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# I. SUMMARY OF FINDINGS

## INTRODUCTION

The Asian Productivity Organization (APO) organized a Working Party Meeting of the correspondents from APO member countries, held in Bangkok in November 2001, to conduct a fact finding regional survey in seven selected member countries viz. Republic of China, India, Japan, Malaysia, Philippines, Thailand and Vietnam. The main objectives of the Survey were to measure productivity / competitiveness of selected vital tradable agricultural commodities and to analyze the trade performance of these tradable commodities based on such indices and compares it across countries and/or benchmarks it against "best" farms/factories.

The Working Party Meeting was followed by Symposium held in Bangkok during 15-17 December 2003 to present and discuss the results of the survey in the form of individual country reports and regional report. The regional survey report was prepared by Professor Saburo Yamada while correspondents of member countries presented their respective country reports. Mr. Glenn Ronan, the resource speaker, made special presentation on the 'Benchmarking'.

## REGIONAL SURVEY REPORT

**Regional Survey Report On Agricultural Productivity Index** (Professor Saburo Yamada)

Given the globalization and ongoing trade reforms under the World Trade Organization, more pressure is being exerted on agriculture to improve its productivity, especially in respect of certain major commodities that need to compete in international markets. To measure and analyze productivity / competitiveness of selected vital tradable agricultural commodities, eight commodities namely rice (paddy), maize, coconut, sugarcane, pineapple (canned), palm oil, natural rubber and soybeans were selected under the Survey. Since all these commodities were not relevant for every country, the selection of the commodities was made according to correspondents' own analysis of their respective countries. The main findings are summarized below.

The importance of the surveyed commodities in terms of share of exports in their respective total agriculture and food exports varied a great deal across countries. On one end of the spectrum lie ROC (Republic of China) and Japan where total shares of export of the surveyed commodities in total agriculture and food export have been less than 1 percent during 1990s, and on the other end lie The other countries occupied middle portion of the spectrum. The commodity-wise performance across member countries has been recapitulated as under.

### Rice

The rice has been surveyed in six countries namely ROC, India, Japan, the Philippines, Thailand and Vietnam. Of them, India, Thailand and Vietnam have been leading exporters. The trends of export volume corresponds to those of TFP indices in ROC during 1990-2000. In the case of India, her export volumes declined during 1995-2000. More important than the value aspect of TFP, it was due to low share of basmati rice (premium quality and as such higher prices) in the total export of rice in 1995. This situation reversed in 2000 when the share of basmati rice was higher than that of non-basmati rice and hence higher average export price in that year. In Japan**,** trade trends were mainly influenced by domestic policy and WTO agreement, although some trade trends were explained by values of TFP. However, no relationship between trade volume and TFP emerged in case of the Philippines, Thailand and Vietnam.

Import of rice to Asia increased from 5 million MT to 13 million MT during 1990-1995 in response to demand expansion associated with income growth in the region. The Philippines has been the leading rice importer in 1990s, except for 1991 and 1992. Japan was following a policy of self-reliance until 1993 when it imported 2,590 thousand MT of rice. Japan started importing rice regularly from 1995 in pursuance of its obligation under minimum access volume (MAV). Imports of rice to ROC, India and Vietnam were negligible during 1990-2000.

Import prices of rice varied significantly across the countries. The prices increased during the first half of 1990s but decreased during the second half of 1990s in cases of ROC, Japan, India and Philippines, although the rates of change were different for these countries. These trends were in consonance with changes in land and labor productivity in these countries. Vietnam did not follow this trend in price behavior which may not be representative as quantity imported was nominal.

**Sugar**

The sugar has been surveyed in four countries namely India, Japan, the Philippines and Thailand. The share of Asia in the world sugar export was moderate at only 13-17 percent during 1990-2000. Amongst sugar exporters in Asia, Thailand has been the fore runner. The Philippines exported 0.25 million MT sugar, one tenth of Thai's in 1990 but volume declined to 0.13 million MT in 2000. In contrast, India expanded sugar export significantly from 27 to 349 thousand MT during the corresponding period. The significant decline of both land and labor productivity of sugar for India is consistent with export expansion and price decline during 1990-95. In contrast, productivity increased in case of the Philippines during 1990-95 which led to erosion of competitive position of the Philippines as is reflected in significant decline in its export share during 1990-95.

The world sugar export price showed a significant declining trend during 1990-2000. The sugar price of Thailand ebbed by almost half during 1995-2000. Its 2000 price of $152 per MT was 78 percent of that of Asia and 62 percent of the average world price. Such a low price explains expansion of export market for Thailand. The sugar prices in India and the Philippines also showed declining trends but the price levels remained at much higher levels than those of Thailand or the Asia/ world average. The price of the Philippine sugar was more than double of Thai's sugar with the result that the Philippines could not compete with Thailand.

Japan has been a regular importer who imported 1.5-1.8 million MT per annum during the decade of 1990s. The Philippines was a net sugar exporter till 1994 but imported 377 thousand MT while exporting 154 thousand MT, thus shifting to a net importer in 1995 and has kept this status until 2000.

**Natural Rubber**

The natural rubber has been surveyed in four countries namely India, Malaysia, Thailand and Vietnam. Malaysia was the leading exporter of rubber in 1990 and gradually lost that position to Thailand by 2000. However, a drastic shift in export performance of these two countries has been observed during the decade of 1990s when Malaysia's share of rubber export dropped down significantly from 35 percent in 1990 to 16 percent in 2000. Such a drastic decline has taken place due to the continuous diversification of acreage under natural rubber to palm oil. At the same time, Thailand realized a drastic expansion of rubber export and its share increased from 30 percent to 49 percent in Asia during the decade of 1990s. Vietnam exported only 76 thousand MT of rubber and its share was 2 percent of total export from Asia in 1990. India has been net importer of natural rubber and there was no export of this commodity in 1990. However, with introduction of a scheme for export promotion of rubber, a modest quantity of 13.36 thousand MT valued at US $ 8.18 million was exported by India in 2000.

Malaysia had been the leading rubber exporter and became the rubber price setter until the middle of 1990s. Prices of Malaysian rubber doubled during1990-95 when gap between demand and supply increased. This gap had crept in due to declining export capacity of Malaysia and a steady expansion in demand in the world. Steep rise in prices sent strong signals to neighboring countries such as Thailand and Indonesia to expand rubber production and export. Under very high world rubber price situation, production was promoted not only by Thai government agencies but also by a number of private enterprises who involved Malaysian experts on cultivation and processing of rubber.

Japan and ROC were leading rubber importers in the region in 2000. Import of rubber from Malaysia has increased from 136 to 432 thousand MT during 1990-2000. Imports to India fluctuated in the range of 8 thousand MT to 52 thousand MT in 1990s. Imports to Thailand and Vietnam were negligible during 1990s.

**Pineapple**

Pineapple has been surveyed in two countries namely the Philippines and Thailand. Value added per hectare and value added per man-day at constant 1995 US$ terms of pineapple (fresh) have been higher for the Philippines than for Thailand and the productivity indices had a steep fall in case of Thailand in 2000.The Philippines was able to maintain its productivity level (at constant US $ terms) during the second half of 1990s and increased their planted/harvested area. Unlike the Philippines, productivity declined significantly in Thailand which could have a stronger competitive position in the international market.

TFP of pineapple (Fresh) exhibited downward trend during 1995-2000 in both the countries. However, decline has been more pronounced in case of Thailand which contributed to improvement in Thailand's competitiveness in international market and consequently led to export expansion through an export price decline. While Thailand exports pineapple (canned) and not fresh pineapple, the Philippines exports a good mix of both forms of pineapple. Export of canned pineapple has increased steadily in the 1990s both in the world and in Asia. Thailand has been the most dominant exporter, accounting for about 50 percent share in Asia. Export prices of canned pineapple, both in Asia and the world, did not change during 1990-95. But a clear decline in prices in all the markets has been noted during post-1995 period due to subdued demand for the commodity in Asia. The prices of Philippine pineapple have ruled much lower than those of Thai and such price gaps would support higher growth export expansion from the Philippines than from Thailand.

**Palm Oil**

The palm oil has been surveyed by two countries viz. Malaysia and Thailand. Land and labor productivity indices in terms of value added per hectare and value added per man-day (at constant US$ 1995) prices have increased considerably, almost three times during 1990-95 in Malaysia. This phenomenon sent strong signals for diversification from other crops, mainly rubber, into palm oil. Both indices of productivity namely value added per hectare and value added per man-day declined to half in 2000, which adversely affected comparative advantage in domestic agriculture but might enhance its international competitiveness. Trends of TFP indices of palm oil have been in consonance with those of land and labor productivity in case of Malaysia. However, it was not so in case of Thailand. While TFP of both Malaysia and Thailand increased sharply during the first half of 1990s, it had a free fall during the second half of 1990s in Malaysia.

Malaysia has been the leading exporter of palm oil with about three quarters of Asia's share in 1990 and Asia commands about 90 percent of global export. Malaysia has exhibited an upward trend in export of this commodity in absolute terms. Though Thailand started in a modest manner, its contribution is noticeable when it expanded its volume of

export significantly during 1995-2000. The average export prices doubled from about US$300 per MT in 1990 to over US$ 600 per MT in 1995 but returned to around US$300 per MT again in 2000.

**Coconut**

The Coconut has been surveyed by two countries viz. India and the Philippines. In India, both measures of productivity showed significant declining trends during 1990-2000. However, these increased during the first half of 1990s before decreasing during the second half of1990s in case of the Philippines. Land productivity levels were higher in India than in the Philippines, particularly during 1990-95. In 1990, labor productivity was higher in India compared to that of the Philippines, it turned other way round in 2000.

Until 1995, volume of export of coconut by India has been negligible. However, a quantity of 400 MT was exported in 2000 as against 2.1 million MT, 2.4 million MT and 1.8 million MT in 1990, 1995 and 2000 respectively by the Philippines. No specific trend in export of coconut has emerged. Export prices of coconut fluctuated in the range of US$ 0.2-0.9/kg. in case of India while these were US$0.2-0.6/kg in the Philippines. Neither India nor the Philippines imported any significant quantity of copra during 1990-2000.

**Maize**

The maize has been surveyed by four countries viz. ROC, India, the Philippines and Thailand. The value added per hectare, per man-day and per MT for ROC were very high compared to those of other counties and value added per man-day had steadily increased during 1990-2000. This has led to quite a high level of value added per MT compared to its import price in case of ROC in 2000. As regards other three countries, the magnitudes of productivity have been comparable. A declining trend in value added per MT has been observed in India and value added per MT was very close to the international export price level of this commodity in 2000. This partly explains recent increase in volume of export from India, albeit in small measure. Conversely, an upward trend in value added per MT partly explains recent increase in import to the Philippines and Thailand. TFP of maize has shown an increasing trend in Thailand and ROC while it fluctuated in India and the Philippines during 1990-2000. It is also noted that upward trends in TFP have been accompanied by sustained decline in export and increasing trend in import in case of Thailand while such a linkage has not been observed in case of ROC. Thus, TFP trends do not always explain the trade performance of different countries.

Thailand had been leading exporter until 1995 but it decreased to one-fifth during the intervening period 1995-2000. India has exhibited an upward trend in export of this commodity during 1995-2000, her volume was still low at 33 thousand MT in 2000. The most significant export expansion was made by ROC, with its share increasing from 69 percent of Asia's in 1990 to 99 percent in 2000.

The largest maize importer in Asia has been Japan with a share of 35-50 percent of Asia's import. Japan, however, did not cover maize under the survey. Amongst the four countries in which maize was surveyed, ROC was the leading importer and accounted for 12-15 percent of share of Asia's import of this commodity during the decade of 1990s. However, its import share ebbed to 12 percent in 2000 from 15 percent in 1990. In case of other three countries, upward trends in volume of imports have been observed during the decade of 1990s, except during 1990-95 in case of the Philippines.

Setting aside the cases of small quantities of imports of maize to India during 1990-95 and to Thailand in 1990, import prices increased marginally during the first half of 1990s but ebbed during the second half of 1990s in the world, Asia and also in all the surveyed countries. Recent export expansion partly explains this behavior of import prices.

**Soybeans**

The soybeans have been surveyed by three countries viz. India, Japan and Thailand. Land and labor productivity of soybeans in terms of value added per hectare and per man-day (at constant 1995 US$ terms) for Japan were high compared to those of other countries. Productivity of the commodity in India and Thailand were comparable in 1990, it declined in 2000 in both countries and rate of decline was faster in case of former than in latter. In fact, India's productivity dropped to less than half of Thailand's in 2000. TFP of soybeans in both these countries decreased during 1990-2000 and the trends were in conformity with those of the export prices. Changes in TFP of Japan, a significant soybeans importer, did not affect her stable soybeans import volume during the reference period.

The average export price of Asian soybeans increased from US$248 per MT to US$303 per MT during 1990s while volume declined from 1.0 million MT to 0.5 million MT during the corresponding period. In 2000, India's export price declined to half of the level prevailed in 1995 and became competitive in the world market. Thailand could export negligible quantity of soybeans in 2000. In contrast to exports, imports of soybeans from Asia expanded remarkably from 9 million MT to 24 million MT during 1990-2000. Japan had remained the largest soybeans importer in Asia, importing about 5 million MT annually. Unlike Japan, Thailand exhibited a discernible increasing trend from nil to 1.3 million MT or 5 percent of Asia's share during the corresponding period. India's import of soybeans has been negligible. The level of import prices of soybeans have been stable during 1990-2000. The average price in Asia ruled marginally higher than that of the world average, yet much cheaper than its export price. Under such a situation, Asian countries could not compete with other exporters in the world.

To gauge the potential for improvement of agriculture and food trade competitiveness, the budget on cost of production /value of output etc. of benchmark (BM) farms/ factories have been compared with the corresponding budgets of National average (NA) farms/factories. Benchmarking analysis has been undertaken in terms of ratios of certain key indicators of productivity of the national average farms to the benchmark farms. Given that BM farms/factories represent 'best' farm/ factory of the respective country, ratios of NA to BM are expected to lie between zero and unity. This has been validated in general by empirical data of various countries, *albeit* with a few exceptions. The cost structures in terms of the percent shares of various inputs to total cost both for NA and BM farms for 1995 and 2000 varied a great deal across countries.

Empirical evidence suggested that overall trade performance of any country can not be fully attributed to changes in productivity alone. Besides productivity, there are other international and domestic factors which impinge on the trade performance. While international factors that affect trade include liberalization of trade policies, removal of QRs, changes in exchange rates, effect of AoA on productivity, minimum access volume under AoA, differentials in input prices across trading countries, international technology transfer and international prices, domestic factors range from price support policy, market information for tradable commodities, backward and forward linkages to trade expansion of the downstream sectors of primary commodities.

Disaggregated analyses revealed that productivity and prices of commodities do influence shares of exports of individual commodities in various countries in their respective total agriculture and food export. However, these factors alone do not fully explain trade performance of commodities under the study. Other factors such as productivity of other international competitors, quality or preference for a particular variety of a given commodity, interplay of macro level policy instruments like trade liberalization, tariff and exchange rates etc. also influence movements in international trade.

## HIGHLIGHTS OF RESOURCE PAPER

**Benchmarking in Agriculture: Measuring Competitiveness Indicators** (Glenn Ronan)

Benchmarking is widely used by firms to monitor and control own-firm process efficiency and to compare efficiency against like firms in pursuit of continuous improvement of processes. The case for process-based benchmarking rests on the proposition that comparison of relative performance is relevant and beneficial to continuous improvement within firms and sustainable development within agricultural industries.

The scope of benchmarking varies a great deal depending upon context. Benchmarking has been conducted in a range of industries in Australian agriculture. The majority of work is farm based for farmer clients. In Australia, the 'benchmarking in agriculture' studies of the mid-1990s have become agri-food industry studies by the late 1990s. It is a change in favor of consideration of competitiveness in broad sense.

In market-driven economies national economic development policies exert pressure on agriculture (and also other sectors) to adjust. Agriculture sector efficiency in a developing economy requires on-going restructuring, the relative shrinkage of agriculture in the economy occurs as other sectors grow faster. Reducing subsidies and increasing exposure to import competition is a spur to efficiency. In Australia, non-farm industry growth in regions and the availability of off-farm regional employment opportunities for farmers has enabled substantial adjustment within farm businesses to better manage farm risk and income variability, family security and welfare and involuntary exit from agriculture. Farm family access to national 'safety-net' welfare programs has also helped farm families to stabilize during a rural industry crisis to better assess options in or out of farming.

Scorecard analysis is integral to the South Australia (SA) Government Food Industry Strategy. 'Scorecard' data can be compared or benchmarked based on time series data or cross-sectional data (between regions and States). Scorecarding features a blending, or balancing, of measurable ('hard') and less measurable (imputed, proxy or 'soft') outcomes. Balanced scorecarding mixes financial and non-financial indicators, with the capacity to simultaneously display economic, environmental and social scores. Food chain scorecards have been used in Australia to measure the contribution of industries and regions to state performance. Developed by PIRSA (Primary Industries and Resources South Australia) in SA, the methodology has recently been adopted as an aid to the National Food Industry Strategy in Australia. Food chain scorecards calculate value added along food chains, using state and national data where available and sourcing other data where necessary. PIRSA has recently extended food chain scorecarding to embrace environmental and social impacts. Development of scorecard indicators opens a wider field for the application of benchmarking in food and fiber supply chains.

The central issue is as to why do firms based in particular nations achieve success in distinct segments and industries. The search is for the decisive characters of a nation that allow its firms to create and sustain a competitive advantage in particular fields. That is, what gives rise to the competitive advantage of nations? Porter's model of international trade competitiveness has given a comprehensive and cogent explanation for the complexities of why some industries/economies are more successful than others in the pursuit of productivity, national wealth and community welfare. Porter found that firms gain and sustain competitive advantage through improvement, innovation and upgrading. He identified four broad determinants of national competitive advantage that shape the business environment to the benefit or hindrance of a nation's firms. Porter sees these determinants as the domestic forces that provide firms with the pressures, incentives and capabilities to improve and innovate.

Government at any level can influence competitive advantage in an industry if its policies influence one or more of the four determinants identified by Porter. At the broadest level, a number of principles must guide the government policy if it is to enhance domestic competitive advantage rather than detract from it. According to Porter, the following eight principles provide a set of benchmarks against which to evaluate any government initiative for industry development:

i. Government actions must be biased toward markets, and toward the private sector.
ii. Domestic competitive advantage in an industry is relative. Standards for competitive advantage are not set domestically but by firms in other nations.
iii. Short-term cost advantages do not lead to competitive advantage; dynamism does. Policies that convey static, short-term cost advantages, but unconsciously undermine innovation and dynamism represent the most common error in government policy toward industry.
iv. Industries must upgrade to create state prosperity. Competitive advantage based on such sources as abundant natural resources, low cost labour, or even a single product new idea is notoriously unstable.
v. Competitive advantage can be intensely geographically concentrated. Industries and industry clusters frequently concentrate in a region and the bases for competitive advantage are intensely local. This concentration amplifies the forces that upgrade and sustain advantage.
vi. Competitive advantage is created through a long-term process of upgrading human skills, investing in products and processes, building clusters and expanding market access.
vii. States gain advantages through differences, not similarities.
viii. Change is a component of economic growth. Government policy must provide an environment in which an industry can prosper if its firms are innovative and achieve high productivity by international comparison.

Productivity is the root cause of a nation's standard of living. To achieve productivity growth, an economy must be continually upgrading. This requires continual improvement and innovation in existing industries and the capacity to compete successfully in new industries.

## HIGHLIGHTS OF THE COUNTRY REPORTS

### THE REPUBLIC OF CHINA

ROC selected two commodities namely rice and maize under the survey. The importance of these commodities and their performances are summarized below.

#### Rice (Paddy)

The production of rice, the staple food crop and the only cereal in which ROC is self sufficient, peaked at 3.4 million MT of paddy in 1976. It declined to 1.7 million MT in 2001 mainly due to decreasing domestic consumption and policy shift to selectively diversify area under rice (paddy) to other crops. In value terms, it constituted 20 percent of total crop production and 12.5 percent of total farm production (crops and livestock). Prices of rice in the country have ruled at a level much higher than the world price. The export of this commodity has been resorted mainly to dispose government’s inventory of old crop. Import of rice has not been allowed for domestic consumption until ROC’s entry to the WTO on January 1, 2002.

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during 1990-2000, albeit with fluctuations. The increase in yield rate during the first half of 1990s has been due to adoption of high yielding varieties, selective diversification of

low yielding areas and farm mechanization. Value added per hectare of rice (paddy) farms (at constant 1995 US $) increased annually at 8.79 percent during 1990-95 but declined at (-) 0.68 percent during the second half of 1990s due to devaluation of NT$ vis-à-vis US$. Value added per MT declined faster compared to value added per hectare during the second half of 1990s. Higher intensity of labor has taken place due to increase in the efficiency of mechanization resulted from improvement in farm machine and the tendency to use more tractors. Value added per depreciation of rice (paddy) posted a negative annual growth rate at (-) 3.56 percent per annum during 1990-1995 against (-) 6.48 percent during 1995-2000. Capital productivity followed a path of negative growth as most rice (paddy) farms in the country have purchased rice seedlings and hired labor with machines for field preparation, transplanting, harvesting and drying. Due to selective diversification of low yielding areas and intensive farm mechanization, labor productivity improved during 1990-95, which led to growth in TFP at 6.40 percent per annum. However, this could not be sustained during the second half of 1990s and TFP posted a negative growth at (-) 0.73 percent per annum.

