the author, it is suggested that the share of traditional exports for Pakistan should be decreased and that of non-traditional exports increased since the demand for the former is either stagnant or declining in the world market due to a drastic shift in the structure of international trade. Manufactured goods now account for about 80% of world merchandize exports. There is further need to explore new areas of comparative advantage and increase the variety of exports by moving towards exports of semi-manufactured and manufactured commodities from the raw commodities. There is a need to adjust the market distribution of exports, and there is room to explore new rapidly growing markets such as Indonesia, Malaysia, China, and states of the former Soviet Union.

There is no difference of opinion regarding the conclusions and policy indicators as enumerated by the author of the research study. The country has to increase the production of exportable commodities as well as importable commodities, particularly oil seeds, pulses, etc. Pakistan is one of the biggest importers of edible oil. The import bill has gone up to Rs 34.2 billion in 1994/95. While this unprecedented increase in edible oil import is due to the escalation of international prices, expansion and local consumption, which is about 8% per annum, and inadequate indigenous oilseed production contributed to a greater extent.

The government of Pakistan established the Pakistan Oilseed Development Board (PODB) in the Ministry of Food, Agriculture and Livestock (MINFAL) in 1994 to enhance indigenous oilseed production and reduce the import bill for edible oils. Due to initiatives taken by the Board, the import bill in 1995/96 was reduced by Rs 1 billion due to increased domestic production of oilseeds.

The private sector has been mobilized by the Board and encouraged to play a role in oilseed promotional efforts. The Board has effectively supported private seed companies by providing them a forum for discussion and policy decision making. The Board satellite network developed a close functional relationship with the private sector including seed companies. In accord with a cabinet decision to develop a comprehensive crash program for canola cultivation, a target of 100,000 acres was fixed for the upcoming rabi 1995 season. The canola cultivation campaign by PODB has already been initiated and institutional arrangements have been made in all the canola production areas in the country. The canola crop has demonstrated excellent potential through vivid indicators of germination, growth and productivity. This crop has been successfully grown in areas in southern Punjab, barani areas of Potohar and extending into the province N.W.F.P. Canola is being cultivated on 500,000 acres in the current season. Canola acreage now has been extended further into southern Sindh and Baluchistan.

An Oil Palm Development Pilot Project was designed by the Board and approved by the CDWP for execution in coastal areas of Sindh and Baluchistan provinces for oil palm plantation on an area of about 12,000 acres which will produce about 14,000 tons of edible oil every year on maturity of these plants.

A Salicornia Development Pilot Project has been approved by the government for cultivation of Salicornia, a new edible oil yielding crop, in Sinch and Baluchistan provinces. The Salicornia crop grows on saline and desert lands and flourishes well on saline or sea water. It is now planted on 5,000 acres. It is a high oil yielding crop bearing 30% edible oil. The area under Salicornia will subsequently be increased tremendously as it does not compete with any other crop for land, precious water, etc.

Notwithstanding the considerable untapped opportunities for fruit and vegetable exports in fresh/processed state in foreign markets, the country did not succeed in boosting the production and export environment of these value added products. Annual production of fruit and vegetables in 1994/95 stood at 5.11 million tons and 4.47 million tons respectively. Only a nominal proportion of production was exported. Poor methods of harvesting, inadequate storage, poor packaging and poor methods of transportation result in high production losses. The traditional post-harvesting handling and marketing system of perishable commodities is still so primitive that around 30-40% of the production is lost in handling. The author of the country paper has rightly regarded the poor marketing system as the single most important factor constraining farmers from obtaining full production potentials of fruit and vegetables. Inadequate storage facilities and the inappropriate and inadequate transportation system in the country are responsible for high quantitative and qualitative losses of these products.

Despite these constraints, the food processing industry in the country has made progress in the field of fruit flavoured beverages and fruit juice concentrates. In fact, the fruit juice

industry has almost exclusively exported its production. The packaging industry has also developed into an organized sector over the years with the ability to meet domestic and export requirements. There is, however, still ample scope for joint ventures in fruit juice and concentrate production, date processing for export, tomato processing, potato processing and dehydration of vegetables. There are large varieties of fruits and vegetables which are suitable for processing and preservation. Unfortunately, only 10-12% of the fruit production and 2% of the vegetables are processed. There are many constraints which need to be removed. The government is aware of the problem and is taking measures necessary to improve the situation by involving the private sector in the process.

On the export side, the government of Pakistan has announced a highly attractive package for foreign investors so that profitable investment opportunities may be made available to them in the country's efforts to modernize export marketing, particularly in respect to non-traditional items to increase their export earnings, and to increase income and employment especially in the rural areas. The country is vigorously pursuing a policy with a basic focus on growing crops for export, import substitution, concentration on high potential areas, development of water management and irrigation potential and conservation of the natural resource base. The idea is to move towards sustainable agricultural growth. This would be possible only through intensive agriculture and minimizing the gap between actual and potential yields which is very high for vegetables and fruit: 65% for potato, 58% for mango, 64% for citrus and 31% for apple. In other words, production has the potential of increasing almost three times that of the present level from the same cultivated area provided the excess produce can be marketed at home and abroad.

In the end, it will not be out of context to mention that the author has ably described point by point and crop by crop the weaknesses and strengths of market prospects of upland crops in Pakistan. The government is fully cognizant of the existing impediments in production and export potentials and will benefit from the recommendations of the workshop. We have already initiated a series of policy measures in the field of production, pricing and marketing. The country is following a minimum guaranteed price policy for many crops including upland crops. The trade policy in recent years has undergone major changes. Tariffs have been lowered; non-tariff barriers to imports have been slashed down; the negative list in respect of agricultural commodities has been curtailed to include items which bear religious sanctity; and quota restrictions have been abolished. Different duties and taxes have been abolished on export of agricultural products and incentives provided for increasing exports. With these policy changes, Pakistan's trade policy has been globalized. Recently, the Cotton Export Corporation of Pakistan and Rice Export Corporation of Pakistan have been reorganized to decrease their operating expenses and to make them more responsive to the new world trading environment. This step is expected to have a wholesome impact on cotton and rice marketing.

The Export Promotion Bureau is doing its best to explore foreign markets for traditional and non-traditional items including strawberries and mushrooms. Apart from this, the Export Promotion Bureau is also trying through various seminars, conferences and training courses to acquaint exporters and manufacturers with international trade regulations and standards. The policy environment is conducive for production and marketing of crops in local as well as in international markets. The only need is to improve the environment further to make it up to-date and producer friendly.

The government is indebted to UN/ESCAP and the CGPRT Centre for selecting Pakistan as a research project country to answer the growing regional concern for the market prospects of upland crop products. Needless to mention, Japan has always been helpful in TCDC activities. Japan has been extending financial support to many developing countries including Pakistan in

crucial areas of agricultural development. The areas relate to policies and institutions in the irrigation sub-sector with particularly emphasis on ways to improve operation and maintenance; increasing private investment, and meeting the needs of the poor particularly for livestock, inputs and machinery. The ever increasing technical assistance of all donor countries including Japan is commendable. This will go a long way in augmenting development efforts/programmes of developing countries including Pakistan. The main policy objectives of Pakistan in the agricultural sector currently being followed relate to growth with equity, increasing productivity, export enhancement and improvement in physical infrastructure. Technical assistance in these programmes will always be welcome. Our emphasis is to expand the role of the private sector in the field of production, marketing and processing of high value crops. The government presence in the future will focus on areas where the private sector cannot work efficiently. It is hoped that agriculture will continue to play a critical role in achieving the objective of increasing production and marketing prospects of high value crops in the country.

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# Comments on the Pakistan Country Report

*Naseer Alam Khan*[*]

As a part of the MPUPA project, Dr. Akhtar has made an impressive effort to develop a study report for Pakistan. The main objectives of the study were to review changes in consumption patterns of UCPs, analyze various domestic demand scenarios as well as to examine external trade performance and potential as affected by government policies and measures.

The author has organized his report in two major parts. The first part of the report covers domestic demand aspects including dietary pattern, demand composition (food, feed, seed), policy impacts and demand projection. The second part deals with market potential aspects such as marketing/processing of UCPs, external trade performance, newly emerging non-traditional products/markets, and case studies of successful attempts and failed marketing attempts. The analytical procedure mainly used in the study consists of compound growth rates, trade analysis, income elasticities and population growth rates.

The following comments/views are offered:

- Agricultural trade statistics indicate that agriculture's share in total exports has declined from 32% in 1985/86 to only 9% in 1993/94. It fluctuated due to cotton diseases but improved in certain years. In fact the share of agricultural exports (raw, semi-finished finished) is almost 65-70% of total exports of the country.
- The production trends of important cereals indicate minimal improvements except for potatoes, cotton and fruits. Recent studies conducted by MINFAL also reveal that Pakistan has a comparative advantage in growing cotton and rice (Basmati) but not wheat and other cereals. Annual average growth rates (compound growth rate) change with different base periods, hence short duration growth rates may not reveal the true picture.
- Agricultural policy measures adopted by the government have from time to time in the past been reviewed. These include subsidies on fertilizer, seed, tubewells, pesticides, subsidized credit, support prices and food subsides for the poor. However, the impact of such incentives is not clear. Also private sector farm-level investment (capital formation) should be elaborated.
- Although the export of rice and cotton is generally controlled by the government, the import of agricultural commodities is handled by the private sector. In order to examine the structures of taxes and duties at least 5 years data may be more useful.
- Household Income and Expenditures Survey (HIES) data for 1979 and 1993 are used to examine changes in dietary patterns of rural and urban populations. These estimates, besides the sampling error, are subject to bias because of seasonal variations and the recall problem.
- Soybean is a very important crop as we are badly deficit in soybean oil and meal. However, for the past two decades the crop could not be commercialized and it is sown on only a few thousand hectares in the mountain areas, mainly in orchards. Hence, its

[*] National Agricultural Research Centre, Islamabad, Pakistan.

production is erratic and it does not contribute much to the total edible oil and meal availability in Pakistan. Demand projections of soybean oil are 1.33 thousand tons against our import of 239 tons in 1994-1995.

- Potatoes are grown all over the country; they are the most important vegetable of the Pakistan diet. Production has increased more than three-fold. The consumption estimates and demand projections are inconsistent due use of different sources such as FAO and Federal Bureau of Statistics (FBS). The author has clarified this inconsistency.
- The domestic demand for rice for human consumption has been estimated at more than 3 million tons for the year 2000 by using a growth rate of 3-7%. Keeping in view the current production and consumption trends, this seems appropriate.
- Similarly, the demand projections for meat show that it will increase from 2.2 million tons in 1995-96 to 3.2 million tons in the year 2000 using the consumer demand projection approach, while trend projection values are on the low side.
- The livestock feed demand projection was made using livestock output units (LOUs) and the feeding ratios. This is a standard procedure used in a few studies.
- Among the newly emerging enterprizes, the author has picked up canola, mushroom and strawberry. Canola is a premium oil crop. Recently, the government has been striving hard to popularize the adoption of this crop by farmers. Despite public sector intervention, the crop has not been adopted into the cropping patterns of Pakistan. So it is not certain that it will emerge as new enterprize in the farming system. The other two crops, strawberry and mushrooms, have great scope for expansion.
- The choice of mango, citrus and molasses is correct as far as successful attempts are concerned. Citrus and mango are two major fruits with surplus and potential demand in the gulf states. Molasses production has increased significantly with an increase of sugar-mills to more than 100 from 47.
- The commodities selected as failed attempts are also appropriate. Because of climatic hazards, the production of these crops fluctuates every year. Lack of modern production technology results in low productivity. Also the post-harvest technologies and facilities do not permit the export of these crops.

# Market Prospects for Upland Crops in Indonesia

*Memed Gunawan*[*]

## Introduction

In Indonesia upland crops other than rice are known as *palawija* or secondary crops. These crops are second to rice in terms of commodity development priority and consumer preference. To some extent, they are recognized as important food crops that substitute for rice. The role of *palawija* in direct human consumption in Indonesia is decreasing. Most are considered inferior: the amount of direct human consumption declines as real income of consumers increases. On the other hand, indirect consumption may increase with income. The average increase in per capita real income during the country's fourth and fifth (1984-1994) Five Year Plans (*Pelita*) was 2.5-3.5% and it is expected to significantly affect direct human consumption of *palawija* or upland crops.

During the last decade the role of the agricultural sector in the Indonesian economy has declined relative to other sectors. The current share of agricultural Gross Domestic Product (GDP) is 17.66% with a rate of growth of 2.36% per year (MOA 1994). Agricultural growth is lower than growth in industry (10.40%), trade (7.72%), construction (12.08%), transportation (9.37%), and banking (13.72%). In 1990, the agricultural sector absorbed 49.4% of total labor in Indonesia in a declining trend. The agricultural sector remains a strategic sector due to its importance in terms of food security, labor absorption, and support for agroindustry development in Indonesia. In 1985, the labor force working in the agricultural sector was 34.142 million, and increased to 35.747 million in 1990 at a 0.92% annual growth rate. Agricultural labor productivity is the lowest compared to other sectors. In 1990, the total labor productivity was Rp 632,000/year, while in the industrial sector it was Rp 2,724,000, trade Rp 1,769,000, services Rp 1,273,000, and in transportation Rp 2,440,000.

## The role of secondary crops in the food subsector

A tremendous effort has been made to increase rice production in Indonesia. Demand for rice increases with income. In 1984, Indonesia achieved a historical rice self sufficiency which was retained in the following years with slight fluctuations. Cassava, maize, soybean, groundnut and sweet potato are the most important secondary crops after rice. In contrast, the development of these commodities is relatively poor.

After the achievement of rice self sufficiency in 1984, the government as well as the private sector began to pay more attention to the development of selected secondary crops. In general the planted area of cassava, maize and sweet potato declined, while the planted area of soybean, groundnut and mungbean increased. The harvested area of soybean increased 4.92% in the period of 1988-1993 as an impact of a special program to boost the production of this particular commodity. Yield of upland crops increased slowly at a rate of less than 2%, except for maize

[*] Center for Investment Development and Environmental Impact Assessment, Ministry of Agriculture, Jakarta, Indonesia.

which increased 2.25% per annum. The production of sweet potato was almost stagnant while maize production increased only 0.48%, and cassava increased 1.54% annually. Groundnut and mungbean production increased more than 2% and soybean increased tremendously at a rate of 5.99% yearly (Table 1).

**Table 1 Trends in production, harvested area, and yield of secondary crops, 1988-1993.**

| Commodity | 1988 | 1989 | 1990 | 1991 | 1992 | 1993* | Growth (%/yr) |
|---|---|---|---|---|---|---|---|
| Maize | | | | | | | |
| Production ('000 ton) | 6,652 | 6,193 | 6,734 | 6,256 | 7,995 | 6,385 | 0.48 |
| Harvest area ('000 ha) | 3,406 | 2,944 | 3,158 | 2,909 | 3,629 | 2,929 | 1.74 |
| Yield (qt/ha) | 19.53 | 21.04 | 21.32 | 21.50 | 22.03 | 21.78 | 2.25 |
| Cassava | | | | | | | |
| Production ('000 ton) | 15,471 | 17,117 | 15,830 | 15,954 | 16,515 | 16,564 | 1.54 |
| Harvest area ('000 ha) | 1,303 | 1,408 | 1,312 | 1,319 | 1,351 | 1,367 | 1.08 |
| Yield (qt/ha) | 118.73 | 121.57 | 120.66 | 121.90 | 122.00 | 121.00 | 0.39 |
| Sweet potato | | | | | | | |
| Production ('000 ton) | 2,159 | 2,224 | 1,971 | 2,039 | 2,171 | 2,140 | 0.03 |
| Harvest area ('000 ha) | 248 | 240 | 209 | 214 | 230 | 224 | - 1.78 |
| Yield (qt/ha) | 87.06 | 92.67 | 94.31 | 95.00 | 94.00 | 95.00 | 1.79 |
| Soybean | | | | | | | |
| Production ('000 ton) | 1,270 | 1,315 | 1,487 | 1,555 | 1,870 | 1,655 | 5.99 |
| Harvest area ('000 ha) | 1,177 | 1,198 | 1,334 | 1,368 | 1,666 | 1,452 | 4.92 |
| Yield (qt/ha) | 10.79 | 10.98 | 11.15 | 11.37 | 11.22 | 11.40 | 1.40 |
| Groundnut | | | | | | | |
| Production ('000 ton) | 589 | 620 | 651 | 652 | 739 | 639 | 2.05 |
| Harvest area ('000 ha) | 608 | 621 | 635 | 628 | 720 | 626 | 0.98 |
| Yield (qt/ha) | 9.69 | 9.98 | 10.25 | 10.38 | 10.27 | 10.22 | 1.08 |
| Mungbean | | | | | | | |
| Production ('000 ton) | 284 | 262 | 272 | 282 | 318 | 319 | 2.56 |
| Harvest area ('000 ha) | 361 | 332 | 342 | 301 | 387 | 379 | 1.90 |
| Yield (qt/ha) | 7.87 | 7.89 | 7.95 | 7.88 | 8.26 | 8.42 | 1.38 |

Source: CBS.
* Preliminary figures.

## Government strategies

Substantial changes in the agricultural development approach occurred during the beginning of the country's fourth Five Year Plan. The change was due to some policy changes such as a more liberal trade regime, an outward looking economic policy, a focus on rural development and increasing farmers' income, sustainability and environmental issues, and the aim of agricultural development to support agroindustry.

An important approach known as the agribusiness system approach focuses on vertical coordination of each sub-system in agriculture, i.e. input marketing and distribution, production, processing and marketing which can be harmoniously developed to improve the whole system of agribusiness. In this concept, the role of the market is considered the most important. Many failures in agroindustry development are caused by market inefficiency where the market fails to generate economic incentives to all agribusiness participants. Some studies in the Agribusiness

Development Project identified the market structure and market uncertainty as the main factors of agribusiness failure (Kilmer 1993).

In addition, special attention on particular commodities such as rice, soybean, wheat, and sugar played a significant role. To boost food production, diversification, intensification, extensification, and rehabilitation programs were intensified. In general the self sufficiency in rice attained in 1984 can be maintained although production fluctuates and is very sensitive to small changes in conditions such as drought, flood or pest outbreaks. Food security and price stabilization are the main reasons for the government's deep involvement in the marketing of these commodities due to the sensitive food problem. In addition, secondary crops have also been on the list of development priorities. Research and investigation on biotechnology, cultivation and product development are continually conducted by the Agency for Agricultural Research and Development (AARD) and other independent institutions.

The agricultural sector in Indonesia continues to be carried by smallholders. This is one of the reasons why many agricultural policies focus on small farmers, price stabilization, rice self sufficiency, input/credit subsidy, poverty alleviation, and environmental issues. The role of BULOG (Badan Urusan Logistik = National Stock Agency) is to deal with price stabilization of the most strategic commodities, such as rice, sugar, wheat, and soybean.

The outward looking policy, adopted by the government since the early 1980s, has been implemented through continuous deregulation. Imported raw materials such as wheat and maize are zero tariff, and infant industries are protected through high tariffs.

Rice self sufficiency has continually been the priority in Indonesian food policy. Rapid conversion of rice fields (*sawah*) into industrial and public facilities in Java (estimated at 16 - 30,000 ha per year) will clearly affect rice production. Although there are new openings of agricultural area in the other islands, primarily Kalimantan and Sumatra, one should note that the land productivity is much lower than that in Java.

The government intends Indonesia to be self-sufficient in soybean. High and continually increasing demand for this crop indicates the possibility to transfer income from soybean to producers. With regard to price stability, the government is mainly involved in rice and soybean.

Maize becomes increasingly important due to the expanding livestock industry in Indonesia. Indonesia is a net maize importer. With the high growth of the poultry industry in Indonesia, demand for maize is increasing because about 50% of the feed consists of maize. Similarly, demand for cassava in Indonesia has increased lately. Indonesia has almost never met the preferential cassava export quota set by the European Union. Currently, with increasing demand for tapioca in the textile and confection industries, there are larger tapioca imports from Thailand and Vietnam.

Fertilizer has been subsidized since the 1950s when the rice production program was launched. In 1970 the farm formula determined the fertilizer price = unhusked rice (*gabah*). The formula has encouraged farmers to apply more fertilizer per hectare. The price of fertilizer relative to rice declined during the period of 1960-1982. Since 1983 there was a readjustment of fertilizer prices. In 1995 the subsidy on phosphate fertilizer (TSP) was removed and the subsidy to nitrogen fertilizer (urea) was reduced significantly.

Currently the fertilizer price in Indonesia is about the lowest in the Asean region (Table 2). The fertilizer price is continually adjusted along with the floor price of rice. The fertilizer/rice price ratio, however, has remained almost unchanged at around 0.71-0.79 over the recent years. The floor price of rice has not been very effective so far, because the prevailing price in the market during the harvest season actually dips on occasion below the floor price. However, the ceiling price of rice is effective. BULOG will immediately undertake market operations, releasing stock if the price is higher than the ceiling price.

**Table 2 Price of fertilizers (US $) in Asean countries, 1993.**

| Country | Urea | TSP | ZA |
|---|---|---|---|
| Indonesia | 116.03 | 149.88 | 116.03 |
| Malaysia | 198.04 | 233.68 | 97.37 |
| Philippines | 209.50 | n.a. | 137.97 |
| Thailand | 204.69 | n.a. | 116.07 |

Fertilizer use in Indonesia has been exceptionally high compared to that in neighboring countries. The government has determined the recommended level, but farmers have been using far above the recommended level. It is not easy to convince farmers that they have been using too much fertilizer. This is the result of cheap price fertilizer policy adopted since the Bimas program (Bimbingan Massal = Mass Guidance) was launched in 1968.

The prime task of the government in the seed and planting material market is to guarantee that good quality seed and planting materials are made available to farmers at the right time, right place and right price. The government has subsidized rice seed since the rice production program in the late 1950s. This has never been done for secondary crops. Farmers usually buy their seed at market prices, although new varieties are always introduced through intensive extension programs. In contrast, high quality seed and plant materials other than rice are limited. The certified seed production and distribution system needs improvement. In 1992/93 seed production was about 20-50% of the requirement. If the seed problem is not immediately solved, increasing yield will be difficult to realize.

A credit program was developed in 1968 as part of the program. Subsidized credit (with interest of 12% pa) is given to rice farmers for fertilizers, insecticides, seed and the cost of living. This in kind credit was then changed to cash credit, so farmers have more options to vary the composition of the input. KUT (kredit usaha tani = farm credit) was introduced in the late 1980s. In this credit scheme a group of farmers, led by a leader and guided by the KUD (koperasi unit desa = village unit cooperative), proposes a credit package collectively. Farmers return the credit to the BRI (Bank Rakyat Indonesia = People's Bank of Indonesia) through KUD. This scheme has been modified due to high levels of bad credits.

Irrigation up to tertiary level in Indonesia is mostly a public investment. An irrigation fee has been introduced in the last 10 years, but it is still highly subsidized. The irrigation cost in Pelita I was Rp 114.4 billion. In Pelita II, it increased to Rp. 617.1 billion, in Pelita III to Rp. 1,908.2 billion, and in Pelita IV to Rp. 2,294.6 billion. Irrigation development includes rehabilitation, new construction, swamp/tidal areas, and river/flood control. All irrigation infrastructures are generally public facilities.

The government funds research and development. Agricultural innovation and technology resulting from government funded research and development are disseminated through extension workers. Currently there are more than 50,000 extension workers in the Directorate General of Food Crops alone.

## Marketing policies

Price stabilization policies adopted by the government since the early 1960s have been continued. Floor and ceiling prices of rice were established; however, only the ceiling price is usually effective.

The price of soybean cake as a raw material for feed is set by the government with a slight price variation. BULOG imports soybean and supplies a national soybean crusher. The soybean

cake is distributed by BULOG. Feed industries are required to buy 20% of their required soybean cake from BULOG and import the remaining 80%.

Maize, cassava, and sweet potato are not under price control by the government. The domestic market, however, is severely controlled by buyers, because the market for these commodities is nearly oligopsonic.