The number of rice mills decreased from about 2000 in the year 1991 to about 800 in 2000 mainly due to the decline in production of rice (paddy) and introduction of automatic milling equipments. The utilization rates of rice mills have been below 30 percent. Further, the top ten percent of rice mills accounted for about 70 percent of total production value. Value added per worker of rice (mills) increased at 8.11 percent annually during the first half of 1990s. The growth turned negative during the second half of 1990s. The movements in value added per depreciation have also been similar to those of value added per worker. It posted a growth rate at 1.98 percent per annum during the 1990-95 before turning negative during 1995-2000. This indicates that higher level of modernization of rice mills has taken place during the second half of 1990s compared to that during the first half of 1990s. TFP of rice mills posted a positive growth rate at 6.95 percent per annum during 1990-95, which also turned negative during the second half of 1990s.

**Maize**

Maize is a major feedstuff for the ROC's livestock industry. The country produced 0.28 million MT of maize in 1990 which peaked at 0.29 million MT in 1994 before gradually declining to 0.22 million MT in 997. The production drastically decreased to the level at 0.12 million MT in 1998 when the price support was withdrawn. The production level declined to 0.07 million MT in 2000 and further to a level of less than 60 thousand MT, accounting for only 1.2 percent of total domestic demand in 2001. Import of maize increased from 5 million MT in 1990 to 6.5 million MT in 1995 as production of livestock grew. However, it decreased to 4.9 million MT in 2001 as a result of outbreak of foot and mouth disease in 1997. The country imported maize valued at US$ 586 millions or 8.6 percent of total agricultural and food import in 2001.

Land productivity of maize in physical quantity terms has shown an upward trend during 1990-2000, albeit with fluctuations. It recorded a growth rate at 1.25 percent per annum during 1990-95, which turned negative at (-) 0.12 percent per annum during 1995-2000. Value added per hectare of maize farms decreased marginally at (-) 1.40 percent per annum during 1990-95 before posting a positive growth at 0.18 percent per annum during the second half of 1990s. The movements in value added per MT have been similar to those of value added per hectare. Value added per man day (at constant 1995 US $) exhibited an upward trend throughout the decade of 1990s. Labor productivity of maize farms improved due to high level of farm mechanization. Value added per depreciation posted annual growth rate at 4.45 percent during 1990-1995, which turned negative to (-) 2.24 percent during 1995-2000. During 1990-95, the total input decreased faster at (-) 10.88 percent per annum whereas total output declined at (-) 0.87 percent per annum with the result that TFP increased at 11.24 percent per annum. The faster decline in the total input

has been mainly due to intensive farm mechanization, which consequently reduced the number of man-days per hectare. However, this could not be sustained during the second half of 1990s and TFP posted a low growth at 1.66 percent per annum.

**Benchmarking Analysis**

Benchmarking[1] analysis has been undertaken in respect of rice (paddy) farms in ROC to compare and contrast performance of national average farms with those of benchmark (best) farms. The choice of this commodity is enabled by availability of quality data of this crop. The analysis revealed the following important points:

i. The ratios of expenditures per hectare of respective inputs and of output value at current domestic prices, of national average (NA) farms to benchmark farms (BM), for various countries for 1995 and 2000 reveal that the BM farms in ROC are highly mechanized.

ii. The cost structures of respective inputs as percent of total cost, both for NA and BM farms, for 1995 and 2000 indicate that in ROC, share of depreciation in NA farms has been about 5 percent while it was about 30 percent in case of BM farms.

As domestic consumption of rice in ROC has been almost equal to its production, its share in the export of this commodity has been low at only 1 percent of Asia's share. At the same time, import of rice has been prohibited by the Government to protect domestic rice producers. In the absence of any significant volume of trade of rice, no inference could be drawn on correlation between trade performance and productivity indices. Maize is produced in the country mainly as animal feed and accounts for less than two percent of the total domestic demand. ROC, therefore, resorts to import of this commodity and accounted for 12-15 percent of total Asia's import of this commodity during 1990s. Considering huge gap between domestic demand and production, it is not expected that productivity indices would explain the movements in trade of this commodity. Besides productivity, other important factors that affect trade performance include price support policy, diversification program, promotion of quality farm mechanization program, and Research & Extension.

**INDIA**

India selected six commodities namely rice (paddy), sugarcane, rubber (natural), coconut, maize and soybeans under the "Survey on Agriculture Productivity Index" to develop a set of internationally comparable indicators which can illustrate competitiveness of agricultural commodities in international trade. In India, the earnings from agricultural exports have been higher than the outgo on agricultural imports. There has been a substantial increase in agriculture exports from India in the year 1995 when AoA came into effect and Quantitative Restrictions (QRs) were removed. The commodity-wise performance and its relevance to agriculture and food sector have been recapitulated as under.

**Rice**

The land productivity, labor productivity and TFP of rice (paddy) have improved faster during the second half of 1990s compared to the performance achieved during the first half of 1990s. This may be seen in the backdrop of the fact that the year 1995 has been the pacesetter in the international trade of agriculture when Agreement on Agriculture (AoA) negotiated under the Uruguay Round came into effect. Productivity of labor and capital in real rupee terms have moved in the opposite directions during the decade of 1990s. While the labor productivity has exhibited an increasing trend, the

[1] Appendix on 'Concepts, Definitions and Limitations' refers.

capital productivity has shown a declining trend. This indicates that there is an effect of substitution between the two factors of production namely labor and capital.

India realized a remarkable expansion of rice exports around 10 folds during 1990-95 and its share in Asia surged from 6.5 percent in 1990 to 30.7 percent in 1995. Upto 1994, the export share of basmati rice (scented premier quality rice) was much higher than that of non-basmati rice. But situation changed from 1995 when the share of non-basmati rice in total rice export increased significantly. In 1999, export of non-basmati rice decreased sizably and again the share of exports of basmati rice was higher than that of non-basmati rice in value terms.

**Sugarcane and Sugar**

Land productivity of sugarcane in physical quantity terms has shown an upward trend during the decade of 1990s. A moderate growth rate at 0.73 percent per annum during the first half of 1990s further ebbed to 0.52 percent per annum during the second half of 1990s. The value added per hectare in constant 1995 US $ a term has decreased from US $ 1515.70 in 1990 to US $ 1149.19 in 1995 before increasing to US $ 1300.07 in 2000. Value added per MT increased at slower pace compared to rate of increase in value added per hectare during the second half of 1990s. The TFP of sugarcane has exhibited downward trend during 1990s and the decline was more pronounced during the first half of the decade due to higher growth in input prices compared to that of output.

India's position in sugar trade has fluctuated during 1990-2000 due to regular cycles of surplus and deficit of sugar production in the country. Import of sugar was negligible till 1993. In 1994, 1.4 million MT was imported. Then, there was a period of low imports in next three years before it reached a level of 0.90 million MT in 1998 and 1.18 million MT in 1999. It drastically declined to 30.40 thousand MT in 2000. The spurt in import of sugar was attributed to private sector response to low international prices and liberal government policy rather than a conscious effort to bridge gap between domestic demand and supply.

**Rubber**

Land productivity of natural rubber (NR) has shown an upward trend during 1993-2000. An impressive growth rate at 36.94 percent in value added per MT terms has been recorded during 1993-95, which decreased to (-) 13.98 percent per annum during the second half of 1990s. This is explained by the record high prices of rubber in international market in 1995, which could not be sustained in post-1995 period. Labor to land ratio (man-day/hectare) exhibited downward trend during the second half of 1990s, though it increased marginally at 0.44 percent per annum during the first half of 1990s. Lower ratio indicates higher intensity of labor, which may be taking place due to farm mechanization. The growth rate in the TFP at 18.75 percent per annum during 1993-95 decelerated to 8.14 percent per annum during the second half of 1990s mainly due to non-sustainability of high price of rubber that ruled in international market in 1995.

India has been a net importer of NR as the domestic production has been in deficit compared to its demand (consumption). The country imported 49.69 thousand MT of NR valued at US $ 42.49 million in 1990. However, the volume of import of this commodity has been fluctuating during last eleven years from 1990 to 2000. It reached a peak of 51.64 thousand MT valued at US $ 83.24 million in 1995, trough of 8.09 thousand MT valued at US $ 8.67 million in 1994 and 8.69 thousand MT valued at US $ 6.48 million in 2000.

Of late, the government has been able to increase area under the crop in non-traditional areas in north-eastern part of the country through conscious policy instruments including export promotion with incentives to exporters of NR for quality

improvement, certification, packaging and transportation, a modest quantity of 13.36 thousand MT valued at US $ 8.18 million has been exported in the year 2000. It is expected that export of NR from India will get a boost and India's presence in the export market of NR will be felt.

**Coconut**

Land productivity of coconut has increased from 6.60 thousand nuts per hectare in 1990 to 7.07 thousand nuts per hectare in 1995 before declining to 6.85 thousand nuts per hectare in 2000. It recorded a growth rate at 1.39 percent per annum during the first half of 1990s compared with (-) 0.63 percent per annum during second half of the decade. Value added per MT decreased at (-) 12.76 percent per annum during the second half of 1990s compared to (-) 11.40 percent per annum during the first half of 1990s.

Value added per worker of Copra in constant US$ a term of copra has shown an upward movement during the decade of 1990s. It posted a high growth rate at 9.34 percent per annum during the first half of 1990s, which further improved to 11.80 percent during the second half of 1990s. Value added per depreciation of Copra also registered a positive growth rate at 5.92 percent per annum during the first half of 1990s compared to 8.23 percent per annum during the first half of 1990s. The TFP index of Copra followed a path of positive growth throughout the reference period. It posted a growth at 4.00 percent per annum during the first half of 1990s, which increased remarkably to 12.91 percent per annum during the second half of 1990s. This has happened mainly due to increase in total output in contrast to decline in total input during post-1995 period. The international trade of coconut has been either negligible or nil during the decade of 1990s.

**Maize**

Land productivity of maize has shown an upward trend during the decade of 1990s. It recorded a growth rate at 2.91 percent per annum during the second half of 1990s compared to nominal growth at 0.99 percent per annum during the first half of 1990s. Value added per MT decreased at (-) 2.51 percent per annum during pre-1995 period but the rate of decline decelerated to (-) 1.19 percent during post-1995 period. Value added per man-day (at constant 1995 US $) decreased from US $ 4.00 per man-day in 1990 to US $ 2.74 per man-day in 1995 before increasing to US $ 3.65 per man-day in 2000. Labor to land ratio (man-day/hectare) exhibited downwards trend during the second half of 1990s, though it increased at 6.20 percent per annum during the first half of 1990s. Lower ratio indicates higher intensity of labor, which may be due to farm mechanization. While the labor productivity in real terms has increased during post-1995 period, the capital productivity has declined during the corresponding period. This mirrors substitution effect between the two factors of production namely labor and capital as a result of the process of farm mechanization. The TFP has exhibited fluctuations and posted a positive growth rate at 4.88 percent per annum during the post-1995 period compared to (-) 6.93 percent per annum

Land productivity, labor productivity and TFP of maize have improved faster during post-1995 period compared to the performance of corresponding indicators during pre-1995 period. This may be seen in the backdrop of the fact that the year 1995 has been the pacesetter in the international trade of agriculture when AoA came into effect.

The share of maize in the total agriculture and food imports has been negligible in 1990 and1995, which marginally increased to 0.11 percent in 2000.

**Soybeans**

Land productivity of soybeans has declined at (-) 4.08 percent during the second half of 1990s while it remained almost constant during the first half of 1990s. Value added per MT posted a negative growth rate at (-) 9.29 percent per annum during the first half of 1990s compared to (-) 8.17 percent per annum during the second half of 1990s. Value added per man-day (at constant 1995 US $) witnessed a downward trend during 1990s. Value added per depreciation posted a negative annual growth rate at (-) 2.78 percent per annum during the first half of 1990s against (-) 12.73 percent during the second half of 1990s. The TFP has exhibited declining trend and posted a negative growth rate at (-) 6.31 percent per annum during pre-1995 period compared to (-) 5.19 percent per annum during post-1995 period. During the second half of 1990s, index of total input increased while that of total output declined and this explains sharper decline in TFP during the corresponding period.

The domestic production of edible oils in India is almost 50 percent of her domestic demand. To meet huge deficit, high level of imports of edible oils is resorted to. Despite this, the import of soybeans has not been of any significant quantity mainly due to availability of low priced substitute such as palm oil. The fact that earlier India imported rapeseed but later on switched over to palm oil, for instance, demonstrates the effect of substitutability within the oilseeds group. Given highly elastic nature of demand for edible oils, behavior of international prices will, to a great extent, determine the quantum of future imports.

On undertaking benchmark analysis for the year 2000, the following important points emerged:

- Inefficiencies in varying degrees exist in national average farms/factories.
- The Benchmark Farms (BM) tend to spend higher expenditure on inputs such as irrigation, labor and also rent on land compared to national Average (NA) farms.
- The BM farms are able to attract skilled/experienced laborers by offering them higher wages.
- It does not make an economic sense to cut cost of cultivation by resorting to 'second rated' inputs (both physical and human).
- The costs of cultivation per hectare of BM farms are higher compared to those of NA farms.
- The higher expenditure incurred by the BM farms is more than offset by higher 'value added' by them. This is accomplished mainly through higher land productivity and also better quality of their produce, which ultimately command higher prices.

In the era of globalization and accessibility to international market, commodity prices have assumed greater importance in determining the volume of trade. Therefore, general behavior of global prices of food articles compared to those of domestic prices assumes importance. In this context, the commodity specific total 'cost of delivering' to a common port of an importing country has been analysed by employing NPC[2].

To explore the existence of correlation between trade performance and productivity, two hypotheses viz. exportable hypothesis and importable hypothesis have been postulated. The exportable hypothesis has been validated by the performance of export of rice and soybeans during pre-1995, maize and copra during the post-1995 and also of natural rubber during the period 1993 to 2000. The productivity and the relevant performance of imports of rice, maize, soybeans and sugar during pre-1995 period support importable hypothesis. However, there have been other cases, which do not support either of the two hypotheses. Besides, prices and productivity, other factors such as trade policy, production promotion policy including input subsidies, agriculture credit,

[2] *Appendix on 'Concepts, Definitions and Limitations' refers.*

crop Insurance, price support policy, investment in Infrastructure, research and extension and Changes in Exchange Rate do have bearing on international trade.

The process of opening up of Indian agriculture and its integration with the world economy has begun. India have accorded greater access to foreign competition in its market. India's (and for that matter any country's) overall trade performance can not be fully attributed to changes in productivity alone. The broad trends in international trade need to be viewed in wider perspective of macro level policy measures following liberalization and structural adjustments.

Bulk of Indian exports relies on price competitiveness and prices can determine the level of competitiveness in export and import of the commodities of interest. To improve competitiveness, 'efficiency shifters' such as hiring of skilled labor, investment in irrigation, land, technology and modernization of plants and machinery by benchmark farms/factories need to be replicated by national average farms/ factories.

**JAPAN**

Japan has been net importer of agriculture and food products and trade balance on this account has been consistently negative during the decade of 1990s. While the imports of agriculture and food products increased from US$ 40.0 billion in 1990 to US$ 52.9 billion in 2000, the exports increased from US$ 2.4 billion to US$ 2.8 billion during the corresponding period. Thus, imports of agriculture and food products exceeded the corresponding exports by US$ 50.01 billion in the year 2000. Japan has selected three commodities namely rice, sugar and soybeans under the Survey. The importance of these commodities and their performances are summarized below.

**Rice**

Rice (paddy) commands the highest share in Japanese agriculture in terms of its value of output and contributes a quarter of total value of Japanese agricultural production. Japan has been following a policy of self-reliance due to its concern for food security. However, in 1993 the country imported 2,590 thousand MT of rice which was necessitated due to heavy damage to rice production as a result of unusually cold and rainy summer. Since 1995, Japan has been importing rice due to obligation of Minimum Access Volume (MAV) under AoA (Agreement on Agriculture).

Japan exports superior quality of rice to meet the demand of high income group Japanese diaspora. The annual quantity of rice exported is low at less than 0.1 percent of the total agriculture and food export.

Except in 1993, land productivity of rice (paddy) in physical quantity terms has been generally robust during 1990s. Value added per hectare of rice (paddy) farms increased annually at 2.63 percent during the first half of 1990s but declined at (-) 5.10 percent per annum during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s mainly due to subdued prices caused by shift in taste/consumption pattern, especially of younger generation, from rice to Italian pasta, bread and noodles as staple food. High level of value added per man-day (at constant 1995 US $) at US$210 in 2000 makes Japanese rice less competitive in the international market.

Value added per depreciation posted an annual growth rate at 8.89 percent during 1990-1995 against (-) 4.30 percent during1995-2000. This trend mirrors the changes in economic conditions due to recession in 1995. As more than 60 percent of rice producing farmers in Japan depends heavily on non-farming income, they have not exhibited any willingness to take risk in making investment in the wake of recession. TFP of rice (paddy) increased at a nominal rate of 0.40 percent per annum during the first half of 1990s but declined at (-) 2.64 percent per annum during the second half of 1990s.

Value added per worker of rice (milled) increased at 5.55 percent annually during 1990-95, which accelerated at 20.17 percent per annum during 1995-2000. Value added per depreciation increased at an annual rate of 15.81 percent during 1990-95, which decelerated to 11.46 percent during 1995-2000. This indicates that higher level of mechanization / modernization of rice mills has taken place during the second half of 1990s compared to that in the first half of 1990s. TFP of rice (milled) increased at 1.32 percent annually during the first half of 1990s. However, the rate of increase accelerated at 12.03 percent per annum during the second half of 1990s.

**Sugar**

Japan produces sugar from sugar beet and sugarcane. While sugar beet is grown in the northernmost island of the Japanese archipelago, the southernmost provinces lead the production of sugarcane. The country is deficit in domestic production of sugar. To meet this deficit, 1.7 million MT was imported in 1990, which marginally declined to 1.6 million MT in 2000 due to decrease in its consumption. The share of import of sugar in the total agriculture and food import has been about 1 percent compared to 0.1 percent in case of export.

Land productivity of sugarcane has increased from 66.89 MT per hectare in 1990 to 74.83 MT/hectare in 1995, registering an annual growth rate at 2.27 percent during 1990-95. However, the growth declined to (-) 2.79 percent per annum during the second half of 1990s. Value added per hectare of sugarcane increased at 2.27 percent per annum during the first half of 1990s but declined at (-) 2.79 percent during the second half of 1990s. Value added per MT increased at 6.66 percent per annum during the first half of 1990s but declined during the second half of 1990s at (-) 1.97 percent per annum. Unlike the case of rice (paddy), movements of value added per hectare and value added per MT of sugarcane have followed similar trends during the decade of 1990s. Value added per depreciation posted a growth rate at 12.79 percent per annum during 1990-1995 against (-) 2.55 percent per annum during1995-2000. TFP increased at a nominal annual rate at 6.80 percent during the first half of 1990s but declined at (-) 1.72 percent during the second half of 1990s.

Unlike sugarcane, land productivity of sugar beet declined during the decade of 1990s. Value added per hectare of sugar beet farms increased annually at 6.05 percent during the first half of 1990s but declined at (-) 9.71 percent during the second half of 1990s. Value added per MT posted an annual rate at 6.29 percent during the first half of 1990s but declined during the second half of 1990s at (-) 8.39 percent per annum. Movements of value added per hectare and value added per MT of both sugarcane and sugar beet have followed similar trends during the decade of 1990s. Investment in farm mechanization accelerated. Value added per depreciation posted an annual growth rate at 16.09 percent during 1990-1995 against (-) 6.71 percent during1995-2000. TFP increased at (-) 3.86 percent per annum during the first half of 1990s but declined faster at (-) 6.68 percent during the second half of 1990s.

**Soybeans**

Japan has deficit in the production of soybeans and imports around five million tonnes of soybeans every year. The country meets more than 95 percent of demand of this commodity by imports. It accounts for about 3 percent of total imports on account of agriculture and food while export of this commodity has been nil. No tariff is imposed on import of soybeans. To achieve self-sufficiency of this crop and also to develop an alternative crop for plantation on paddy fields, soybeans cultivation is encouraged. The prices of the commodity have declined due to non-conforming to quality standards demanded by consumers.

As in case of sugarcane, land productivity of soybeans increased from 2.07 MT/ hectare in 1990 to 2.44 MT/hectare in 1995 before declining to 2.30 MT/ hectare in 2000. Value added per hectare of soybeans farms increased annually at 11.60 percent during the first half of 1990s but declined at (-) 5.75 percent during the second half of 1990s. Value added per hectare increased between 1990 and 1995 and then, decreased between 1995 and 2000. Value added per depreciation posted an annual growth rate at 17.85 percent during 1990-1995 and remained almost unaltered during 1995-2000. TFP increased at 9.84 percent per annum during the first half of 1990s but declined faster at (-) 1.86 percent during the second half of 1990s.