The role of BULOG is increasing since it is carrying out importation and distribution of wheat, sugar, rice, soybean, and maize. The last deregulation package (May 23, 1995) eased some regulation and significantly reduced the import tariff of some inputs and raw material crops (change from 5% to 0% tariff). In general tariffs that were at the 0-5% level did not change. This includes wheat, rice, flour, soybean, palm oil and sugar (Table 3).

The general policy instruments applied to food commodities are shown in Table 3.

**Table 3 Policy instruments applied to food commodities.**

| Policy Instrument | Rice | Cassava | Maize | Soybean |
|---|---|---|---|---|
| **Farm level** | | | | |
| Public investment: research, training and extension | + | + | + | + |
| Land development | + | – | – | – |
| Irrigation system | + | – | – | – |
| Machinery | – | – | – | – |
| Input subsidies | | | | |
| Research | + | + | + | + |
| Seed/Plant materials | + | – | – | – |
| Fertilizer | + | + | + | + |
| Insecticide | – | – | – | – |
| Credit | + | – | – | – |
| Guarantee price, floor price | + | + | – | – |
| **Marketing and processing level** | | | | |
| Marketing boards | – | – | – | + |
| Price support programs | + | – | – | – |
| Food subsidy to consumers, ceiling price | + | – | – | – |
| Support for investment, priority | + | | – | – |
| **International trade** | | | | |
| Import tariff and surcharge | + | – | – | + |
| Export subsidies | – | – | – | – |
| Non-tariff barriers | – | – | – | – |
| Export promotion | – | – | – | – |

## Trends in food consumption

The budget share for rice and cereals, fruit and vegetables, and fish, meat, eggs and milk changed significantly in the last 10 years. The consumption of fish, meat, eggs and milk, prepared food, and food away from home is still low but increasing rapidly. This increase probably occurs in the emerging middle income group.

This trend is mainly related to:

- Increase in real income. In the last 20 years per capita real income increased four-fold and has created new demand for better quality and larger quantity food commodities. Growth of average per capita real income in Indonesia is about 3-4%. In the 1970-1995 period, per capita income per year has increased from around US $ 200 to US $ 800. Consumers gradually change their consumption pattern, increase consumption or shift to better quality food.

- Working conditions have changed in the last 25 years. Better accessibility and transportation facilities make it possible for one to commute to work at a location far away from home.
- Women's participation in the labor market has increased tremendously, especially in the urban areas. This has immensely influenced consumption patterns.
- Greater access to information and new food items through TV commercials, newspaper, radio and other media has affected consumption patterns.
- Increase in the average education level in the last 20 years has contributed to awareness of health.

Consumption of prepared food is still low but increasing rapidly at a rate of 10.5% per year. Unfortunately, the consumption away from home is not recorded in the survey. The consumption of cereals and tubers has declined; in 1993, consumption of these commodities were about 3% less than in 1987 (Table 4). On the other hand, consumption of meat, fish, egg, milk, and prepared food increased significantly. Average calorie consumption as indicated by *Susenas* 1987, 1990, and 1993 has not changed significantly. Protein consumption has a similar trend to that of calories. Cereals contributed 67% of calorie consumption in 1987, Then it declined to 64% in 1990 and 1993. In general the consumption pattern has been relatively unchanged over the last decade.

Consumption of almost all food commodities, except cereals, tubers, vegetables, and fruits increased parallel with income improvement. Consumption of these commodities in 1993 increased around 20% compared to 1987 (Table 4). Cereals, particularly rice, have been the main food item for urban as well as rural people, and for consumers in all income brackets. There is almost no difference in consumption level of cereals between income group and between urban and rural areas.

Consumption of meat, fish, eggs and milk increased in line with income. Compared to the average income group (Rp 40,000 - 60,000 per capita per month), the three highest income groups consumed 50% more fish, 200-400% more meat, and 200-350% more eggs/milk. The difference in meat, fish, eggs and milk consumption was very significant between lower and higher income groups.

**Table 4 Average home consumption of calories in rural and urban areas, 1987, 1990, 1993 (calories/capita/day).**

| Commodity | Urban | | | Rural | | | Urban + Rural | | |
|---|---|---|---|---|---|---|---|---|---|
| Group | 1987 | 1990 | 1993 | 1987 | 1990 | 1993 | 1987 | 1990 | 1993 |
| Cereals | 1,105. 71 | 1,124.13 | 1,073. 54 | 1,295.07 | 1,300.65 | 1,278. 42 | 1,245.03 | 1,247.20 | 1,210.42 |
| Tubers | 45.95 | 42.30 | 42.91 | 125.65 | 134.50 | 118.91 | 104.60 | 106.57 | 93.70 |
| Fish | 35.11 | 37.15 | 40.33 | 33.80 | 38.85 | 40.07 | 34.16 | 38.33 | 40.14 |
| Meat | 31.89 | 28.36 | 32.25 | 12.88 | 16.38 | 15.29 | 17.91 | 20.02 | 20.91 |
| Eggs and milk | 41.21 | 37.20 | 47.49 | 15.56 | 14.71 | 18.00 | 22.35 | 21.53 | 27.79 |
| Vegetables | 37.60 | 34.23 | 34.30 | 41.29 | 42.99 | 39.49 | 40.33 | 40.33 | 37.75 |
| Legumes | 59.61 | 57.96 | 62.23 | 40.79 | 45.36 | 45.51 | 45.77 | 49.17 | 51.07 |
| Fruits | 37.45 | 37.32 | 34.93 | 40.25 | 45.28 | 39.30 | 39.49 | 42.88 | 37.83 |
| Other food items | 331.69 | 379.98 | 379.98 | 291.75 | 322.81 | 334.97 | 302.30 | 330.02 | 349.91 |
| Prepared food | 10.41 | 15.31 | 15.31 | 5.50 | 3.45 | 6.59 | 5.80 | 5.24 | 9.47 |
| Alcoholic beverages, tobacco, betelnut | 0.19 | 0.17 | 0.17 | 0.0 | 0.14 | 0.12 | 0.13 | 0.15 | 0.14 |
| Total Food | 1,735. 92 | 1,745. 81 | 1,763. 44 | 1,902.64 | 1,965.12 | 1,936. 67 | 1,858.64 | 1,901.44 | 1,879.13 |

Source: CBS, Susenas 1989, 1990, and 1993.

Consumption of calories from cereals and tubers in rural areas is higher than that in urban areas (1,278 and 119 calories compared to 1,073 and 43 calories), but higher consumption of calories from meat and eggs and milk is found in urban areas (32 and 48 calories compared to 15 and 18 calories). Rural people consume more calories from vegetables and fruits (40 and 39 calories compared to 34 and 35 calories) but fewer calories from beverages, spices, other food and prepared foods (88, 27, 12, and 7 calories compared to 106, 20, 23, and 15 calories). Better availability and diversity of food and higher per capita income in urban areas allow urban people to consume more and better nutritious food. Both urban and rural consumption trends, however, consistently increased in the period of 1987-1993. The trend of carbohydrate (cereals and tubers) consumption seem to be flattening, while consumption of animal products is increasing. Rural people consume more cereals compared to urban people (16% higher), tubers (177% higher), and fruit and vegetables (9% higher), but consume less animal products (36% lower), prepared food (60% lower) and other food items (12% lower). Total calorie consumption in 1993 was 1,763 kcal in urban and 1,937 kcal in rural areas, but these figures do not include food consumption away from home.

## Demand for CGPRT Crops

Reliable data on utilization of each upland crop commodity for different purposes such as feed, food industries, and human consumption are not available. The time series Food Balance Sheet (FBS) data provide information on the average availability of each crop per capita per year and the use for feed and food industries as well as for human consumption. These data are published by MOA and CBS. Production, export and import on the supply side are regarded as accurate, but the data on feed and food industries are generally very poor. Data on seed, feed and food industries are usually estimated as percentages of total supply. In FBS data, the portion of commodity for seed is estimated as 5%, waste around 20%, and feed 2% (see CBS: Statistik Indonesia 1993). Hence, it is difficult to estimate the trend in demand for industry for a particular commodity using FBS data.

According to FBS data, cassava is used for feed, as a raw material in industry and for fresh consumption. During the period of 1968-1992, cassava use for these purposes was relatively constant at 2-3%, 34-35%, and 61-62%, respectively. On the other side, the utilization of maize has changed significantly. In 1968-1980 less than 100 thousand tons of maize was used for feed (0.3% of total availability). In the 1990s it increased to around 400 thousand tons (0.6%). Industrial use fluctuated between 300 and 500 thousand tons (1.0%). Maize is used primarily for direct consumption (98-99%). The figure shows an increasing trend from around 2 million tons in 1960s to 5-6.4 million tons in the 1990s. Soybean has been mainly used for human consumption (98%) and this has not changed over the period of 1968-1992. Sweet potato was also used for direct human consumption. In general, demand composition of cassava, maize, soybean and sweet potato has not changed significantly.

In contrast, with the current growth rate of development of the processing industry, there is no question that demand by industry for secondary crops is high. A large portion of soybean is processed in food industries and a large amount is also processed in sauce industries. The direct consumption is actually small compared to the availability of these commodities.

## *Demand elasticities*

Various studies on rice and secondary crop demand have been conducted. These studies used secondary time series aggregate data. Table 5 presents estimated income elasticities and price elasticities from each study.

**Table 5 Income and price elasticities of rice and secondary crops.**

| Source | Rice | Maize | Cassava | Soybean |
|---|---|---|---|---|
| **Income Elasticity** | | | | |
| IPB[1] | 0.34 | 0.31 | 0.35 | 0.56 |
| MOA[2] | 0.29 | 0.39 | 0.26 | 0.54 |
| IPB[3] | 0.26 | 0.38 | 0.02 | 0.54 |
| Rosegrant[4] | | | | |
| Altemeier and Bottema[6] | 0.33 | 0.41 | 0.10 | 0.75 |
| CASER[7] | | | | |
| Rural | | | | |
| Low | 0.20 | -0.10 | 0.20 | 0.80 |
| Medium | 0.10 | -0.20 | 0.10 | 0.60 |
| High | 0.03 | -0.30 | 0.05 | 0.35 |
| Urban | | | | |
| Low | 0.15 | -0.10 | 0.10 | 0.70 |
| Medium | 0.07 | -0.30 | 0.05 | 0.50 |
| High | 0.02 | -0.50 | 0.02 | 0.30 |
| **Price Elasticity** | | | | |
| MOA | -0.17 | -0.19 | -0.37 | -0.69 |
| IPB[3] | -0.08 | -0.21 | -0.17 | -0.66 |
| Squire[5] | -0.15 | -2.27 | -0.19 | |
| Altemeier and Bottema[6] | -0.097 | -0.33 | -0.17 | -0.54 |
| CASER[7] | | | | |
| Rural | | | | |
| Low | -0.40 | -0.60 | -0.60 | -0.60 |
| Medium | -0.25 | -0.40 | -0.45 | -0.50 |
| High | -0.12 | -0.30 | -0.30 | -0.40 |
| Urban | | | | |
| Low | -0.35 | -0.50 | -0.45 | -0.60 |
| Medium | -0.20 | -0.30 | -0.30 | -0.50 |
| High | -0.08 | -0.20 | -0.20 | -0.30 |

Source: [1]Using time series cross sectional data: *Susenas*, 1981, 1984.
[2]MOA, using AIDS model, time series data 1968/69-1982/83.
[3]IPB, using time series data 1969-1990.
[4]Rosegrant et al. 1987.
[5]Squire 1991.
[6]Altemeier and Bottema 1991, time series 1969-1988.
[6]Assumption made by CASER (1992) in estimating demand for those crops in year 2000-2005 (Food Situation and Outlook for Indonesia).

Earlier studies by IPB (using 1981 and 1984 data), MOA (1968-1983 data), IPB (1969-1990 data), Rosegrant (1984 data) and the Altemeier and Bottema (1968-1988 data) found fairly high price and income elasticities. CASER estimated significantly different income and price elasticities. CASER used lower income and price elasticities in the 1990s for estimation of the food situation in 2000-2005.

The earlier income elasticity estimates which used 1980s data are probably not accurate to represent the current situation. It is believed that the elasticities will not exceed 0.2. In this estimation simple equations will be applied to the Susenas 1993 data. With this cross sectional data, it is assumed that there is no price effect. Lack of good data on secondary crop use for feed, industry and

food processing makes it impossible to estimate separate demand for feed and industry using the common model as required in the proposal of this study.

*Income elasticity estimation*

Total consumption is equal to direct human consumption plus other uses for feed and raw material for processing industries. Total consumption of a crop or total availability in FBS data is considered to be accurate and can be used to estimate income elasticity. The real price is assumed to be constant, therefore it is not included in the model. Direct human consumption in *Susenas* survey data is used to estimate income elasticity of demand for direct human consumption. The demanded quantity for direct human consumption is simply the per week average consumption multiplied by 52, and then by total population in the respective year (1993).

The model for estimating income elasticity of total demand and human consumption demand is:

$$\ln(Q) = a + b \ln(Y) \quad (1)$$

where Q is quantity demanded/capita and Y is real income/capita.

The growth rate of total demand for each crop is:

$$r_q = r_p + e_y r_y \quad (2)$$

where $r_q$ is the growth rate of demand, $r_p$ is the growth rate of population, $e_y$ is income elasticity, and $r_y$ is the growth rate of real income per capita.

The total demand in 1995-2000 is calculated using the model:

$$Q_{t(n)} = Q_{t(0)}(1 + r_{qt})^n \quad (3)$$

where $Q_{t(n)}$ is the total quantity demanded in year n, $Q_{t(0)}$ is the total quantity demanded in year 0, and $r_{qt}$ is the growth rate of total quantity demanded from equation (2). Similarly the direct consumption quantity demanded is calculated using:

$$Q_{c(n)} = Q_{c(0)}(1 + r_{qc})^n \quad (4)$$

where $Q_{c(n)}$ is the direct consumption quantity demanded in year n, $Q_{c(0)}$ is the direct consumption quantity demanded in year 0, and $r_{qc}$ the growth rate from equation (2).

The industrial demand is calculated as a residual of total demand minus fresh consumption, or:

$$Q_i = Q_t - Q_c \quad (5)$$

where $Q_i$ is the industrial quantity demanded, $Q_t$ is the total quantity demanded, and $Q_c$ is direct consumption quantity demanded.

The difference between the projected total demand and food demand is the estimate of industrial (food and feed) demand. The total quantity demanded for each commodity is estimated using time series (1960-1992) data from FBS table by regressing total availability ($Q_t$) with real GDP/capita (GDP/CPI in the respective year). The income elasticities of total demand are presented in Table 6.

**Table 6 Estimated income elasticity of selected secondary crops.**

| Crop | Income Elasticity of Total Demand* |
|---|---|
| Cassava | 0.1100 |
| Maize | 0.3517 |
| Soybean | 0.1282 |
| Sweet potato | -0.0482 |

* Calculated from FBS data, 1968-1992, using the model ln(Q) = a + b ln(Y), where Q is total availability of the commodity in the respected year, and Y is real per capita income.

Income elasticity of demand for direct human consumption was calculated from 1993 *Susenas* survey data by simply regressing consumption with the mean value of the class of expenditure using a double log function model. The income elasticity estimates are presented in Table 7. Since the consumption does not include the amount of the commodity for feed and food industries, the income elasticities in Table 7 are clearly different from those in Table 6.

As shown in Table 7, direct human consumption, with the exception of rice, declines as real income increases.

**Table 7 Regression coefficients of the double log function.**

| Commodity | Constant | Coefficient* |
|---|---|---|
| Cassava | 2.324611 | -0.59479 |
| | | (0.178522) ** |
| Maize | 4.084088 | -1.131360 |
| | | (0.139309) |
| Rice | -0.28752 | 0.124738 |
| | | (0.053071) |
| Sweet potato | 1.086036 | -0.44389 |
| | | (0.05625) |
| Soybean | -3.26354 | 0.112066 |
| | | (0.063837) |

* The coefficient represents income elasticity.
** Numbers in parentheses are t statistics.

The coefficients indicate that cassava, maize and sweet potato are inferior commodities for direct human consumption. Every 1% increase in income will result in a 0.59% decrease in average consumption of cassava. Similarly, 1% increase in income will cause 1.13% decrease of maize consumption, and a 0.44% decrease of sweet potato consumption. On the other hand, consumption of rice and soybean will increase with increase of income, by 0.12% for rice and 0.11% for soybean for every 1% increase in per capita real income.

### *Demand projection*

The demand projection uses equations (1) to (5). The population growth according to the last population survey by CBS (1990) was 1.89%. It is assumed that in the next 10 years the population growth will be about 1.6-1.8%. The government has also targeted a population growth of 1.6% for the sixth Five Year Plan (Pelita VI). Further, GDP in dollar terms increases about 7-8% yearly. Adjusted to population growth and inflation, the per capita real income increase is about 3-4% annually.

In the calculation, population growth is assumed to be 1.6% per year and growth of real income 2.5% per year. Since the real prices of the commodities are assumed constant, the price factor from the quantity demanded estimation can be excluded. For human consumption, the average consumption/week was multiplied by 52 and then by the total population in the respective year. The projected total population in 1993 was 187 million.

The projected total demand, direct consumption demand and industrial demand are given in Table 8. Note that industrial demand here is actually the apparent non-direct consumption demand. It includes all uses in households, mini, small, medium and large industries, simple processing by small food traders and other indirect consumption. More than 75% of cassava, 86% of maize and 99% of soybean is processed in various industries from household to large industries. Currently only 47% of total available sweet potato is processed. More than one-half (53%) of sweet potato production is for direct consumption.

Some preliminary conclusions can be made from these findings, namely:

- Direct consumption of secondary crops is actually slight. A large proportion of the production of these commodities is processed in food or feed industries. Therefore, the development of secondary crops should focus on marketing and processing improvement.
- The secondary crops creats substantial added value and economic activities in processing and marketing. The secondary crops have a wide diversity of possibilities for processing. From the production-marketing-processing linkage, secondary crops have wider prospects than the traditional crop of rice.
- Effective promotion of secondary crop processed products is necessary to improve the image and status of these commodities consumers.

**Table 8 Growth of demand and projected demand for some upland crops in 1995-2000.**

| Crop | Growth of Demand (%) | Projected Demand ('000 tons) 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|---|---|---|---|---|---|---|---|
| Total demand | | | | | | | |
| Cassava | 1.7275 | 14,945 | 15,202 | 15,465 | 15,732 | 16,004 | 16,281 |
| Maize | 2.5793 | 5,093 | 8,302 | 8,516 | 8,736 | 8,961 | 9,192 |
| Soybean | 2.0205 | 2,462 | 2,512 | 2,563 | 2,615 | 2,668 | 2,721 |
| Sweet potato | 1.5795 | 1,999 | 2,030 | 2,062 | 2,095 | 2,128 | 2,162 |
| Human consumption demand | | | | | | | |
| Cassava | 1.481 | 3,745 | 3,800 | 3,856 | 3,913 | 3,971 | 4,030 |
| Maize | 1.373 | 1,098 | 1,113 | 1,128 | 1,143 | 1,159 | 1,175 |
| Soybean | 1.622 | 20 | 20 | 20 | 21 | 21 | 21 |
| Sweet potato | 1.511 | 1,060 | 1,076 | 1,093 | 1,109 | 1,126 | 1,143 |
| Industrial demand* | | | | | | | |
| Cassava | | 11,200 | 11,402 | 11,609 | 11,819 | 12,033 | 1,251 |
| Maize | | 6,995 | 7,189 | 7,388 | 7,593 | 7,802 | 8,017 |
| Soybean | | 2,442 | 2,492 | 2,543 | 2,594 | 2,647 | 2,700 |
| Sweet potato | | 939 | 954 | 969 | 986 | 1,002 | 1,019 |

* Industrial demand includes demand of households, mini, small, medium and large industries.

## Domestic demand and market potential

### *Soybean*

Soybean is an increasingly important grain in Indonesia, both as a food and as an industrial commodity. Considerable research on different aspects of soybean has been accomplished in Indonesia (Syam and Musaddad 1991; CGPRT 1992; Purwoto et al. 1993; Silitonga and Erasnita 1986). National soybean production in 1994 was around 2 million tons. In the Asia-Pacific region, soybean production in Indonesia was the third largest after China (10 million tons) and India (3 million tons). During the period of 1980-1992 soybean production grew at a rate of 9.5% per annum. This rapidly increasing production, however, could not meet the growth rate of demand for soybean in food and feed industries. The current demand for soybean increases up to 12% a year. Up to now Indonesia has been a major soybean importing country. In the last 3 years the soybean import was about 600 thousand tons annually and it is increasing steadily. In 1980 the soybean import was 193 thousand tons and in 1991 it increased more than 3 times to 673 thousand tons. The growing domestic poultry industry is the main cause of the increasing soybean meal importation.

The substantial role of this crop in the Indonesian economy has forced the government to pay special attention to soybean production and marketing. For decades soybean importation has been

under the control of the government although the domestic supply/demand mechanism is not particularly regulated.

Several important constraints in soybean development associated with natural and economic characteristics of the crop are:

- Naturally it is difficult to compete with subtropical soybean producers like USA and China because soybean grows better in subtropical regions. The current yield of 1.1-1.2 ton/ha is far lower than that in subtropical countries.
- Insufficient high quality seed and other inputs have been a significant problem for soybean development in Indonesia. The supply and distribution of seed and other inputs need to be improved.
- Soybean in Indonesia competes with rice, which has been the top priority in commodity development in the country. Unless soybean is grown in non rice irrigated fields, competition between the two crops in using land resources will continue.
- Demand for soybean for human food in Indonesia is very high. Although Indonesia is the third largest producer after China and India, the per capita consumption is higher than in China and India.

*Cassava*

Up to the past decade, direct human consumption of cassava was limited. However, the future of cassava will depend very much on the growth of demand for food and industrial uses. In the last 10 years, the growth rate of cassava production was about 3.8% per annum. However, area harvested grew by 1.39% a year. In the period of 1960-1992 the harvested area declined considerably. The increase in production was mostly due to increase in yield because of adoption of improved cassava varieties and chemical fertilizers. It is clear that increase in production resulted from the increase in yield rather than area expansion. The average yield of cassava was 12.2 ton/ha, but the potential cassava yield may be up to 20-30 ton/ha. The wide gap between potential and actual yield of cassava is due to improper adoption of modern technology by farmers. Technology adoption will increase cassava production as well as farmers' income.

Market development constraints of cassava can be summarized as follows:

- Cassava is a low profit commodity. For farmers, cassava is usually the lowest priority crop to grow. Current agricultural technology improvement is moving to high price intensive and non-land based commodities. Coupled with increasing land rent, cassava cultivation will face a high opportunity cost.
- Cassava is usually grown in marginal land areas, hence it requires high fertilization to maintain soil nutrients. This environmental concern conflicts with the fact that cassava is a low profit crop.
- Cassava farmers have to assume the market risk associated with the naturally bulky cassava. To manage this, farmers usually keep the crop in the field until they fix a selling price with the buyer. Therefore, farmers prefer to sell under the *tebasan* system.
- Traders and processors of fresh cassava gain much higher profit per unit weight and time than farmers do. Fresh cassava traders and processors also gain higher profit than *gaplek* traders and exporters. This is actually an indication that traders and processors take advantage of the risk associated with the perishability of cassava. While cassava farmers have to carry the burden of risk and price fluctuation, traders and processors will always get a positive profit margin regardless of the farm gate price. In other words, although the cassava marketing system involves only a few marketing channels, the system has not guaranteed the distribution of risk and benefit evenly among the market participants.

Farmers have low bargaining power, carry all the market risk, and obtain the lowest benefit from the whole marketing system. This is the constraint for cassava economy development in Indonesia.

*Maize*

Maize is the second most important food commodity in Indonesia after rice. For the Madurese and some of East Javanese ethnics, maize is the main foodstuff. However, consumption is declining as real income increases. Since the expansion of the poultry industry in the early 1980s, a substantial amount of maize has been used for feed. Total production of maize in 1992 was more than 7 million tons, which was the third after China (95.34 million tons) and India (9.74 million tons). In the past Indonesia was a maize exporting country, but now the export is declining and import is increasing.

The maize yield can be improved significantly by use of improved varieties of seed and proper application of new technologies. In Central Java 59% of farmers use a local maize variety, 11% use old national improved varieties, 26 % use a new national variety, and only 4% use hybrid seed.

Market development constraints are associated with technical and institutional aspects. Since the import market is completely open, domestic production faces a difficult position competing with imported maize, particularly if the yield is not improved through cultivation and biological technology. Hybrid maize seeds are now available in the market but the price is still considered expensive and many farmers can hardly afford the seeds. Fertilizer prices continue to increase, although currently the price is less than in neighboring countries. Phosphate fertilizer is no longer subsidized, and the nitrogen fertilizer subsidy has been significantly reduced.

Another important constraint is the unstable price which has increased farmer's uncertainty. The weak bargaining position of farmers in the market results in a great loss if production increases. The poor marketing institution does not provide economic incentive to farmers to produce a larger quantity and better quality of maize. This cycle occurs continually and will improve only with the existence of a mechanism that guarantees a good price to farmers.

*Sweet potato*

In the secondary crop group, sweet potato harvested area is the lowest. In 1991 sweet potato harvested area was only 224,000 ha, much lower than that of mungbean, soybean, maize, and cassava. Apart from high family labor income from sweet potato (see CBS: Cost Structure), its production, harvest and planting area have not greatly expanded. Sweet potato harvested area declined from more than 300 thousand ha to around 200 thousand ha in the 1980s and 1990s. Yield increased from 8.7 tons/ha in 1988 to 9.5 tons/ha at a rate of 1.79% per year. Productivity flattened since 1991 at 9.5 tons per hectare. Total production is almost unchanged with a growth rate of 0.03% per year, which indicates little incentive and demand for sweet potato, regardless of increasing uses of sweet potato for various industries.

Several conclusions can be drawn regarding sweet potato marketing:

- The market for sweet potato is relatively small and, therefore, does not create incentive to farmers. Increasing production under the current consumption pattern will result in a price decrease, primarily because of the oligopsonic power.
- Fresh root consumption of this crop is declining. Creating demand for further processing is essential to develop a better sweet potato market.

- Current methods of transaction and marketing are considered a disincentive for sweet potato market expansion. The degree of uncertainty in sweet potato transactions has kept the farm gate price low and there is no incentive for quality improvement.
- The highly concentrated market structure results in a weak bargaining position of farmers. This condition may lead to exploitation and hampers sustainable market expansion.

A common problem in sweet potato processing industries is the lack of raw material in terms of quantity, quality and continuity. The Indonesian farm structure is not only small, but also scattered, which makes the collection cost, collection time and post harvest damage exceptionally high.

Non continuity of supply is the main constraint for agroindustrial development and sweet potato processing. The sweet potato processing industry often fails to meet the agreed delivery time in the export market. Weak vertical coordination in the raw material market has hampered the processing industry. In the absence of economic incentive to farmers, production and quality of the product are difficult to improve. It is obvious that institutional aspects are dominant in this situation. A mutual and beneficial relationship between farmers and the processing industry has to be established to improve the farm-industry linkage. Poor marketing institutions such as the market structure, price information, and pricing mechanism have put farmers in a weak bargaining position in the marketing of their product. Although price information may be available at the price information center or announced over the radio, the prevailing price is usually to the advantage of the buyer.

## Emerging upland commodities

### *Cabbage*

Cabbage has good prospects for the export market for several reasons: (a) a considerable potential area suitable for cabbage growing exists in Indonesia; (b) there is increasing demand for cabbage and Indonesia is close to importing countries such as Singapore, Malaysia, and Hong Kong; and (c) the government strongly supports horticulture development. Cabbage grows in many parts of Indonesia, such as Brastagi (North Sumatra), Bogor and Bandung area (West Java), Dieng area (Central Java), Malang area (East Java), and North Sulawesi. A new production area was established in South Sulawesi a few years ago and it has changed South Sulawesi from a vegetable importer to an exporter.

Cabbage is a high risk commodity because of its sensitivity to climatic change, pests and diseases, besides its perishable and bulky characteristics. Long rainy periods stimulate mold diseases and pests. Farmers also tend to use a large amount of insecticides, which could be a disadvantage in the long run.

The yield of intensively-cultivated cabbage is 22-40 tons per ha, the total production cost Rp 6.0 million per ha (not including land rent), and the sale price Rp 200 to 250 per kg. Profit varies between Rp 0.5 and 1.2 million per hectare of harvested area depending upon the sale price of the product. The high production cost is the primary constraint, due to farmer's limited capital.

The handling cost is usually high and there is a large price difference between production and consumer areas. The price at the production area (the farm gate price) ranged between Rp 196 and 393/kg in 1994, and the consumer market price was Rp 197-993/kg (DGFCH 1995). Product damaged during transportation is around 20% at the village market, and 20% at the consumer market due to poor handling, packaging and transportation facilities.

Strategy to improve cabbage exports and horticultural crops in general should emphasize the improvement of cultivation technology and marketing institutions. The main constraints to this vegetable market are:

- Limited capital hampers cabbage farmers from using the best technology available, and does not allow farmers to escape the detrimental system of illegal financial markets.
- Seed and planting materials are expensive and not easily available at the production areas.
- The market structure tends to be oligopsonic and gives farmers little bargaining power in the produce market. This condition discourages farmers from improving both quantity and quality of the product.
- The supporting facilities such as transportation, packaging industries and cold storage facilities are inefficient.

### *Mango*

Mango is a promising fruit to cultivate for several reasons. Besides Indonesia's suitable climatic conditions, the market for exotic tropical fruits is increasing. The large number of mango varieties in Indonesia has been an advantage as well as a disadvantage. Some varieties are highly respected as exotic tropical fruit, while others are more suitable for juice. The sweetness, aroma and the color of the fruit also vary. Consumer preferences also differ considerably. However, the fruit's genetic characteristics developed in research and development have not been focused for a particular market, which usually demands standardized size, sweetness, color, and performance. Mango is usually not commercially grown but is grown in home yards. Mango production is very seasonal with the peak season varying between Java (July-September) and South Sulawesi (August-January).

The domestic market of mango is highly seasonal and mango is only available in the market during the season. Cool storage for mango is not common due to the rapid change in aroma and flavor. The price of high quality mango in Indonesia is higher than the FOB price (ADP 1995). Income elasticities of demand for mango in South Sulawesi and East Java in 1993 were 0.76 and 3.06. As indicated by income elasticity, a 1% increase in real income in East Java will increase mango consumption by more than 3%. Inelastic income elasticity in South Sulawesi may be related to low quality mango in this area.

The market prospects of mango are also related to the increasing orchard type plantation using high quality varieties and professional cultivation. A significant improvement in mango exports is due to:

- high quality orchards which have been developed in East Java;
- establishment of new production centers all over the country;
- new marketing arrangements being developed by these orchards with farmers; and
- new marketing methods such as mail order, which have also been developed in East Java.

### *Potato*

Potato is an important vegetable in Indonesia and in the export market. Potato production increased at a rate of 4% annually during 1988-1993. In 1981 the harvested area was 30,278 ha, production 216,713 tons, and yield 7.16 ton/ha. In 1984 demand for potato grew 17.6% per year, while production growth was 13.2%. Potato market prospects have received sufficient response from farmers. The harvested area increased, and planted area expanded not only on the highland plateau but also at lower altitudes. The harvested area remained around 30-32 thousand ha until it increased rapidly in 1988. In 1988 the harvest area was 38,983 ha and production 418,154 tons, almost double than in 1981. In 1993 harvested area was 54,802 ha, production 866,840 tons and yield 15.8 ton/ha. The largest potato producers in 1993 were West Java (12,339 ha), Central Java (12,991 ha), and North Sumatra (11,766 ha).

During the last decade potato production multiplied as much as four times due to the increase in harvested area (almost doubled) and yield (more than doubled). This large increase in production is just about parallel with the increase in demand of about 20% per year. The government has actively supported this market expansion. In general the government's intention to support the development of horticultural crops is due to:

- The development of horticultural crops has been far left behind compared to cereal crops.
- Horticultural development has a large potential because of the area availability, climatic condition and market prospects.
- Horticultural crops have potential as new sources of agricultural growth as rice and traditional crops approach the leveling off stage.

Potato export has potential and will become a large source of foreign earning. Greater efforts to improve export include: (a) auction markets at production areas, which are important to improve market efficiency; (b) credit provision for farmers to encourage the implementation of cultivation technology; (c) provision of transportation, storage, and packaging facilities at production centers, and (d) improvement of the process and pricing procedure at the central market.

## uccessful and failed domestic/export market attempts

*Cacao*

Cacao, a relatively new estate crop in Indonesia, was established in 1976. The planned expansion of cacao area during the cacao market boom in the 1970s has brought success to cacao market development, which has further promoted cacao to a rapid production increase. More than 60% of the cacao area in Indonesia was under smallholder plantations. In 1985 the smallholder plantation of cacao was 51,765 ha, state owned plantation 29,198 ha, and private large plantations 11,834 ha. The state owned plantations were located mainly in North Sumatra and East Java, which accounted for 70% of the total state owned plantation. By 1994 the state owned cacao plantation had more than doubled (68,551 ha) but North Sumatra and East Java remained as the center of state owned cacao plantation.

South Sulawesi is probably the most active in expanding the cacao plantation area. The local government encouraged farmers to grow cacao for a simple reason, that the demand for cocoa at that time was increasing. Local people returning from cacao plantations in Malaysia brought home some technical and market knowledge about cacao and became pioneers of the cacao plantation expansion in Sulawesi. Cacao was planted on large areas of uncultivated agricultural dry land. Southeast Sulawesi which regarded the commodity as a regional development priority was also a rapidly developing cacao production area.

Indonesian cacao export has increased at a high rate. In 1983 the export of cacao beans was 15,885 tons valued at $ 26.350 million with Belawan in North Sumatra as the primary port of cacao shipment. By 1993 it had increased more than ten-fold to 200,111 tons valued at $ 165.679 million, with the largest shipment from Ujung Pandang (South Sulawesi) where the largest plantation was now located.

Indonesia also exports cocoa butter. Total export of cocoa butter in 1991 was 10,509 tons worth $ 22.883 million. USA was the largest importer of cocoa butter, followed by the Netherlands, Sweden, Japan, Spain, Singapore, and other countries.

The only competitor for Indonesian cacao in Asia is Malaysia. Although the current Malaysian plantation area and production are probably lower than Indonesia's, its processing improvement has prompted the country to export processed cocoa butter and other cocoa products of better quality.

Since a large percentage of the cacao plantation in Indonesia is still in its growth phase, production is expected to increase in the near future. About 16% of state owned plantation, 52% of large private cacao plantation, and 35% of smallholder plantations were under 4 years of age in the year 1994. In the next four years, production is expected to increase by at least 40%.

Cacao processing industries have been assisted by various government measures. Improvement of bean quality and product diversification have become the main focus to increase the competitiveness of Indonesian cacao beans and cacao products. However, there are other factors that jointly induce successful cacao development in Indonesia. These factors are:

- low labor cost;
- suitability of cacao for smallholder plantations. It is manageable by small farmers, not bulky, so transportation cost is low, with easy post-harvest processing at the farm level. All year round production of cacao secures farmers' income;
- the right timing for expansion of cacao plantation when the market for cacao was about to increase; and
- the development of cacao plantations was also followed by increasing development of domestic confectionery industries.

### *Palm oil*

The establishment of state owned oil palm plantations started in early 1960s. The state owned plantation area increased only 15% in the last 10 years from 340,511 ha in 1984 to 393,696 ha in 1994. Large private oil palm plantations expanded rapidly from 130,958 ha in 1984 to 818,979 ha in 1994. Smallholder plantations increased from 40,552 ha to 564,597 ha in the same period. These rapid changes are due to active measures of the government in supporting estate development through the NES (Nucleus Estate Smallholder) and PIRTRANS (Transmigration Smallholder Nucleus Estate) programs. The following factors are responsible for the success of oil palm development:

- expansion of oil palm plantations through the PIRTRANS (Transmigration Smallholder Nucleus Estate). The government credit policy for oil palm development boosted the oil palm estate plantation, especially the private plantation. The PIRTRANS has some advantage compared to traditional smallholder tree/estate crop plantation due to good vertical coordination between production activities by farmers and processing/marketing by the nucleus enterprise. This program became the model for estate crop development in new areas, especially Sumatra, Kalimantan, and Eastern Indonesia. The same model has been widely used for rubber, coconut, and cacao.
- the establishment of domestic cooking oil industries has been fully supported by raw material from oil palm plantations. Domestic demand for cooking oil increased steadily and prompted the government to set a policy to secure the supply of crude palm oil (CPO) for the cooking oil industry. Indonesia also occasionally imports CPO from Malaysia to supply the cooking oil industry. As demand for cooking oil increases, the market for oil palm will be secured for years in the future.
- the government also takes some measures to encourage the establishment of complementary activities in palm oil production centers such as cattle raising and fattening using oil palm by-products as cattle feed.

From the market prospect, palm oil is a competitive edible oil compared to the earlier well known soybean, coconut, and sunflower oils. The climate, temperature, humidity, and sunlight duration of tropical Indonesia provide a perfect milieu for oil palm development. Currently, oil palm is probably the most important estate crop for Indonesia and its demand is always increasing due to the wide use of this commodity. Besides its use as cooking oil, a wide variety of products from CPO

include olein, stearin, cosmetics, pharmaceuticals, detergents, and sweeteners. The large populations in Indonesia and other importing countries such as China, India, Pakistan, Eastern Europe, and African countries constitute potential markets for palm oil in the future.

Increasing investment of both domestic and foreign capital prompted the rapid oil palm production. To anticipate the more open market, new plantation areas of 100,000 hectares in West Kalimantan will be opened soon. The local government has taken some important measures related to infrastructure and facilities required to develop this commodity. The smallholder plantation under five years of age in 1994 was about 235,000 ha or 42% of the area, while for large private plantations, it was 532,000 ha or about 65% of the total area of oil palm plantation. These figures indicate that future production will be large and, consequently, will need immense supporting transportation and processing facilities.

In 1992 Indonesian palm oil production was half of that of Malaysia. Indonesia's palm oil production growth was 13.4% compared to 7.7% for Malaysia's production. With the enormous effort to boost production, Indonesia will probably become the world's largest palm oil producer in the next 10 years.

### *Canned pineapple*

Two basic models of fruit and vegetable processing exist in Indonesia. The first model, called the *vertical integration model*, is an integrated production model where all economic activities such as production of raw materials, processing and marketing are established under one management because the processing plant has its own raw material plantation. The second model, called *the vertical coordination model*, is where a large processing plant does not have its plantation, but relies on supply from a large number of farmers.

The rapid development of Great Giant Pineapple in South Sumatra is an example of a success story of the vertical integration model as found in other large plantations of rubber, palm oil, tea, coffee or cacao, where the whole planning process covers all subsystems and adequate control over the production of raw materials. The company cultivated 13,000 ha and since then the company developed into a highly competitive pineapple canning industry. In this case, the entire production and processing technology belonged to the company. The development of an estate type plantation was encouraged by deregulation of land utilization rights in 1993 which allows large investors to utilize land for up to 30 years, with possible renewal for another 30 years if necessary. This regulation allows an investor to make a longer production and investment plan. The company also implemented modern management and high technology in cultivation, processing and marketing.

### *Passion fruit*

Passion fruit is an exotic tropical fruit with an increasing consumption both in domestic and international markets. In Indonesia the more popular *markisa* juice has been widely known although a significant amount of fresh fruit is now available in the market. The total area of passion fruit in Indonesia is estimated at around 1,000 ha of purple passion fruit and about the same area of golden passion fruit. South Sulawesi and Sumatra are the main passion fruit producing areas. There are only two passion fruit processing factories in the country, both of them currently operating far below installed capacity due to lack of passion fruit supply. If the two plants fully operated, Indonesia would be one of the largest passion fruit juice producers in the world. On average, the factories in Malino, South Sumatra and in Brastagi, North Sumatra operate at 20-30% of their installed capacity.

There are actually two different views of the passion fruit problem. While farmers have no technical constraint in producing more fruit as long as the price is right, the processing company considers the price is too high for them to be sufficiently profitable.

Failure in passion fruit market development was caused by the following conditions:

- Large scale installed capacity was built without support of raw material supply. The surviving successful processing plants are usually small scale with simple processing technology which process juice for the domestic market.
- The excessive role of middlemen ruined the marketing arrangement between farmers and the processing company.
- A good relationship between farmers and the processing industry was not maintained, and a reward and penalty system was not consistently implemented.
- Passion fruit varieties of low productivity and poor cultivation techniques are other factors which make passion fruit farming not profitable to farmers.

*Pepper*

Historically, Indonesia has been a pepper producing and exporting country. In the past Indonesia's richness of spices brought this country into a prolonged and difficult period of colonization. Currently, Indonesia is the second largest in terms of area under pepper cultivation, and the first in production and export. Other pepper producing countries are Brazil, Malaysia, Madagascar, Thailand, Sri Lanka, and Vietnam. Indonesian pepper is world famous; Lampung black pepper and Muntok white pepper are regarded as standards that all other pepper in the world is compared with.

This large export, however, is limited to unprocessed or semi-processed pepper. High quality ground pepper available at the market is usually imported from Malaysia, India, USA or Europe. Indonesia, as one of the largest producers, actually has a good chance to improve the whole marketing function including quality improvement, processing and packaging. However, the practice of growing and processing pepper has not changed over the centuries. Black pepper is produced by drying the immature berry. The quality is evaluated on the basis of appearance, aroma, flavor, and cleanliness. It is clear that a proper drying process is important to produce high quality black pepper. White pepper is prepared from the fully ripe berries by removing the berries from their spikes and pericarp/mesocarp by a fermentation process. Farmers usually put the pepper in woven plastic bags and submerge the bag in a slow moving stream for 1 or 2 weeks until the core of the fruit is separated from the pericarp and mesocarp.

Although traditional pepper cultivation is one aspect that is currently being resolved, quality and processing are the major failures in the development of pepper in Indonesia. In the domestic market, processed pepper is low in quality compared to that imported from other countries, and after years of experience in producing and exporting, there is almost no improvement in the processing technique. Pepper has a large variety of related products such as black pepper, white pepper, green pepper, pepper oleoresin, black paper oil, white pepper oil, and pepper paint. These products have not been developed, although there is increasing demand for better quality pepper products.

The export earning declined steadily from US $ 148.187 million in 1987 to US $ 61.385 in 1992. In general the undeveloped pepper processing industry is a disadvantage for the pepper economy in Indonesia in terms of:

- loss of value added from processing activities;
- no alternative market for a bumper domestic pepper crop, which has a serious impact on pepper cultivation. During the price drop in 1991/92, the farm gate price of white pepper in

Lampung was Rp 900/kg or around US $ 0.40/kg. At this price pepper cultivation is no longer profitable. A large number of pepper farmers shifted to cassava or other cash crops; and

- a significant amount of processed pepper (high quality packed white pepper beans, ground pepper, and bottled ground black pepper) is imported from Malaysia, Europe and USA.

## Conclusions

- The major prospects for CGPRT crop market development rely on food and feed processing sectors. Direct human consumption is predicted to decrease due to the fact that most CGPRT crops are inferior to non-upland crops. The strong connection of CGPRT crops with processing sectors indicates that the CGPRT crops actually generate more economic activities and added value than rice. Out of the total domestic supply, 75% of cassava, 86% of maize and 99% of soybean is processed. After the achievement of rice self sufficiency, the market development of CGPRT crops should be fully supported, especially in processing techniques and product promotion.
- Although biological and cultivation constraints for CGPRT crop development are important, the main constraint is the market institution. The current marketing system cannot provide mutually beneficial and long term relationships between farmers as raw material producers and processing companies. In general, the highly concentrated nature of the CGPRT crop market has been to the advantage of processing companies to control the market. However, in return, there is no strong and competitive development of either the agricultural commodity or the processing sector.
- The highly concentrated market (such as the cassava market) and the highly distorted market due to government intervention (the soybean market) seem to have similar impacts: an inefficient market that leads to a weak/non-competitive commodity market which affects the economic activities related to these commodities. In any effort to develop the market of these commodities, emphasis should be put on improvement of the market structure. The role of middlemen has also been very high (the case of sweet potato and passion fruit). Direct transactions between farmers and processing industries have to be facilitated.
- Mango, cabbage and potato are among horticultural crops that have market potential due to future domestic as well as world demand. Their yield and export increased in the last decade, but there is a lot of room for further improvement. The main constraints are poor linkages between producers, and processing and marketing companies.
- Successful processing is characterized by strong integrated and large plantation type processing industries (the case of government owned estates, and Great Giant Pineapple). Since Indonesian agriculture is characterized by small scale and scattered farms, strong vertical coordination is required to gain the market potential of CGPRT crops. An institutional approach is probably more effective (the case of NES program).
- The failed marketing experience is characterized by poor production-processing-marketing linkages. Low quality processed products are associated with low economic incentives, especially to farmers.

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# Comments on the Indonesian Country Report

*Erwidodo*[*]

I would like to thank the organizers, particularly Dr Inagaki and Dr Kedi S., for giving me this opportunity to share my personal views on Dr Gunawan's paper. Allow me first to congratulate Dr Gunawan for his excellent presentation and comprehensive report, given his tight schedule after being promoted to his new position during the course of the study.

The study is timely and the topic has direct relevance to Indonesian policy issues. Dr Gunawan has succeeded in assessing the demand and market prospects of a number of commodities. I did enjoy reading the report, particularly on marketing aspects of soybean and cassava of which the author put in great detail in his analysis.

It is not clear what criteria were used for choosing commodities considered as upland crops and new emerging products. Why was mango chosen, given the fact that mango is widely produced in lowland areas. Why were cabbage and potatoes selected, instead of chili or onion, given their market share and economic value. I think good criteria are important and they must be described in the methods section of the report.

On the demand side of the analysis, I understand that Dr Gunawan has faced difficulties getting reliable and accurate data particularly on the demand for food and feed processing industries. It is hard to believe the figures in the Food Balance Sheet (FBS), that the demands for food and feed industries for the crops have been very low and constant for a long period of time (1968-1992), as indicated in Table 4.1. Therefore, I accept the author's initiative in estimating the demand for feed and food industries using simple regression analysis (as the difference between total quantity demanded and total demand for direct consumption). However, I would like to suggest that the author use the recent input-output table (a desegregated one) to calculate the inter-industry demand as well as the final demand and the demand for export of the corresponding crops.

Even though not heavily distorted as in the case of soybean and rice, there is a strong indication that markets of upland crops are imperfect, as indicated by a high degree of market concentration, particularly at wholesaling, exporting and processing levels. As in the case of market distortion, this market imperfection also generates inefficiency and unfair distribution of economic incentives, and in turn discourages product market expansion and development. It would be very useful if detailed analysis of market structure-conduct-performance were undertaken, as was done for soybean and cassava.

I have no objection to the use of simple partial analysis. However, simple analysis with an outdated data set calls for caution. The author should take into account factors associated with rapid change in the world market environment in the years to come. In other worlds, the author should take into account trade liberalization agreements (AFTA, APEC, GATT) in doing food demand projections and estimating market prospects.

The policy recommendations appear to be too broad and too general, so that they have no direct connection to upland crops. Policy recommendations should be more specific in addressing upland crops in general or directed to a specific upland crop.

[*] Center for Agro-Socio Economic Research, Bogor, Indonesia.

I believe that the results of this study are useful not only for researchers undertaking further research, but also for policy makers.

# Comments on the Indonesian Country Report

*I Wayan Rusastra*[*]

In my mind at least, there are two general hypotheses dealing with upland crop development in Indonesia (maize, soybean and groundnut):

- The hypothesis that crop production is efficient but poor, because there has been no significant improvement in technology for upland crop development. If we accept this hypothesis it means that technological adoption in the upland area has already occurred. If this is indeed the case, marketing efficiency improvement will have little impact on farmer income and may have no impact at all on the production side.
- The hypothesis that we can apply the same approach for upland crop development as for irrigated wetland crop development. We can introduce a certain package of technology for a certain commodity for all upland areas.