The costs of production of sugarcane/sugar beet and soybeans in Japan are higher than the corresponding market prices. To cover this gap, cultivators are heavily subsidized. High level of subsidy underscores the government's policy to become self-reliant.

**Benchmarking Analysis**

Benchmarking analysis of rice (paddy) reveal that level of mechanization by BM farms is higher than that of NA farms and BM farms adopt 'precision farming' practices by applying various inputs more judiciously. It also emerged that NA farms incur higher costs per unit of area on inputs than corresponding costs by BM farms. This explains, to a great extent, high domestic price of rice in Japan, which makes Japanese commodities less competitive in the international market.

Apart from benchmarking, break-even point (BEP) tool has been employed to compare and contrast the competitiveness of farm management of different regions. The analysis showed that the businesses of large-scale farms have been generally more stable than that of small scale farms. However, costs exceeded sales, regardless of size of the farm, during 1995-2000 due to steep fall in prices of the commodities. Data also revealed that it is unprofitable for large scale farms with 15.0 hectares or more in some areas to continue in the business.

The volumes of import of sugar and soybeans have been determined by the gap between domestic demand and domestic availability and not by levels of productivity. In this scenario, no conclusion can be drawn on the relationship between trade performance and productivity of the commodities covered under the survey. However, the need for improving productivity cannot be undermined. Besides productivity and prices, factors such as trade policy including export promotion, price support, investment in infrastructure, Research and Extension affect trade performance.

**MALAYSIA**

Malaysia selected two commodities namely palm oil and rubber (sheet) under the Survey. The choice of these two commodities has been enabled by their export orientation, although imports of these commodities have been in the range of 4 to 5 percent of their total agriculture and food imports. The importance of these commodities and their performances are summarized below.

**Rubber**

Rubber had been the main contributor of Malaysian agriculture GDP until the 1960s. However, this position has been taken over by palm oil from 1970s. Due to favorable climatic and soil conditions, rubber was planted on a commercial scale in early 1900s by diversifying area under coffee. Area covered under the natural rubber in Malaysia was 1.4 million hectares or 25 percent out of a total of 5.7 million hectares under the agriculture in 2000. In 2000, the country produced 0.73 million MT against the domestic consumption of 0.37 million MT. The bulk of the domestic consumption is used by the downstream industries such as latex products (69.1 percent), tyre (13.3 percent), general rubber goods (12.3 percent), industrial rubber goods (3.9 percent) and footwear (1.4 percent). About 85 percent of the total rubber production has been contributed by small holders and large plantation companies have contributed the remaining 15 percent.

The exports of rubber by Malaysia have declined both in volume and value terms during the decade of 1990s. It decreased from 1.13 million MT valued at US$912.7 million in 1990 to 0.9 million MT valued at US$589.6 million in 2000, mainly due to continuous diversification of area under rubber to oil palm cultivation as palm oil cultivation offers higher returns, has a shorter maturity period and large plantation companies have played a leading role in this diversification. Nonetheless, rubber industry still contributes significantly in terms of supply of raw materials to downstream industries, especially to latex and pharmaceutical industries.

Land productivity of rubber farms in physical quantity terms has shown an upward trend during 1991-2000, albeit with fluctuations. It recorded a moderate growth rate at 2.13 percent per annum during the second half of 1990s compared to (-) 0.52 percent per annum during 1991-95. Value added per hectare of the commodity increased from US$ 1633 in 1991 to US$1931 in 1995 before falling to US$ 1213 in 2000. Value added per man-day also exhibited similar trend. The reason for declining productivity is that large plantation companies have been diversifying to palm oil with the result that more than 85 percent of the total area under the crop is now cultivated by small holders whose propensity to invest in technology and buy superior inputs is low. This has adversely affected quality of the commodity. In this scenario, a large number of small holders let the land remain fellow and some of them seek temporary employment elsewhere. The capital investment in rubber cultivation is mainly for the acquisition of labor saving apparatus used in tapping such as RRIMFLOW which is a technical device used to control both the flow of latex and tapping frequency and ultimately achieves saving in cost of labor. Index of capital productivity for the rubber recorded a declining trend and posted a negative growth rate at (-) 1.89 percent per annum during 1991-1995 against (-) 10.74 percent during 1995-2000. The decline in capital productivity has been due to inadequate investment as a result of switch over of large plantation companies from rubber cultivation, which resulted in low yield rate besides prevalence of non-remunerative price regime. TFP of rubber posted a positive growth rate at 2.30 percent per annum during 1991-95. However, it declined at (-) 8.23 percent per annum during the second half of 1990s from 91.3 in 1991 to 65.1 in 2000, mainly due to sharp decline in the total output compared to total input. Of late, the rubber is cultivated more for the wood than for the latex content.

The TFP of the processed rubber recorded a declining trend during 1991-2000. Its index declined from 128.7 in 1991 to 59.5 in 2000 (1995=100) mainly due to the disproportionate increase in the cost of production compared to the prices of the processed products as a result of weak demand in the international market.

**Palm Oil**

The cultivation of palm oil was started in the country in 1970s on an experimental basis by using seedlings from West Africa. The share of palm oil in agriculture GDP has been progressively increasing and it occupies the commanding position in Malaysian agriculture. The area covered under this commodity was 3.4 million hectares or 59 percent

of the total agriculture area in 2000. and produced 10.37 million MT of crude palm oil (CPO). In contrast to rubber, major producers of palm oil are large plantation companies (estates) who cultivate about 90 percent of the total area under the crop. Besides the CPO, palm kernel, a by-product of palm fruit, is processed into palm kernel oil (PKO) and palm kernel cake. The palm oil industry is supported by nationwide network of refineries and mills to further process the CPO into other related palm products such as palm olein, palm stearin, oleo chemicals which give more value to the palm oil products. In 2000, there were 46 palm oil refineries with a processing capacity of 14.6 million MT of CPO and 350 palm oil mills with a processing capacity of 66 million MT of fresh fruit branches (FFB).

In contrast to rubber, the export of palm oil has increased from 5.65 million MT valued at US$1.63 billion in 1990 to 8.14 million MT valued at US$2.56 billion in 2000. It posted a growth rate at 4.6 percent per annum in value terms, which is remarkable in view of devaluation of currency (RM) against US Dollars and the fact that seventeen other close substitutes within the oils group compete with palm oil. The main reasons for this performance are as under:

i. Palm oil is used as an edible oil and an industrial commodity widely traded in the international market;
ii. Its cultivation offers a high economic returns and is less labour intensive compared to rubber; and
iii. It requires less maintenance and less prone to disease.

Land and labor productivity of palm oil in terms of value added per hectare and per man-day (at constant 1995 US$ prices) increased considerably during the first half of 1990s while these indicators declined during the second half of 1990s. A high annual growth at about 24 percent, both in value added per hectare and value added per man-day, during 1990-95 sent strong signals for diversification from other crops, mainly rubber, to palm oil. However, these productivity indicators witnessed negative growth rates at (-) 13 percent during 1995-2000, which adversely affected comparative advantage in domestic agriculture market but might enhance its international competitiveness. Capital investment for palm oil cultivation is required mainly for the acquisition of tractors and trailers for the transportation of the fresh fruit branches (FFB). Value added per depreciation declined at an annual rate of (-) 13.40 percent per annum during the second half of 1990s compared to growth rate at 20.11 percent per annum during the first half of 1990s. The index of TFP of palm oil increased from 37.0 in 1990 to 51.5 in 2000 for the palm oil farms. Notwithstanding conscious policy and strategy of implementation of farm mechanization programs, improvement in plant genetics, good farm agronomic management practices and use of biotechnology, TFP declined during second half of 1990s. Of late, Indonesia has emerged as a strong competitor of palm oil and has resulted in relatively over-supply of the commodity. This has led to free fall of the prices during 1995-2000, particularly during 1998-2000 which in turn explains low value added per capital.

The TFP index of processed palm oil has decreased from 100 in 1995 to 23.8 in 2000. Such a low level of TFP in 2000 has been due to crashing of prices caused by over supply of oils and fats in the global market consequent upon emergence of other suppliers like Indonesia.

It is noted that movements in trade of rubber and its TFP have been in the same direction while these two parameters have moved in the opposite directions in case of palm oil. Thus, Malaysia's trade performance is not fully explained by relative movements in the productivity of the corresponding commodities as other factors such as national agriculture and trade policy, prices, exchange rates, productivity of other competing countries, macro economic performance etc. also influence trade performance. Besides, a number of factors impinge upon pattern of national trade, notable among them includes international prices and trade performance of competing exporters, differentials in wages and input prices among trading countries, exchange rates and technical/management capacity subsidies,

price instability and price support, research and extension and policy on supply of raw material to industry do influence national trade patterns.

The internal conditions induce sustained diversification of area under rubber to palm oil cultivation. The advantages of palm oil cultivation over rubber cultivation are that it offers higher returns, have a shorter maturity period and requires less labor. Thus, future generation of farmers are expected to have a bias towards palm oil cultivation compared to rubber.

**PHILIPPINES**

The Philippines selected five commodities namely rice, maize (yellow), coconut (copra), sugarcane (raw), and pineapple (canned) under the Survey. The importance of these commodities and their performances are summarized below.

**Rice**

The rice occupies the first position amongst the top ten agricultural commodities imported by the Philippines. The volume of imports has generally exhibited an upward trend. The highest volume of 2.4 million MT valued at US$ 646.6 million was imported in 1998, mainly from India, Thailand and Vietnam. The U.S. is also a major trading partner in rice, usually under the arrangement of the Public Law 480 (PL 480) commodity loan.

Land productivity of rice (paddy) has shown an upward trend during 1991-2000, albeit with fluctuations. The country experienced a rice crisis in 1995 as a result of the El Nino occurrence in 1994 and La Nina in the second half of 1995. Yield recovered in succeeding years as a result of expansion in irrigated area**.** Labor to land ratio (man-day/hectare) exhibited an upward trend during 1991-2000, though growth decelerated during the second half of 1990s. Labor requirement in paddy farms have increased due to intensive care of crops especially in irrigated farms and those planted to HYVs. Value added per depreciation followed a path of negative growth. TFP of rice (paddy) followed a declining trend throughout the reference period, 1991-2000. Value added per worker of rice (milled) increased at 5.18 percent annually during 1990- 2000. Value added per depreciation has also decreased. TFP of rice (milled) in the Philippines exhibited downward trend during 1991-2000.

**Sugar**

Raw sugar figures amongst the top ten agricultural exports of the Philippines. The country was a net sugar exporter till 1994 but became a net importer due to shortfalls in domestic production and increasing domestic consumption, as a result of expansion of industrial use such as beverages and manufactured food. Both raw and refined sugars are imported. The Philippines imports the commodity mainly Australia, Brazil, South Korea, South Africa and Thailand.

The yield of the national average sugarcane farms fluctuated during the decade of 1990s. The depressed yield at 49.40 MT per hectare in 1995 was caused by a prolonged drought started in 1994. Value added per hectare of sugarcane farms (at constant 1995 US $) increased annually at 6.57 percent during 1991-95 but declined at (-) 6.89 percent during the second half of 1990s due to sharp devaluation of Pesos vis-à-vis US Dollars. Value added per MT declined faster compared to value added per hectare during the second half of 1990s. The movements in the partial productivity are reflected in the general declining trend in the TFP.

Value added per worker of sugar (raw) decreased at (-) 5.22 percent per annum during 1995-2000. Value added per depreciation, however, increased at 0.98 percent per annum during this period. BM sugar mills with capacity exceeding 5000 TCD (tons cane per day) have larger scale of operations, have higher volume of output and number of employees compared with the national average sugar mills with capacity less than

5000 TCD. The processing cost per MT of BM sugar mills was about one third higher compared to that of the average sugar mills. TFP of sugar (raw) in the country exhibited downward trend during 1995-2000. Faster growth in the total input at 4.05 percent per annum compared to 1.19 percent per annum in the total output during 1995-2000 has led to negative growth in TFP during the corresponding period.

**Pineapple**

The share of the export of the canned pineapple in the total export of pineapple was the highest at 57 percent followed by juice at 17 percent, fresh fruit 16 percent and dried and concentrates at 11 percent. In 2000, 1.61 million MT of pineapple valued at US$155.95 million of pineapple and its products was exported compared with 1.20 million MT valued at US$138.87 in 1990. The leading markets for pineapple products are Japan, the Netherlands, South Korea and USA.

Land productivity of pineapple has shown a downward trend during 1995-2000 and posted a negative growth rate at (-) 2.15 percent per annum during the period. The decline in yield rate, especially in 1996, was mainly due to aberrant weather conditions. Value added per MT of pineapple orchards (at constant US $ prices) increased marginally at 1.61 percent during 1995-2000. TFP declined at (-) 11.29 percent per annum during 1995-2000 due to faster growth in the total input at 7.57 percent per annum in contrast to fall in the total output at (-) 4.58 percent per annum during the corresponding period.

Growth in output of pineapple (canned) is contributed largely by the plantation farms dominated by two multinational corporations. A preponderate proportion of the processed pineapple is shipped to the U.S. and Japan, the owners of these multinational companies. Value added per worker and value added per capital in real terms decreased during 1995-2000. The corresponding labor and capital productivity indices have also demonstrated negative growth. TFP of pineapple (canned) exhibited downward trend during 1995-2000.

Value of exports of coconut products by the Philippines has been declining in recent years. This can be attributed to low productivity of coconut and the changing composition of the country's coconut product exports including shift from copra to coconut oil (CNO). Non-traditional or higher value added coconut product exports such as oleo-chemicals and green coconut have increased. The major markets for CNO are the Malaysia, the Netherlands and U.S.

Land productivity of coconut in physical quantity terms has shown an upward trend during 1991-2000, although the growth decelerated during the second half of 1990s, which can be traced to presence of number of old bearing trees. Besides, subdued prices of coconut products in the world market as a result of competing oil products has led the situation in which farmers apply inputs at sub-optimal level to cut the cost of production. Value added per MT declined faster compared to value added per hectare during the second half of 1990s. Labor to land ratio (man-day/hectare) exhibited an upward trend during 1991-2000, though growth decelerated during the second half of 1990s. The capital productivity of the national average coconut orchards exhibited a downward trend throughout the reference period of 1991-2000 but it marginally slowed down during 1995-2000. TFP exhibited a declining trend during 1991-2000 due to steep decline at (-) 7.50 percent per annum in the total output and increase in total input at 14.39 percent per annum during the second half of 1990s.The trends of yield and partial productivity indices are factored in the movement of the TFP index of national average farms.

Value added per worker of copra increased posted a negative growth rate at (-) 4.15 percent per annum during the second half of 1990s. TFP also exhibited downward

trend during 1991-2000 due to an upward trend in the total input in contrast to downward trend in the total output during 1991-2000.

**Maize**

During the decade of 1990s, the Philippines turned from maize exporter to net importer. From 1995, the country started importing large volumes of yellow maize, due to growth in the hog and poultry industries, mainly from Argentina, China, Thailand and U.S. The country also exports maize seeds to Indonesia and Thailand.

Land productivity of maize in physical quantity terms has shown an upward trend during 1991-2000. A stronger protection accorded to more politically sensitive commodities such as rice and sugar has resulted in decreasing relative price of maize vis-à-vis rice and sugar. This adversely affected interests of farmers to grow maize in lieu of the other two crops. Value added per MT declined faster compared to value added per hectare during the second half of 1990s. Value added per depreciation posted annual growth rate at 4.03 percent during 1991-1995, which turned negative to (-) 13.93 percent during 1995-2000. The mechanization in maize farms is generally low compared to neighboring maize growing Asian countries. TFP declined at (-) 11.13 percent annually during the second half of 1990s in contrast to positive growth at 1.49 percent per annum during 1991-95. This has happened due to steep decline in the total output at (-) 6.91 percent per annum and increase in the total input at 4.75 percent during the second half of 1990s.

The dispersed location of production (of maize) and consumption areas coupled with weak infrastructure links, lack of bulk handing and monopoly in inter-island shipping has resulted in high marketing costs.

Benchmarking analysis of rice (paddy) Farms, sugarcane farms, pineapple orchards and rice (milled) reveal the following:

i. National Average (NA) farms of rice (paddy) hired more laborers and/or leased more land than benchmark farms (BM) during 1995.
ii. One unique aspect of the Philippine sugarcane farming is that BM farms (export farms) depend entirely on hired labor.
iii. The gap between NA and BM pineapple orchards is widening. This is understandable, given the fact that pineapple BM farms are dominated by MNCs who invest in technology.
iv. Benchmark rice mills have higher real absolute levels of labor and capital productivity and the gap between benchmark factory and average factory have been large due to scale of operations.
v. Low capacity utilization of sugar mills in the country at about 60 percent is due to shortage of cane supply. The average sugar recovery rate at 80.68 percent, which is below the world average of 85 percent. The sucrose content of sugar is affected by delays in bringing the cane from the field to the sugar mills.

Based on the movements in productivity and trade performance of various commodities in the Philippines, it is inferred that productivity is an important factor that influence trade performance. However, it alone can not explain the trade performance of a given commodity for there are other factors such as National Agriculture Policy, trade policy, macro economic performance, relative performance of other countries that have bearing on the overall trade performance.

**THAILAND**

Thailand selected seven commodities namely rice, sugarcane, pineapple, rubber, maize, palm oil and soybeans under the survey. The importance of these commodities and their performances are summarized below.

**Rice**

Rice, one of the most important crops of Thailand, contributes about 22 percent in the total value of output of agriculture. The export of the commodity increased from 4.02 million MT in 1990 to 6.14 million MT in 2000, though its share in the export of agriculture and food products declined from 12.39 percent in 1990 to 10.46 percent in 2000.

Thailand has been the most dominant exporter of rice and accounted for over 50 per cent of Asia's total rice export in 1990. It posted an annual growth rate of 9.1 percent during 1990-95. However, its share declined to 37-39 percent during the second half of 1990s due to significant export expansion by other countries and it recorded a negative annual growth rate at (-) 0.2 percent during this period. Thailand's rice for export has been categorized into three qualities, namely superior, medium and inferior. For the best quality rice, the US has been a major competitor while Vietnam, Pakistan, China and Myanmar compete with Thai's inferior quality rice. The major export markets are in Asia, the Middle East, Africa and Europe.

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during the entire reference period and the growth rate during 1994-2000 has been higher at 1.06 percent per annum compared to 0.54 percent per annum during 1991-94.Value added per hectare of rice (paddy) farms decreased annually at (-) 6.56 percent during 1991-94. However, declining trend showed down to (-) 0.81 percent during 1994-2000. Value added per MT declined faster compared to value added per hectare during the entire reference period. Value added per depreciation posted an annual growth rate at (-) 10.74 percent during 1990-1994 against (-) 8.12 percent during 1994-2000. This trend mirrors the farm mechanization. TFP of rice (paddy) decreased at an annual rate at (-) 4.23 percent during 1991-94 but increased at 1.54 percent during 1994-2000. The positive growth in TFP during latter period has taken place due to the fact that total output has increased faster than total input during the corresponding period.

**Sugarcane and Sugar**

The volume of export of sugar increased from 2.42 million MT in 1990 to 3.84 million MT in 1995 and further to 4.24 million MT in 2000. Thailand continues to be a leading exporter in Asia and accounted for two-third of Asia's total export of this commodity in 2000. As Thailand's export of sugar accounts for about 70 percent of its total production, farm prices heavily depend on the prices in the international markets. The production cost of the Thai sugar has exhibited an increasing trend due to low efficiency, adversely affecting Thailand's advantageous position. Globally, Thailand is placed fourth after Brazil, EU and Australia in terms of export of sugar.

Land productivity of sugarcane in physical quantity terms has shown an upward trend. The growth rate during 1992-95 has been higher at 3.57 percent per annum compared to that of 0.52 percent during the second half of 1990s. Value added per hectare increased at 10.02 percent per annum during 1992-95 but declined at (-) 0.66 percent per annum during the second half of 1990s. Value added per MT posted an annual growth at 6.22 percent per annum during 1992-95 but declined at (-) 1.18 percent per annum during the second half of 1990s. Movements of value added per hectare and value added per MT of sugarcane have followed similar trends during the reference period. TFP increased at an annual growth of 7.57 percent per annum during 1992-95 but declined at (-) 18.22 percent during the second half of 1990s. This has happened due to the fact that total input increased faster at (-) 22.89 percent per annum compared to (-) 0.50 percent in total output during the second half of 1990s.

**Rubber**

The volume of export of natural rubber from Thailand increased from 1.13 million MT in 1990 to 2.54 million MT in 2000. Thailand has achieved a remarkable growth in its

share of Asia's total export from 30 percent in 1990 to 49 percent in 2000. About 90 percent of the domestic production is exported and some of its buyers are Japan, Malaysia, South Korea and the US.

Land productivity of rubber in physical quantity terms has shown an upward trend during 1995-2000 and posted a growth rate of 6.04 percent per annum during this period. Both value added per hectare and value added per MT of rubber farms declined during the second half of 1990s and the rates of decline have been (-) 8.12 percent per annum and (-) 13.35 percent per annum respectively. TFP of rubber declined at (-) 0.25 percent during the second half of 1990s mainly due to faster decline in total output at (-) 4.51 percent per annum compared to (-) 4.28 percent decline in total input during the second half of 1990s.