However, the microclimates and soil conditions in upland areas are quite variable. In this case there is wide variation in economic or technical inefficiency for certain upland crop production systems. The solution in this respect is not improvement of the managerial skill of the farmer, but the generation of specific technology for a specific location in the upland area. Therefore, the real problem of upland crop development is not in the demand side (or marketing is not the main problem), but in the supply side. Increasing the yield of most crops is the highest priority.

If it is true that the first limiting factor in marketing improvement is market structure, as stated in the conclusions of the study, then any effort to improve marketing efficiency such as price support policy, reducing marketing cost, etc., will not give significant improvement in this regard.

Even though the demand side is no problem, in the sense that price is quite attractive, price transmission does not run well.

Is there a direct policy instrument to solve this problem, in terms of increasing the competitiveness of marketing of commodities?

[*] Centre for Agro-Socio Economic Research, Bogor, Indonesia.

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# Market Prospects for Upland Crops in the Philippines

*Josefina M. Lantican*[*]

## Introduction

The Philippines has a total agricultural land area of 12.6 million hectares, representing 42% of the country's total land area. About 9.45 million hectares are classified as upland. Among the crops, rice occupies the largest area accounting for 26% or 3.3 million hectares, followed by maize with 3.1 million hectares. Aside from the grain area, 38.8% of the total farm hectarage is planted to major crops, led by coconut which alone covers 3.1 million hectares. The other leading crops grown, in terms of planted area, are sugarcane, banana, sweet potato, coffee, abaca, tobacco, rubber, pineapple, and mango. Minor crops occupy 10.6% of the total agricultural crop area. These are fiber crops (excluding abaca), vegetables, legumes and other minor crops.

In terms of value of production, rice gives the highest value, followed by coconut and then maize.

## Food consumption

The last food and nutrition survey in the Philippines was undertaken in 1993. This survey showed wide variations in the amounts of food consumption between the lowest and highest per capita income groups and per capita per day food peso value, which refers to the cost of food items consumed by a household for the survey day, including those bought, own-produced and received, based on the prevailing prices. The food group/items which progressively increased with rising per capita income were other cereals and products; sugar; fats and oils; fish, meat, and poultry; eggs, milk and milk products; vegetables; fruits; and miscellaneous foods.

As for the mean daily per capita food consumption vis-a-vis the one-day per capita food peso value, increases were accompanied by rising trends in the intake of other cereals and products; eggs, milk and milk products; vegetables; fruits; and miscellaneous food items. Consumption of rice and products fluctuated and reached the highest level when the one-day per capita food peso value increased to P25.00 - P30.00.

In terms of urbanization, rural households consumed more rice and maize and products (except other cereals and products) than urban residents. Consumption of these products was 361 grams, against 318 grams in the urban areas. Other food groups consumed in greater quantity in the rural areas relative to the urban were starchy roots and tubers, fish and products, vegetables, and other fruits, owing partly to the fact that these crops are home-produced while fish are caught in abundance. As expected, the per capita consumption of more expensive food items such as sugar, fats and oils, meat and poultry products, eggs, milk and milk products, fruits and miscellaneous

[*] Bureau of Agricultural Research, Department of Agriculture, Diliman, Quezon City, the Philippines.

foods was greater in the urban areas. This could be explained by the higher average household income in the urban areas than in the rural areas.

### *Changes in food consumption*

Results of the four consumption surveys of FNRI in 1978, 1982, 1987 and 1993 indicate the general pattern of food consumption in the Philippines. From 1978 to 1982, increases in per capita intake were manifested in the majority of the food groups, while decreases of the intake in several of the food groups were observed in 1987 and 1993 compared to 1982 levels.

Comparing the results of each consumption survey, per capita intake of cereals declined from 367 grams in 1978 to 356 grams in 1982. Cereal consumption further decreased to 345 grams and 340 grams in 1987 to 1993, respectively. Decline in rice consumption, especially in 1993 was about 7%. Consumption of maize decreased but only minimally, by 4 grams daily from 1978 to 1982 and by 10 grams in 1987 compared to 1972. Maize consumption dramatically increased in 1993, posting a 50% rise over that of 1987.

Per capita intake of fish, meat and poultry was on the uptrend, posting a large increase of 21 grams per day from 1978 to 1982, then increasing slightly by 3 grams from 1982 to 1987. It decreased however, by 6.4% (10 grams) in 1993. Poultry consumption, nevertheless, significantly increased, by 56%. Consumption of vegetables was on the downtrend, which in 1993 went down by 4.5% from the 1987 level. Fruit consumption decreased slightly from 1978 to 1982, rose again from 1982 to 1987, but dropped significantly by 28% in 1993.

Intake of starchy roots and tubers fluctuated, increasing by 5 grams daily from 1978 to 1987 but decreasing by 20 grams from 1982 to 1987. This further dropped by 23% in 1993. The other high energy foods - sugar and syrup, and fats and oil - posted increases in 1982 and 1987, only to decrease again in 1993.

Fluctuations were observed for milk and milk products. Per capita intake in 1982 was up by about 2 grams daily from the 1978 level and was down by 1 gram in 1987 from its 1982 level, but increased again by 1 gram in 1993. Eggs and protein foods (dried beans, nuts and seeds) showed upward trends in 1982 to 1993.

The decrease in per capita food consumption was generally associated with the slowdown in economic activity which the Philippines began to experience in 1983, persisting until 1987. Calorie and protein intakes were influenced significantly by per capita income, one-day food peso value, meal planner's years of schooling and household size.

### *Food demand*

In the absence of up-to-date cross-sectional data on per capita food consumption in the Philippines vis-a-vis family incomes, historical data on net food supply per capita (1970-1992) for direct consumption were used. These figures were assumed to represent food consumed within each year and were used in the regression analysis. The explanatory variables utilized were the yearly real prices of food items studied and the per capita gross domestic product (GNPC) in real terms. Attempts were made to include other explanatory variables such as own price and prices of substitutes but they appeared to be insignificant and/or have opposite signs.

Fish consumption decreased in response to the increase in GNPC, but showed a positive reaction to increase in its own price. The negative behaviour of fish demand to the increase in GNPC may be due to the shift in demand in favour of other food products such as meat or eggs. The positive response of fish demand to increase in its own price could be due to a smaller increase in price of fish than its substitutes.

For meat, there was no significant increase in demand in relation to GNPC increase. As expected, meat demand dropped as its price increased. For vegetables, consumption showed a tendency to decrease as their prices increased, but the demand responded positively to the increase in GNPC.

For other food groups/items, the only explanatory variable used was GNPC in the absence of historical data on their respective prices. However, the coefficients of determination ($R^2$) came out to be very low.

### *Projected food demand*

Utilizing the regression coefficients estimated, the consumption of food groups/items was projected from 1994 to 2000 A.D. However, in cases where the correlation of food demand with the independent variables was weak, the average yearly increase or decrease in consumption of the particular food group/item from 1970 to 1992 was used in the projection.

Based on an average annual growth of 0.04% per capita consumption from 1970 to 1992, rice demand is projected to increase slightly per year, posting 6.18 million metric tons in 1994 and 7.08 million metric tons in the year 2000 (Table 1). Following the same method, maize consumption will be up by an average of 1.4% per year. Although the average per capita consumption growth for 1970 to 1992 was -0.53%. Meat demand is seen to increase yearly by an average of 3.7%. Milk consumption is expected to increase by an average of 5% annually, while eggs by an average of 2%. For fish, consumption will be down by an average of 0.15% per year.

**Table 1 Projected food consumption, Philippines 1994-2000 (in thousand metric tons).**

| Year | Rice** | Maize** | Meat* | Milk** | Eggs** | Fish* | Vege-tables*** | Fruit*** | Roots & Tubers** | Dried Beans, Seeds & Nuts** | Sugar** | Fats** | Other** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1994 | 6,181 | 1,092 | 1,585 | 2,071 | 3.33 | 2,521 | 1,995 | 4,309 | 1,554 | 670 | 1,665 | 405 | 2,068 |
| 1995 | 6,332 | 1,112 | 1,662 | 2,223 | 3.40 | 2,598 | 2,442 | 4,548 | 1,595 | 757 | 1,759 | 430 | 2,226 |
| 1996 | 6,481 | 1,132 | 1,712 | 2,340 | 3.47 | 2,605 | 2,632 | 4,843 | 1,637 | 856 | 1,857 | 456 | 2,393 |
| 1997 | 6,631 | 1,151 | 1,804 | 2,484 | 3.54 | 2,612 | 2,857 | 5,206 | 1,679 | 968 | 1,959 | 483 | 2,572 |
| 1998 | 6,780 | 1,165 | 1,881 | 2,686 | 3.61 | 2,564 | 3,164 | 5,539 | 1,722 | 1,092 | 2,066 | 511 | 2,762 |
| 1999 | 6,930 | 1,194 | 1,980 | 2,796 | 3.69 | 2,543 | 3,432 | 5,949 | 1,764 | 1,233 | 2,178 | 541 | 2,965 |
| 2000 | 7,080 | 1,202 | 2,043 | 2,965 | 3.76 | 2,495 | 3,874 | 6,319 | 1,807 | 1,391 | 2,294 | 572 | 3,182 |
| Ave. Annual Increase (%) | 1.9 | 1.38 | 3.69 | 3.82 | 2.04 | -0.15 | 9.94 | 5.62 | 0.30 | 10.46 | 3.17 | 3.61 | 5.08 |

* Calculated using the double log demand equation.

** Calculated based on the average yearly increase (decrease) from 1970 to 1992.

*** Calculated using the regression coefficients.

Vegetable and fruit consumption is seen to increase significantly, by an average of 10% and 5.6% per year respectively. Consumption of other food groups/items is expected to increase considerably within the same time frame.

## Market prospects of major upland crop products

### *Maize*

The area planted to maize showed an increasing trend from 1982 to 1990, but later decreased gradually in 1991 through 1993. The yield of maize, nevertheless, has been generally increasing due to improvement of productivity brought about by the government's maize production programs, in

which high yielding variety seeds and other inputs are subsidized. Productivity was also enhanced through stepped-up research and extension activities.

Although there have been improvements in maize production, the Philippines imports maize to augment its yearly requirement, which fluctuates yearly. An average of 4.2% of the national maize demand was imported, over the period 1989 to 1993.

The domestic demand for maize in 1989 through 1993 averaged 5.4 million metric tons annually (including imports) as shown in Table 2. Almost three-fourths went to livestock and poultry feed formulation and waste. A yearly average of 974,700 tons of the maize national supply, particularly the white maize, is consumed as a staple largely in the southern parts of the country. A small portion was processed into various food products and the rest was utilized as seed.

**Table 2 Maize demand composition, 1989-1993.**

| Demand Composition | Annual Average Demand ('000 metric tons) | Share (%) |
|---|---|---|
| Feed (including waste) | 3,900.0 | 72.14 |
| Direct food | 974.7 | 18.03 |
| Processing | 460.4 | 8.52 |
| Seed | 70.6 | 1.31 |
| Total | 5,405.73 | 100 |

Source: Bureau of Agricultural Statistics.

The specific demand for maize by utilization was projected using double log demand equations. In cases where the correlations between maize consumption and the independent variables utilized were not significant, either simple linear regression or the demand growth rate covering 1970 to 1992, which ever was appropriate, was used in the projection. The values of the projected demands were combined to arrive at an overall demand for maize in the Philippines.

Maize feed use which accounts for the bulk of the total maize consumption is projected to increase by 1% yearly from 1994 to year 2000 (Table 3).

**Table 3 Projected demand for maize by use, 1994-2000.**

| Year | Direct Food* | Feed** | Processing** | Seed*** | Total |
|---|---|---|---|---|---|
| 1994 | 1,092 | 3,805 | 368 | 72 | 5,337 |
| 1995 | 1,112 | 3,843 | 389 | 73 | 5,417 |
| 1996 | 1,132 | 3,882 | 418 | 74 | 5,506 |
| 1997 | 1,151 | 3,921 | 454 | 74 | 5,600 |
| 1998 | 1,165 | 4,000 | 507 | 74 | 5,746 |
| 1999 | 1,194 | 4,040 | 556 | 75 | 5,865 |
| 2000 | 1,202 | 4,081 | 616 | 76 | 5,975 |
| Annual Growth (%) | 1.39 | 1.01 | 7.64 | 0.78 | 1.63 |

* Estimated using average annual growth rate from 1970 to 1992.

** Estimated using double log demand equation.

*** Estimated using the formula $LnQ = a + bT$, where Ln is natural log, Q is quantity demanded and T is time.

Although the per capita direct food consumption of maize, mainly white maize, decreased by 0.53% per year, the total maize food demand is projected to increase by 1.4% due to population increase. The utilization of maize for processing is expected to increase by 7.6% annually. An insignificant increase in seed requirement is expected over the period 1994-2000 as the area grown to maize has not shown any significant expansion. The overall yearly growth in maize demand is estimated at 1.6% annually.

*Soybean*

In the period 1989 to 1993, the country produced an annual average of 4,102 metric tons, representing only 8% of the total soybean requirement. Shortfalls in production are met by imports of raw soybean, soybean meal, soybean oil, and soybean-based processed products. Significant volumes of soybean meal are imported, largely for the livestock and poultry industries. Similarly, considerable volumes of soybean oil are imported for food and industrial uses.

Soybean in the Philippines is mainly processed into various food products (Table 4). To meet the needs of the livestock and poultry industries for feed formulation, soybean meal is heavily imported. Soybean oil is also imported to supply the needs of the manufacturing sector in the production of various products.

**Table 4 Soybean demand composition, 1989-1993.**

| Demand Composition | Annual Average Demand ('000 tons.) | Share (%) |
|---|---|---|
| Processing | 48.28 | 91.03 |
| Seed (including waste) | 3.21 | 6.05 |
| Feed | 0.94 | 1.77 |
| Export | 0.61 | 1.15 |
| Total | 53.04 | 100 |

Source: Bureau of Agricultural Statistics.

Using a simple linear regression, it is expected that demand for soybean from local processors will be on the uptrend, with annual growth estimated at 9.4% (Table 5). Growth in feed utilization will be on the rise, from 1,900 to 28,700 tons during the said time frame (based on the 60% annual average growth rate covering 1970 to 1992). Soybean seed utilization will grow at 3.2% per year. On the overall, total soybean demand is expected to reach an overall growth of 12.5%.

**Table 5 Projected demand for soybean by use, 1994-2000 (in thousand metric tons).**

| Year | Processing* | Seed** | Feed*** | Total |
|---|---|---|---|---|
| 1994 | 54 | 2.26 | 1.9 | 58.16 |
| 1995 | 60 | 2.34 | 3.0 | 65.34 |
| 1996 | 66 | 2.43 | 4.7 | 73.13 |
| 1997 | 74 | 2.52 | 7.4 | 83.92 |
| 1998 | 82 | 2.62 | 11.6 | 96.22 |
| 1999 | 91 | 2.72 | 18.2 | 111.92 |
| 2000 | 101 | 2.82 | 28.7 | 132.52 |
| Annual Growth(%) | 9.36 | 3.21 | 59.75 | 12.49 |

* Calculated using the formula LnQ = a + bT.

** Calculated using compounded growth rate.

*** Based on the average annual growth rate covering 1970 - 1992.

Soybean oil meal on the other hand is projected to grow at 2.7% annually, from 1.5 million tons in 1994 to 1.81 million tons by the year 2000 (Table 6). Soybean oil is projected to increase from 22,000 tons in 1994 to 29,270 tons by the year 2000.

**Table 6 Projected demand for soybean meal and soybean oil Philippines, 1994-2000 (in thousand metric tons).**

| Year | Soybean Meal* Feed Use | Soybean Oil** |
|---|---|---|
| 1994 | 1,497 | 21.92 |
| 1995 | 1,548 | 23.15 |
| 1996 | 1,594 | 24.37 |
| 1997 | 1,646 | 25.60 |
| 1998 | 1,699 | 26.82 |
| 1999 | 1,753 | 28.05 |
| 2000 | 1,809 | 29.27 |
| Annual Growth (%) | 2.74 | 4.22 |

* Calculated using double log demand equation.
** Calculated using growth rate.

## *Cassava*

Cassava in the Philippines is usually planted in backyards or mixed farming systems by small farmers and is generally utilized as a food supplement or prepared into native delicacies, cakes, and other snack items. Significant volumes are processed into starch. A number of large cassava plantations are also operated, mainly for starch manufacture and animal feed formulation in some major cassava growing regions of the country. The area planted to cassava in 1982 through 1993, stagnated 200,000 hectares. Production ranged from 1.49 million m.t. in 1984 to 1.86 million m.t. in 1988.

The largest buyers of cassava are the starch manufacturers which utilized an average of 1.4 million metric tons yearly in 1989 to 1993, accounting for 78% of the national cassava production (Table 7). For the same period, 16% was consumed as direct food, while some 109,390 tons were used as feed.

**Table 7 Cassava demand composition, 1989-1993.**

| Demand Composition | Annual Average Quantity ('000 tons) | Share (%) |
|---|---|---|
| Processing | 1,419.16 | 78.13 |
| Direct food | 287.90 | 15.85 |
| Feed (including waste) | 109.39 | 6.02 |
| Total | 1,816.45 | 100 |

Source: Bureau of Agricultural Statistics.

The estimation of demand for cassava for processing using the double log equation was tried, but the result showed an insignificant correlation with independent variables used (GNPC and own price). Adopting the compounded annual growth method, cassava for processing is projected to increase slightly from 1.48 million m.t. to 1.51 million m.t. in the year 2000 (Table 8). Using a double log demand equation, the per capita direct consumption of cassava is placed at 3.6 kilograms in 1994 and is projected to grow to 43.8 kilograms by the year 2000, accruing from the increase in GNPC. Since the 43.8 kilograms per capita per year projection seems doubtful (following the cassava consumption trend from 1982 to 1992), simple linear regression using time as the independent variable was adopted. Hence, the demand for direct food consumption for 1994 is expected to increase by about 3.7%. Utilization of cassava for feed will decrease from 71,000 m.t. in 1994 to 56,000 m.t. during the same period. Overall, cassava consumption will increase by less than 1% per year during the seven-year period under study.

**Table 8 Projected demand for cassava by use, 1994-2000 (in thousand metric tons).**

| Year | Processing* | Direct Food** | Feed and Waste** | Total |
|---|---|---|---|---|
| 1994 | 1,475 | 361 | 71 | 1,907 |
| 1995 | 1,483 | 377 | 68 | 1,928 |
| 1996 | 1,490 | 393 | 65 | 1,948 |
| 1997 | 1,497 | 410 | 62 | 1,969 |
| 1998 | 1,503 | 428 | 60 | 1,991 |
| 1999 | 1,508 | 447 | 58 | 2,013 |
| 2000 | 1,513 | 466 | 56 | 2,035 |
| Annual Gowth (%) | 0.36 | 3.71 | -3.33 | 0.93 |

* Estimated using the average annual growth covering 1970 to 1992.
** Estimated using the formula LnQ = a + bT.

*Banana*

The area planted to the banana crop in the country gradually increased from 283,000 hectares in 1982 to 325,800 hectares in 1993. Banana production, however, fluctuated from a low of 2.91 million m.t. to a high of 3.36 million m.t. in the 1982-1993 period. The value of the annual production for 1989 to 1993 ranged from US $ 225.7 million to US $ 406.30 million.

Almost one-third of the average production of banana for 1989 to 1993 went to the export market, while more than one-fourth was directly consumed (Table 9). A considerable amount was processed into banana chips and other banana products, while 19% went to feed and waste.

**Table 9 Demand composition of banana by use, 1989-1993.**

| Demand Composition | Annual Average Demand ('000 tons) | Share (%) |
|---|---|---|
| Direct food | 796.6 | 26.24 |
| Processing | 721.7 | 23.77 |
| Feed (including waste) | 585.8 | 19.29 |
| Export | 932.3 | 30.70 |
| Total | 3,036.4 | 100 |

Source: Bureau of Agricultural Statistics.

The demand of banana for direct food consumption and for processing was projected using double log demand equations. Based on the results, it is expected that banana food demand in fresh form will increase significantly at a rate of 31% annually (Table 10). The increase in banana direct food consumption could be attributed to the rise in demand, in view of the increases in GNPC and the Philippine population. The average annual increase in the real price of banana, however, was minimal (based on the moving average from 1970 to 1994). The demand for food processing is expected to grow to 1.4 million metric tons in 2000 A.D from 906,000 metric tons in 1994. The utilization of banana as feed and waste is expected to decrease slightly. The total demand for banana is projected to increase at a rate of 16% per year.

## Major policies concerning the main upland crops

*Maize*

Policy instruments to stimulate maize production have been formulated since the 1930s. Together with rice, this is one of the earliest forms of government intervention affecting the maize industry. These policies gave rise to the National Rice and Maize Corporation, aimed at regulating the trading and farmgate, wholesale and retail prices of this commodity.

**Table 10 Projected demand for banana by use, 1994-2000 (in thousand metric tons).**

| Year | Direct Food* | Processing** | Feed & Waste** | Total |
|---|---|---|---|---|
| 1994 | 577 | 906 | 581 | 2,064 |
| 1995 | 701 | 956 | 578 | 2,235 |
| 1996 | 884 | 1,007 | 574 | 2,465 |
| 1997 | 1,197 | 1,094 | 570 | 2,861 |
| 1998 | 1,825 | 1,187 | 563 | 3,575 |
| 1999 | 2,517 | 1,288 | 560 | 4,365 |
| 2000 | 3,759 | 1,397 | 556 | 5,712 |
| Annual Growth (%) | 30.70 | 6.38 | -0.63 | 15.65 |

* Calculated using double log demand eqautions.
** Estimated using the formula LnQ = a + bT.

Among agricultural commodities in the country, rice and maize have been the recipient of various production and marketing programs. These programs, which were implemented in the 1970s, were designed to increase production and influence the output price. In addition, the government executed fiscal, financial and trade policies which were designed to support these production and marketing programs.

Currently, the Philippines' Department of Agriculture is implementing a five-year (1993-1998) program for rice and maize, the Grains Production Enhancement Program or GPEP. This program focuses on increased infrastructure, such as farm-to-market roads and postharvest facilities. Likewise, GPEP is implementing a seed subsidy amounting to one 20 kg bag of certified maize seed per hectare per cropping, a fertilizer subsidy exempting imported fertilizer grades, particularly nitrogenous fertilizers, from payment of full tariff (5%). Other program activities being undertaken are research, training, extension, infrastructure improvement, information dissemination, and policy advocacy.

Compared with the previous programs on maize, GPEP advocates a freer interplay of market forces in determining maize prices. Although the price support policy for maize initiated by the government during the 1970s remains in effect, this will be resorted to as a last recourse in case of a market/price breakdown which would make maize production unprofitable.

Recent developments in domestic and world trade motivated the government to initiate policy measures that would protect the maize industry, albeit temporarily. These include the imposition of an importation ban on maize and a tariff on maize importation whenever it becomes inevitable. Since 1986, the government has imposed an importation ban on maize but allowed its importation during periods of low maize harvest as happened in 1987. Under the existing tariff structure, maize imports are taxed at the rate of 20%.

### *Soybean*

The policies formulated specifically on soybean are centered on marketing. The production policies imposed on rice and maize generally have an affect on other commodities including soybean. These policies govern inputs such as fertilizer and provision of credit, among others. As to processing of soybean as animal feed, it is subject to value-added tax (VAT) of about 20%.

### *Cassava*

Cassava production is not given direct support by the government despite its growing importance. The expansion of area planted to cassava was mainly initiated by the starch/glucose manufacturing plants through a contract growing scheme. As for soybean, policies affecting cassava were those pertinent to rice and maize production. This includes fertilizer subsidies and credit

guarantees which were also applicable to other agricultural commodities. Cassava processing into starch/glucose is subject to VAT of about 20%.

*Banana*

One of the key factors affecting the banana industry is the area limitation imposed on export banana which started in 1973. The policy was intended to control the supply of export banana which was expected to influence export price. Initially, 21,000 hectares were allotted to export bananas. This was increased to 26,250 hectares in 1979 to account for the increasing export banana market. The area limit is allocated by the Board of Investments (BOI) to the Philippine Banana Growers and Exporters Association composed of 25 members, five of which are big transnational corporations. Policy analysts indicate that the imposition of this area restriction makes it impossible for new firms and incremental investments to make way into the export banana industry. In effect, it promotes inefficiency in the industry by creating a monopolistic environment. These conditions prevent expansion of Philippine banana exports in its key markets and in the world banana trade.