**Pineapple**

The volume of export of canned pineapple increased from 0.40 million MT in 1990 to 0.47 million MT in 2000, though its share in the export of agriculture and food products decreased from 2.46 percent in 1990 to 1.26 percent in 2000. There are 23 pineapple canneries, processing 1.7-1.8 million MT or 80 percent of the fresh pineapples for canned pineapple, pineapple juice, dehydrated pieces, paste, etc. These canneries operate at about 50 percent of the total manufacturing capacity.

The volume of export of canned pineapple from Thailand exhibited an upward trend during the decade of 1990s, albeit with fluctuations. It increased from 0.40 million MT in 1990 to 0.47 million MT in 2000, though it dipped to 0.39 million in 1995.

Land productivity of pineapple orchards declined from 22.60 MT per hectare in 1991 to 22.49 MT per hectare in 2000.Value added per hectare increased at 23.17 percent during 1991-98 but declined at (-) 60.05 percent during 1998-2000. Value added per MT also exhibited similar trends. Value added per depreciation posted an annual growth rate at 19.39 percent per annum during 1991-1998 but sharply declined at (-) 53.22 percent per annum during 1998-2000. TFP of pineapple increased at 23.28 percent per annum during 1991-98 but declined at (-) 49.69 percent per annum during 1998-2000. The decline in TFP has been due to free fall in total output as a result of steep fall in prices of this commodity.

**Palm oil**

Throughout Thailand's vegetable oil history, palm oil has been the most competitive amongst the vegetable oils group, both in its production and local marketing potentials. Thailand exported only 100 MT of palm oil in 1990, which increased to 6 thousand MT in 1995 and further to 37 thousand MT in 2000. As Thailand is strategically located and has congenial environment for plantation of palm oil, it is expected that it would make a significant contribution in the trade of this commodity in near future.

Land productivity of palm oil farms posted growth rate at 27.48 percent per annum during 1992-94, which decelerated to 2.08 percent per annum during 1994-2000. Value added per hectare increased at 19.84 percent per annum during 1992-94 but declined at (-) 10.16 percent per annum during 1994-2000. Value added per MT declined at (-) 5.99 percent per annum during 1992-94 and further declined at (-) 11.99 percent per annum during 1994-2000. Value added per depreciation posted an annual growth rate at 9.11 percent per annum during 1992-94 against (-) 8.74 percent during1994-2000. TFP of the commodity increased substantially at 79.85 percent per annum during 1992-94. The growth decelerated to 2.71 percent per annum during 1994-2000.

**Maize**

The volume of export of maize decreased from 124 thousand MT in 1990 to 24 thousand MT in 2000 and its share in the export of agriculture and food products declined from 1.85 percent in 1990 to 0.05 percent in 2000 during the corresponding period. Increase in the domestic demand mainly due to the fast expansion of the animal feed industry has caused decline in export of maize. The country exports maize to Malaysia, Singapore, Indonesia and at times to Taiwan.

Land productivity of maize posted a growth rate at 4.71 percent per annum during 1992-96 which decelerated to 2.29 percent per annum during 1996-2000. Value added per hectare increased at 3.21 percent per annum during 1992-96 which accelerated to 9.65 percent per annum during 1996-2000. Value added per MT first declined at (-)1.43 percent per annum during 1992-96 before posting a growth rate at 7.19 percent per annum during 1996-2000. Value added per depreciation posted an annual growth rate at 0.51 percent during 1992-1996 against (-) 6.44 percent during1996-2000. TFP increased at 8.82 percent per annum during 1992-96. However, it decelerated at 2.85 percent per annum during 1996-2000.

**Soybeans**

Soybeans crop was introduced in Thailand in early 1990s when prices of major Thai crops were subdued and farmers were looking for alternative crops to cover risk against low prices of agricultural crops. Its usefulness lies in the fact that it is a substitute of palm oil fishmeal and has considerable demand from a large number of downstream oil mills. Besides, it can be cultivated as a rotational crop in tandem with maize, cassava and sugarcane.

Thailand imported 203 thousand MT of soybeans in 1995, which substantially increased to 1320 MT in 2000. Its share in Asia's total import increased from 1.8 percent to 5.4 percent during the corresponding period. Thailand imports this commodity mainly from Argentina, Brazil, Canada and the US. Import price of soybeans influence the domestic prices of the commodity.

The growth rate of land productivity of the crop was higher at 2.51 percent per annum during the second half of 1990s compared to 0.60 percent per annum during the first half of 1990s. Value added per hectare increased annually at 1.29 percent during the first half of 1990s but declined at (-) 3.53 percent during the second half of 1990s. Value added per MT posted a low growth rate at 0.68 percent per annum during the first half of 1990s but declined during the second half of 1990s at (-) 5.89 percent per annum. Value added per depreciation declined at (-) 5.35 percent per annum during 1990-1995 against (-) 3.95 percent per annum during1995-2000. TFP of Soybeans declined during the decade of 1990s.

Thailand's trade performance of various agricultural commodities is not fully explained by relative movements in the productivity of the corresponding commodities. This is so because other factors such as national agriculture and trade policy, flow of agriculture credit, agricultural markets, investment in infrastructure, research and extension, domestic and international prices, exchange rates, productivity of other competing countries, macro economic performance etc. also influence trade performance. Therefore, it is not expected that productivity alone would fully explain the movements in the trade.

**VIETNAM**

Vietnam transformed herself from a net importer of rice to a leading exporter of rice during the decade of 1990s. Another commodity that is important from the country's economic perspective is natural rubber. Historically, rubber had been cultivated mainly to meet the demand of French rulers. The country selected two commodities namely rice

and rubber under the survey. The importance of these commodities and their performances are summarized below.

**Rice**

Vietnam has been one of the most important rice exporters in Asia during the decade of 1990s.The volume of rice (milled) exported by Vietnam posted an annual growth rate of 4.1 percent during the first half of 1990s which substantially increased to 11.8 percent during the second half of 1990s. The share of import has been negligible during the entire reference period.

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during the decade of 1990s. It recorded a growth rate at 3.04 percent per annum during the first half of 1990s, which marginally accelerated to 3.13 percent per annum during the second half of 1990s. Value added per hectare of rice (paddy) farms (at constant 1995 US $) declined at (-) 5.56 percent during the first half of 1990s and the rate of decline slowed down to (-) 1.05 percent per annum during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s. Value added per man day (at constant 1995 US $) has been declining sharply which may be seen in the light of devaluation of local currency vis-à-vis US dollar.

Vietnam had experienced a declining trend in productivity of rice (milled) and value added per worker attained a low level at US $1297 in 1995, half of what was achieved in1990. The situation slightly improved during the second half of 1990s when the growth rate turned positive at 0.60 percent compared to (-) 13.3 percent during the first half of 1990s.

**Rubber**

Rubber has been and continues to be considered as a strategic commodity in agriculture of Vietnam. Historically, a preponderate proportion of tapped natural rubber used to be transferred to France and very little was left for domestic industry. With mechanization, modernization and industrialization campaign, both acreage and production of the commodity have increased.

Vietnam has exported moderate quantity of rubber during the decade of 1990s mainly to Laos and Cambodia. The growth in export at 12.7 percent during the first half of 1990s accelerated to 14.6 percent during the second half of 1990s. The country did not import any quantity of rubber during the corresponding period.

Like growth in export, growth in land productivity also accelerated to 9.53 percent per annum during the second half of 1990s. Value added per hectare (at constant 1995 US terms) increased at 6.49 percent per annum during the first half of 1990s. However, it declined at (-) 8.18 percent per annum during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s.

The country has experienced a declining trend in the productivity of rubber (processed) and value added per worker attained a low level at US $1078 in 1995, less than half of level achieved in1990. During 1995-2000, the situation improved when the growth rate turned positive at 2.5 percent compared to (-) 14.2 percent during 1990-95.

On the basis of analysis of movements in the levels of export and their productivity, it is inferred that there exists no conclusive evidence between productivity and trade performance in the country. It is also noted that Vietnam had strong economic and friendly relations with the then USSR and changes in political scenario like crashing of USSR has adversely affected trade performance of Vietnam as it lost its market in USSR. However, Vietnam turned towards its traditional trading partners, especially Cuba and Iraq and managed to recover the lost ground. Besides, globalization has made a

paradigm shift from closed economy to open one and paved the way for bilateral and/or Multilateral Trade Agreements. With this, Vietnam's economy has transformed from central planning to market-oriented regime and invited foreign investors to invest in agriculture.

## CONCLUSION

Competitiveness is crucial to successful trade. Successful international trade is a well-trodden route to national wealth and improved living standards. Pressure to lift trade competitiveness for agricultural commodities in APO member countries arises from many sources including population growth and a changing world trade environment. New bilateral, regional and multilateral trade agreements have implications for agricultural competitiveness, rural environments and social well-being. Empirical evidence, based on the data of the most of the participating countries, suggests that productivity alone can not explain trade performance of a country. Nor incremental improvement in a nation's own historical performance alone can pull trade of a given commodity. Other domestic and international factors also influence movements in international trade.

Benchmarking analysis reveal that there exists a considerable potential for improvements in performance of national average farms compared to those of 'benchmark' farms. There is a case for identifying performance 'shifters' of benchmark farms so that the methods and practices adopted by benchmark farms can be replicated in national average farms to enable them to be more competitive. Benchmarking of focused, balanced scorecards presented a route to lift export competitiveness of traditional food and fiber supply chains.

The Symposium afforded the correspondents an opportunity to critically analyze the productivity measures of various agricultural commodities in their respective countries, compare and contrast the levels of productivity and trade performances with other APO member countries. The usefulness of the survey on 'Agricultural Productivity Index' has been recognized and appreciated by all APO member countries that participated in the Survey. All these countries have agreed in principle to set up a formal mechanism for conducting such surveys in future.

# II. REGIONAL SURVEY REPORT ON AGRICULTURAL PRODUCTIVITY INDEX

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## 1. BACKGROUND

Agriculture has been and continues to be an important sector of most of economies in Asia and the Pacific region, particularly in the context of the increasing concern for food security and employment opportunities for increasing population. Given the globalization and ongoing trade reforms under the World Trade Organization, more pressure is being exerted on agriculture to improve its productivity, especially in respect of certain major commodities that need to compete in international markets. APO conducted a fact finding regional survey in selected member countries to measure and analyze productivity / competitiveness of selected vital tradable agricultural commodities.

### 1.2 OBJECTIVES OF THE SURVEY

The survey sought to offer policy makers and industry leaders a tool to measure the efficiency of resource utilization and provide a basis for comparative analysis across industries and countries in the region. The main objectives of the survey were as follows:

i. To compare the measured agricultural productivity/competitiveness indices of selected crops/commodities in selected countries; and
ii. To analyze the trade performance in general and export in particular of these tradable commodities based on such indices and compare it across countries and/or benchmarking it against “best” farms/factories.

### 1.3 COVERAGE OF COUNTRIES, COMMODITIES AND REFERENCE PERIOD

#### 1.3.1 Coverage of Countries

The criteria for selection of country were based on the quantities of production of the commodities selected under the Survey, volume and value of exports and imports of those commodities. Following this criteria, initially eight countries namely Republic of China, India, Indonesia, Japan, Malaysia, Philippines, Thailand and Vietnam were envisaged to be covered under the survey. Except Indonesia, all other seven countries attended the Symposium and participated in the Survey.

#### 1.3.2 Coverage of Commodities

The broad criterion for selection of commodities was whether they were exported or had potential for export in foreseeable future. The commodities that were presently imported but for which import substitution could be promoted in future were also considered. On this broad criterion, eight commodities were suggested by the Working Party Meeting of representatives of APO member countries held in November 2001. These commodities were paddy, maize, coconut, sugarcane, pineapple (canned), palm oil, natural rubber (sheets) and soybeans. However, it was noted in the meeting that all eight commodities may not be relevant for every country. Therefore, it was decided that the selection of the commodities should be made according to correspondents’ own analysis

of their respective countries. After having due regard to their views, APO finalized the country-wise commodities in July 2002 (**Table 1**).

**Table 1. Country-wise Selection of Commodities under the Survey**

| Country | Rice (milled) | Sugar (raw) | Rubber (sheet) | Pineapple (canned) | Palm Oil | Coconut (copra) | Maize | Soybeans |
|---|---|---|---|---|---|---|---|---|
| ROC | √ | x | x | x | x | x | √ | x |
| India | √ | √ | √ | x | x | √ | √ | √ |
| Japan | √ | √ | x | x | x | x | x | √ |
| Malaysia | x | x | √ | x | √ | x | x | x |
| Philippines | √ | √ | x | √ | x | √ | √ | x |
| Thailand | √ | √ | √ | √ | √ | x | √ | √ |
| Vietnam | √ | x | √ | x | x | x | x | x |

Note: '√ ' indicates selection and 'x' non-selection of the commodity under the Survey.

The rationale behind selection of the commodities by different countries was guided by their respective national perspective and policies and is recapitulated in the following sub-paragraphs:

i. ROC surveyed rice because it is the staple food crop and the only cereal in which ROC is self sufficient. Therefore, rice has great political/ social significance. Maize has been selected as it is an important import commodity.

ii. India surveyed rice as main export commodity and sugar and rubber as import substitutable commodities. Although the shares of other three commodities namely maize, coconut, and soybeans either in total exports or imports on agriculture and food were negligibly little, these commodities were surveyed to improve their productivity to meet domestic demand.

iii. Though exports and imports of rice from and to Japan have been negligible, Japan selected this commodity as it contributes a quarter of total value of Japanese agricultural production and a third of total value of crop production. It has immense political and social significance as it is considered indispensable from the point of view of food security of the country. Besides, Japan surveyed soybeans and sugar as important import commodities.

iv. Malaysia surveyed palm oil and rubber because these two commodities were completely export oriented. Notwithstanding this, Malaysia imported some quantities of these commodities.

v. Philippines surveyed coconut, sugar and pineapple from export orientation while rice and maize were selected for their import concerns.

vi. Thailand has selected rice and rubber as major export commodities, sugar and pineapple as the secondary export commodities while maize and palm oil as minor export commodities. Soybean was surveyed due to increasing volume of its import and declining trend in its domestic production and higher domestic cost of production. It is an import substitutable commodity.

vii. Vietnam surveyed two commodities viz. rice and rubber because each of these two commodities accounted significant shares in the total export on agriculture and food. Thus, the selection of these commodities was based on their being export oriented.

### 1.3.3 Reference Period of the Survey

The reference time period of the Survey was 1990-2000. The choice of this period was guided by the consideration to capture important phases witnessed in Asia viz. dynamic economic growth phase, financial-economic crisis phase and the subsequent recovery phase. Considering constraints of time and availability of data, it was decided to

collect, compile, collate the requisite data for the three years falling in the range of the reference period of the survey namely 1990, 1995 and 2000. Thus, comparisons were made on observations for 1990, 1995 and 2000 only. Though some annual fluctuations in trade performance in some countries might have been witnessed, those observations need not necessarily reflect any real long term trend.

## 1.4 METHODOLOGY AND SCOPE

APO sent a draft questionnaire on Agricultural Productivity Index to selected APO member countries in July 2001. This was followed by the Working Party Meeting of the correspondents from APO member countries, held in Bangkok in November 2001, where the questionnaire was examined threadbare and revised. This version of the questionnaire was expanded in July 2002 to incorporate 'competitiveness' indicators and also supplementary information in the form of non-price measures. The updated questionnaire was then sent to the correspondents in those APO member countries who attended the Symposium for conducting the survey in 2002-2003.

The questionnaire consisted of two parts. Part-I covered the following broad aspects:

i. Survey Commodities and Their Trade Performance
ii. Measured Productivity Indices of the Survey Commodities
iii. Analysis of Trade Performance and Productivity Indices of the Survey Commodities
iv. Prospects for future Development / Potential of the Survey Commodities
v. Proposal for Setting up a Formal Mechanism for Future Surveys

Responses to Part-I of the questionnaire were in the form of description, narration, analytical information and were qualitative in nature. Part-II solely captured a variety of statistical data which included basic indicators, commodity production and trade, farm budget, factory budget, prices of inputs and products, processing and marketing costs, productivity indices at farm and factory levels, besides supplementary information on non-price measures.

The results of the survey were presented in the form of individual country reports and regional report at an APO Symposium held in Bangkok during 15-17 December 2003. As these reports were found to be useful, APO decided in the Symposium to publish them after carrying out modifications/improvements, wherever necessary.

## 1.5 IMPORTANCE OF SURVEYED COMMODITIES AND THEIR SHARE OF TRADE IN TOTAL AGRICULTURE AND FOOD TRADE

The importance of the surveyed commodities in terms of share of exports in their respective total agriculture and food exports varied a great deal across countries (Annexure-I). On one end of the spectrum lie ROC (Republic of China) and Japan where total share of export of surveyed commodities in total agriculture and food export have been less than 1 percent during 1990s, and on the other end lie Malaysia and Vietnam where the corresponding share was upto 72 percent. While it increased from 58 percent in 1990 to 72 percent in 2000 in case of Malaysia, it decreased from 44 percent to 35 percent in case of Vietnam during the same period. The other three countries occupied middle portion of the spectrum. While total share ranged between 8 percent and 24 percent in the decade of nineties in case of India, it fluctuated between 50 percent and 63 percent in the Philippines, and between 26 percent and 34 percent in Thailand during the corresponding period. Disaggregated analysis of shares of exports of individual commodities in various countries in their respective total agriculture and food export indicate that commodities have not been selected for the survey from export concern alone.

On analyzing the shares of imports of the surveyed commodities in the total agriculture and food imports by respective countries (Annexure-II), the following important points emerge:

i. ROC, India, Japan and Philippines have witnessed a downward trend in the share of imports of the surveyed commodities to their respective total agriculture and food imports during the decade of nineties. This could be due to their agriculture policies to attain self sufficiency and food security.
ii. No import of the two commodities selected under the Survey by Vietnam has taken place during the period under reference. The selection of these commodities has been based on their being completely export oriented.
iii. Likewise, the choice of two commodities selected under the Survey by Malaysia has been guided by their export orientation, although imports of these commodities were in the range of 4 to 5 percent of their total agriculture and food imports.
iv. Out of seven commodities surveyed by Thailand, only one commodity namely soybeans was selected due to upward trend in its imports.

## 2. PRODUCTIVITY AND TRADE PERFORMANCE OF SURVEYED COMMODITIES

To investigate the relationship between the productivity and trade performance of various commodities, the trends of measured productivity indices of various commodities have been compared with the corresponding trade performance, particularly export performance, in the countries covered under the survey. Although it is not expected that a particular productivity index would fully explain trade performance of a commodity, the relative level and trend of some indices do indicate certain aspects of its trade movements. Such relationship varies a great deal across commodities and countries. The analysis has been focused on export countries of respective commodity and discussions on import countries have been restrictive.

The results of comparative analysis of productivity and trade performance of commodities have been presented in the following order:

i. **Rice** (3 main exporters out of 6 countries);
ii. **Sugar** (3 exporters out of 4 countries);
iii. **Rubber** (3 exporters out of 4 countries);
iv. **Pineapples** (2 exporters, 2 countries);
v. **Palm oil** (1 exporter out of 2 countries);
vi. **Coconut** (1 exporter out of 2 countries);
vii. **Maize** (no exporter out of 4 countries); and
viii. **Soybeans** (no exporter out of 3 countries).

The above commodities have been arranged in the descending order of number of countries exporting that particular commodity, excluding minor exporters.

### 2.1 Productivity and Trade Performance of Rice (Paddy)

The analysis of productivity of rice (paddy) /rice (milled) and the trade performance of rice (milled) has been discussed under the following sub-sections:

#### 2.1.1 Land and Labor Productivity of Rice (Paddy)

One of the important factors that affects comparative advantage of a tradable product of a country is the level of productivity of the commodity in its raw farm. In view of this, various indices of productivity have been measured and compared across countries. In this section, the following two perspectives of productivity have been discussed:

- **Land and Labor Productivity of Rice in Terms of Physical Quantity; and**

- **Land and Labor Productivity of Rice (Paddy) in Value Terms**

**2.1.1.1 Land and Labor Productivity of Rice in Terms of Physical Quantity**

Land and labor productivity of rice (paddy) varied significantly across countries. The productivity levels for ROC and Japan have been much higher than those of the other four countries where this commodity has been surveyed. Land productivity for these two countries ranged between 5.2 and 5.9 MT per hectare while it ranged between 2.0-3.0 MT per hectare for India, the Philippines and Thailand and between 3.1-4.2 MT per hectare for Vietnam.

Thailand and Vietnam, the main rice export competitors in the region, realized a steady increase in land productivity during 1990s. However, the growth for Vietnam was much higher than that of Thailand, attaining a level of 4.2 MT per hectare, double of Thai level in 2000.

Labor/land (man-day/hectare) ratio, an important measure that indicates technological characteristics such as the extent of labor intensity, varied across countries. On one end of the spectrum was ROC where it was 28 man-days per hectare during 2000 and Vietnam on the other end with the corresponding ratio at 115 man-days per hectare. In case of Thailand, ratio decreased marginally from 34 to 32 during 1995-2000 and was about one-third compared to that of Vietnam. During the corresponding period, it declined from 104 to 75 in case of India. Thus, trends in labor intensity varied a great deal across three rice exporting countries.

**Table 2. Land and Labor Productivity of Rice (Paddy) in Terms Of Physical Quantity**

(1995=100)

| Country | Productivity | Land Productivity (MT/ hectare) | | | Labor/Land ratio (man-day/ hectare) | | | Labor Productivity(kg / man-day) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| ROC | Absolute | 5.0 | 5.7 | 5.6 | 38.3 | 29.5 | 27.9 | 130.9 | 193.5 | 201.1 |
| | Index | 88.0 | 100.0 | 100.0 | 130.0 | 100.0 | 95.0 | 68.0 | 100.0 | 106.0 |
| India | Absolute | 2.6 | 2.7 | 2.9 | 101.2 | 103.6 | 74.8 | 26.0 | 26.0 | 38.0 |
| | Index | 97.0 | 100.0 | 106.0 | 98.0 | 100.0 | 72.0 | 99.0 | 100.0 | 147.0 |
| Japan | Absolute | 5.3 | 5.2 | 5.4 | 56.9 | 48.9 | 43.4 | 94.0 | 84.0 | 123.0 |
| | Index | 103.0 | 100.0 | 105.0 | 117.0 | 100.0 | 87.0 | 112.0 | 100.0 | 146.0 |
| Philippines | Absolute | 2.8 | 2.8 | 3.0 | 55.9 | 85.3 | 86.1 | 50.1 | 32.4 | 34.7 |
| | Index | 101.0 | 100.0 | 108.0 | 65.5 | 100.0 | 101.0 | 154.8 | 100.0 | 107.2 |
| Thailand | Absolute | 2.0 | 2.0 | 2.1 | 34.4 | 33.5 | 32.1 | 57.6 | 60.2 | 66.9 |
| | Index | 98.0 | 100.0 | 107.0 | 103.0 | 100.0 | 96.0 | 95.8 | 100.0 | 111.2 |
| Vietnam | Absolute | 3.1 | 3.6 | 4.2 | 110.0 | 98.0 | 115.0 | 28.2 | 36.7 | 36.50 |
| | Index | 86.0 | 100.0 | 117.0 | 112.0 | 100.0 | 117.0 | 77.0 | 100.0 | 99.0 |

Notes: 1. In case of Japan, original per hour data have been converted into per man-day by multiplying 8 hours.
2. In case of the Philippines, data for 1991 have been used as proxy for 1990.
3. In case of Thailand, data for 1994 have been used as proxy for 1995.

Source: Country Reports Table 3-1 (Cost of Production Survey).

Out of three main rice exporting countries, labor productivity (kg/man-day) increased in India and Thailand while it remained almost the same in Vietnam during 1995-2000. In case of other countries, it showed an increasing trend and was the highest in ROC at 201, followed by Japan at 123 and Philippines at 35 in 2000.

### 2.1.1.2 Land and Labor Productivity of Rice (Paddy) in Value Terms

In Thailand, Value added per hectare and value added per man-day decreased and as a result value added per MT (at constant US$ 1995 terms) decreased from US$ 156 in 1990 to US$ 112 in 2000. In Vietnam, these measures decreased significantly during the 1990s and value added per MT declined from US$208 in 1990 to US$109 in 2000. In India those indicators first decreased during 1990-95 but increased during 1995-2000 (Table 3).

**Table 3. Land and Labor Productivity of Rice( Paddy) in Value Terms**

(At constant 1995 US$, 1995=100)

| Country | Measure | Value added / hectare | | | Value added / man-day | | | Value added / MT | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| ROC | Absolute | 2920.0 | 3420.0 | 3128.0 | 76.2 | 116.1 | 112.2 | 582.4 | 600.0 | 557.9 |
| | Index | 85.0 | 100.0 | 92.0 | 66.0 | 100.0 | 97.0 | 97.0 | 100.0 | 93.0 |
| India | Absolute | 408.0 | 326.0 | 364.0 | 4.0 | 3.1 | 4.9 | 156.0 | 121.0 | 127.0 |
| | Index | 125.0 | 100.0 | 112.0 | 128.0 | 100.0 | 154.0 | 129.0 | 100.0 | 105.0 |
| Japan | Absolute | 10244.0 | 11667.0 | 8979.0 | 180.0 | 239.0 | 210.0 | 1922.0 | 2265.0 | 1660.0 |
| | Index | 88.0 | 100.0 | 77.0 | 75.0 | 100.0 | 88.0 | 85.0 | 100.0 | 73.0 |
| Philippines | Absolute | 471.0 | 737.0 | 647.0 | 8.4 | 8.7 | 7.5 | 168.2 | 267.2 | 216.4 |
| | Index | 64.0 | 100.0 | 87.0 | 77.5 | 100.0 | 86.9 | 63.0 | 100.0 | 81.0 |
| Thailand | Absolute | 310.0 | 252.0 | 241.0 | 9.0 | 7.5 | 7.5 | 156.0 | 125.0 | 112.0 |
| | Index | 123.0 | 100.0 | 95.0 | 119.0 | 100.0 | 100.0 | 125.0 | 100.0 | 94.0 |
| Vietnam* | Absolute | 643.3 | 483.3 | 458.5 | 93.0 | 44.7 | 22.0 | 207.5 | 134.2 | 109.2 |
| | Index | 133.1 | 100.0 | 94.9 | 208.1 | 100.0 | 49.1 | 154.6 | 100.0 | 81.3 |

Source: Tables 7-1 of respective Country Reports.

The measures of productivity in ROC, Japan, and the Philippines followed similar trends but had different magnitudes. These increased during 1990-95 before declining during 1995-2000. The value added per MT was much higher in these countries compared to those of rice exporting countries, making it unfavorable for them to compete in international markets.

### 2.1.2 Total Factor Productivity of Rice (Paddy)

TFP indices have fluctuated in ROC, Japan and Thailand, increased in India and declined sharply in the Philippines during the decade of 1990s (Table 4).

**Table 4. Indices of Total Output, Input and TFP of Rice (Paddy)**

(1995 = 100)

| Country | Index | 1990 | 1995 | 2000 |
|---|---|---|---|---|
| **ROC** | Total output | 108 | 100 | 90 |
| | Total input | 148 | 100 | 94 |
| | TFP | 73 | 100 | 96 |
| **India** | Total output | 93 | 100 | 116 |
| | Total input | 97 | 100 | 89 |
| | TFP | 95 | 100 | 131 |
| **Japan** | Total output | 119 | 100 | 72 |
| | Total input | 121 | 100 | 82 |
| | TFP | 98 | 100 | 88 |
| **Philippines** | Total output | 83 | 100 | 78 |
| | Total input | 44 | 100 | 147 |
| | TFP | 189 | 100 | 53 |
| **Thailand** | Total output | 121 | 100 | 116 |
| | Total input | 106 | 100 | 106 |
| | TFP | 114 | 100 | 110 |

Note: Vietnam has not provided relevant data.
Sources: Tables 7-1 of respective Country Reports.

The impact of TFP on trade performance has been discussed in the sub-section 2.15 on 'Exports of Rice'**.**

### 2.1.3 Labor and Capital Productivity of Rice (Milled)

Value added per worker and value added per depreciation for rice (milled) at constant US$1995 prices varied a great deal across the countries. Vietnam had experienced a declining trend in value added per worker, attaining a level at US $1334 in 2000, half of 1990, while India had an increasing trend and reached US$31068 in 2000, 5 times that of 1990. This suggests stronger competitive position of Vietnam in recent times. This is so as lower productivity implies lower returns to resources and thus lower cost of production which in turn means a higher competitiveness in international markets. The levels of value added per worker in ROC and Japan were much higher than those of rice exporting countries and hence a negative factor for international competitiveness.

The trends of value added per depreciation show similar movement in ROC, India and the Philippines while it has increased in Japan.

**Table 5. Labor and Capital Productivity of Rice (Milled)**

(At constant US$ 1995, 1995=100)

| Country | Productivity | Value added / worker | | | Value added / depreciation | | |
|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| ROC | Absolute | 49,683.0 | 73,388.0 | 61,680.0 | 190.0 | 210.0 | 161.0 |
| | Index | 68.0 | 100.0 | 84.0 | 91.0 | 100.0 | 77.0 |
| India | Absolute | 6,453.0 | 19,311.0 | 31,068.0 | 1,075.0 | 1,832.0 | 1,584.0 |
| | Index | 33.0 | 100.0 | 161.0 | 59.0 | 100.0 | 86.0 |
| Japan | Absolute | 190,083.0 | 248,984.0 | 623,940.0 | 0.1 | 0.3 | 0.4 |
| | Index | 76.0 | 100.0 | 251.0 | 50.0 | 100.0 | 177.0 |
| Philippines | Absolute | 2,513.0 | 3,076.0 | 2,356.0 | 0.2 | 0.1 | 0.1 |
| | Index | 82.0 | 100.0 | 77.0 | 107.0 | 100.0 | 71.0 |
| Vietnam | Absolute | 2,643.0 | 1,297.0 | 1,334.0 | .. | .. | .. |
| | Index | 204.0 | 100.0 | 103.0 | .. | .. | .. |

Note: Thailand has not provided relevant data.
Sources: Tables 8-1 of respective Country Reports.

### 2.1.4 Total Factor Productivity of Rice (Milled)

Thailand and Vietnam, the two major rice exporting countries, did not provide TFP indices of rice (milled). In case of ROC and India, it increased during the first half of 1990s. However, it declined in ROC and remained unaltered in India during the second half of 1990s. The Philippines witnessed declining trend in contrast to Japan's increasing trend throughout the reference period (**Table 6**).

**Table 6. Total Output, Input and TFP of Rice (Milled)**

(1995 = 100)

| Country | Index | 1990 | 1995 | 2000 |
|---|---|---|---|---|
| **ROC** | Total output | 77 | 100 | 72 |
| | Total input | 107 | 100 | 91 |
| | TFP | 72 | 100 | 78 |
| **India** | Total output | 85 | 100 | 93 |
| | Total input | 133 | 100 | 93 |
| | TFP | 64 | 100 | 100 |
| **Japan** | Total output | 118 | 100 | 180 |
| | Total input | 126 | 100 | 102 |
| | TFP | 94 | 100 | 176 |
| **Philippines** | Total output | 102 | 100 | 73 |
| | Total input | 68 | 100 | 123 |
| | TFP | 150 | 100 | 60 |

Note: Thailand and Vietnam have not provided relevant data.
Sources: Tables 8-1 of respective Country Reports.

### 2.1.5 Exports of Rice

Rice, a major trading commodity in the international agriculture and food markets of Asia and Pacific region, commands importance not only from economic but also from social and political viewpoints. The world rice export has recorded a significant annual growth rate at 12.5 percent during the first half of the 1990s (**Table 7**) which was due to increased production caused by the Green Revolution in Asia on one hand and the increased demand due to population growth and increased per capita income on the other. The growth rate, however, stagnated at 0.6 percent during the second half of 1990s.

**Table 7. Exports of Rice and Its Growth Rates -1990 to 2000**

| Country/ Region | Volume ('000MT) | | | Growth Rate (%) | | Export Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 12,482.0 | 22,509.0 | 23,163.0 | 12.5 | 0.6 | **Share in the world** | | |
| Asia | 7,791.0 | 15,984.0 | 16,489.0 | 15.5 | 0.6 | 62.4 | 71.0 | 71.2 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| ROC | 79.0 | 189.0 | 120.0 | 19.1 | -8.7 | 1.0 | 1.2 | 0.7 |
| India | 505.0 | 4,913.0 | 1,533.0 | 57.6 | -20.8 | 6.5 | 30.7 | 9.3 |
| Japan | 0.0 | 13.0 | 42.0 | 265.2 | 26.4 | 0.0 | 0.1 | 0.3 |
| Thailand | 4,017.0 | 6,198.0 | 6,140.0 | 9.1 | -0.2 | 51.6 | 38.8 | 37.2 |
| Vietnam | 1,624.0 | 1,988.0 | 3,477.0 | 4.1 | 11.8 | 20.8 | 12.4 | 21.1 |
| Sub-total | 6,225.0 | 13,301.0 | 11,312.0 | 16.4 | -3.2 | 79.9 | 83.2 | 68.6 |
| **Other Countries** | | | | | | | | |
| China* | 326.0 | 47.0 | 2,951.0 | -32.1 | 128.9 | 4.2 | 0.3 | 17.9 |
| Pakistan | 744.0 | 1,852.0 | 2,016.0 | 20.0 | 1.7 | 9.5 | 11.6 | 12.2 |

Notes : 1. Excluding ROC
2. Philippines has been excluded due to no export of rice.
Sources: FAO Trade Year Books, 1992, 1997 and 2000 except for ROC. Data for ROC have been taken from concerned Country Report.

During 1990-95, export of rice from Asia doubled at an annual growth rate of 15.5 percent against 12.5 percent growth rate in respect of the world rice export. The Asia's export share in the world increased from 62 percent to 71 percent during the

corresponding period. However, the rice export almost stagnated during 1995-2000, registering a nominal growth rate of only 0.6 percent both in Asia and in the world. Asia's share in the world remained at around 71 percent during the period. Such a phenomenon occurred due to over supply of rice followed by a sharp decline in prices in the world market during the period.

Thailand has been the most dominant exporter whose share in Asia was over 50 percent in 1990, registering an annual growth rate of 9.1 percent during 1990-95. However, its share declined to 37-39 percent during second half of 1990s due to significant export expansion by other countries and it recorded a negative annual growth rate at -0.2 percent during this period.

Vietnam has expanded rice production and export since the introduction of *Doi moi* policy, and has been the second largest exporter during 1990 and 2000. Its export share in Asia was about 21 percent in 1990, though it declined in 1995 due to considerable expansion of export from India. During 1995-2000, rice export increased remarkably at a growth rate of 11.8 percent and its share increased to 21 percent in 2000. The reason of this impressive growth can be traced to steady increase in land productivity of rice (paddy) in Vietnam.

India realized a remarkable expansion of rice export around 10 folds during the period 1990-95 and its share in Asia surged from 6.5 percent in 1990 to 30.7 percent in 1995. Upto 1994, the export share of basmati rice scented premier quality rice) was much higher than that of non-basmati rice. But situation changed from 1995 when the share of non-basmati rice in total rice export increased significantly. This implies that at least in physical terms exports of non-basmati rice have gained importance and have the potential of outstripping the exports of basmati rice in terms of value also. This continued till 1998. In 1999, export of non-basmati rice decreased sizably and again the share of exports of basmati rice was higher than that of non-basmati rice in value terms.

Rice exports from ROC, Japan and the Philippines were negligible and their total share in Asia's export was about 1 percent during 1990s.

The total share of rice exported by the surveyed countries in Asia was about 80 percent during 1990-95 which ebbed to about 70 percent in 2000 due to significant rice export expansion from ROC and Pakistan whose combined share attained the level of 30 percent in 2000.

The trends of export volume corresponds to those of TFP indices in case of ROC during 1990-2000. In the case of India, its export volumes declined during 1995-2000. More important than the value aspect of TFP, it was due to low share of basmati rice (premium quality and as such higher prices) in the total export of rice in 1995. This situation reversed in 2000 when the share of basmati rice was higher than that of non-basmati rice and hence higher average export price in that year. As regards lower volume of export in 2000 compared to 1995, India exported non-basmati rice in 1995 to meet demand from other co-developing countries. When inter-developing countries' trade had started increasing, the volume of export from India could not be sustained and hence lower quantity of export in 2000. In Japan**,** trade trends were mainly influenced by domestic policy and WTO agreement, although some trade trends were explained by values of TFP. However, no relationship between trade volume and TFP emerges in case of Thailand and the Philippines.

### 2.1.6 Imports of Rice

Import of rice to Asia increased from 5 million MT to 13 million MT at an impressive growth rate of 21 percent per annum during 1990-1995 in response to demand expansion associated with income growth in the region. However, this growth could not be sustained and import decreased to 11 million MT in 2000 when it registered a negative growth rate at (-) 3.4 per cent during the second half of 1990s (**Table 8**). The share of imports to Asia in

the world imports was 40 percent in 1990, which increased to 58 percent in 1995 before declining to 49 percent in 2000.

Amongst the surveyed countries, the Philippines has been the leading rice importer in 1990s, except for 1991 and 1992 when 10 and 35 thousand MT respectively was exported. Imports of rice fluctuated depending upon the gap between domestic production and consumption. While import in 1995 was relatively small, it increased to 867 thousand MT in 1996.

Japan has been following a policy of self-reliance due to its concern for food security until 1993 when it imported 2,590 thousand MT of rice which was necessitated due to heavy damage to rice production as a result of unusually cold and rainy summer. Since 1995, Japan has been importing rice due to minimum access obligation under AoA (Agreement on Agriculture). The quantity fixed under minimum access was 379 thousand tons (in terms of polished rice) in 1995 with a proviso to increase it annually by 76 thousand MT. From 1st April 1999, tariff measures instead of quantitative restrictions were applied. The incremental quantity of minimum access was then halved to 38 thousand MT per annum which was envisaged to be further reduced to 682 thousand MT from 2000 until the time a new agreement under WTO agricultural negotiations comes into force.

Imports of rice to ROC, India and Vietnam were negligible during 1990-2000. While Indonesia marked a significant increase in its share of import from 1 percent in 1990 to almost one-fourth of Asia's total imports of rice in 1995, it declined to about 13 percent in 2000. In contrast, Malaysia's share first declined from almost 7 percent in 1990 to about 3 percent in 1995 before increasing to approximately 5 percent in 2000 (**Table 8**).

**Table 8. Imports of Rice and its Growth Rates-1990 to 2000**

| Country/ Region | Volume ('000MT) | | | Growth Rate (%) | | Import Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 12,305.0 | 22,163.0 | 21,777.0 | 12.5 | -0.4 | **Share in the world** | | |
| Asia | 4,973.0 | 12,764.0 | 10,719.0 | 20.7 | -3.4 | 40.4 | 57.6 | 49.2 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| ROC | 4.0 | 4.0 | 6.0 | 0.0 | 8.4 | 0.1 | 0.0 | 0.1 |
| India | 66.0 | 0.1 | 13.0 | -76.2 | 204.1 | 1.3 | 0.0 | 0.1 |
| Japan | 18.0 | 29.0 | 656.0 | 10.0 | 86.6 | 0.4 | 0.2 | 6.1 |
| Philippines | 593.0 | 263.0 | 642.0 | -15.0 | 19.5 | 11.9 | 2.1 | 6.0 |
| Vietnam | 2.0 | 11.0 | 5.0 | 40.6 | -14.6 | 0.0 | 0.1 | 0.0 |
| **Sub-total** | **683.0** | **307.1** | **1322.0** | -14.8 | 33.9 | 13.7 | 2.4 | 12.3 |
| **Other Countries** | | | | | | | | |
| Indonesia | 50.0 | 3,158.0 | 1,355.0 | 129.1 | -15.6 | 1.0 | 24.7 | 12.6 |
| Malaysia | 330.0 | 428.0 | 477.0 | 5.3 | 2.2 | 6.6 | 3.4 | 4.5 |

Sources: FAO Trade Year Books, 1992, 1997 and 2000 except for ROC. Data for ROC have been taken from concerned Country Report.

### 2.1.7 Behavior of Export Prices of Rice (Milled)

As Thailand has been the leading rice exporter, Thai price of US$270/MT determined the Asian average price of US$275/MT in 1990. In response to a drastic expansion of rice import in Asia from 5 million MT to 13 million MT, Thai rice price increased to US$315/MT in 1995. However, lower priced rice from other countries expanded considerably during 1990-95 with the result that relative price of Thai rice become the highest, about 111 percent of the Asia average in 1995, before declining to the same price level as 1990 in 2000 (**Table 9**).

**Table 9. Export Prices of Rice (Milled)-1990 to 2000**

| Country/Region | Price (US$/MT) | | | Rate of Change (%) | | Relative Price (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 332.0 | 326.0 | 279.0 | -0.4 | -3.1 | **World = 100** | | |
| Asia | 275.0 | 282.0 | 251.0 | 0.5 | -2.3 | 82.8 | 86.5 | 90.0 |
| **Surveyed Countries** | | | | | | **Asia = 100** | | |
| ROC | 177.0 | 212.0 | 142.0 | 3.7 | -7.7 | 64.4 | 75.2 | 56.6 |
| India | 511.0 | 288.0 | 427.0 | -10.8 | 8.2 | 185.8 | 102.1 | 170.1 |
| Japan | .. | 231.0 | 333.0 | .. | 7.6 | 0.0 | 81.9 | 132.7 |
| Thailand | 270.0 | 315.0 | 267.0 | 3.1 | -3.3 | 98.2 | 111.7 | 106.4 |
| Vietnam | 188.0 | 197.0 | 192.0 | 0.9 | -0.5 | 68.4 | 69.9 | 76.5 |
| **Average** | 267.0 | 286.0 | 264.0 | 1.4 | -1.6 | 97.1 | 101.4 | 105.2 |
| **Other Countries** | | | | | | | | |
| China | 242.0 | 237.0 | 188.0 | -0.4 | -4.5 | 88.0 | 84.0 | 74.9 |
| Pakistan | 325.0 | 250.0 | 264.0 | -5.1 | 1.1 | 118.2 | 88.7 | 105.2 |

Note: Prices have been derived by dividing export value by the corresponding volume.
Source: FAO Trade Yearbook, 1992, 1997 and 2000 except for ROC. Data for ROC have been taken from the concerned Country Report.