## Case studies of successful market attempts

*Banana chips*

In the Philippines, the cooking variety of banana, plantain, which accounts for 40% of the country's total banana production, is largely processed into banana chips, catsup, dried bananas and flour aside from being boiled or fried for snacks. The most common banana products are the chips and catsup.

Banana chips are among the country's non-traditional exports which gained a foothold in the export market in the 1980s. These are consumed as a snack or breakfast food. This product made an impressive performance in the export market when the volume of shipment rose significantly from 1978 to 1981, posting an increment ranging from 66% to 146% annually. The volume of export, nevertheless, dropped by 21% in 1982, but continued an upward trend except in 1987, 1989, 1990, and 1992. For the period 1989 to 1993, banana chip exports averaged 12,802 metric tons annually, valued at $ 13.4 million. In 1993, the chips were exported to 38 countries around the world. The biggest importer was the United States, which imported 5,222 metric tons or about 35% of the country's total banana chip exports in 1993. Significant volumes were also exported to the United Kingdom and Northern Ireland, Germany, Hong Kong, and Japan.

One of the major problems in banana chip processing is the high cost of transporting raw bananas from the points of production to the processing plants. Although raw bananas in Mindanao and in the Visayas are cheaper than in Luzon, the processors in Luzon, which have branches in these islands, leave them unoperational due to the inadequacy of shipping facilities in those areas. Bringing the raw banana for processing in Luzon is also not practical in view of the inadequacy and high cost of inter-island shipping.

Another apprehension faced by processors is the increasing price of sugar used in chip sweetening, which has risen from $7.69 to $9.62 per 50 kilogram bag. This is compounded by the high cost of cartons used as packaging material. The high tariffs imposed on the input components used in the manufacture of packaging materials, meant to protect domestic producers, increase the price of the export products. Packaging materials constitute 20% to 50% of the f.o.b. price of the products.

Banana chips successfully penetrated the export market in spite of the problems encountered in production and marketing. This was made possible with the help of promotional activities undertaken by the government. These activities involve trade missions and participation in trade fairs abroad, in cooperation with the processors. The success of these promotional efforts, however, rests largely on the good quality of products promoted, which includes proper hygiene, and meeting packaging standard requirements and eating preferences, etc.

Aside from the foregoing standard requirements, banana chips continue to sell successfully in the export market due to the ability of local processors to adequately meet the demand throughout the year, which is made possible by pooling their products. The ability to supply the quantities ordered by importers is essential to maintain foreign market access. The other reasons which brought about the continuing success of banana chip exportation and of other products, in general, are the abolition of the 4% export tax in 1986 and the freeing of export products from payment of the 10% valued added tax implemented in 1993.

### *Processed mangoes*

Processed mangoes, specifically dried mangoes, are among the country's non-traditional products which have carved a niche in the export market. These have been exported for almost two decades, during which time the volume sold gradually grew from 37.36 metric tons in 1978 to 760 tons in 1993. The volume of annual exports from 1991 to 1993 averaged 704 metric tons valued at US $ 4.42 million. Dried mangoes are sold to 37 countries in Asia and the Pacific region, Middle East, Europe, North America, and the Southern Hemisphere. Other forms of mango products exported are the puree, juice, frozen, salted and glazed mangoes. The combined value of the country's processed mango exports in 1993 was US $ 15.7 million.

The biggest importer of processed mango products (dried, juice and concentrates) is Hong Kong, which in 1993 accounted for 52% of the Philippines total mango products export, amounting to 5,095 metric tons. China and the United States purchased considerable quantities of 1,312 m.t. and 1,247 m.t., respectively during the same year.

One problem encountered by the country in the processing of mango is the inadequacy of fresh mango supply during the off-season. This situation increases the price of mango, forcing mango processors to stop operation temporarily until adequate amounts of fruit can be supplied by producers at reasonable price levels. Another problem is the keen price competition posed by other mango product exporting countries. Philippine mango products cost more in the world market than those exported by its counterparts, due to the high farm/wholesale price of fresh mangoes in the local market and the high exchange rate of the peso against the dollar, among others.

Similarly, the significant growth in the volume of processed mango exports is partly attributable to the promotional efforts of the government and the processors. In spite of the keen competition in the world market, these products survived due to their high quality. The success of these products in penetrating foreign markets is largely due to the growing interest in tropical fruits, especially in Europe and to the health-food craze which has been sweeping many countries around the world.

### *Guyabano juice*

Guyabano cultivation in the country covered a little more than 2,000 hectares in 1993. The volume of production averaged 3,124 metric tons per year for the period 1989 to 1993. The plant is grown in various provinces of Luzon and the Visayas.

Guyabano in the Philippines used to be eaten fresh until the 1970s when techniques for juice extraction and pulp preservation were developed and introduced to homemakers. Small-scale

production of the juice for the domestic market later proliferated. The supply of the juice in the local market increased in the latter part of the 1980s with the entrance of big food manufacturers in guyabano juice processing. The preservation and processing of guyabano fruits have been expanding, because of its increasing acceptability not only in the domestic market, but also in foreign markets.

As guyabano fruit is highly perishable like many other tropical fruits, the government in the 1970s encouraged value-added processing among farmers to minimize fruit post production losses and to increase farm incomes. The development of tropical fruit processing and preservation techniques was undertaken by the DA's Bureau of Plant Industry and a number of state agricultural colleges. The techniques were disseminated to farmers through demonstrations and free training to farm households via extension workers. The transfer of these technologies was accelerated with the establishment of training centres attached to the Department of Trade and Industry aimed at promoting small and medium-scale enterprises. The utilization and commercialization of appropriate technologies were promoted in line with the government's national socio-economic development thrusts.

The demand for guyabano juice, as well as of other tropical fruits, quickly picked up in the late 1980s, when it was supplied by one of the country's biggest food manufacturers known for its quality products. The rise in demand could also be attributed to the then increasing preference of health-conscious local consumers for fruit juices over carbonated drinks. Various brands of guyabano juice then emerged in groceries and supermarkets all over the country, indicating a high demand for the product.

The main problem in guyabano processing is the difficulty of procuring substantial volumes of the fruit from one locality due to the dispersed guyabano farms. Processors have to go from one place to another in order to buy a sufficient quantity for their processing requirements.

## Case studies of failed market attempts

*Mango*

Mango is one of the major crops grown in almost all parts of the archipelago. The country is the fifth largest mango producer in the world, with an average annual production of 336,000 metric tons in 1989-1993.

The area planted to mango has been gradually increasing. From 51,200 hectares in 1982, the area grew to 57,700 hectares in 1993. Of the total production, an average of 6.2% or 21,430 metric tons annually was exported to different countries of Asia and to Australia in 1989 through 1993.

The volume of mango exportation fluctuated during the years 1978 through 1986. Exportation of mangoes started to pick up in 1987 and grew by 147% in 1993. The surge in demand was brought about by increasing mango consumption in mainland China, where Philippine mangoes were imported through Hong Kong, the Philippines' biggest importer of the fruit. The other big importer is Japan.

Some 58 to 81% of the country's export mango is shipped to foreign markets in the months of February to June, as these are the peak months of mango production. The rest of the fruit is exported in July through January. The low supply of Philippine mangoes in the export market during these months prompts importers to buy from other exporting countries, replacing the Philippines as the traditional supplier. In Singapore, for example, Philippine mangoes were replaced by those coming from Australia and Pakistan from 1991 to 1993. This accounted for a decline of 52% in export volume, from 1,611 metric tons in 1991 to 843 metric tons in 1993 in that market.

Another constraint to increasing the volume of mango export is the keen price competition with other supplying countries. Although the Manila super mango is recognized as the best in the world, it is higher priced, such that it cannot compete with inexpensive ones supplied by other countries. The higher price set on Philippine mangoes could be attributed partly to the fact that the VHT facilities for disinfecting mangoes are located in Manila, necessitating the shipment of export mangoes grown in all parts of the country to Manila. This entails higher costs in bringing the produce to the export market. It was only in late 1994 that VHT was established in Davao City (in Southern Mindanao). Moreover, the high cost of packaging materials which comprise 40 to 50% (for fresh fruits and vegetables) of the f.o.b. price poses a problem in the exportation of mangoes.

The Philippines exports significant volumes of mangoes to some parts of Asia, but could not successfully penetrate other markets, particularly the United States and countries in Europe. The United States used to be a significant buyer of local mangoes but ceased to be so due to various events. The country's mango suffered many setbacks in that market, as well as in Japan and Australia. The problems in the Philippine mango include banning due to fruitfly and mango weevil infestation and banning due to ethyl dibromide residues.

As a result of the continuous ban imposed by major importing countries in the past, the country's share in the mango export market was taken over by other mango-supplying countries. It is now difficult for the Philippines to expand exportation of the fruit due to the very keen price competition posed by other mango exporting countries. It is only in Hong Kong and Japan that the Philippines was able to expand its mango exportation due to its ability to compete in terms of price due to lower air freight cost incurred by virtue of geographical proximity to those markets.

Much as the Philippine wants to expand mango exportation to countries other than those in Asia and the Pacific, the perennial problem of high transportation cost by land (in the domestic movement) and air serves as a stumbling block. The Philippines, for instance, is not exporting Guimaras mangoes, at present, to U.S. due to the prohibitive cost of transport, compounded by high cost of packaging materials, among others. The European market was tapped, but the exportation was prevented by the same foregoing reasons, aside from the fact that Europeans are not very familiar with mangoes.

### *Papaya*

Papaya is generally cultivated as a backyard crop in the Philippines. In commercial papaya growing, 50% of the farms are within the size of 0.5 hectares to 3 hectares. Papaya is usually planted under coconuts or intercropped with banana trees or grown in a variety of mixed systems, combined with other perennial crops (e.g. pineapple, coffee and cassava).

There has not been a considerable expansion in the area planted to papaya for the last 14 years except in 1989. The area devoted to papaya growing in 1980 through 1988 stagnated within the range of 2,854 hectares to 3,509 hectares. The area then increased by 39%, to 4,888 hectares in 1989. Although the area planted to papaya considerably increased, the total production of the fruit, more or less, remained the same. This could be attributed to the aftermath of the papaya ring virus infestation which occurred in Southern Luzon in 1981, especially in the province of Cavite which then led in papaya production. The virus has not been eradicated at present, but phytosanitary measures are strictly instituted to prevent the spread of the disease. At present, papaya is mostly grown in Mindanao and Visayan Island.

Only small quantities of fresh papayas were exported in 1978 through 1986. The export volume of the fruit started to pick up in 1987 and surged in 1990 when 1,072 tons were shipped to foreign markets, registering a growth rate of 174% over the previous year. This increased furthermore by 111% the following year. The average value of papaya exports in 1989 to 1993 was

US $ 603,576 (f.o.b.) annually. The primary market for Philippine papaya was Hong Kong, which imported 98% of the total papaya exports in 1993, amounting to 2,038 metric tons. Small quantities were exported to United Arab Emirates and Singapore.

Papaya suffered the same fate as mango, when Japan closed its doors to Philippine fresh papayas in 1978. The entry of these fruits (solo variety) to Japan was banned due to signs of fruitfly infestation on papaya. The ban was prolonged by the papaya ring virus attack and continued on for 21 years, until May 1994. Although the ban was lifted, all Philippines papayas for export to Japan are required to undergo VHT prior to shipment to avoid the danger of transmitting fruitflies.

Local farmers have not responded to the new opportunity opening up with this development. This could be explained by the fact that it is not easy for many of them to shift readily to planting papaya due to various reasons. The success of exporting this fruit to Japan in large quantities remains to be seen, due to the keen competition with the traditional papaya-supplying countries.

### *Passion fruit*

Passion fruit is considered an obscure plant in the Philippines. The area grown to passion fruit occupied only 113 hectares in 1989 but more than doubled to 238 hectares in 1991 which could be due to extensive planting of the crop. The planted area again diminished to 190 hectares in 1992 and further to 144 hectares in 1993. In spite of the decline in the area grown to the crop, production exhibited a rising trend stemming from improved productivity. From 322 metric tons in 1989, it increased by 50% or to 484 metric tons in 1993. The production of passion fruit in the country is mostly handled by large exporters or by contract growers who supply these exporters.

The production of passion fruit was promoted in 1990, when the Department of Agriculture (DA) in the Philippines, upon perceiving the potential of selling passion fruit juice in foreign and local markets, encouraged farmers to grow the fruit to augment their incomes. The first passion fruit growing project was launched in Sampaloc, Quezon Province (in Southern Luzon), where 47 participating farmers planted the crop under coconut trees. The DA supported farmers by extending low interest loans (at 12% interest) for the construction of trellises, procurement of planting materials and inputs and for payment of the crop insurance premium. The DA linked the participating farmers to a big food company through a buying contract. The company, on the other hand, extended technical assistance to the farmers. As provided for in the contract, the company would buy all the farmers' produce at a stipulated price.

The total area involved in the project then was 54.5 hectares. A production of 15,000 kilograms per hectare annually was projected for the first year of operation or a total of 817,000 kilograms for the entire project area.

A similar project involving 84 farmers tilling 300 hectares was launched in 1990 in Lucban, also in Quezon Province. The farmers then delivered 2,000 kilograms weekly of passion fruit to the same contracting company. However, the company could not absorb all the fruit from the contract growers due to the inability of the company's existing machinery to produce the double-strength juice (concentrate) demanded by foreign markets. The puree that the company produced was mainly used for the domestic market. The company's original demand for passion fruit was only from 200 hectares, but contract growers were over-supplying the fruit, since the hectarage grown expanded to 750 hectares. The Lucban farmers sued the company for breach of contract and asked the latter to pay them the value of the passion fruit. The farmers won the case, but the company severed its ties with them. The farmers entered into a buying contract with another firm. However, the firm had to cut down on its passion fruit processing due to a decline in the price of passion fruit juice in foreign markets.

Likewise, a passion fruit growing project was implemented in the same year in Iloilo province (in Western Visayas). The farmers were to supply the requirement of the same company which had a processing plant in the neighbouring island province of Guimaras. However, this arrangement was aborted, since the island was declared by the Bureau of Plant Industry as a fruitfly-free area. Thus, no fruit, including passion fruit, which was suspected of being a potential carrier of fruitflies, was allowed entry to the island.

At present there are only two large fruit processors engaged in passion fruit processing, but the volume of the passion fruit juice produced has been drastically reduced. As to other forms of processed passion fruit, one small processor interviewed reported that the fruit is made into marmalades, jams, and jellies.

One of the constraints in passion fruit processing encountered by small processors is the volume inadequacy of the fruit that can be procured in one contiguous area. Another is the rising cost of sugar which constitutes 55% of the operating cost. The high cost of freight in bringing the products to Europe and the United States is also perceived to be a problem confronting exportation. As previously mentioned, local consumers are not familiar with passion fruit juice, such that production should not have been encouraged, unless intensive product promotion had been successful.

The government was successful in encouraging the growing of passion fruit among farmers on a commercial scale during the initial stages of the projects. Assuming that the contract growing between farmers and processors, mentioned earlier, had not been aborted, it is still apparent that the growing of passion fruit in large volumes would not be sustained in view of the low demand in both local and foreign markets. Growth in local demand could have been induced if only vigorous promotional efforts had been undertaken.

## Conclusions

There are various concerns in the production and marketing of agricultural products covered in this paper which need to be given closer attention. These concerns hinge largely on the policy measures being adopted by the government. These are detailed below.

### *Lack of infrastructure such as farm-to-market roads, and postharvest and port facilities*

The inadequacy of these infrastructure facilities results in high cost of transport and high postharvest losses, giving rise to higher prices of agricultural products. Public investment in the building of this infrastructure must be increased to increase efficiency in marketing.

### *Low yield*

Low productivity of agricultural crops is caused by various reasons. The most common is attacks of pests and diseases. The research and development budget needs to be increased to generate and develop technologies addressing the major problems in agriculture.

*High cost of packaging materials*

The high cost of packaging materials arises from the high tariff levied on imported material content to protect local producers. This policy increases the prices of export products, so the tariff should be reviewed and lowered to a reasonable level.

*Rising cost of sugar for sweetening sugar-based agricultural products*

This concern stems from the distorted sugar quota system, where the national sugar production is allotted for domestic use, export, and reserve. Most of the sugar is allocated export in order to keep the quota given to the Philippines by importing countries, particularly the United States. In effect, the allocation for domestic consumption is inadequate, raising the price of domestic sugar constantly above the world price level.

*Distortion in the value added tax on processed agricultural products*

Agricultural products are exempted from the payment of 10% VAT. However, once they are processed, the value added to the raw products is included in the tax estimation. In effect, processed agricultural products are subject to 20% VAT. This should be reviewed in order for these products to be competitive in the export market.

*High interest rate on credit*

Interest on loans for agricultural production is set by the government 25% lower than the prevailing rate. However, producers still find this rate high in comparison to other Asian countries. This should, likewise, be reviewed and decreased to a reasonable level.

*High exchange rate*

Exporters allege that the exchange rate of the peso against the dollar is artificially high. This makes Philippine export products less competitive in the world market in terms of pricing. Hence, the prevailing market forces should determine the real exchange rate.

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# Comments on the Philippine Country Report

*Carolyn C. Castro*[*]

## Introduction

The Philippine economy is founded on agriculture. Therefore, discussing market prospects of upland crops in Asia will be interesting, given recent international developments affecting agriculture. The participation of the Philippines in the GATT-WTO, APEC, and ASEAN is premised on the understanding that these international groupings will work together in promoting an even playing yield in the global market for goods and services.

Trade liberalization is an important strategy for achieving sustainable growth. This will allow competition and promote efficiency in domestic industries, and foster the ability to respond to markets or adapt to changes. It is within this context, therefore, that we could enrich the discussion on the market prospects for upland crop products.

The ratification by the Philippine Senate of the Uruguay Round Final Act is a significant development for the country's agricultural sector. It paves the way for membership in the World Trade Organization (WTO). This membership is critical in the country's effort to preserve and create new markets for our products.

Since our concern is for market prospects, let us take a look at policies to enable agriculture to compete in both local and international markets. In the Philippines, the nature of government support to the agricultural sector has primarily been in the form of price supports and input subsidies such as fertilizer and seed. Not only are these support measures not sustainable, they do not reach a significant percentage of the country's farming population. Thus, the limited budgetary resources need to be channeled into areas where these resources derive the highest possible returns.

To help increase farm productivity and income, the government's agricultural programs are geared toward people empowerment, cooperative development, and producer-user linkages as the catalysts for sustainable growth in the agriculture sector. Prospects for the agriculture sector will be favourable with a conducive macro-economic policy environment, hand-in-hand with adequate rural infrastructure and vital support services well in place.

There are emerging new markets for Philippine products that should be further explored. As such, the following need to be carried out: (i) making production technologies comparable with those of other parts of the world and affording local industries equal access to relevant market information and production input; and (ii) providing infrastructure, support services, and policy reforms to prepare the sector to face opportunities and challenges posed by a more liberalized world market. The policy reforms needed are as follows:

- enactment of legislation supportive of growth of the agricultural sector as it faces the opportunities of the new world trade order;
- adoption of a fiscal policy that would allocate more government resources to rural infrastructure development;

[*] Policy Analysis Division, Planning and Monitoring Service, Department of Agriculture, Diliman, Quezon City, The Philippines.

- creation of a more conducive rural credit environment by enhancing and encouraging the flow of credit from institutional sources to rural areas;
- enactment of trade reforms in support of the growth and competitiveness of agriculture and agribusiness activities;
- formulation of transport policies that will encourage the growth of a competitive and efficient agricultural transport system;
- adoption of an exchange rate policy supportive of agricultural growth;
- adoption of a fair and equitable taxation policy for agricultural processors;
- strengthening of research and development on, and the extension of, appropriate production and postharvest technologies;
- streamlining of government regulations;
- increasing and improving agricultural support services; and
- provision of support for the development of the farmer's cooperative movement.

*On the major policies affecting demand for main upland crop products (UCPs)*

The discussions centered on issues affecting production. It would have been better if, at the onset, existing and potential markets for these commodities are presented since these will determine other concerns affecting demand and supply as well. Our policies should not be too production-oriented unless we are assured of markets to absorb this production at competitive prices. Food security, poverty alleviation, better income distribution, and sustainable development are also factors that should be addressed.

*Erratum: tariff on maize committed under the WTO-GATT*

The Philippines has not committed specific tariff rates for maize or any sensitive agricultural products; we only committed the binding rates. For maize, the bound rate in 2004 in 50% and 35% for imports with MAVs.

*On dietary patterns*

While a section on dietary patterns in the Philippines is helpful to give readers information on food consumption, nutrient intake, etc., discussions of the significant contribution of the specific UCPs under study should be included. Given a pattern of food consumption, supply, etc., can we conclude that UCPs as a subgroup of food impact on our dietary requirements? Perhaps this needs to be highlighted so that the section could still relate to the main subject of market prospects.

*On the demand and market potential of UCPs*

Specifically on external trade performance, we should include the major current markets, then go on to discuss or assess how to maintain, develop, and expand these markets, if necessary. For instance, if we import a larger portion of a commodity than we produce, an assessment of whether the local production could be improved to lessen importation or if it would be more advantageous to go on importing instead, should be considered. In the same manner, if we export, what programs should we undertake to sustain or expand these markets. The issue of comparative advantage should be considered. Most programs are also geared for the development of traditional crops.

*On the emerging product and markets*

The author has identified several commodities with high potential in both local and export markets. Specific strategies to address the problems of the respective commodity industry should be noted for these products to gain continuous success in these markets.

*On the successful and failed production/market promotion attempts*

A wholistic review of the industry should be emphasized. For example, in the case of problems relating to standards and quality, we may need to review the standards of major markets to ensure that there are not disguised trade restrictions. Domestically, we also have to come up with standards for food safety and quality for products, whether for local or foreign markets.

In addition, how do macro-economic policies influence the success or failure of these agribusiness activities?

On market promotions, we should deal with these seriously since these undertakings will dictate whether our market prospects will be favorable or not.

*On the statistics*

Statistics should be updated; 1994 to 1996 figures could possibly reflect changes in trends due to recent international developments. These updated statistics are also useful bases for forecasting/projecting the commodity outlook.

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# Comments on the Philippine Country Report

*Benjamin L. Buetre*[*]

It is an honor to be invited by the CGPRT Centre to comment on the study of Ms. Lantican. In the study, Ms. Lantican investigated the domestic demand and the market potential of major UCPs and other selected products. Specifically, she examined the dietary pattern and the composition of domestic demand. The major policies in agriculture that affect the supply of and demand for these agricultural commodities have also been discussed. Other emerging agricultural products have also been covered in the study. Among the very important information worth noting in the study are:

- identification of problems and their suggested solutions necessary for the growth of the respective products;
- reasons for successful and unsuccessful market attempts for non-traditional products;
- instead of using old estimates of the sensitivities of demands for the products, Ms. Lantican estimated elasticities through regression analysis using the latest available statistics. This information is important for policy planning; and
- projections have been made for the medium term using the estimated demand functions.

The completion of this comprehensive study covering several crops required tremendous effort and resources. The report (Lantican 1997) is an outstanding accomplishment and I would like to congratulate the author and commend her for her efforts. However, as in many studies as broad and comprehensive as this, there are some blemishes which should be corrected. From the point of view of a researcher, these are:

- The projections need to be reviewed for possible errors. In Table 4.5, the projected demand for soybean oil meal in 1994 is 1,497 metric tons. This represents a large jump from the actual feed demand of 676.8 metric tons in 1992 in Table 4.3. A similar jump of projected demand for feed maize from 2,680 tons in 1992 in Table 4.3 to 3,805 tons in 1994 in Table 4.5 is also noticeable. Feed and waste projection in Table 5.19 should also be reviewed in relation to Table 5.17.
- I would like to suggest that the author take a second look at the data she used to estimate the demand equations (see Table 4.3). There appear to be problems with the series data particularly for cassava and other root crops. For cassava consumption, the figure (26 in 1970 and 89 in 1977) increased from 136.6 in 1978 to 227.04 in 1986 and declined to 70.93 in 1987 and remained stable up to 1992. This problem could be due to the use of data from different sources. In any case, however, it could have been helpful if the author provided an ample description of the data or variables used in the demand estimation, including limitations as a matter of caution in treating the sensitivities of demands. In addition, all other data used in the projections should be provided in the appendix.