The export prices of Vietnamese rice hovered in the range of US$188-197 per MT throughout the 1990s, which were much lower than those of Thai rice. Although quality of Vietnamese rice was somewhat inferior to that of Thai rice, Vietnam was able to expand the export volume to more than double during 1990-2000, primarily due to price differentials.

The average price of rice exported by India was high at US $511/MT in 1990 because the export share of basmati (premier quality) rice was much higher, as stated earlier, than that of non-basmati rice. In 1995, it reduced to US $288/MT, almost the same as the Asian average, which was due to drastic increase in export of low priced non-basmati rice. Then it increased to US $427MT in 2000 because the export share of basmati rice again increased.

In South Asia, export prices of rice from Pakistan were generally lower than those of India's which explained steady increase in rice export from Pakistan during 1990-2000. Decrease in export prices of Chinese rice from US$242/MT to US$188/MT during the 1990-2000 mainly explained the substantial increase in its export volume from 0.3 million MT in 1990 to 3 million MT in 2000 and increase in its share in Asia's total export of the commodity from 5 percent in 1990 to 19 percent in 2000. Thus, prices have played an important role in determining the volume of exports.

### 2.1.8 Behavior of Import Prices of Rice (Milled)

Import prices are affected not only by the international market conditions but also by various country-specific domestic conditions such as domestic prices, cost of production, consumers' preferences for a particular taste/quality of the commodity, food policy, food security concerns, gap between demand and supply. It has been observed that average import prices of rice varied significantly across the countries (**Table 10**).

**Table 10. Import Prices of Rice (Milled) -1990 to 2000**

| Country/ Region | Price (US$/MT) | | | Rate of Change (%) | | Relative Price (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 386.0 | 357.0 | 334.0 | -1.5 | -1.3 | **World = 100** | | |
| Asia | 347.0 | 319.0 | 344.0 | -1.7 | 1.5 | 89.9 | 89.4 | 103.0 |
| **Surveyed Countries** | | | | | | **Asia = 100** | | |
| ROC | 324.0 | 459.0 | 361.0 | 7.2 | -4.7 | 93.4 | 143.9 | 104.9 |
| India | 333.0 | 400.0 | 308.0 | 3.7 | -5.1 | 96.0 | 125.4 | 89.5 |
| Japan | 167.0 | 759.0 | 404.0 | 35.4 | -11.8 | 48.1 | 237.9 | 117.4 |
| Philippines | 216.0 | 316.0 | 212.0 | 7.9 | -7.7 | 62.2 | 99.1 | 61.6 |
| Vietnam | 500.0 | 273.0 | 400.0 | -11.4 | 7.9 | 144.1 | 85.6 | 116.3 |
| Average | 227.0 | 356.0 | 309.0 | 9.4 | -2.8 | 65.4 | 111.6 | 89.8 |
| **Other Countries** | | | | | | | | |
| Indonesia | 280.0 | 280.0 | 235.0 | 0.0 | -3.4 | 80.7 | 87.8 | 68.3 |
| Malaysia | 303.0 | 332.0 | 310.0 | 1.8 | -1.4 | 87.3 | 104.1 | 90.1 |

Note: Prices have been derived by dividing export value by the corresponding volume.
Source: FAO Trade Year books, 1992, 1997 and 2000 except for ROC. Data for ROC have been taken from concerned Country Report.

The import prices of rice increased during the first half of 1990s but decreased during the second half of 1990s in cases of ROC, Japan, India and Philippines, although the rates of change were different for these countries. These trends were in consonance with changes in land and labor productivity in these countries (Table 3). Vietnam did not follow this trend in price behavior which may not be representative as quantity imported was nominal.

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### 2.1.9 Effects of Price of Rice (Paddy) on its Trade Performance

#### 2.1.9.1 General Price Movement (GDP deflator) and Exchange Rates

Except for Japan where prices were stable as its GDP deflator has been in the range of 96-100 during 1990s, there were inflationary trends in the other surveyed countries. Amongst them, the Philippines experienced the highest inflation where GDP deflator increased from 57 in 1990 to 174 in 2000 while ROC showed a modest increase from 87 to 104 during the corresponding period. In the case of three rice exporting countries *viz*. India, Thailand and Vietnam, it has been in fair-to-middling zone. The price trend was rather moderate in Thailand (**Tables 11 and 12**).

Exchange rates in US$ terms of different countries witnessed different trends during 1990-95 compared to those during 1995-2000. During 1990-95, local currency value declined by about half in India and Vietnam while it was stable in Thailand, ROC and the Philippines. Japan was the only country where it became significantly stronger during this period. During 1995-2000 when the financial crisis emerged in Asia, all countries devalued their currencies to a considerable extent.

**Table 11. Domestic Prices of Rice (Paddy) in Rice Exporting Countries-1990-2000**

| Measure | India | | | Thailand | | | Vietnam | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| GDP deflator | 61.8 | 100.0 | 133.1 | 78.9 | 100.0 | 115.0 | 67.5 | 100.0 | 138.7 |
| Exchange rate/US$ | 17.9 | 33.5 | 45.7 | 25.6 | 25.0 | 40.2 | 5374.0 | 11,029.0 | 15,050.0 |
| **In local price** | Rs | | | Baht | | | '000Dong | | |
| Output price/MT | 2,360.0 | 4,179.0 | 5,080.0 | .. | 3,810.0 | 4,665.0 | 1,289.0 | 1,957.0 | ,853.0 |
| Wage/man-day | 13.3 | 27.0 | 46.0 | .. | 100.0 | 145.0 | 7.0 | 10.0 | 20.0 |
| Land rent/ hectare | 1,281.0 | 2,424.0 | 2,738.0 | .. | 1,325.0 | 1,142.0 | 644.0 | 978.0 | 926.0 |
| **In current US$** | | | | | | | | | |
| output price/MT | 132.0 | 125.0 | 111.0 | .. | 153.0 | 116.0 | 240.0 | 177.0 | 123.0 |
| Wage/man-day | 0.7 | 0.8 | 1.0 | .. | 4.0 | 3.6 | 1.3 | 0.9 | 1.3 |
| Land rent/hectare | 71.0 | 72.0 | 60.0 | .. | 53.0 | 28.0 | 120.0 | 89.0 | 62.0 |

Note: Wage rate is imputed for main family work.
Sources: Tables 1-1 and 3-1 of respective Country Reports.

**Table 12. Domestic Prices of Rice (Paddy) in Other Countries-1990-2000**

| Measure | ROC | | | Japan | | | Philippines | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| GDP deflator | 86.5 | 100.0 | 104.2 | 95.5 | 100.0 | 96.1 | 56.5 | 100.0 | 173.6 |
| Exch. rate/US$ | 26.9 | 26.5 | 31.2 | 144.8 | 94.1 | 107.8 | 24.3 | 25.7 | 44.2 |
| **In local price** | NT$ | | | '000Yen | | | Peso | | |
| Output price/MT | 16,630.0 | 192,20.0 | 18,190.0 | 292.0 | 285.0 | 236.0 | 4,740.0 | 7,720.0 | 8,770.0 |
| Wage/man-day | 771.0 | 1367.0 | 1487.0 | 8.9 | 11.7 | 12.4 | 57.7 | 93.0 | 132.5 |
| Land rent/hectare | 13,189.0 | 16,524.0 | 14,757.0 | 304.0 | 281.0 | 225.0 | 536.0 | 807.0 | 979.0 |
| **In current US$** | | | | | | | | | |
| Output price/MT | 618.0 | 726.0 | 582.0 | 2,016.0 | 3,030.0 | 2,190.0 | 195.0 | 300.0 | 198.0 |
| Wage/man-day | 29.0 | 52.0 | 48.0 | 61.0 | 124.0 | 115.0 | 2.4 | 3.6 | 3.0 |
| Land rent/ hectare | 490.0 | 624.0 | 473.0 | 2,099.0 | 2,987.0 | 2,088.0 | 22.0 | 31.0 | 22.0 |

Note: Wage rate is imputed for main family work.
Sources: Tables 1-1 and 3-1 of respective Country Reports.

### 2.1.9.2 Price Levels of Output and Inputs For Rice (Paddy) Production

With the changes in GDP deflator and exchange rates in various countries as noted above, rice related prices have changed as follows:

Export prices of rice in US$ terms showed a declining trend during 1990s in all the three rice exporting countries. Among them, the price level and its rate of change were the highest in India. In case of Vietnam, price level was the lowest but the declining trend was the most significant. In so far as Thailand is concerned, declining trend was in-between those of India and Vietnam (**Table 11**). In case of remaining countries, rice price in US$ terms increased significantly during the first half of 1990s then reverted to the level of 1990 in 2000. The price levels in US$ terms in these countries were much higher than those of exporting countries, making it unfavorable for them to compete in international markets (**Table 12**).

Wage rates in US$ terms in India was the lowest but showed a steady increase. In Vietnam, it was a little higher than that of India, declined during the first half of 1990s before increasing to the level of 1990 during 1995-2000. The wage rate was much higher in Thailand than the two countries in 1995 but declined marginally in 2000, though the

level was still higher than the two, reducing its competitive position in this aspect (Table 11). In other countries, wage rates increased significantly during the first half of 1990s but decreased to some extent during the second half of 1990s. The level of wages in these countries was much higher, particularly in Japan and ROC than those in exporting countries (Table 12). The levels of wage rates seem to have some correlation with per capita income of respective countries.

Land rent in US$ declined in all the surveyed countries. In 2000, it was at the lowest level in the range of US$22-28 per hectare in Thailand and the Philippines, about US$60 per hectare in India and Vietnam, but very high (US$473- US$2088) per hectare in Japan and ROC. Those levels and trends did not necessarily correspond to rice trade performance in respective countries.

## 2.2 Productivity and Trade Performance of Sugarcane and Sugar

The analysis of productivity of sugarcane, sugar and the trade performance of sugar has been discussed under the following sub-sections:

### 2.2.1 Land and Labor Productivity of Sugarcane

Land and labor productivity of sugarcane varied significantly across countries. The productivity levels for Japan have been much higher than those of the other three countries where this commodity has been surveyed. In India, trends of value added per hectare and value added per man-man day have declined during the first half of 1990s and then increased during the second half of 1990s. However, these measures increased during the first half of 1990s and then ebbed during the second half of 1990s in Japan and the Philippines (**Table 13**). Thailand witnessed similar trend in land productivity only and exhibited an upward trend in labor productivity throughout the reference period.

**Table 13. Land and Labor Productivity of Sugarcane**

(At constant 1995 US$, 1995=100)

| Country | Productivity | Value added / hectare | | | Value added / man-day | | |
|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| India | Absolute | 1,516 | 1,149 | 1,300 | 10 | 6 | 8 |
| | Index | 132 | 100 | 113 | 165 | 100 | 124 |
| Japan | Absolute | 8,840 | 13,650 | 10727 | 50 | 103 | 88 |
| | Index | 65 | 100 | 79 | 49 | 100 | 85 |
| Philippines | Absolute | 1,131 | 1,459 | 1021 | 16 | 21 | 15 |
| | Index | 78 | 100 | 70 | 77 | 100 | 70 |
| Thailand | Absolute | 530 | 705 | 682 | 2 | 10 | 11 |
| | Index | 75 | 100 | 97 | 23 | 100 | 105 |

Sources: Table 7-series of respective Country Reports.

### 2.2.2 Total Factor Productivity of Sugarcane

Total Factor Productivity (TFP) indices of Sugarcane showed declining trends in respect of all the countries during 1995-2000. This decline is more pronounced in the Philippines and Thailand (**Table 14**).

**Table 14. Indices of Total Output, Input and TFP of Sugarcane**

(1995 = 100)

| Country | Index | 1990 | 1995 | 2000 |
|---|---|---|---|---|
| India | Total output | 89 | 100 | 99 |
| | Total input | 74 | 100 | 108 |
| | TFP | 120 | 100 | 92 |
| Japan | Total output | 122 | 100 | 84 |
| | Total input | 168 | 100 | 92 |
| | TFP | 72 | 100 | 92 |
| Philippines | Total output | 99 | 100 | 59 |
| | Total input | 66 | 100 | 149 |
| | TFP | 150 | 100 | 40 |
| Thailand | Total output | 79 | 100 | 102 |
| | Total input | 98 | 100 | 280 |
| | TFP | 80 | 100 | 37 |

Sources: Tables 7-series of respective Country Reports.

### 2.2.3 Exports of Sugar

The share of Asia in the world sugar export was moderate at only 13-17 percent during 1990-2000. Amongst sugar exporters in Asia, Thailand has been the fore runner who exported 2.4 million MT of sugar in 1990 which represented 59 percent of Asia's share. It expanded at an annual growth rate of 9.6 percent during the first half of 1990s but growth rate decelerated to 2 percent during the second half of 1990s (**Table 15**).

Two other exporting countries of sugar under the survey exhibited different trends during 1990-2000. The Philippines exported 0.25 million MT sugar, one tenth of Thai's in 1990 but declined to 0.13 million MT in 2000. In contrast, India expanded sugar export significantly from 27 to 349 thousand MT during the corresponding period.

**Table 15. Exports of Sugar and its Growth Rates -1990 to 2000**

| Country/ Region | Volume ('000 MT) | | | Growth Rate (%) | | Export Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 29,925 | 35,393 | 38,988 | 3.4 | 2.0 | **Share in the world** | | |
| Asia | 4138 | 5927 | 6473 | 7.5 | 1.8 | 13.8 | 16.7 | 16.6 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| India | 27 | 388 | 349 | 70.4 | -2.1 | 0.7 | 6.5 | 5.4 |
| Philippines | 247 | 154 | 139 | -9.0 | -2.0 | 6.0 | 2.6 | 2.1 |
| Thailand | 2,426 | 3,842 | 4,241 | 9.6 | 2.0 | 58.6 | 64.8 | 65.5 |
| Sub-total | 2,700 | 4,384 | 4,729 | 10.2 | 1.5 | 65.2 | 74.0 | 73.1 |
| **Other Countries** | | | | | | | | |
| ROC | 630 | 534 | 463 | -3.3 | -2.8 | 15.2 | 9.0 | 7.2 |
| Korea | 319 | 247 | 330 | -5.0 | 6.0 | 7.7 | 4.2 | 5.1 |

Note: 1. Sugar Raw Equivalent.
2. Japan's export was nil.

Sources: FAO Trade Year Books, 1992, 1997 and 2000.

It is noted that Thailand has been the leading exporter of sugar in the region during 1990-2000 and reason for this can be partly traced to lower figures for value added /

hectare compared to those of other countries (**Table 13**). Likewise, the significant decline of both land and labor productivity of sugar for India is consistent with export expansion and price decline during 1990-95. In contrast, productivity increased in case of the Philippines during 1990-95 which led to erosion of competitive position of the Philippines as is reflected in significant decline in its export share during 1990-95.

### 2.2.4 Imports of Sugar

Out of four countries surveyed for sugar, Japan has been a regular importer who imported 1.5-1.8 million MT per annum during the decade of 1990s. The Philippines was a net sugar exporter till 1994 but imported 377 thousand MT while exporting 154 thousand MT, thus shifting to a net importer in 1995 and has kept this status until 2000. India's position in sugar trade has fluctuated during 1990-2000 due to regular cycles of surplus and deficit of sugar production in the country. Import of sugar was negligible till 1993. In 1994, 1.4 million MT was imported. Then, there was a period of low imports in next three years before it reached a level of 0.90 million MT in 1998 and 1.18 million MT in 1999. It drastically declined to 30.40 thousand MT in 2000. The spurt in import of sugar was attributed to private sector response to low international prices and liberal government policy rather than a conscious effort to bridge gap between domestic demand and supply.

### 2.2.5 Behavior of Export Prices of Sugar

The world sugar export price showed a significant declining trend during 1990-2000 with an annual rate of (–) 4.5 percent during 1990-95 and even faster decline of (–) 7.5 percent during 1995-2000 following the sustained export growth.

**Table 16. Export Prices of Sugar- 1990 to 2000**

| Country/ Region | Price (US$/MT) | | | Growth Rate (%) | | Relative Price (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 456.0 | 362.0 | 245.0 | -4.5 | -7.5 | **World = 100** | | |
| Asia | 330.0 | 326.0 | 196.0 | -0.2 | -9.7 | 72.4 | 90.1 | 80.0 |
| **Surveyed Countries** | | | | | | **Asia = 100** | | |
| India | 444.0 | 314.0 | 275.0 | -6.7 | -2.6 | 134.5 | 96.3 | 140.3 |
| Philippines | 453.0 | 429.0 | 374.0 | -1.1 | -2.7 | 137.3 | 131.6 | 190.8 |
| Thailand | 285.0 | 301.0 | 152.0 | 1.1 | -12.8 | 86.4 | 92.3 | 77.6 |
| Average | 302.0 | 306.0 | 165.0 | 0.3 | -11.6 | 91.5 | 93.9 | 84.2 |
| **Other Countries** | | | | | | | | |
| ROC | 371.0 | 361.0 | 190.0 | -0.5 | -12.0 | 112.4 | 110.7 | 96.9 |
| Korea | 386.0 | 385.0 | 218.0 | -0.1 | -10.8 | 117.0 | 118.1 | 111.2 |

Note: 1. Sugar Raw Equivalent.
2. Japan's export was nil.

Sources: FAO Trade Year Books, 1992, 1997 and 2000.

The sugar price of Thailand ebbed by almost half during 1995-2000. Its 2000 price of $152 per MT was 78 percent of that of Asia and 62 percent of the average world price. Such a low price explains expansion of export market for Thailand. The sugar prices of India and the Philippines, the other exporting countries under survey, also showed declining trends but the price levels remained at much higher levels than those of Thailand or the Asia/ world average. The price of the Philippine sugar was more than double of Thai's sugar with the result that the Philippines could not compete with Thailand.

### 2.2.6 Effects of Prices of Raw Sugar on its Trade Performance

Out of four countries in which sugarcane was covered under the survey, prices (in US$) exhibited a declining trend during 1995-2000 in three countries of India, the

Philippines and Thailand. The decline was sharp in the Philippines and Thailand while it was moderate in India. The absolute price level was the lowest in Thailand in 2000 which is reflected in the corresponding low export price. As regards the fourth country namely Japan, prices were 'outliers' (**Table 17**) and therefore is not discussed in this sub-section.

**Table 17. Domestic Prices of Sugarcane -1990 to 2000**

| Measure | India | | | Japan | | | Philippines | | | Thailand | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 | 1995 | 2000 |
| GDP deflator | 61.8 | 100.0 | 133.1 | 95.5 | 100.0 | 96.1 | 56.5 | 100.0 | 173.6 | 100.0 | 115.0 |
| Exchange Rate/US$ | 17.9 | 33.5 | 45.7 | 144.8 | 94.1 | 107.8 | 24.3 | 25.7 | 44.2 | 25.0 | 40.2 |
| **In local currencies** | Rs. | | | '000Yen | | | Peso | | | Baht | |
| Output price/MT | 390.0 | 648.0 | 860.0 | 19.9 | 20.5 | 21.0 | 500.0 | 809.0 | 771.0 | 500.0 | 500.0 |
| Wage/man-day | 19.0 | 41.0 | 66.0 | 7.7 | 8.8 | 9.9 | 58.0 | 92.0 | 133.0 | 100.0 | 120.0 |
| Land rent/hectare | 3,331.0 | 7,482.0 | 8,976.0 | 156.7 | 131.7 | 126.6 | 536.0 | 807.0 | 979.0 | 3,125.0 | 3,344.0 |
| **In current US$** | | | | | | | | | | | |
| Output price/MT | 21.7 | 19.4 | 18.8 | 137.0 | 218.0 | 195.0 | 20.6 | 31.5 | 17.4 | 20.0 | 12.5 |
| Wage/man-day | 1.1 | 1.2 | 1.4 | 53.0 | 94.0 | 92.0 | 2.4 | 3.6 | 3.0 | 4.0 | 3.0 |
| Land rent/ hectare | 186.0 | 224.0 | 196.0 | 1,082.0 | 1,400.0 | 1,174.0 | 22.0 | 31.4 | 22.2 | 125.2 | 83.3 |

Notes: Wage rate is imputed for main family work.
Sources: Tables 1-1 and 3-series of respective Country Reports.

In 1990, wage rate in US$ terms was the lowest in India followed by the Philippines. While it increased steadily in case of India during 1995-2000, it ebbed in the Philippines and Thailand during the corresponding period.

Land rent in US$ first increased during 1990-95, then declined during 1995-2000 in all the three countries. The rent per hectare was the lowest at US$22-31 in the Philippines followed by Thailand at US$83-125 and India at US$ 186-224. These trends did not exhibit any relationship with trade performance of sugar in respective countries.

## 2.3 Productivity and Trade Performance of Natural Rubber

The productivity of rubber (natural) and its trade performance has been analyzed under the following sub-sections:

### 2.3.1 Land and Labor Productivity of Natural Rubber

One of factors that affects the comparative advantage of a tradable commodity is the level of productivity of its raw farm product. Land and labor productivity of rubber (natural) production of various countries have been presented in **Table 18**.