[*] Information Systems Office, Bureau of Agricultural Research, Diliman, Quezon City, The Philippines.

- I have trouble in understanding how the objective "to increase the farm incomes" in page 1 can be achieved by the study. The information generated by the study will not directly benefit the farmers, but rather the policy makers. Whether the information is translated into higher farm incomes depends on whether the measures recommended in the study are implemented. Perhaps this objective should be reworded.
- The decreasing projected demands for cassava feed and waste (Table 5.19), other root crops (Table 4.5) and banana feed and waste need explanation. The government is embarking on a livestock development program for the medium term, which is expected to increase demand for feed. Feed and waste will decline if a large proportion of it is waste and there is an expectation of improving recovery or minimizing waste perhaps due to employment of new technology or better handling.
- In looking at the market prospects and the functioning of a market, a price analysis will be important. This should include retail and farm prices to see how efficient the marketing chain is and whether changes in retail prices are translated to better farm prices of UCPs. Border and domestic prices have also to be looked at. The foreign demands for these UCPs, particularly for banana where 30% of local production is exported, and the likely development in the global market deserve attention as well in addition to domestic demand. Global and regional arrangements such as the Philippines ratification of GATT, commitments to trading blocks such as APEC, and BIMP-EAGEA also have to be considered in the market prospect of UCPs. Overall, the global outlook for the supply of and demand for UCPs is important for a study on market prospects of UCPs in view of liberalization of trade.

Lastly, the study needs a section for policy implications.

## Reference

Lantican, J. M. 1997. Market Prospects for Upland Crops in the Philippines. Working Paper No. 23. Bogor: CGPRT Centre.

# Market Prospects for Upland Crops in Vietnam

*Dao Huy Chien*[*]

## Introduction

Agriculture is a key sector in the Vietnamese national economy. Percentages of agriculture, forestry and fishery in GDP were 40.5, 33.9, 29.9, 29.3 and 29.0 in 1991, 1992, 1993, 1994 and 1995 respectively. It is estimated that the rural population accounts for 80% of the total population. Vietnam remains a relatively poor country still suffering from the effect of prolonged war. GDP per capita was estimated at US $ 211 in 1994 and US $ 273 in 1995.

In recent years the government's economic reform policy, *doi moi*, has moved the country a long way from central planning towards a more market oriented economy. In general, the *doi moi* policy has been successful in generating strong growth in GDP (8.8% in 1994 and 9.5% in 1995). Total export value increased from US $ 2,404 million in 1990 to US $ 4,054 million in 1994 and US $ 5,200 million in 1995. However, Vietnamese agriculture faces challenges since the starting point of the national economy is low, the infrastructure is poor, the population is growing and there is increasing demand for agricultural products. Therefore, the products of upland crops such as rice, maize, soybean, cassava, coffee, cashew nut, sugarcane, root crops, fruits and vegetables are of vital importance in national food security.

This study provides information on production, domestic demand, market potential and prospects of upland crops and recommendations for improving their production, marketing and trade. The study focuses or major upland crops such as rice, maize soybean, cassava, cashew nut, orange, coffee, groundnut, sugarcane, potato, sweet potato and tomato.

## Domestic demand

### *Dietary pattern*

Daily per capita energy and protein intake changed during 1965-1989 in Vietnam. Total energy intake increased from only 1,872 Kcal to 1,966 Kcal. Total protein intake increased from 47 to 58g. Total fat intake increased from 14.5 to 20.5 g. In terms of energy composition, most energy originated from carbohydrate intake (83% in 1964-1965 and 77.9% in 1967-1989). Energy from fat increased from 7% in 1964-1965 to 9.7% in 1987-1989. The dietary patterns varied from region to region of the country.

From 1965 to 1989, the annual average per capita intake of animal food products was low. The proportion of protein intake from animal products was more or less adequate in the South but deficient in the North. People in the North consumed much more vegetables, roots and tubers and soybean than people in the South where more fish and sugar were consumed. People in rural areas consumed more rice than people in urban areas. However, for meat, eggs, fish and shrimp, tofu, fruit, sugar, milk and coffee, people in urban areas consumed much more than people in rural areas.

[*] Root Crops Research Centre, Vietnam Agriculture Science Institute, Hanoi, Vietnam.

It is important to mention that, since 1990, with the *doi moi* policy, Vietnam has been successful in generating strong economical growth. This has had a great positive impact on dietary patterns of the Vietnamese. In the coming years, the national average dietary intake of 1,950 Kcal/person/day should be raised to 2,100 Kcal/person/day and then to 2,300 Kcal/person/day.

With respect to food expenditure per capita by commodity group and region, people in region 6 (South North East) show the highest level of food expenditure/capita at 1,070,900 VND/year followed by region 7 (Mekong River Delta) at 798,600 VND/year, and region 2 (Red River Delta) at 717,900 VND/year. Region 3 (North Central) had the lowest level of food expenditure per capita of 582,000 VND/year. It should be noted that price levels of food are not always similar in various regions of Vietnam.

From 1991 to 1995, the gross output of food (paddy equivalent) per capita per year increased from 324.9 kg to 372.5 kg.

### *Demand composition*

Rice production greatly improved from 1980 to 1995. Rice production area increased from 5,600,200 ha to 6,765,600 ha accompanied by an increment of yield from 2,080 tons/ha to 3,690 tons/ha. This resulted in a production increase from 11,647,400 tons to 24,963,700 tons. During the past 15 years, the average annual growth rate was 1.27% for rice area planted, 3.5% for yield and 5.3% for production.

From 1991 to 1995, domestic consumption accounted on average for 87% of rice production. Domestic consumption includes direct consumption, simple traditional processed products, feed and seed. In 1994, total domestic consumption of rice was 20,526,200 tons.

From 1980 to 1995, maize production increased from 428,800 tons to 1,177,200 tons. From 1992 to 1995, domestic consumption accounted for 91% of total maize production. In 1994, total domestic consumption of maize was 1,035,240 tons. Domestic consumption involves direct consumption as food, feed, traditional processed products and seed.

From 1985 to 1995, total production of soybean increased from 79,100 tons to 125,500 tons. Almost all of the soybean production is for domestic consumption. From 1992 to 1995, domestic consumption accounted for 98% of total soybean production. Only 2% of total soybean production was for export.

Domestic consumption of cassava consists of the processing industry, traditional processed products such as dried chips, flour, starch, maltose and noodles, direct consumption as food and use for feed in both fresh and dried form.

### *Policy measures*

The new policies related to agriculture along with a series of other macro policies in recent years have had a great impact on agricultural production in Vietnam. During the period of the centrally planned economy, the state and collective economic sectors were the basis of the agricultural economy of the country. The role of the farm household economic sector was not properly recognized. Since 1988, each farm household has been considered as an independent, self-directed economic unit that has the right to plan and operate its own farm and business. The state has also reformed management of state enterprises and agricultural cooperatives, encouraged development of a private economy in agriculture and created a favourable environment for development of all economic sectors.

A series of new policies on land use, agricultural land utilization tax, credit for farm households, science and technology and agricultural extension, circulation of agroproducts and agricultural input materials was adopted to promote agricultural production, including upland crop production.

The quantities demanded for domestic consumption of rice, maize, soybean and cassava from 1996 to 2001 were projected using simple linear regression (Table 1).

**Table 1 Total projected domestic demand for rice, maize, soybean and cassava in tons.**

| Year | Rice | Maize | Soybean | Cassava |
|---|---|---|---|---|
| 1996 | 22,926,722 | 1,129,621 | 176,894 | 2,343,708 |
| 1997 | 23,931,698 | 1,230,549 | 197,862 | 2,313,133 |
| 1998 | 24,936,673 | 1,331,477 | 218,830 | 2,282,558 |
| 1999 | 25,941,648 | 1,432,404 | 239,798 | 2,251,984 |
| 2000 | 26,946,624 | 1,533,332 | 260,766 | 2,221,389 |
| 2001 | 27,951,598 | 1,634,260 | 281,735 | 2,190,834 |

## Market potential

### *Rice*

Since 1988, with new government policies, marketing and processing participants have diversified in both public and private sectors. The key participants are farmers, state companies and private traders. After Resolution 10 was adopted in 1988, farmers received full rights to transport and sell their surplus rice. This has encouraged farmers to sell their surplus rice and now rice circulates freely. This is favourable not only for farmers (producers) but also for traders. processors, exporters and consumers.

Before 1989, Vietnam annually imported large qualities of rice, with a peak import of 482,000 tons in 1986. Fortunately, with new policies and *doi moi*, Vietnam became an important rice exporter in 1989. In 1995. Vietnam exported 1,921,955 tons of rice with a value of US $ 495,649,916 or US $ 257/ton. Surprisedly despite typhoons and heavy flooding in many areas in 1996, Vietnam exported more than 3 millions tons of rice. The quantity of rice exports has increased. At the same time, with improvement in the rice processing industry and accumulated experience in marketing and organization, rice quality has also improved as has the export price.

### *Maize*

Like rice, after Resolution 10 was adopted in 1988, farmers received full rights to transport and sell their surplus maize. Local assemblers buy maize from farmers and then sell to local processors or traders. Traders buy maize from local assemblers and transport to areas where animal husbandry is intensive for feed processing. Traders also sell maize to exporters for export.

From 1976 to 1980, Vietnam imported maize. The quantity of maize imported was highest in 1978, at 104,900 tons. However, in 1980, only 4,800 tons of maize was imported. In 1993, Vietnam exported 20,600 tons of maize. The peak of maize export was 119,985 tons in 1992, followed by 109,760 tons in 1994. However, in 1995, only 42,616 tons were exported.

*Soybean*

Soybean is mainly for domestic consumption and partly for export. Private traders, state traders and state firms and food processors are the key participants in the soybean market. Private traders are the principal participants in the domestic market. Moreover, private traders play a major role in the unofficial import of soybean from China and Cambodia. Surplus soybean of farmers is mainly circulated in the domestic market. State traders basically buy soybean from private traders and then export the soybean. The domestic demand of soybean for both food processing and feed processing has increased rapidly.

*Cassava*

Cassava is mainly for domestic consumption and partly for export. Usually, cassava serves as a buffer food. When farmers lose their rice crops because of typhoons, flooding, etc., cassava in upland areas becomes very important, and most cassava is used as food for people. When farmers have successful rice harvests, cassava is mainly used for animal feed or for processing.

Because of its many intermediate and end uses, cassava is a most complicated commodity in processing and marketing. There are many kinds of cassava products such as fresh root, dry chips, flour, dry starch, wet starch, maltose, alcohol, noddles, monosodium glutamate, etc. Since 1988, as the other agricultural products, cassava products have circulated freely, which is favourable for cassava production, processing and marketing.

The cassava export of Vietnam is mainly in the form of dry chips. The cassava export increased from 5,598 tons in 1992 to 66,802 tons in 1995 worth US $ 688,796 and US $ 8,624,280 respectively. The export of this commodity seems to be promising.

## New and emerging products or markets

*Cashew nut*

The total area of cashew was 78,983 ha in 1992, increasing to 187,553 ha in 1995. The total cashew production was 23,730 tons in 1992, increasing to 50,676 tons in 1995. Since 1993, Vietnam has ranked number three in the world in cashew production after Brazil and India. At present Vietnam has 52 cashew processing plants with a total capacity of 100,000 tons/year. Most of the processing plants are concentrated in Song Bo, Dong Nai, Tay Ninh and Ho Chi Minh City.

The demand of cashew for the domestic market is still low. Less than 10% of the total production is for the domestic market, which means that more than 90% is for export. Export volumes have varied over the years. India was the biggest market for cashew export of Vietnam, but recently, China has also become a market for cashew export. The USA is potentially a very important market for cashew nut export of Vietnam.

In the South of Vietnam, hundreds of thousands of hectares of marginal land can be planted to cashew. Cashew is an easy crop, so there is great potential for development of this crop in Vietnam.

*Cassava dry chips*

Approximately, 50% of cassava produced is processed into dry chips. With export market developments, the dry chip export has increased recently. The volume of cassava export

was 5,598 tons worth US $ 688,796 for 1992 and 66,602 tons worth US $ 8,524,280 for 1995 respectively. The cassava export was mainly based on cassava dry chips.

*Orange*

Orange is one of the most popular fruit crops in Vietnam. With renovation (*doi moi* policy), the living standard of the people has improved. This has resulted in an increase in demand for fruit for domestic consumption. Orange is a very promising commodity for the domestic market. Total production of orange was 99,302 tons in 1995 increasing to 379,405 tons in 1995. From 1985 to 1995, the annual growth rate of orange production was 15.8%.

The orange processing industry has not yet developed in Vietnam. Most of the orange production is consumed in fresh form. The orange export was insignificant. This means that most orange was for domestic consumption. It is clear that there is strong growth in domestic demand for orange and orange is a very promising commodity for domestic consumption.

## Successful and unsuccessful market promotion attempts

*Coffee, a success case*

Coffee is a very important crop in Vietnam. Recently, total area planted and production of coffee rapidly increased. Almost all coffee produced in Vietnam is for export. Vietnam now ranks number seven in the world and number two in Asia in coffee export. Its development can be considered as a success. The total production of coffee was only 12,300 tons in 1985 increasing to 218,100 tons in 1995. From 1985 to 1995, the average annual growth rate in total production of coffee was 36.5%. It is evident that the total production of coffee has greatly increased in the past 10 years.

In general, coffee processing in Vietnam is not yet well developed. It is limited only to simple processing. Most coffee is processed into bean form. So far, there is only one coffee processing plant in Dongnai producing refined coffee. Usually, Vietnam exports coffee in the form of beans. Therefore, the export price is low. There is an urgent need to invest in coffee processing to increase volume of value added products of coffee so that Vietnam can export coffee at a much higher price.

The domestic demand of coffee is still low. The Vietnamese consumed approximately 15,000 tons of coffee per year, equivalent to nearly 10% of the total coffee production in 1994 or 1995. This means that more than 90% of total coffee production was for export. The volume of exported coffee increased from 89,600 tons in 1990 to 240,534 tons with a value of US $ 564,789,728 in 1995.

Marketing participants include farmers, state farms, traders, processors and exporters. It is estimated that 80% of total coffee was produced by farmers and only 20% was produced by state farms.

Reasons for success of coffee development in Vietnam area:

- Vietnam has suitable land area and favourable climatic conditions for coffee growth and development, especially in the Central Highland region.
- Since 1976, after unification of the country, much attention has been given by the government to coffee development.
- In the recent years, the price of coffee in the international market was high. This is the most favourable condition for rapid growth of coffee production in Vietnam.

- Investment for coffee development has originated not only from government but also from farmers.

*Groundnut, a success case*

The total production of groundnut was 95,200 tons in 1980 and 334,400 tons in 1995. From 1980 to 1985, the annual growth rate of total production was 8.3%.

The groundnut processing industry is not yet developed and processing facilities are backward. Therefore, most of the groundnut for export and domestic markets is in grain form. For domestic markets and household consumption, groundnut is processed only in traditional simple ways into fried groundnut, boiled groundnut, groundnut candy, etc.

From 1993 to 1995, around 45% of the total groundnut production was for export. The remaining 55% of total production was for domestic consumption in several forms for humans. Groundnut is popularly used for household food consumption and commonly kept as a reserve food at the household level not only for rural areas but also for urban ones.

Singapore, Indonesia, Laos, Malaysia, the Philippines and Thailand are important markets for groundnut exports of Vietnam. The volume and value of export groundnut were 58,780 tons and US $ 28,204,800 in 1992, increasing to 93,266 tons and US $ 56,250,993 in 1995 with an annual value growth rate of 43.4%.

Reasons for successful groundnut development in Vietnam are:

- Natural conditions, such as land, temperature, sunlight, rainfall, and water sources are very favourable for groundnut growth and development.
- Groundnut is an important and valuable crop in Vietnam. Demand or groundnut for domestic consumption has increased.
- The export price of groundnut increased considerably (US $ 480/ton in 1992 to US $ 603/ton in 1995).
- Groundnut is a traditional export commodity of Vietnam. Therefore, the marketing system is fairly good. Facilities for storage, packaging and transport are simple for groundnut.
- Groundnut is a good cash crop for farmers. It can also provide a very valuable food convenient for household consumption.

*Sugarcane, a success case*

Total planted area and production of sugarcane were only 109,800 ha and 4,358,900 tons in 1980, but they increased to 224,800 ha and 10,711,200 tons in 1995. Total production of sugar and molasses was 175,400 tons in 1980, increasing to 393,000 tons in 1995 with an average annual growth rate of 7%.

Sugarcane is processed into sugar and molasses. A small part of sugarcane is consumed in fresh form. Sugar is processed by sugar plants while molasses is processed by farmers at the household level.

All of the sugarcane production is for domestic consumption, but the annual production of sugar and molasses is not sufficient for domestic demand. Therefore, sugar has to be imported. The volume and value of imported sugar were 134,043 tons and US $ 39,393,122 for 1994 and 109,858 tons and US $ 44,525,077 for 1995.

The government has launched a sugarcane program aimed at producing 1 million tons of sugar in the year 2000. Strong investment priority has been given to the sugar processing industry. For example, in Toy Ninh province, a sugar processing plant with an investment of US

$ 95 million is under construction. With socio-economic development and the growing population, domestic demand for sugarcane and sugar will increase greatly.

Reasons for success of sugarcane development in Vietnam are:

- Land and climatic conditions in Vietnam are very suitable for sugarcane growth and development. It is popularly grown throughout the country.
- Domestic demand of sugar has increased considerably over time.
- Sugarcane development has been strongly supported and encouraged by the government, especially in investment for sugar processing.

### *Potato, a crop of decreasing importance*

The total planted area and total production were 93,000 ha and 872,200 tons in 1980, decreasing to 30,000 ha and 300,000 tons in 1995. From 1980 to 1995, the annual growth rate was - 5.1% for total planted area and - 2.4% for total production.

The processing industry for potato is not yet well developed. Most of the potato production is for domestic consumption. In recent years, potato export was not significant, while it is estimated that several thousands tons of potato are unofficially imported each year from China during August to December for domestic consumption.

Reasons for failure of potato export are:

- Due to high production cost, the price of potato is high.
- The price of good quality seed is high, and the supply system of good quality seed is still poor.
- Seed storage facilities are very poor.
- Most potato producers use degenerated seed in their potato production, which results in low productivity.
- The marketing system is not yet developed.
- Facilities for storage, packaging, transport, loading and unloading are very poor.
- The processing industry is not yet developed.

### *Sweet potato, a crop in decline*

The total planted area and total production of sweet potato in Vietnam were 450,000 ha and 2,417,600 tons in 1980, decreasing to 304,600 ha and 1,685,800 tons in 1995. The average annual growth rate was - 2.4% for total planted area and -0.8% for total production.

The processing industry for sweet potato is not yet developed. Sweet potato is popularly used after simple traditional processing such as boiling for fresh consumption, making dry chips as reserved food for household consumption and cooking with rice or beans in the daily diet. Most sweet potato is for domestic consumption for both food and feed. In 1995, only a very small quantity of sweet potato was exported.

Reasons for failure of sweet potato development in Vietnam are:

- Sweet potato is always considered an important crop but not much attention has been given to it.
- Most sweet potato produced in Vietnam is for domestic consumption.
- Processing and export industries for sweet potato are not yet developed.
- Sweet potato is not given sufficient fertilizer.
- The national average yield of sweet potato is only 5 to 6 tons/ha.
- The root dry matter content of existing sweet potato cultivars is low. This is a main limiting factor for sweet potato processing and export.

*Tomato, a case of slow growth*

Total tomato planted area and total production were 12,038 ha and 114,882 tons in 1986, increasing to 15,593 ha and 163,535 tons in 1995. From 1986 to 1995 the average annual growth rate was 2.9% for total planted area and 5.7% for total production.

Tomato processing is not yet well developed. Most of the tomato production is for domestic consumption in fresh form. Tomato is usually cooked with various kinds of food in the daily diet. In 1995, a small quantity of tomato was exported. In the long term, there is potential for tomato export.

Reasons for failure of tomato export are:

- The tomato processing industry is not yet well developed. Most tomato is marketed and consumed in fresh form.
- Fresh tomato is a perishable commodity. However, the transportation infrastructure is not good yet and the facilities for packaging, storing, transporting, loading and unloading are very poor.
- The marketing system of tomato is not yet well developed.

## Animal husbandry

From 1985 to 1995, at constant 1989 prices the gross output of animal husbandry increased from 2,551,806.9 million VND to 4,237,362.0 million VND. The total quantity of feed increased from 3.0 million tons in 1985 to 5.7 million tons in 1995. It is clear that there is a strong tendency towards development of animal husbandry.

The Department of Agriculture and Forestry Extension (Ministry of Agriculture and Rural Development) projected that feed demand will be 6.724 million tons in 1996 and 8.441 million tons in the year 2000.

During the past 10 years (1985-1995), with socio-economic progress, the development of animal husbandry has been rather strong. It is expected that animal husbandry development will be even stronger in the near future. Therefore, demand of upland crop products for feed processing will rapidly increase, particularly for maize, soybean and root crop products.

## Conclusions and recommendations

*Market demand prospects*

The results of the study on Vietnamese dietary patterns show that Vietnamese people have changed their food consumption behavior. Dietary intake (g/capita/day) decreased for rice, roots, tubers and vegetables. However, it increased for meat, fish, milk, egg, tofu, sugar and fruits. In the coming years, it will be necessary to raise the national average dietary intake.

In general, the dietary intake of Vietnamese people does not provide enough energy. Rice provides 85% of energy. Deficiency of protein, vitamins and fat are common.

It is expected that the consumption of meat and dairy products will increase in the future. This will have a great impact on the demand of upland crops especially maize and soybean.

Animal husbandry production has increased. Maize, soybean, sweet potato and cassava are becoming more important as sources of animal feed. Therefore, there is a need to further develop all aspects such as production, processing and marketing of upland crops.

Rice production increased during the last five years. Vietnam not only produces enough rice for domestic consumption but also for exports. Rice has contributed an important part of the

total value of exports. However, the rice processing and rice marketing systems need to be improved.

The growth rate of maize was rather high during the last five years, especially maize production from hybrid seed. This benefits the feed processing industry and animal husbandry development.

Soybean is very important not only for food but also for feed. However, soybean production has not been developed to meet market demand. In terms of policy, more attention needs to be given to this crop.

Cassava has good prospects for both domestic and foreign markets. The processing industry has had a great impact on cassava production in the South only. Therefore, there is a need to develop the cassava processing industry in the North.

Cashew nut is not only a good cash crop, but also a crop which is able to adapt to poor and dry soil conditions. This crop has very good prospects for export. In the South of Vietnam, there is good potential for development of cashew. Cashew is a good crop for regreening the deforested hilly areas. The market prospects need careful consideration in adjusting production to demand.

Orange is an important fruit tree in Vietnam. During the past five years, the growth rate of orange was high, although export of orange was not great. This indicates that orange has very good prospects for the domestic market. Therefore, orange production needs to be improved with good quality orange cultivars and good crop management. There is also a need to develop the processing industry and post harvest technology for orange.

Coffee is a very good cash crop and export product. However, almost all coffee is exported in the raw material from. It would be better to develop a refined coffee processing industry in Vietnam.

Coffee has proved to be a very important export commodity. However, recently there is a growing tendency towards uncontrolled deforestation to plant coffee. This has resulted in severe negative impact on the environment, natural resources and the ecological balance. As a result, drought is more frequent now in Dac Lac province. In the dry season, lack of water is common not only for crops but also for human daily direct uses. This suggests that it is necessary to properly develop new coffee planting areas. The coffee development plan must consider both the economy and environment protection.

Groundnut is a very good commodity for food and for export. In the past ten years, groundnut planting area has been extended. Groundnut is a traditional commodity for export of Vietnam. However, to improve groundnut production and export, varietal and cultural practice improvement is needed. The small nut size and low oil content make the Vietnam groundnut price lower than that of others in the international market.

Sugarcane is an important crop in Vietnam. The total area of sugarcane production has increased rapidly. Vietnam's growing population needs more and more sugar. The government gives considerable attention to sugarcane sugar production, including a program to produce one million tons of sugar in the year 2000. However, the development of the sugar processing industry has been slower than that of sugarcane production, which resulted in an imbalance between sugarcane supply and sugarcane demand. In late 1995 and in 1996, the sugarcane price in South of Vietnam was very low. It is necessary to regulate the growth rate of sugarcane production and the sugar processing industry to keep sugarcane supply and demand in balance to avoid economical losses to sugarcane farmers.

Potato is a good crop in Vietnam. During the past 15 years, the total production and planted area decreased very much although there is a great potential for potato production in Vietnam. The lack of good quality seed supply and the use of degenerated seed are the major

constraints for potato development in Vietnam. The processing industry of potato is not yet developed, and the potato export is very limited, which are constraints for potato development. To solve these problems, it is necessary to develop good seed production and supply systems; the development of potato processing and marketing are also important. Recovering traditional markets and entering new markets for potato exports are also possible. All of above need to be integrated for potato development.

Sweet potato is an important crop in Vietnam. Together with cassava, sweet potato plays a buffer role in food supply and demand balance in Vietnam. It can be used as food or feed depending on the success or the failure of the rice crop. However, despite of its importance, not much attention has been given to this crop in all aspects such as production, processing, marketing, research and development. Sweet potato is a very good commodity for domestic consumption, and recently, processed sweet potato products from Dalat have been exported to Taiwan, Japan, Hong Kong, etc. This suggests that there is a potential for sweet potato export of Vietnam. However, low dry matter content is a major limiting factor of sweet potato export. Therefore, it is necessary to develop and introduce sweet potato varieties with high dry matter content.

Vietnam has great potential for tomato production, especially in the Red River Delta where the cool winter is suitable for tomato cultivation. However, tomato processing is not yet developed; moreover, facilities for packaging, transporting, storage, loading and unloading are very poor. This has resulted in failure of tomato export. Nevertheless, tomato was recently, exported in small quantity to foreign markets, which suggests that there is promise for tomato exports. Therefore, it is necessary to give attention to tomato development including production, processing and marketing (domestic and foreign markets).

For some upland crops such as rice, maize, soybean, cassava, cashew, coffee, groundnut and sugarcane, processing industries are being developed to a certain level. However, for fruits and vegetables, the processing industry has not been developed much. Fruits and vegetables are perishable commodities, so processing industries are especially important to them.

### *Opportunities and needs for policies and measures*

- It is very important to invest in processing and marketing of upland crop products such as rice, maize, soybean, cassava, cashew, orange, coffee, groundnut, sugarcane, potato, sweetpotato and tomato.
- Recently, improvement in rice processing has had a positive impact on rice marketing, particularly on exports. The export price of rice has increased. However, in general, there is a need to invest more for rice processing so that Vietnam can obtain a higher price for rice exports.
- During the process of social economic development, the growth rate of animal husbandry will become more prominent. The feed processing industry is developing rapidly. Maize production needs to be developed much more to meet the demand of feed for development of animal husbandry.
- Similar to maize, soybean is a very important raw material for the feed industry. To meet the increasing demand of soybean for animal husbandry development, it is important to increase soybean production.
- The cassava processing industry is being developed strongly in the South. This is not the case for the North. There is a need to invest in the cassava processing industry in the North.

- Cashew nut is not only a good cash crop, but also a good tree for reforestation. In the South, there is good potential for cashew development. Cashew has proved to be a good commodity for export. A suitable policy for cashew development is required so that cashew will be able to contribute more and more to the total annual export value of agriculture.
- Orange is a good cash crop in Vietnam. However, the marketing and eating quality of orange are poor. It is important to invest in varietal development and extension of newly improved orange varieties in order to improve orange quality.
- Coffee is a very important export commodity of Vietnam. However, there is a need for a coffee development policy and measures to prevent uncontrolled coffee development so that forests and the environment can be protected.
- At present, most coffee is exported in the form of raw material. It is necessary to invest more for processing coffee for both domestic and foreign markets.
- There is a need to invest in groundnut varietal development in order to develop and introduce new varieties with larger nut size and higher oil content.
- At present, there is an active program of investment for sugarcane and sugar. However, the rate of construction of sugar processing plants is slow. Moreover, the payment of interest for the loans is a challenge for the sugar processing industry. In the sugar processing industry, there is a need for further consideration of the market and price, the supply and demand of sugar and sugarcane.
- There is great potential for potato development in Vietnam. However, seed production, seed supply and processing are major limiting factors for the development of potato. It is important to invest in establishment of seed potato production and supply systems and in the potato processing industry.
- In sweet potato development, there is a need to invest in sweet potato processing. Sweet potato cultivars with high dry matter content are required for production of sweet potato suitable for processing and export.
- The potential for tomato development is great in the Red River Delta and Lamdong province (where Dalat City is located). However, tomato production is limited. Therefore, it is necessary to invest in tomato processing and marketing.

This study shows that there are many opportunities to invest in UCPs, which will have a beneficial effect on the circulation of money in rural areas. It should be taken into account that opportunities are location specific.

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# Comments on the Vietnamese Country Report

*Nguyen Trung Que and Phi Manh Hung*[*]

The study achieved its objectives covering all information about the production, domestic demand and export value of most of the upland crops cultivated in Vietnam. Moreover, the report mentioned issues on policy and dietary patterns concerning the above-mentioned upland crops.

As you know, in Vietnam the data bank has not been completely formulated, but the author of the report has tried his best to systematically collect statistical tables and analyze the data in this report.

In Vietnam during recent years, agricultural production including upland crops has reached high quality and quantity. A number of different factors are responsible for this success including policy measures, scientific and technical research, marketing, and international cooperation, but the most influential factor to agricultural production is policy measures, according to the evaluation of the Vietnamese government.

The report mentioned the most important policies that have been applied during the renovation period such as those relating to:

- farm - household economy and agriculture;
- land;
- agricultural land utilization tax;
- credit for farm households;
- science, technology and agricultural extension; and
- hunger eradication, poverty alleviation, employment and rural development.

If the above mentioned new policies could be analyzed with detailed examples, the reader would understand better how these policies influence agricultural production in Vietnam. These new policies directly related to agriculture, along with a series of other macro policies, have supported the agricultural production of Vietnam. Since 1987, although the population has increased by 6 million, the growth in rice production and other crops has contributed to a stabilized society and has facilitated the process of restructuring agriculture. These are important preconditions for Vietnam to enter a period of industrialization and modernization of the country's economy.

Regarding the oriented development of upland crops in Vietnam, we have some ideas. The major direction for agricultural development in Vietnam is to raise agriculture from poverty and remove its image of small-scale, subsistence production, to create a commercial agriculture that is gradually modernizing with high productivity, quality, efficiency, and a diversified structure that combines development of food production for food security with that for industrial crops, where animals, forestry, and fishery development are balanced, and agriculture and the agroprocessing industry are coordinated. Thus, a modern agriculture will be built based on ecologically and economically sustainable development, along with an agriculture - industry - service structure in new rural development so that farmers have enough employment and an

[*] Ministry of Agriculture and Rural Development, Hanoi, Vietnam.

increasing income. In this way, they will become richer people with hunger and poverty eliminated to create a rural society of equity and a civilization that integrates agriculture and industry, and rural and urban areas, through industrialization and modernization of the country.

In the agriculture of Vietnam, rice production was, is and will continue to be most important sector. In the coming year, Vietnam's rice production must focus not only on productivity but also on quality and economical efficiency. The total land area for rice production in Vietnam is now 4.2 million ha. This area might be reduced. Therefore, Vietnam must increase rice yield from the present 3.4 t/ha per crop to 4.0 - 4.5 t/ha per crop by the end of this century.

The upland rice area in Vietnam represents about 400,000 ha and its yield is very low, from about 0.6 up to 2 t/ha. Vietnam is planning to reduce the area of upland rice to protect the environment, but also to increase its yield. At the present, Vietnam must expend greater efforts on increasing rice productivity up to 30 million tons per year and rice export to more than 3 million tons.

In Vietnam, the production of upland and tuber crops plays a key role in the development of a commercial/commodity production agriculture. In the agricultural production plan to the year 2000, Vietnam clearly defines the targets of upland and tuber crop production: maize output of 2.5 - 3 million tons; groundnut, 300,000 tons; tea, 70,000 tons; rubber, 200,000 tons; cassava, move than 2.5 million tons; and legumes, 150,000 tons.

If these objectives are achieved, Vietnam will be capable of producing sufficient upland and tuber crops to meet the domestic demand of the processing industry, to serve livestock production and to create a considerable amount of export agroproducts for ASEAN and international markets, such as coffee, rubber, tea, and groundnut which are the traditional products. In 1995-1996, Vietnam exported more than 200,000 tons of coffee beans, 130,000 tons of rubber, 20,000 tons of dried tea, more than 130,000 tons of groundnut and grain. This actually is remarkable progress.

In the 1995 - 2000 plan, the average growth rate of agriculture is expected to be 4 to 4.5%, in which the rate of the increase of tuber and upland crop production is expected to be higher. To fulfill these objectives, Vietnam must implement orderly integrated measures, which aim to:

- increase the cultivated area under these crops, especially in the Central Highlands, Northern Midland and cropping sessions in the Red River Delta.
- promote scientific research activities and the application of advanced technology (biological technology) to create high yield varieties which can return high quality products and the relevant farming techniques to meet both domestic and export demand.
- formulate relevant policies to encourage various economical components to invest in production of upland crops. These activities should involve extension, technical transfer, price subsidy, credit finance, etc.
- promote investment to develop the processing technology to produce the high quality products to meet the market demand and export.
- expand and create new markets for the products: groundnut, tea, coffee, rubber, cashew, etc. in addition to the traditional markets.
- research the necessary conditions to gradually integrate into ASEAN, APEC, WTO and, at the same time, to seek the new clients for exports.
- step by step, renovate the existing financial, banking, commercial and export policies to attract more economical sectors to participate in production and export of agroproducts.

All potential and advantages will be fully exploited to develop upland and tuber crops in Vietnam in an attempt to raise the economical efficiency of the crops and the quickly integrate the nation into regional and worldwide markets.

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# Discussion Comments

## Country Reports

## Chinese Country Report

**Dr. Inagaki:** We are very sorry that the Chinese participants were unable to attend. Many thanks to Dr. Boonjit for presenting the Chinese country report on their behalf.

I would like to ask Dr. Boonjit if he can describe the Vegetable Basket Program and tell us about the current disposition of the production responsibility system.

**Dr. Boonjit:** The aim of the Vegetable Basket Program is to supply vegetables especially to large cities where much of the land has been converted to non-agricultural purposes. In this program, land near cities is allocated for only growing vegetables. The township subsidizes fertilizer and other inputs for farmers who are typically a husband/wife team working a plot less than one tenth of a hectare. All of the produce is sent to a central market, built and subsidized by the government. This is typical around Beijing.

At Guangchou, near Hong Kong, most of the land is occupied by factories. Here the townships have allocated some land for vegetable production. The factories have formed partnerships with the townships and share the costs of subsidizing vegetable production.

With regard to the production responsibility system, it is still operating to ensure food security. In this system, land is allocated for grain production and it is expected to produce a certain amount. I anticipate that this system will gradually change.

**Dr. Erwidodo:** China won't give up the production responsibility system because of its huge population and the need to ensure its food supply. Lester Brown has predicted a food shortage in China. I would like to ask the Chinese what their reaction is to this prediction.

**Dr. Boonjit:** I am also somewhat pessimistic about China's ability to meet its food demand. As the economy expands, it overheats, and shortages can be expected. Consumption of high quality food items is almost a cult in the south, but these must be imported. The north in particular is still very poor.

**Dr. Bottema:** The vegetable consumption recorded in China seems very high at about 150 kg/capita/year. Perhaps a shift back to rootcrops might be expected.

## Indian Country Report

No discussion.

## Thai Country Report

No discussion.

## Pakistan Country Report

**Dr. Bottema:** What is the current situation of Basmati rice in the world market?

**Dr. Akhtar:** The government distributed new varieties and these had extremely high adoption rates by farmers. Unfortunately, the quality of the new rice is lower, with the result that Pakistan is losing its Basmati markets.

**Dr. Kelley:** The wheat : maize price relationship is very interesting. Can you explain it? Is the maize price equal to the world market price? And a final question, is wheat being used in feed?

**Dr. Akhtar:** The wheat : maize price relationship is due to the fact that wheat is the staple food with support prices, whereas maize trades on the open market. The maize price in Pakistan is below the world market price. Wheat is indeed being used in feed because maize is more expensive.

**Dr. Erwidodo:** Can you explain your remark that market efficiency is important for soybean export expansion.

**Dr. Akhtar:** Soybean is not a well established crop in Pakistan. There is no export promotion board for fruit and vegetables so marketing is inefficient.

## Indonesian Country Report

**Author's response:**

**Dr. Gunawan:** Regarding the selection of emerging crops and markets, we considered not only upland or dryland but also the crops with the greatest future potential. For the unsuccessful case studies, we selected crops with real potential which had not lived up to their potential due to government policies.

The input - output table was not used because it is not sufficiently detailed. It should be noted that the current situation has changed somewhat from the situation at the time the study was conducted.

In response to Dr. Wayan's comments, I remind you that the agribusiness approach considers both supply and demand aspects together.

## Philippine Country Report

**Dr. Gerard:** You noted some nutrient deficiencies in the Philippine diet. Is there a possible contradiction between the effort to correct the diet and export promotion efforts? The exchange rate is considered high, but if it were low, imports would be more expensive.

**Author's response:**

**Ms. Lantican:** There is indeed some contradiction here, but the study focused on export promotion.

**Dr. Erwidodo:** The country reports are tailored to the project requirements. Poverty alleviation per se and removing disparities were not addressed in this project. We might save this issue for the general discussion session.

## Vietnamese Country Report

**Dr. Bottema:** Regarding rice exports, the huge jump in 1991/92 seems too large to be explained by policy changes alone. Is it possible that unregistered exports were occurring previously?

**Author's response:**

**Mr. Chien:** Factors other than policy may be involved, but policy change is considered the most important. It is estimated that technological development accounts for 35% of the increase in rice production and export. The major change in policy caused the large increase in production.

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# General Discussion

**Dr. Boonjit:** The first and perhaps most important item for consideration in this general discussion is to examine the policy recommendations for improving market potential and issues for further research presented by Mr Sotaro. Is there anything that should be added or deleted from this list?

**Dr. Kumar:** All country experts should check their country data in the summary tables of the integrated report and inform Mr Sotaro of any errors.

**Dr. Boonjit:** This is an excellent suggestion. Please check those parts of the integrated report that apply to your country. Now, I would like to come back to the policy recommendations. Let's start with the production level.

**Dr. Mruthyunjaya:** I think the major production constraint for upland crops that should figure in our policy recommendations is the lack of improved varieties for different agro-ecologies. That should be the first recommendation. Furthermore, the term 'irrigation' may not be sufficient; management of available water, then harvesting water and making use of it may be more appropriate than irrigation.

**Dr. Boonjit:** We used the term irrigation because we found it in many of the country reports.

**Dr. Bottema:** This project gives unique data on each country, large and small. However, the policy recommendations must be given in a specific country setting. The value of this study is in showing the variety of policy recommendations. Therefore, I suggest changing policy recommendations to policy issues.

**Dr. Boonjit:** Very good suggestion. We will consider them issues.

**Dr. Kelley:** I'm concerned that some of the items listed are too general to be meaningful.

**Dr. Mruthyunjaya:** Cooperatives and the agribusiness concept should be highlighted here with respect to fruit and vegetables. Also, participation of the private sector needs to be encouraged in the fruit and vegetable sector at the production level.

**Mr. Chien:** Environmental issues are listed under vegetables and fruit but not under major upland crops. Environmental issues are extremely important in upland areas, so this issue should be listed there also.

**Dr. Boonjit:** You're quite right of course.

**Dr. Kumar:** Quality seed is available, but this does not mean that it meets the needs of processors. We should specify this.

**Dr. Kelley:** Who are these policy recommendation for, government or the private sector? Some people believe that the government shouldn't be involved in some of these issues, eg seed quality.

**Dr. Boonjit:** This depends very much upon the country.

**Dr. Itharattana:** In the Thai report, we did not separate our recommendations into those applying to major upland crops vs those applying to vegetables and fruit.

**Dr. Bottema:** Let's not forget that that we are dealing with policy issues not recommendations. A further point, some of the policy recommendations in the country reports are supported by data while others are not supported by the research.

**Dr. Boonjit:** All country experts, please check that the integrated report is consistent with your country report. We have summarized the common recommendations/issues from the individual country reports, and we will refer to them as important policy issues derived from the study.

**Dr. Kumar:** For clarification, I would like to ask if there will be a section on policy recommendations in the integrated report? And will they be prioritized?

**Dr. Boonjit:** Yes, I believe the policy recommendations will be included, but they will be country specific. We will follow consensus regarding prioritization.

**Dr. Castro:** For both upland crops and fruit and vegetables, crop protection and management should be included at the production level.

**Dr. Boonjit:** Agreed. Now shall we go on to the processing and marketing level.

**Dr. Bottema:** Strengthening linkages, a term which appears in many reports, is too general to be meaningful. We should specify what is meant.

**Dr. Boonjit:** Definitely. It could be contract farming, vertical integration or many other things.

**Dr. Kelley:** My question concerns promotion of investment in the processing industry for major upland crops. Does this refer to subsidies and tax breaks to encourage the private sector or to removing obstacles.

**Dr. Boonjit:** It refers to all of those and many other possible actions.

**Dr. Maan:** Agricultural credit should be listed at the production level because it is considered a production input.

**Dr. Boonjit:** Availability of credit is important for all market participants at all levels, including farmers.

**Dr. Mruthyunjaya:** Selective farm and processing mechanization needs consideration because of labor shortage. This could be included under both production and processing/marketing.

**Dr. Boonjit:** Mechanization is important at all levels so this is a general issue, like credit.

**Dr. Khan:** Many of the country reports mention that UCP have low priority, are inferior, but are expensive. Should there be some issue related to this?

**Dr. Boonjit:** Yes, this is a good general policy issue that we should come back to later.

**Dr. Bottema:** Market information should also be mentioned in the general section.

**Dr. Boonjit:** Now let's move on to issues concerning external trade. Item number six regarding pest and disease control should also be included at the production level.

**Dr. Bottema:** In item number one, does deregulation refer to producers or to importers?

**Dr. Boonjit:** The country studies generally looked at export commodities, deregulation here refers to producers. You're right in pointing out that deregulation could refer to either party.

**Dr. Bottema:** Do we have to deregulate in order to promote?

**Dr. Boonjit:** In some cases, yes; in others, no.

**Dr. Kelley:** I think it is important to note that some promotion efforts recommended in some of the country reports actually contradict deregulation.

**Dr. Boonjit:** Yes, this is true. For example, soybean is highly protected in Thailand. Deregulation of soybean would really benefit the livestock industry in particular and the whole country in general. Maybe we should be more specific and say "deregulation for export".

**Mr Chien:** I recommend the use of the term IPM in the issue concerning pest monitoring and management.

**Dr. Boonjit:** IPM may be relevant at the production level, but here at the export level, we are dealing with quarantine measures.

**Dr. Bottema:** We should then be more specific and use wording like "promotion of IPM" at the production level and "quarantine" at the export level.

**Dr. Boonjit:** We have an important question to consider; should this report prioritize recommendations for each country or should we only make general recommendations. I would like to ask Dr. Kelley who has not been associated with the project to comment.

**Dr. Kelley:** First, I would like to say that I am impressed by the volume of data and the analysis in these studies. These will be extremely useful reference documents for a long time. However, I'm a little concerned about the policy recommendations. They're too general. Furthermore, the results of the study don't always point to the policy recommendations. This is not to say that the recommendations are not valid. They are, but they are not all based on the results of the study. My suggestion is not to make policy recommendations, but to lay out what the key issues are. It will take time to digest these issues. For instance, what are the implications of the trade gaps predicted for the year 2010 and whether or not a country has a comparative advantage in filling these gaps. There's going to be a large gap for fruits and vegetables for and pulses for India. If we're really looking for trade opportunities we shouldn't be in such a hurry to fill those gaps by production. We should first assess who has the comparative advantage within and outside the region, and then make good on the advantages that exist in trade.

So, my suggestion is to lay out the issues. For instance, where and when should government intervene and what should be left to the private sector? My own feeling is that seed can be left to the private sector, while government's scarce resources should be used where the private sector cannot capture a return from investment. Market information is an area where governments can play a role. Another issue is the question of self sufficiency versus self reliance. Should production of strategic crops such as rice or sorghum continue even if the production is inefficient? Or should we promote trade and the inherent advantages? Another area where government support may be forthcoming is in grading and standardization. The private sector is probably not very adept at doing this. I don't know how relevant it is for the crops discussed here, but for the ICRISAT crops we have always been somewhat concerned about promoting or exploring alternative uses for what have previously been food security or poor man's crops. The reason is, once there are alternative uses of the poor man's crops, the demand goes up with an impact on the price and where the poorest of the poor are net purchasers of these primary commodities, it can adversely affect them. This may not affect most of the crops discussed in the country reports, except possibly sweet potato and potato. Most of the emerging crops are higher value crops and it may not apply. In the case of sorghum in Africa, we felt that too many people would be affected by development of alternative uses.

Thus, I would suggest that we lay out issues that need to be further explored rather than clear-cut policy recommendations.

**Dr. Boonjit:** Thank you very much. Are there any other views?

**Dr. Akhtar:** While we might not make policy recommendations, we should specify the implications of the study to researchers, to extension workers and to policy makers, so these people could get a clear-cut message of what they have to do.

**Dr. Boonjit:** It's becoming clear to me that we cannot make specific policy recommendations. We can however pinpoint important policy issues, under the present categories (production; processing and marketing; external trade; and general). Is this agreeable? The general policy issues will include environment and sustainability, standardization of processed products, marketing research, provision of credit, and the lack of priority for UCPs. Is there anything else that should be considered a general policy issue?

**Dr. Bottema:** This study didn't do anything on the environment. Thus, mention of the environment is simply fashionable and unnecessary here.

**Dr. Boonjit:** I agree that any recommendation on environment would not be based on the results of the study. Similarly, IPM was not mentioned previously. However, it seems appropriate to add general issues at this point.

**Dr. Bottema:** Many of the policies are crop specific and crops are area specific. Thus, the policies may become area specific. The spatial impact of policies should be investigated in further research.

**Dr. Maan:** The country reports list their study objectives, etc., so we have a clear perspective of what they are about. Perhaps the integrated report could follow the same sort of format. The term policy implications is acceptable; it is up to governments to accept them or not. It is normal at forums such as this to come up with conclusions.

**Dr. Boonjit:** The term to be employed will be determined by discussion with ESCAP. The policy implications will definitely be included in some form or other. Now, I conclude the policy discussion and we now move on to general discussion.

**Mr. Tengku Ariff:** It is generally believed that consumers are right. For instance, there are some studies which indicate that consumer diets are shifting towards low calories, sodium and fats, but high protein, minerals and vitamins. If this is true, as the standard of living increases, demand for high quality foods also increases. However, the country reports show that vegetable consumption registered positive growth only in a couple countries and negative growth in other countries. This needs to be explained. Is the vegetable supply so acute that prices have risen, driving consumption down? There are other apparent inconsistencies between the data reported and expectations.

**Dr. Kumar:** The income elasticity for vegetables in India is less than 1.

**Dr. Boonjit:** Are you suggesting that vegetables in India are not high value or are inferior goods? Because in terms of income elasticity, they are inferior.

**Dr. Kumar:** The income elasticity is in fact 0.2 but they are not inferior goods. We need more data on the level of consumption, not just on income elasticity. The demand for vegetables has increased at the rate of 4% per annum.

**Dr. Bottema:** There are different types of trends in different countries. Perhaps we should examine the normal expectations in greater detail.

**Dr. Kumar:** In most of these studies, there are many assumptions, for instance that 2% of production goes for seed. We should recommend that more detailed data collections are required.