**Table 18. Land and Labor Productivity of Natural Rubber**

(At constant 1995 US$,1995=100)

| Country | Productivity | Value added / hectare | | | Value added/man-day | | |
|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| India | Absolute | 1,075.0 | 2,230.0 | 1,164.0 | 4.8 | 9.8 | 5.5 |
| | Index | 48.0 | 100.0 | 52.0 | 49.0 | 100.0 | 56.0 |
| Malaysia | Absolute | 1,633.1 | 1,931.1 | 1,213.2 | 0.5 | 0.6 | 0.4 |
| | Index | 84.6 | 100.0 | 62.8 | 85.1 | 100.0 | 63.5 |
| Thailand | Absolute | .. | 1,281.0 | 839.0 | | 9.1 | 8.2 |
| | Index | .. | 100.0 | 65.0 | | 100.0 | 90.0 |
| Vietnam | Absolute | 21,766.0 | 29,804.0 | 19,452.0 | 3.6 | 4.9 | 3.2 |
| | Index | 73.0 | 100.0 | 65.3 | 73.1 | 100.0 | 66.2 |

Sources: Table-7 series of respective Country reports.

### 2.3.2 Total Factor Productivity of Natural Rubber

Total Factor Productivity (TFP) indices of rubber (natural) showed steep increase in case of India, remained almost constant in Thailand and has exhibited declining trend in Malaysia during the second half of 1990s (Table 19).

**Table 19. Indices of Total Output, Input and TFP of Natural Rubber**

(1995=100)

| Country | Index | 1990 | 1995 | 2000 |
|---|---|---|---|---|
| India | Total output | 67 | 100 | 164 |
| | Total input | 95 | 100 | 111 |
| | Total factor productivity | 71 | 100 | 148 |
| Malaysia | Total output | 100 | 100 | 62 |
| | Total input | 109 | 100 | 95 |
| | Total factor productivity | 91 | 100 | 65 |
| Thailand | Total output | . | 100 | 79 |
| | Total input | . | 100 | 80 |
| | Total factor productivity | . | 100 | 99 |

Notes: 1. In case of India, figures for 1993 have been used as proxy for 1990.
2. Vietnam has not furnished relevant data.

Sources: Table-7 series of respective Country reports.

As noted earlier, Malaysia was the leading exporter of rubber in 1990 and gradually lost that position to Thailand by 2000. This is reflected in trends of land, labor and total factor productivity of Malaysia during 1995-2000 which declined faster than those of the other countries (Tables 18 and 19).

### 2.3.3 Exports of Natural Rubber

In 1990, Malaysia was the leading exporter of rubber in the world, followed by Thailand and they accounted for 35 percent and 30 percent respectively of the share of Asia (**Table 20**). However, a drastic shift in export performance of these two countries has been observed during the decade of 1990s when rubber export from Malaysia ebbed significantly from 1.3 million MT in 1990 to 0.8 million MT in 2000 and its share dropped down to only 16 percent, less than half of its 1990 share in Asia. Such a drastic decline has taken place due to the continuous diversification of acreage under natural rubber to palm oil as the latter has a shorter maturity period and yields higher economic returns.

Planted area under rubber has declined from 1.8 million hectares to 1.4 million hectares while that of palm oil increased from 2.0 million hectares to 3.4 million hectares during 1990-2000.

**Table 20. Exports of Natural Rubber and its Growth Rates - 1990 to 2000**

| Country/Region | Volume ('000MT) | | | Growth Rate (%) | | Export Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 4,137.0 | 4,697.0 | 5,701.0 | 2.6 | 4.0 | **Share in the world** | | |
| Asia | 3,760.0 | 4,306.0 | 5,178.0 | 2.7 | 3.8 | 90.9 | 91.7 | 90.8 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| India | 0.0 | 1.2 | 4.0 | 189.0 | 27.0 | 0.0 | 0.0 | 0.1 |
| Malaysia | 1,322.0 | 1,013.0 | 846.0 | -5.2 | -3.5 | 35.2 | 23.5 | 16.3 |
| Thailand | 1,133.0 | 1,632.0 | 2,542.0 | 7.6 | 9.3 | 30.1 | 37.9 | 49.1 |
| Vietnam | 76.0 | 138.0 | 273.0 | 12.7 | 14.6 | 2.0 | 3.2 | 5.3 |
| Sub-total | 2,531.0 | 2,784.2 | 3,665.0 | 1.9 | 5.7 | 67.3 | 64.7 | 70.8 |
| **Other Countries** | | | | | | | | |
| Indonesia | 1,084.0 | 1,324.0 | 1,380.0 | 4.1 | 0.8 | 28.8 | 30.7 | 26.7 |

Sources: FAO Trade Year Books, 1992, 1997 and 2000.

At the same time, Thailand realized a drastic expansion of rubber export from 1.1 million MT in 1990 to 2.5 million MT in 2000 and its share increased from 30 percent to 49 percent in Asia during the corresponding period. Indonesia, the third largest exporter of this commodity, exported 1.1 million MT of rubber with a share of 29 percent in 1990. Indonesia overtook Malaysia in 1995 and has emerged as the second largest rubber exporter in 2000, with a share of 27 percent.

Vietnam exported only 76 thousand MT of rubber and its share was 2 percent of total export from Asia in 1990. Though volume of export was far smaller, its share expanded much faster than that of Thailand. It achieved the level of over 10 percent of Thai export in 2000 and accounted for 5 percent share in Asia.

India has been net importer of natural rubber (NR) and there was no export of this commodity in 1990. However, with introduction of a scheme for export promotion of NR with incentives to exporters for quality improvement, certification, packaging and transportation, a modest quantity of 13.36 thousand MT valued at US $ 8.18 million has been exported in 2000. It is expected that export of NR from India will get a fillip and her presence in the export market will be felt.

### 2.3.4 Imports of Natural Rubber

Japan had been the largest rubber importer in the region and import volume has increased from 0.7 million MT in 1990 to 0.8 million MT in 2000. ROC expanded rubber import dramatically from 0.4 million MT to 0.9 million MT during the period and became the leading rubber importer in the region (FAO Trade Year Book 2000).

Import of rubber from Malaysia has increased from 136 to 432 thousand MT during 1990-2000. The import volume in 2000 was more than half of export during the corresponding year which has been necessitated mainly to meet increasing demand of the local pharmaceutical and rubber products industry for latex concentrate. At the same time, Malaysia has been an important rubber exporter.

Imports to India fluctuated in the range of 8 thousand MT to 52 thousand MT in 1990s, but it showed a declining trend recently from the peak import level of 52 thousand MT in 1995 to 9 thousand MT in 2000. Imports to Thailand and Vietnam were negligible during 1990s.

### 2.3.5 Behavior of Export Prices of Natural Rubber

As mentioned earlier, Malaysia had been the leading rubber exporter and became the rubber price setter until the middle of 1990s. Prices of Malaysian rubber doubled during1990-95 when gap between demand and supply increased. This gap had crept in due to declining export capacity of Malaysia and a steady expansion in demand in the world. Steep rise in prices sent strong signals to neighboring countries, such as Thailand and Indonesia where very similar favorable production conditions of natural rubber exist, to expand rubber production and export. That phenomenon emerged particularly in Thailand because Southern Thailand is adjacent to Malaysia and climatic conditions are the similar. Besides, there were enough relatively cheap land and labor resources compared to Malaysia for expanding rubber cultivation. Under the very high world rubber price situation, production was promoted not only by Thai government agencies but also by a number of private enterprises who involved Malaysian experts on cultivation and processing of rubber. This international technology transfer significantly contributed to Thailand's success in rubber production and export promotion.

**Table 21. Export Prices of Natural Rubber-1990 to 2000**

| Country/ Continent | Price (US$/MT) | | | Rate of Change (%) | | Relative Price (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 829.0 | 1,507.0 | 680.0 | 12.7 | -14.7 | World = 100 | | |
| Asia | 819.0 | 1,498.0 | 662.0 | 12.8 | -15.1 | 98.8 | 99.4 | 97.4 |
| Surveyed Countries | | | | | | Asia = 100 | | |
| India | 2,667.0 | 2,327.0 | 806.0 | -2.7 | -19.1 | 325.6 | 155.3 | 121.8 |
| Malaysia | 846.0 | 1,589.0 | 885.0 | 13.4 | -11.0 | 103.3 | 106.1 | 133.7 |
| Thailand | 814.0 | 759.0 | 598.0 | -1.4 | -4.7 | 99.4 | 50.7 | 90.3 |
| Vietnam | 868.0 | 964.0 | 608.0 | 2.1 | -8.8 | 106.0 | 64.4 | 91.8 |
| Average | 832.0 | 1072.0 | 665.0 | 5.2 | -9.1 | 101.6 | 71.6 | 100.5 |
| Other Countries | | | | | | | | |
| Indonesia | 789.0 | 1,483.0 | 644.0 | 13.5 | -15.4 | 96.3 | 99.0 | 97.3 |

Note: Prices have been derived by dividing current export value by the corresponding volume.
Sources: FAO Year Books, 1992, 1997 and 2000.

As Thailand accounted for almost half of Asia's share of export of rubber in 2000, role of price setter shifted from Malaysia to Thailand who could decrease the price in conjunction with a significant expansion of export share. The world price dropped in 2000 to less than half of the 1995 level. Vietnam and Indonesia once increased rubber price following Malaysia in 1990-95 but lowered it sharply to the Thai price level in 2000.

## 2.4 Trade Performance and Productivity of Pineapple (Canned)

The trade performance and productivity of pineapple (canned) has been analyzed and discussed under the following sub-sections:

### 2.4.1 Land and Labor Productivity of Pineapple (Fresh)

Land and labor productivity of pineapple (fresh) in terms of value added per hectare and per man-day in 1995 US$ for the Philippines and Thailand show the following two aspects:

(a) Value added per hectare and value added per man-day at constant 1995 US$ terms have been higher for the Philippines than for Thailand; and
(b) The productivity indices had a steep fall in case of Thailand in 2000 (**Table 22**).

**Table 22. Land and Labor Productivity: Pineapple**

(At constant 1995 US$, 1995=100)

| Country | Productivity | Value added / hectare | | Value added / man-day | |
|---|---|---|---|---|---|
| | | 1995 | 2000 | 1995 | 2000 |
| Philippines | Absolute | 4,649.0 | 4,544.0 | 53.1 | 51.9 |
| | Index | 100.0 | 97.7 | 100.0 | 95 |
| Thailand | Absolute | 3,840.0 | 613.0 | 26.0 | 4.0 |
| | Index | 100.0 | 16.0 | 100.0 | 15.0 |

Sources: Table 7-series of respective Country Reports.

The above observation may explain the export increase in two countries during 1995-2000 in different ways as follows:

i. The Philippines was able to maintain its productivity level at constant US $ terms during the second half of 1990s, increased their planted/harvested area so that pineapple farms had a more comparative advantage in pineapple farming;

ii. Unlike the Philippines, productivity declined significantly in Thailand so that it could have a stronger competitive position in the international market, though such a sharp decline seems un-realistic.

### 2.4.2 Total Factor Productivity of Pineapple (Fresh)

TFP (Total Factor Productivity) exhibited downward trend during 1995-2000 in both the countries. However, decline has been more pronounced in case of Thailand which contributed to improve Thailand's competitiveness in international market and contributed to export expansion through an export price decline.

**Table 23. Indices of Total Output, Input and TFP of Pineapple**

(1995 = 100)

| Country | Index | 1995 | 2000 |
|---|---|---|---|
| Philippines | Total output | 100.0 | 82.9 |
| | Total input | 100.0 | 133. 9 |
| | TFP | 100.0 | 61.9 |
| Thailand | Total output | 100.0 | 26.0 |
| | Total input | 100.0 | 104.0 |
| | TFP | 100.0 | 25.0 |

Sources: Tables 7-series of respective Country Reports.

### 2.4.3 Labor, Capital and TFP of Pineapple (Canned)

Only the Philippines provided factory budget for canned pineapple, though the data are derived from one of two best factories because pineapple processing and export are dominated by the two large multinational companies in the Philippines.

Value added per worker of pineapple (canned) declined from 12.06 in 1995 to 11.02 in 2000 (at constant 1995 US$ prices) and corresponding indices declined from 100 to 91.4. Value added per capita were US$ 0.29 and US$ 0.26 and its indices ebbed from 100 to 90.0 in the corresponding years. The country experienced a similar decline in productivity of both pineapple (fresh) and its processed form during 1995-2000. TFP index declined significantly from 100 in 1995 to 61.9 in 2000.

### 2.4.4 Exports of Pineapple (Canned)

Exports of pineapple and its products consist of fresh fruit and various forms of processed products such as canned, preserved, dried, juice and concentrates. Among

these, the most important one is canned pineapple. In terms of annual value of export from Asia, canned pineapple posted a trade of around US$400 million mark while it was around US$30 million only for fresh pineapple. As tradable form of pineapple is mainly canned pineapple, trade performance of only canned pineapple has been discussed in this sub-section. Two countries, Thailand and the Philippines, have been the most important exporters of canned pineapple (**Table 24**).

**Table 24. Export of Pineapple and its Growth Rates-1990 to 2000**

| Country/ Continent | Volume ('000MT) | | | Growth Rate (%) | | Export Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 906.0 | 994.0 | 1,070.0 | 1.9 | 1.5 | **Share in the world** | | |
| Asia | 765.0 | 784.0 | 890.0 | 0.5 | 2.6 | 84.4 | 78.9 | 83.2 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| Philippines | 179.0 | 192.0 | 251.0 | 1.4 | 5.5 | 23.4 | 24.5 | 28.2 |
| Thailand | 399.0 | 388.0 | 446.0 | -0.6 | 2.8 | 52.2 | 49.5 | 50.1 |
| Sub-total | 578.0 | 580.0 | 697.0 | 0.1 | 3.7 | 75.6 | 74.0 | 78.3 |
| **Other Countries** | | | | | | | | |
| Indonesia | 49.0 | 91.0 | 132.0 | 13.2 | 7.7 | 6.4 | 11.6 | 14.8 |

Sources: FAO Year Books, 1992, 1997 and 2000.

While Thailand exports pineapple (canned) and not fresh pineapple, the Philippines exports a good mix of both forms of pineapple. Annual export of fresh pineapple by the Philippines was 135-165 thousand MT compared to 179-251 thousand MT of pineapple (canned) during the decade of 1990s. However, in terms of export value, fresh pineapple accounted for about US$25 million against US$90 million by pineapple (canned) in 2000.

Export of canned pineapple has increased steadily in the 1990s both in the world and in Asia and the Asia's share in the world had hovered around 80 percent during the period. Thailand has been the most dominant exporter, accounting for about 50 percent share in Asia. Although volume of export from Thailand has not changed significantly during 1990-1995, it posted a modest growth at 2.8 percent annually during second half of 1990s to attain a level of 446 thousand MT in 2000. However, fluctuations in export volume were more pronounced during the intervening years, achieving a trough at 226 thousand MT in 1998 and a surge at 707 thousand MT in 1994.

The Philippines commanded the second position and exported about half of volume exported by Thailand. It registered higher growth rates at 1.4 percent and 5.5 percent during 1990-95 and 1995-2000 respectively compared to (-) 0.6 and 2.8 percent of Thailand during the corresponding periods, its share increased from 23 to 28 percent in Asia during 1990-2000. The two countries' total share was more than three-fourth of Asia's. Indonesia, though not covered under the survey, is the third country which has experienced a faster export expansion and a significant rise in its share from 6 percent in 1990 to 15 percent in 2000.

### 2.4.5 Behavior of Export Prices of Pineapple (Canned)

Export prices of canned pineapple, both in Asia and the world, did not change during 1990-95. But a clear decline in prices in all the markets has been noted during post-1995 period. The main reason for such a decline has been a sharp decline in demand for pineapple that manifested recently in Asia. After its import increased from 153 to 176 thousand MT in the first half of 1990s, it ebbed to 107 thousand MT in the second half of 1990s despite the fact that the world import had experienced an increasing trend during 1990-2000 (FAO Trade Year Book).

There may be the following two main reasons for such a demand decline for canned pineapple in Asia:

i. Decline in income of Asians caused by the Asian economic crisis in 1997-98; and
ii. Increased availability of diversified preserved foods which are substitutable for canned pineapple in respective domestic markets of the region. In spite of such a significant decline in the demand side, supply continued in the Asian market thus causing over supply and it was inevitable that price was forced to decline significantly.

The prices of Philippine pineapple have ruled much lower than those of Thai prices which could be due to either quality differential or stronger competitive position of the Philippines. In any case, such price gaps would support higher growth export expansion from the Philippines than from Thailand.

**Table 25. Export Prices of Pineapple (Canned)-1990 to 2000**

| Country/ Continent | Price (US$/MT) | | | Rate of Change (%) | | Relative Price (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 571.0 | 574.0 | 481.0 | 0.1 | -3.5 | **World = 100** | | |
| Asia | 553.0 | 531.0 | 444.0 | -0.8 | -3.5 | 96.8 | 92.5 | 92.3 |
| **Surveyed Countries** | | | | | | **Asia = 100** | | |
| Philippines | 497.0 | 422.0 | 363.0 | -3.2 | -3.0 | 89.9 | 79.5 | 81.8 |
| Thailand | 544.0 | 603.0 | 475.0 | 2.1 | -4.7 | 98.4 | 113.6 | 107.0 |
| **Average** | 529.0 | 543.0 | 435.0 | 0.5 | -4.3 | 95.7 | 102.3 | 98.0 |
| | | | | | | | | **Other Countrie** |
| Indonesia | 510.0 | 527.0 | 455.0 | 0.7 | -2.9 | 92.2 | 99.2 | 102.5 |

Note: Export prices have been derived by dividing current export value by the corresponding volume.
Sources: FAO Year Books, 1992, 1997 and 2000.

### 2.4.6 Domestic Prices of Pineapple (Canned)

Domestic prices of outputs and inputs of pineapple have been exhibited in **Table 26**.

**Table 26. Domestic Prices of Pineapple-1990 to 2000**

| **Parameter** | **Philippines** | | **Thailand** | |
|---|---|---|---|---|
| | **1995** | **2000** | **1995** | **2000** |
| GDP deflator | 100.00 | 173.58 | 100.00 | 114.97 |
| Exchange Rate/US$ | 25.71 | 44.19 | 25.00 | 40.20 |
| **In Domestic currency** | Peso | | Baht | |
| Output price/MT | 3,600.00 | 5,240.00 | 2,040.00 | 3,990.00 |
| Wage/man-day | 92.00 | 133.00 | 125.00 | 150.00 |
| Land rent/hectare | 807.00 | 979.00 | 1,625.00 | 1,625.00 |
| **In current US$** | | | | |
| Output price/MT | 140.00 | 118.60 | 81.60 | 99.30 |
| Wage/man-day | 3.59 | 3.00 | 5.00 | 3.70 |
| Land rent/hectare | 31.40 | 22.20 | 65.00 | 40.40 |

Notes: Wage rate is imputed for main family work.
Sources: Tables 1-1 and 3-series of respective Country Reports.

## 2.5 Productivity and Trade Performance of Palm Oil

The productivity of palm oil and its trade performance has been analyzed under the following sub-sections:

### 2.5.1 Land and Labor Productivity of Palm Oil

Land and labor productivity indices in terms of value added per hectare and value added per man-day at constant US$ 1995 prices have increased considerably, almost

three times during 1990-95 in Malaysia. This phenomenon sent strong signals for diversification from other crops, mainly rubber, into palm oil. Both indices of productivity namely value added per hectare and value added per man-day declined to half in 2000, which adversely affected comparative advantage in domestic agriculture but might enhance its international competitiveness.

**Table 27. Land and Labor Productivity of Palm Oil**

(At constant 1995 US$, 1995=100)

| Country/ Region | Productivity | Value added / hectare | | | Value added/man-day | | |
|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| Malaysia | Absolute | 503.7 | 1472.2 | 719.6 | 2.3 | 6.8 | 3.3 |
| | Index | 34.2 | 100.0 | 48.9 | 34.2 | 100.0 | 48.9 |
| Thailand | Absolute | 463.0 | 665.0 | 350.0 | 20.0 | 18.8 | 8.4 |
| | Index | 70.0 | 100.0 | 53.0 | 106.0 | 100.0 | 44.0 |

Sources: Table-7-series of respective Country reports.

In Thailand**,** value added per man-day exhibited a declining trend during 1990-2000 and value added per hectare also decreased in 1995-2000. Although the export from Thailand was negligible in 1990 (Table 29), it has exhibited an increasing trend during 1995-2000 which was in consonance with the trends in productivity.

### 2.5.2 Total Factor Productivity of Palm Oil

Trends of TFP indices have been in consonance with those of land and labor productivity in case of Malaysia. However, it is not so in case of Thailand (**Tables 27 and 28**).