**Mr. Koyama:** Regarding the situation in Japan and Korea, we need further research on vegetable intake and elasticities.

**Dr. Kumar:** I wonder if it would be possible for the authors of the country reports to respond in the proceedings to the commentators remarks.

**Dr. Boonjit:** We have run out of time. However, I have a suggestion. Because this discussion is so important, I recommend that we use a maximum of 30 minutes on Friday morning for a final discussion.

**Dr. Boonjit:** Let me start this session by summarizing the main points of discussion on Tuesday/Wednesday. What we had called *policy implications* will become *important policy issues derived from the study*, at the production level, the processing and marketing level, and concerning external trade. There will also be a miscellaneous category of *general policy issues*, which will include the three points already suggested plus the issues of credit availability and the need for promotion of UCPs. Some recommendations put forth in the discussion are not at all or only partially supported by results of the study.

Now I would like to move on to a consideration of items now listed under general policy issues.

**Dr. Mruthyunjaya:** We should recommend in general that the database be expanded related to all aspects for CGPRT crops.

**Dr. Boonjit:** A regional database of this nature does exist at the CGPRT Centre.

**Dr. Mruthyunjaya:** What I meant was that each country should have its own capability in this area, and then it could provide data to the CGPRT Centre.

**Dr. Kumar:** As I mentioned previously, the database on feed is very poor in India, especially as this relates to UCPs. What data we have is mainly based on residuals fixed in the 1960s at 1 or 2%. These values have totally changed, especially for maize and other upland crops. This makes us very uncertain about the supply side in our county.

**Dr. Boonjit:** This is an excellent comment since most UCPs are used in feed.

**Dr. Khan:** The recommendation regarding marketing research covers only exporting countries. I believe we should include importing countries here too.

**Dr. Boonjit:** The statement will read *import/export*.

**Dr. Maan:** The fourth point under general policy issues should be the promotion of trade in UCPs in the intra-ESCAP region.

**Dr. Mruthyunjaya:** Another suggestion related to the previous remark is that recipes for the use of UCPs be compiled in each country and disseminated to other countries so products can be adapted to the requirements of other countries.

**Dr. Erwidodo:** Why not include research on technology because most countries mention very low yields of most upland crops. This could be included as a general recommendation as

well as under the production heading. A second suggestion: is it possible to standardize units used in the table?

**Dr. Boonjit:** With respect to units, we requested that standard units be used but some countries were unable to provide data in that form. Use of conversion factors might distort the picture.

**Dr. Castro:** With regard to standardization of processed products of upland crops, I think it would be better to seek harmonization of standards for fresh and processed UCPs, because each country has its standards.

**Dr. Boonjit:** In fact, the CODEX standards exist, but we need to implement them.

**Dr. Wayan:** Regarding food security, despite great advances, a large number of people still suffer from deficiencies. While transfer of food from surplus countries to deficient countries occurs, it is far more important that technology be transferred from developed countries to starving countries.

**Dr. Boonjit:** Now I would like to move on to the future research agenda. I would like to ask Dr. Kelley's opinion regarding future research needs.

**Dr. Kelley:** One of the things that comes to mind is the need to consider ways to identify the best trade opportunities, given the wealth of information assembled here. Then the next step is to identify existing constraints to achieving potentials. Is it supply side; is it demand side? How can governments fully exploit comparative advantages in trade? If indeed there are policies that currently discriminate against UPCs, let's identify and remove these obstacles. These are some areas for future research.

**Dr. Boonjit:** Thank you for these comments. Some of what you suggest is in fact included in the follow-up project on trade liberalization.

**Dr. Mruthyunjaya:** The term *coarse cereals* has a negative connotation. Perhaps we should refer to them as nutritive crops or something else.

**Dr. Kelley:** The word coarse indeed has a negative connotation. However, changing the name won't affect demand over time. They are indeed inferior goods for direct food use, but their indirect demand will increase as demand for livestock feed increases. They have perhaps higher elasticity of demand than even the fine cereals. They do have potential not as food, but as feed.

**Ms. Smellie:** With regard to future research, I would like to point out that if upland crops are promoted, there will be an expansion of planted area leading to competition with other crops. We need to know what other crops are competing for this land in each country.

**Dr. Kumar:** We don't know the impact of upland crops on increasing income of upland farmers. In addition, the supply side data are missing for UCPs and these data are very important. We need to know the use of inputs for upland crops. Then we can say how supply trade can take care of food security. These are some suggestions for research.

**Dr. Boonjit:** I agree entirely. These ideas have already been incorporated in the follow-up project. So much for the future research agenda. Now, if there is no further discussion, I will close this session.

# Consolidated Address

*Dr Boonjit Titapiwatanakun*[*]

I have prepared five issues which I will touch upon. The first issue is about the framework of this MPUPA project implementation. The second issue is implementation of this MPUPA project. The third will be the problems. The fourth one will be future research on upland crops. Last, will be the CGPRT Centre's role.

First of all let me take this opportunity to mention a few names. I would like to thank Dr Seiji Shindo and Dr Kunio Tsubota, who are the engineers behind this particular project. Especially Dr Tsubota, the manager of Division I of the International Department, National Research Institute of Agricultural Economics of Japan, who spent one month here in Bogor to conceptualize and to prepare the project objectives and the framework. And Dr Shindo, the previous Director, was also very, very involved. During that time I was caught in the middle, because I was attending the Technical Advisory Committee meeting at the CGPRT Centre. So, I was requested to assist the implementation of the MPUPA project as the Regional Advisor. I must say thanks to both of them, because I learned a lot from this project.

During the finalization of the MPUPA project framework, we thought that we should do something new. Something new means what? Something new means that we have to think of some appropriate framework which is cost effective and efficient. So, for the first time we introduced a project implementation approach which started with a planning meeting, followed by interim mission and final draft meeting, and eventually the regional workshop. It turned out to be very successful, especially the planning workshop.

One can easily imagine that it's difficult for two persons to read two pages of proposal or one page of TOR and come up with an identical interpretation, because people interprete differently. As a matter of fact, no matter how well the proposal and TOR are prepared, there is still a gap in communication with language which is not the first language of the parties concerned. So, in the planning meeting, we spent a lot of time explaining what the CGPRT Centre really expected, that is the objective of the project. As for the methodology, we needed some sort of a common methodology so that the results could be integrated. I must say that we had a good time during the planning meeting. We had a good time arguing. We had a good time brainstorming. Eventually, we ended up happily. We had good planning for the project implementation that suited every country expert's time schedule and the Centre's time schedule as well as achieving the objectives of the project. And all of the country experts felt happy that they could contribute to the project.

The implementation of the project was smooth. However, there were some problems, such as delays in receiving the interim reports before the interim mission. Luckily, we managed to carry out our interim mission successfully. In some cases, we had to review the interim report during our interim mission, especially in the night time.

And finally when we came to the final draft meeting, we again had a very fruitful discussion of the country expert's reports, which were submitted in time. All the country experts worked very hard on their reports and contributed a lot of constructive comments on the country

[*] Department. Agricultural and Resource Economics. Faculty of Economics. Kasetsart University, Bangkok, Thailand.

reports. From all of this exercise, I observed at least one important key issue: that is that the approach of implementation provided a forum for exchange ideas and an opportunity to learn among all parties involved in the project. And in the process, friendship and mutual understanding were developed from a very official to an informal form of relationship. The most important thing is that the Centre created an official relationship and official network within the participating countries and informal personal understanding among the national experts. This is indeed a great success for this particular project.

Now, let me share some experiences of our interim mission. The interim mission was a really good exercise for all of us. The tough part of the mission was that in the day time we visited so many interesting institutions and in the night time we had to read the reports and have meetings. So, it was more than 12-hours work each day. In addition, we had to adapt ourselves to the climate, the culture, the food and the dietary pattern.

However, it is worthwhile to mention two things concerning the interim mission. First, is the role of the CGPRT Centre. The role of the Centre had been interpreted with a rather higher regard than we expected. For example, we were well received in a very formal way. And we were asked to make comments on some particular aspects which are not covered in the project. In an other case, we were asked without any prior notice to give a speech on the international prospects of vegetables and fruit ten minutes after we arrived for a scheduled visit to the institution. It is obvious that all of the countries have great expectations of this ESCAP CGPRT Centre and its role in CGPRT crops. Therefore, whatever we do, we must bear in mind that the quality of work must be live up to these expectations.

The second thing is that there might be some misunderstanding with good intention. Because, we were supposed to conduct interviews to get some information from some institutions in the participating countries but somewhere in the process, we ended up giving information rather than receiving information.

Now, I come to the third point, the difficult issues. The methodology happened to be a very big problem for us. Take for example, the size of the countries which is so different. I agreed totally with the idea that China and India should have separate treatment because these two countries are very big. However, the issue is how big is big; how small is small. How can we classify big, and how can we classify small. Let me share some experience of mine in this field. Population wise and area wise, I would say that India and China are the biggest among this ESCAP region, no doubt of that. Nevertheless in terms of commodities, it is quite different. A small country like Thailand, area-wise may be equal to one province in China, but Thailand is the biggest exporting country of cassava products in the world market. Thailand exported around 5 million tons of cassava products per year, and produces about 20 million tons of cassava root per year. Let us take another example: Japan didn't produce any maize, but Japan consumes 17 million tons of maize per year. If we encourage internal trade within the ESCAP region, the total tradable maize production in this region will not be able to meet this amount. Therefore, Japan is the biggest maize importing country. Having said all this, we have to treat every participating country more or less the same.

Now we come to another extreme. The total production of maize in China is about 200 million tons per year. So, 10% of this amount is 20 million tons, which is a big figure. We don't know how to classify which is big, which is small.

The methodology for projection is indeed a problem. There's no single best method in the world that can predict exactly. If I knew a method that is able to predict price correctly or predict quantity correctly, I don't think I would work for ESCAP or work for my government. I would sit in New York in a stock market and make a lot of money. However, as economists, we

can only predict the trends. We can give a scenario in the future. Although it is extremely difficult to predict a long run, sometimes we boldly predict a long run trend.

As a matter of fact, there are a few famous models in the world that can give many kinds of economic estimations. For these models many million of dollars were spent. With the rather limited budget for the MPUPA project, we have to settle with a very simple, easy to understand, very primitive way of prediction by using trends, income elasticity and population growth. But still, we had a problem. The problem was due to the differences of databases in each country. Some countries cannot have any kind of income elasticity.

Data is a big problem. For example, the reliability of data is one issue. So, what have we done with the data?. We have to rely upon our national experts. We discussed the data reliability issue with our national experts and reminded them to check. In some cases, we checked the data using the databases of the CGPRT Centre. Experience from MPUPA project regarding database for selected upland crops is that there is a need for establishing a database. However, this will be a very costly on-going exercise for the CGPRT Centre to carry out. If we want to go into a primary data collection exercise, I think the Centre must prepare for a big project for that particular exercise. However, it would be feasible for the Centre to compile and publish data of upland crops which are provided from the participating countries.

Having noted all the problems, let me share my ideas of the future direction of research on upland crops. Ladies and Gentlemen, what is the objective of the MPUPA project? We want to increase the poor farmers' income, especially we want to increase the farmer income in the remote irrigated or un-irrigated areas where upland crops or CGPRT crops are grown. We talked a lot about the market imperfection, monopoly, oligopoly, monopsony, whatever you name it. But to increase farmer income, it is not only the market itself, but one has to consider also how much one can sell of the product which is processed from the raw material produced by farmers. Take an example: if the processor can sell tapioca products at a higher price, then he will be able to offer and buy cassava root at a higher price. For the past 20 years in our field of agricultural economic research, we've been focused on the study on production at the farmer level. We study each commodity as a commodity; we seldom got one step further than the commodity into the study of final products. In other words, there is a lack of agro-industrial product studies which provide the value-added of the raw material from agricultural products.

Now let me come to the last point which is what the Centre should do after it has published the reports of the MPUPA project. I believe that everybody agrees with the fact that this study has a lot of good impacts and has contributed some good things to the participating countries. But, Ladies and Gentlemen, how can we quantify this impact? This is a big question. This is the big challenge for the Centre or for all of us to think about. I agreed totally with the Director in his opening remarks that it is the utilization of this particular study in the country concerned which will be a good indicator. Therefore, there is a duty or a challenge to the Director of the Centre to follow up in the future.

So, before I close my consolidated address, I would like to take this opportunity to thank a lot of people here. First and foremost, the Director of the CGPRT Centre, I thank you for your support, not only the administrative support but also for the mental support to this MPUPA project. Certainty, we would not have published all the reports without the good support from Dr Bottema and especially Mr Stoltz, our Chief Editor of the CGPRT Centre. Both of them deserve a big hand for all these reports.

And of course, we would like to express our sincere thanks to the Director's staff, Ms Koniah, your secretary, Ms Sri, and the publication officer, Ms Fetty, the secretary Ms Babay, the database officer, Mr Hasrat, the library assistant Mr Deddy and of course the drivers who provided us with transportation and logistics. Last but not least, we are really very thankful to

our secretary, the project secretary, Miss Rahajeng Pratiwi, or Titiek. Well, all these thanks are on behalf of our team. I said team, which means Mr Inoue and all of our national experts are included. So, please give these people a big hand and thank you.

# Appendix 1 Program

**Monday, 24 February 1997**

Participants arrival

**Tuesday, 25 February 1997**

08.30 - 09.00 *Registration*

09.00 - 09.30 *Opening address:*
Dr Haruo Inagaki, Director, CGPRT Centre
Mr Eiji Suzuki, Policy Coordinator, International Cooperation Planning Division, Min. of Agriculture, Forestry and Fisheries, Japan
Dr Faisal Kasryno, Director General, Agency for Agricultural Research and Development, Min. of Agriculture, Indonesia

09.30 - 10.15 *Keynote address*: Dr Masaru Kagatsume, Professor, Kyoto University, Japan
*International perspective of food market and agricultural development in Asia*

10.15 - 10.45 ---coffee break----

10.45 - 11.00 *Brief review of the MPUPA project*: Mr Sotaro Inoue, CGPRT Centre

11.00 - 11.45 *Country report of China*: Dr Cheng Guoqiang
chairperson: Dr Praduman Kumar
commentator: Dr Liu Xueming
Ms Xiong Chunkai

11.45 - 13.00 Lunch

13.00 - 13.45 *Country report of India*: Dr Praduman Kumar
chairperson: Dr Muhammad R. Akhtar
commentator: Dr Dayanath Jha
Dr Mruthyunjaya

13.45 - 14.30 *Country report of the Philippines*: Ms Josefina Lantican
chairperson: Mr Dao Huy Chien
commentator: Ms Carolyn C. Castro
Dr Benjamin L. Buetre

14.30 - 15.00 ---coffee break----

15.00 - 15.45 *Country report of Pakistan*: Dr Muhammad Ramzan Akhtar
chairperson: Dr Kajonwan Itharattana
commentator: Mr A. H. Maan
Mr Naseer Alam Khan

18.30 Welcome dinner at New Mirah Hotel

**Wednesday, 26 February 1997**

09.00 - 09.45 *Country report of Indonesia*: Dr Memed Gunawan
chairperson: Dr Cheng Guoqiang
commentator: Dr Erwidodo

09.45 - 10.30 *Country report of Thailand*: Dr Kajonwan Itharattana
chairperson: Dr Memed Gunawan
commentator: Dr Boonkerd Budhaka
Mr Boonterm Tiravattnaprasert

10.30 - 11.00 ---coffee break----

11.00 - 11.45 *Country report of Vietnam*: Mr Dao Huy Chien
chairperson: Ms Josefina Lantican
commentator: Mr Phi Manh Hung
Dr Nguyen Trung Que

11.45 - 12.15 *Integrated report*: Mr Sotaro Inoue, CGPRT Centre
chairperson: Dr Boonjit Titapiwatanakun

12.15 - 13.00 Lunch

13.00 - 14.40 *General discussion*: chairperson: Dr Boonjit Titapiwatanakun

14.40 - 15.00 ---coffee break---

15.00 - 16.00 *Pulses Trade Study*: Dr. Nico L. Kana
chairperson: Dr Kedi Suradisastra
commentator: Dr Mruthyunjaya
Ms Daw Shirley Smellie
Mr Naseer Alam Khan
Mr L. P. Rupasena

**Thursday, 27 February 1997** ***One-day field trip*** *(Dr Kedi Suradisastra)*

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|---|---|
| 07.30 | Departure from New Mirah Hotel |
| 08.15 | Arrival at Gunung Mas tea plantation |
| 10.30 | Departure from Gunung Mas tea plantation |
| 11.30 | Arrival at Mekarsari Horticultural Center, Cileungsi |
| | ----- Lunch at Mekarsari Horticultural Center ------ |
| 15.00 | Departure from Mekarsari Horticultural Center, Cileungsi |
| 16.00 | Arrival at New Mirah Hotel |

**Friday, 28 February 1997**

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| 09.00 - 09.40 | *Consolidated address*: Dr Boonjit Titapiwatanakun |
| 09.40 - 09.45 | *Closing address:* Dr Haruo Inagaki, Director, CGPRT Centre |
| 09.45 - 10.00 | ---- coffee break ---- |
| 10.00 - 12.30 | *Preliminary meeting for the TradeLib project*<br>agenda: - project framework and work plan<br>- comments by national expert candidates<br>- others |
| 12.30 - 13.30 | Lunch |
| afternoon | *Individual consultation* |

**Saturday, 1 March 1997**

Participants depart.

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# Appendix 2 List of Participants

**INDIA**

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|---|---|
| Dr Praduman Kumar | Head and Principal Scientist<br>(Agricultural Economics)<br>Indian Agricultural Research Institute<br>New Delhi 110012 |
| Dr Dayanath Jha | Director<br>National Centre for Agricultural<br>Economic and Policy Research<br>Library Avenue, IASRI Campus<br>P.O. Box 11305, New Delhi 110012 |
| Dr Mruthyunjaya | Assistant Director General ESM<br>Indian Council of Agricultural Research<br>Dept. of Agricultural Research and Education<br>Ministry of Agriculture, GOI<br>Krishi Bavan, New Delhi 110001 |

**INDONESIA**

| | |
|---|---|
| Dr Achmad M. Fagi | Director<br>Central Research Institute for Food Crops<br>Jl. Merdeka 147, Bogor 16111 |
| Dr Achmad Suryana | Director<br>Centre for Agro-Socio Economic Research<br>Jl. Ahmad Yani No. 70, Bogor |
| Dr Memed Gunawan | Director<br>Center for Investment Development and<br>Enviromental Impact Assessment<br>Agribusiness Agency, Ministry of Agriculture<br>Gedung F Lt. II, Jl. Harsono R.M. 3, Ragunan<br>Jakarta 12550 |
| Dr Erwidodo | Senior Research, and Coordinator of<br>Agribusiness Research Group<br>Center for Agro-Socio Economic Research<br>Jl. Ahmad Yani 70, Bogor 16144 |
| Dr I Wayan Rusastra | Researcher<br>Centre for Agro-Socio Economic Research<br>Jl. Ahmad Yani No. 70, Bogor |

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|---|---|
| Dr Nico L. Kana | Fac. of Psychology<br>Sanata Dharma University<br>Mrican, P.O. Box 29<br>Yogyakarta 55002 |

**JAPAN**

| | |
|---|---|
| Mr Eiji Suzuki | Policy Coordinator<br>International Cooperation Planning Division<br>Economic Affairs Bureau<br>Ministry of Argiculture, Forestry and Fisheries<br>1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100 |
| Mr Fumihiko Futakuchi | Head, United Nation Section<br>International Cooperation Planning Division<br>Economic Affairs Bureau<br>Ministry of Argiculture, Forestry and Fisheries<br>1-2-1 Kasumigaseki, Chiyoda-ku, Tokyo 100 |
| Mr Toshimitsu Miyamori | First Secretary and Deputy Permanent Representative of Japan to ESCAP<br>Embassy of Japan<br>1674, New Petchburi Road<br>Bangkok 10310, Thailand |
| Dr Masaru Kagatsume | Professor<br>Dept of Natural Resources Economics<br>Graduate School of Agriculture<br>Kyoto University, Sakyo, Kyoto<br>Japan 606-01 |
| Dr Michio Kanai | Director, Library and Information Division<br>National Research Institute of Agricultural Economics<br>Min. of Agriculture, Forestry and Fisheries<br>2-1 Nishigahara 2-Ohome, Kita-ku, Tokyo 114 |
| Mr Osamu Koyama | International Research Coordinator<br>Research Information Division<br>Japan International Research Centre for Agricultural Sciences<br>1-2 Ohwashi, Tsukuba, Ibaraki 305 |

**KOREA**

| | |
|---|---|
| Mr Myung-Hwan Sung | Research Associate<br>Economic Consultant<br>Korea Rural Economic Institute<br>4-102 Hoigi-Dong, Dongdaemoon-Gu<br>Seoul 130-050 |

**LAO**

Mr Onechanh Boonnaphol
Director, Agriculture and Forestry Division
Province Luang Prabang
Department of Agriculture & Extension
Min. of Agriculture & Forestry
P.O. Box 811 Vientiane

**MALAYSIA**

Mr Tengku Mohd Ariff bin Tengku Ahmad
Research Officer/Assistant Director
Economic and Technology Management Research Centre
Malaysian Agricultural Research and Development Institute, MARDI Headquarters
P.O. Box 12301, 50774 Kuala Lumpur

**MYANMAR**

Ms Daw Shirley Smellie
Assistant Manager
Seed Division, Myanmar Agriculture Service
Min. of Agriculture and Irrigation
Insein, Gyogon, Yangon, Myanmar

**PAKISTAN**

Dr Abdul Hamid Maan
Economic Consultant
Economic Wing
Min. of Food, Agriculture and Livestock
Shaheedi-Millat Secretariat, Minfal, 9th Floor
Islamabad, Pakistan

Mr Naseer Alam Khan
Director, Social Science Institute
National Agricultural Research Centre
Park Road, Islamabad

Dr Muhammad Ramzan Akhtar
Programme Incharge
Agricultural Economics Research Unit
National Agricultural Research Centre
Park Road, Islamabad-Pakistan

**THE PHILIPPINES**

Ms Josefina M. Lantican
Supervising Agriculturist
Bureau of Agricultural Research
Department of Agriculture
3/F ATI Building, Eliptical Road
Diliman, Quezon City

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|---|---|
| Ms Carolyn C. Castro | Planning Officer IV<br>Planning and Monitoring Service<br>Department of Agriculture<br>3/F Ati Building, Eliptical Road<br>Diliman, Quezon City |
| Dr Benjamin L. Buetre | Assistant Division Chief<br>Information System Office<br>Bureau of Agricultural Research<br>3/F ATI Building, Eliptical Road<br>Diliman, Quezon City |

**SRI LANKA**

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|---|---|
| Mr Rupasena Liyanapathirana | Head of Marketing and Food Policy Division<br>Hector Kobbekaduwa Agrarian<br>Research and Training Institute<br>Wijerama Mawatha No. 114<br>P.O. Box 1522, Colombo 7, Sri Lanka |

**THAILAND**

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|---|---|
| Dr Boonjit Titapiwatanakun | Dept. of Agricultural and Resource<br>Economics<br>Fac. of Economics<br>Kasetsart University<br>Bangkok 10903, Thailand |
| Dr Kajonwan Itharattana | Policy and Agricultural Development Plan<br>Specialist<br>Office of Agricultural Economics<br>Ministry of Agriculture and Cooperatives<br>Rajdamnern Nok Rd., Bangkok 10200 |
| Mr Boonterm Tiravattnaprasert | Assistant Professor<br>Dept. of Agricultural and Resource Economics<br>Faculty of Economics, Kasertsart University<br>Jatujak, Bangkok 10900 |
| Dr Boonkerd Budhaka | Senior Economist<br>Office of Agricultural Economics<br>Ministry of Agriculture and Cooperatives<br>Rajdanem Nok Road, Bangkok 10200 |

**VIETNAM**

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|---|---|
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**INSTITUTIONS**

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| Mr Keith Fahrney | Upland Agronomist<br>Lao-IRRI Project<br>International Rice Research Institute<br>Luang Prabang Office |
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