**Table 28. Indices of Total Output, Input and TFP of Palm Oil**

(1995 = 100)

| **Country** | **Index** | **1990** | **1995** | **2000** |
|---|---|---|---|---|
| Malaysia | Total Output | 29 | 100 | 66 |
| | Total Input | 79 | 100 | 128 |
| | TFP | 37 | 100 | 51 |
| Thailand | Total Output | 50 | 100 | 86 |
| | Total Input | 162 | 100 | 74 |
| | TFP | 31 | 100 | 117 |

Sources: Tables 7-1 of respective Country Reports.

While TFP of both Malaysia and Thailand increased sharply during the first half of 1990s, it had a free fall during the second half of 1990s in Malaysia due to increase in total input in contrast to decline in the total output. Unlike Malaysia, Thailand posted a positive growth during the second half of 1990s also.

### 2.5.3 Exports of Palm Oil

Malaysia has been the leading exporter of palm oil with about three quarters of Asia's share in 1990 and Asia commands about 90 percent of global export. Although Malaysia has exhibited an upward trend in export of this commodity in absolute terms, its share declined to 65 percent in 2000. This has taken place due to phenomenal export expansion realized by Indonesia when its share increased from 15 percent in 1990 to 33 percent in 2000, attaining a level equivalent to half of Malaysian export (**Table 29**).

Though Thailand started in a modest manner, its contribution is noticeable when it expanded its volume of export by six times during 1995-2000.

**Table 29. Exports of Palm Oil and its Growth Rates -1990 to 2000**

| Country/ Continent | Volume ('000MT) | | | Growth Rate (%) | | Export Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 8,079.0 | 10,211.0 | 14,045.0 | 4.8 | 6.6 | **Share in the World** | | |
| Asia | 7,488.0 | 9,400.0 | 12,612.0 | 4.7 | 6.1 | 92.7 | 92.1 | 89.8 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| Malaysia | 5,656.0 | 6,862.0 | 8,141.0 | 3.9 | 3.5 | 75.5 | 73.0 | 64.5 |
| Thailand | 0.1 | 6.0 | 37.0 | 137.1 | 43.9 | 0.0 | 0.1 | 0.3 |
| Sub-total | 5,656.1 | 6,868.0 | 8,178.0 | 4.0 | 3.6 | 75.5 | 73.1 | 64.8 |
| **Other Countries** | | | | | | | | |
| Indonesia | 1,097.0 | 1,679.0 | 4,110.0 | 8.9 | 19.6 | 14.7 | 17.9 | 32.6 |

Sources: FAO Year Books 1992, 1997 and 2000.

### 2.5.4 Behavior of Export Prices of Palm Oil

During 1990-2000, export prices of palm oil exhibited fluctuations. The prices doubled from about US$300 per MT in 1990 to over US$ 600 per MT in 1995 but returned to around US$300 per MT again in 2000. Similar trends in price movements were observed in individual countries such as Malaysia and Indonesia. In this context, following points are noteworthy:

i. A boom in demand for palm oil occurred along with economic development in the region during 1990-95;
ii. Supply of palm oil could not increase immediately, thus a demand-supply gap emerged and a spurt in price occurred;
iii. Palm oil farms are encouraged by such a price rise to expand planted area;
iv. As lead time is required for fruits to mature, expansion of harvested area lagged behind and it started with production expansion during 1995-2000;
v. The economic crisis in the region during 1997-98 eclipsed the demand boom with the result that critical over-supply emerged during 1995-2000; and
vi. Prices decreased remarkably during the period.

**Table 30. Export Prices of Palm Oil -1990 to 2000**

| Country/ Continent | Price (US$/MT) | | | Rate of Change (%) | | Relative Prices (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 303.0 | 627.0 | 317.0 | 15.7 | -12.8 | **World = 100** | | |
| Asia | 293.0 | 618.0 | 302.0 | 16.1 | -13.3 | 96.7 | 98.6 | 95.3 |
| **Surveyed Countries** | | | | | | **Asia = 100** | | |
| Malaysia | 288.0 | 611.0 | 314.0 | 16.2 | -12.5 | 98.3 | 98.9 | 104.0 |
| Thailand | 750.0 | 667.0 | 351.0 | -2.3 | -12.0 | 256.0 | 107.9 | 116.2 |
| Average | 288.0 | 611.0 | 315.0 | 16.2 | -12.4 | 98.3 | 98.9 | 104.3 |
| **Other Countries** | | | | | | | | |
| Indonesia | 253.0 | 583.0 | 264.0 | 18.2 | -14.7 | 86.3 | 94.3 | 87.4 |

Sources: FAO Year Books, 1992, 1997 and 2000.

## 2.6 Productivity and Trade Performance of Coconut

The Coconut has been surveyed by two countries viz. India and the Philippines. The trade performance and productivity of the commodity in these two countries have been analyzed under the following sub-sections:

### 2.6.1 Land and Labor Productivity of Coconut

The trends of land and labor productivity of coconut have been found to be different in two countries. In India, both measures of productivity showed significant declining trends during 1990-2000. However, these increased during the first half of 1990s before decreasing during the second half of1990s in case of the Philippines.

Land productivity levels were higher in India than in the Philippines, particularly during 1990-95. In 1990, labor productivity was higher in India compared to that of the Philippines, it turned other way round in 2000.

Since higher productivity implies higher returns to respective resources thus higher cost required to produce the output, the recent initiative of India to increase her export of the commodity might be able to explain partly the steep decline of labor productivity for India.

**Table 31. Land and Labor Productivity of Coconut**

(At constant 1995 US$, 1995=100)

| Country | Productivity | Value added / hectare | | | Value added / man-day | | |
|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| India | Absolute | 1,017.0 | 595.0 | 291.0 | 9.2 | 4.7 | 2.8 |
| | Index | 1,71.0 | 100.0 | 49.0 | 199.0 | 100.0 | 61.0 |
| Philippines | Absolute | 205.0 | 260.0 | 212.0 | 5.5 | 6.3 | 5.0 |
| | Index | 79.0 | 100.0 | 82.0 | 86.7 | 100.0 | 79.6 |

Sources :Table 7-series of respective Country Reports.

### 2.6.2 Total Factor Productivity of Coconut

TFP trends of coconut show significant difference between India and the Philippines. India posted a long term increase in its TFP during the decade of 1990s, albeit with fluctuations while it had a free fall in the Philippines during the corresponding period (**Table 32**).

**Table 32. Indices of Total Output, Input and TFP of Coconut**

(1995 = 100)

| Country | Index | 1990 | 1995 | 2000 |
|---|---|---|---|---|
| India | Total output | 77.0 | 100.0 | 105.0 |
| | Total input | 72.0 | 100.0 | 92.0 |
| | TFP | 106.0 | 100.0 | 115.0 |
| Philippines | Total output | 112.4 | 100.0 | 67.7 |
| | Total input | 63.2 | 100.0 | 195.9 |
| | TFP | 177.7 | 100.0 | 34.6 |

Sources: Tables 7-series of respective Country Reports.

### 2.6.3 Exports of Coconut

Coconut is exported in various forms such as coconut (Copra), desiccated coconut, crude coconut oil, refined coconut oil, oleo chemicals (coco fatty alcohol), coco fatty acid and coco methyl. These products have been converted into copra equivalent by use of respective conversion factors.

Until 1995, volume of export of coconut by India has been negligible. However, a quantity of 400 MT was exported in 2000 as against 2.1 million MT, 2.4 million MT and 1.8 million MT in 1990, 1995 and 2000 respectively by the Philippines. No specific trend in export of coconut has emerged.

### 2.6.4 Imports of Coconut

Neither India nor the Philippines has imported any significant quantity of copra during 1990-2000.

### 2.6.5 Export Prices of Coconut

Export prices of coconut fluctuated in the range of US$ 0.2-0.9/kg. in case of India while these were US$0.2-0.6/kg in the Philippines.

## 2.7 Productivity and Trade Performance of Maize

The productivity and trade performance of maize has been analyzed and discussed under the following sub-sections:

### 2.7.1 Land and Labor Productivity of Maize

The levels of value added per hectare, per man-day and per MT for ROC were very high compared to those of other counties and value added per man-day had steadily increased during 1990-2000. This has led to a high level of value added per MT at around US$500/MT in case of ROC which is quite high compared to its import price at US$114 per MT in 2000 (**Tables 33 and 37**).

As regards other three countries, the magnitudes of productivity have been comparable. In 2000, these were the highest in case of the Philippines, followed by India and Thailand. A declining trend in value added per MT has been observed in India and value added per MT was very close to the international export price level of this commodity in 2000. This partly explains recent increase in volume of export from India, albeit in small measure. Conversely, an upward trend in value added per MT partly explains recent increase in import to the Philippines and Thailand.

**Table 33. Land and Labor Productivity of Maize**

(At constant 1995 US$, 1995=100)

| Country | Productivity | Value added / hectare | | | Value added / man-day | | | Value added / MT | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| ROC | Absolute | 2,280 | 2,124 | 2,143 | 59 | 100 | 124 | 526 | 461 | 468 |
| | Index | 107 | 100 | 101 | 60 | 100 | 124 | 113 | 100 | 101 |
| India | Absolute | 219 | 203 | 221 | 4 | 3 | 4 | 144 | 127 | 120 |
| | Index | 108 | 100 | 109 | 146 | 100 | 133 | 113 | 100 | 94 |
| Philippines | Absolute | 188 | 458 | 424 | 4 | 9 | 8 | 111.1 | 207 | 153 |
| | Index | 41 | 100 | 93 | 42 | 100 | 89 | 53.6 | 100 | 74 |
| Thailand | Absolute | 89 | 100 | 145 | 2 | 2 | 2 | 33 | 31 | 41 |
| | Index | 89 | 100 | 145 | 115 | 100 | 128 | 106 | 100 | 132 |

Sources :Table 7-2 series of respective Country Reports.

### 2.7.2 Total Factor Productivity of Maize

TFP has shown increasing trend in Thailand and ROC (**Table 34**) while it fluctuated in India and the Philippines during 1990-2000. It is also noted that upward trends in TFP have been accompanied by sustained decline in export (**Table 35)** and increasing trend in import (**Table 36)** in case of Thailand while such a linkage has not been observed in case of ROC. Thus, TFP trends do not always explain the trade performance of different countries.

**Table 34. Indices of Total Output, Input and TFP of Maize**

(1995 = 100)

| Country | Index | 1990 | 1995 | 2000 |
|---|---|---|---|---|
| ROC | Total output | 104 | 100 | 27 |
| | Total input | 178 | 100 | 25 |
| | TFP | 59 | 100 | 109 |
| India | Total output | 135 | 100 | 133 |
| | Total input | 94 | 100 | 105 |
| | TFP | 143 | 100 | 127 |
| Philippines | Total output | 59 | 100 | 70 |
| | Total input | 62 | 100 | 126 |
| | TFP | 94 | 100 | 55 |
| Thailand | Total output | 73 | 100 | 85 |
| | Total input | 102 | 100 | 76 |
| | TFP | 71 | 100 | 112 |

Sources: Tables 7-1(Table 7-7 in case of Thailand) of respective Country Reports.

### 2.7.3 Exports of Maize

The volume of world maize export has exhibited an increasing trend during 1990-2000, although Asia's share, particularly of the four surveyed countries, was negligible during the entire survey period and even declined to half percent during 1995-2000. Amongst the surveyed countries, Thailand had been leading exporter until 1995 but it decreased to one-fifth during the intervening period 1995-2000. India has exhibited an upward trend in export of this commodity during 1995-2000, her volume was still low at 33 thousand MT in 2000. The most significant export expansion was made by ROC, with its share increasing from 69 percent of Asia's in 1990 to 99 percent in 2000.

**Table 35. Export of Maize and Its Growth Rates -1990 to 2000**

| Country/ Continent | Volume ('000MT) | | | Growth Rate (%) | | Export Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 72,278.0 | 78,234.0 | 81,836.0 | 1.6 | 0.9 | **Share in the World** | | |
| Asia | 4,956.0 | 500.0 | 10,596.0 | -36.8 | 84.2 | 6.9 | 0.6 | 12.9 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| ROC | 0.0 | 0.0 | 0.0 | .. | .. | 0.0 | 0.0 | 0.0 |
| India | 0.0 | 19.0 | 33.0 | .. | 11.7 | 0.0 | 3.8 | 0.3 |
| Philippines | 0.1 | 0.1 | 0.3 | -4.9 | 30.0 | 0.0 | 0.0 | 0.0 |
| Thailand | 124.0 | 107.0 | 24.0 | -2.9 | -25.8 | 2.5 | 21.4 | 0.2 |
| Sub-total | 124.1 | 126.1 | 57.3 | 0.3 | -14.6 | 2.5 | 25.2 | 0.5 |
| **Other Countries** | | | | | | | | |
| ROC* | 3,405.0 | 113.0 | 10,466.0 | -49.4 | 147.4 | 68.7 | 22.6 | 98.8 |

Note: * Excluding ROC.

Sources: FAO Trade Year Books, 1992, 1997 and 2000 except for ROC. Data for ROC have been taken from the concerned Country Report.

### 2.7.4 Imports of Maize

The share of imports of maize to Asia has been has been in the range of 45-60 percent of the world imports of maize during 1990-2000. The largest maize importer in Asia has been Japan with a share of 35-50 percent of Asia's import. Japan, however, did not cover maize under the survey. Amongst the four countries in which maize was surveyed, ROC was the leading importer and accounted for 12-15 percent of share of Asia's import of this commodity during the decade of 1990s. However, its import share

ebbed to 12 percent in 2000 from 15 percent in 1990. In case of other three countries, upward trends in volume of imports have been observed during the decade of 1990s, except during 1990-95 in case of the Philippines. Such a trend is consistent with recent demand expansion for livestock/milk products and thus of animal feed which has been driven by general rise in per capita income. Import increase was significant during the first half of 1990s in Thailand and during the second half of 1990s in India and the Philippines. However, the total share of the four countries hovered in the range of 14 to16 percent of Asia's share.

**Table 36. Imports of Maize and Its Growth Rates -1990 to 2000**

| Country/ Continent | Volume ('000MT) | | | Growth Rate (%) | | Import Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 74,017.0 | 77,015.0 | 81,189.0 | 0.8 | 1.1 | **Share in the World** | | |
| Asia | 33,570.0 | 46,474.0 | 42,135.0 | 6.7 | -1.9 | 45.4 | 60.3 | 51.9 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| ROC | 5071.0 | 6521.0 | 4942.0 | 5.2 | -5.4 | 15.1 | 14.0 | 11.7 |
| India | 0.0 | 0.1 | 29.0 | 61.5 | 204.9 | 0.0 | 0.0 | 0.1 |
| Philippines | 343.0 | 208.0 | 448.0 | -9.5 | 16.6 | 1.0 | 0.4 | 1.1 |
| Thailand | 0.7 | 280.0 | 341.0 | 231.4 | 4.0 | 0.0 | 0.6 | 0.8 |
| Sub-total | 5414.7 | 7009.1 | 5760.0 | 5.3 | -3.8 | 16.1 | 15.1 | 13.7 |
| **Other Countries** | | | | | | | | |
| China* | 4,540.0 | 11,702.0 | 4,944.0 | 20.8 | -15.8 | 13.5 | 25.2 | 11.7 |
| Japan | 16,008.0 | 16,580.0 | 16,111.0 | 0.7 | -0.6 | 47.7 | 35.7 | 38.2 |

Note: * Excluding ROC.
Sources: FAO Year Books 1992, 1997 and 2000 except for ROC. Data for ROC have been taken from the concerned Country Report.

### 2.7.5 Behavior of Import Prices of Maize

Setting aside the cases of small quantities of imports of maize to India during 1990-95 and to Thailand in 1990, import prices increased marginally during the first half of 1990s but ebbed during the second half of 1990s in the world, Asia and also in all the surveyed countries. Recent export expansion partly explains this behavior of import prices.

**Table 37. Import Prices of Maize-1990 to 2000**

| Country/ Continent | Price (US$/MT) | | | Growth Rate (%) | | Relative Prices (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 155 | 163 | 129 | 1.0 | -4.6 | **World = 100** | | |
| Asia | 141 | 148 | 123 | 1.0 | -3.6 | 91.0 | 90.8 | 95.3 |
| **Surveyed Countries** | | | | | | **Asia = 100** | | |
| ROC | 139 | 147 | 114 | 1.1 | -5.0 | 98.6 | 99.3 | 92.7 |
| India | 100 | 545# | 111 | 40.4 | -27.3 | 70.9 | 368.2 | 90.2 |
| Philippines | 169 | 183 | 143 | 1.6 | -4.8 | 119.9 | 123.6 | 116.3 |
| Thailand | 714# | 171 | 111 | -24.9 | -8.3 | 506.4 | 115.5 | 90.2 |
| Average | 141 | 149 | 116 | 1.1 | -4.9 | 100.0 | 100.7 | 94.3 |
| **Other Countries** | | | | | | | | |
| China* | 165 | 152 | 114 | -1.6 | -5.6 | 117.0 | 102.7 | 92.7 |
| Japan | 143 | 145 | 117 | 0.3 | -4.2 | 101.4 | 98.0 | 95.1 |

Notes: * Excluding ROC.
# : As quantities of import were very low, prices are not representative.

Sources: FAO Year Books, 1992, 1997 and 2000 except for ROC. Data for ROC have been taken from the concerned Country Report.

## 2.8 Productivity and Trade Performance of Soybeans

The productivity and trade performance of soybeans has been analyzed under the following sub-sections:

### 2.8.1 Land and Labor Productivity of Soybeans

Land and labor productivity of soybeans in terms of value added per hectare and per man-day at constant 1995 US$ terms for Japan were high compared to those of other countries for all the years (**Table 38**). Although productivity of India and Thailand were comparable in 1990, these declined in 2000 in both cases and rate of decline was faster in case of former than in latter. In fact, India's productivity dropped to less than half of Thailand in 2000. Such a phenomenon reflected cheap export price of India. Thus, India's case is a typical example of the characteristics of value productivity in US$ terms that lower productivity may imply a lower returns to resources hence a lower cost of production, which means a higher competitiveness in the international market.

**Table 38. Land and Labor Productivity of Soybeans**

(At constant 1995 US$, 1995=100)

| Country | Productivity | Value added / hectare | | | Value added / man-day | | |
|---|---|---|---|---|---|---|---|
| | | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| India | Absolute | 342 | 209 | 111 | 7.3 | 3.4 | 2.4 |
| | Index | 163 | 100 | 53 | 212 | 100 | 70 |
| Japan | Absolute | 2,787 | 4,827 | 3,589 | 75 | 166 | 185 |
| | Index | 58 | 100 | 74 | 45 | 100 | 111 |
| Thailand | Absolute | 326 | 348 | 290 | 6.3 | 6.0 | 4.3 |
| | Index | 94 | 100 | 84 | 106.0 | 100 | 72 |

Sources: Table-7-series of respective Country reports.

### 2.8.2 Total Factor Productivity of Soybeans

Total Factor Productivity of soybeans decreased in India and Thailand during 1990-2000. These trends are in conformity with those of the export prices. Changes in TFP of Japan, a significant soybeans importer, did not affect her stable soybeans import volume during the reference period.

**Table 39. Indices of Total Output, Input and TFP of Soybeans**

(1995 = 100)

| **Country** | **Index** | **1990** | **1995** | **2000** |
|---|---|---|---|---|
| India | Total output | 57 | 100 | 89 |
| | Total input | 44 | 100 | 124 |
| | TFP | 131 | 100 | 72 |
| Japan | Total output | 169 | 100 | 148 |
| | Total input | 270 | 100 | 163 |
| | TFP | 63 | 100 | 91 |
| Thailand | Total output | 155 | 100 | 76 |
| | Total input | 87 | 100 | 133 |
| | TFP | 178 | 100 | 57 |

Sources: Tables 7- of respective Country Reports.

### 2.8.3 Exports of Soybeans

Export of soybeans at world level expanded significantly from 26 million MT in 1990 to 47 million MT in 2000 while Asia's export declined from 1.0 million MT to 0.5

million MT during the corresponding period. During this period, world export price declined from US$226 per MT to US$194 per MT while Asia's price increased from US$248 per MT to US$303 per MT. These trends did indicate that Asia was losing its export competitiveness in the world (**Table 40**).

**Table 40. Exports of Soybeans- 1990 to 2000**

| Country/ Continent | Volume (' 0 MT) | | | Price (US$/MT) | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| World | 2,610,288 | 3,192,398 | 4,736,210 | 226 | 232 | 194 |
| Asia | 102,376 | 45,696 | 37,081 | 248 | 272 | 303 |
| **Surveyed Countries** | | | | | | |
| India | 35 | 7 | 7,502 | 200 | 429 | 212 |
| Thailand | 7 | 28 | 62 | 714 | 607 | 419 |
| Average | 42 | 35 | 7,564 | 286 | 571 | 214 |
| **Other Countries** | | | | | | |
| China | 94,048 | 37,514 | 21,084 | 243 | 266 | 304 |
| Vietnam | 3,127 | 4,190 | 3,560 | 237 | 282 | 306 |

Sources: FAO Year Books, 1992, 1997 and 2000.

In 2000, India's export price declined to half of the level prevailed in 1995 and became competitive in the world market. The country exported 75 thousand MT of soybeans in that year, which was possible due to higher level of production in that year as a result of conscious policy of the Ministry of Agriculture to increase area coverage under the oilseeds including soybeans. Thailand could export a negligible quantity of soybeans in 2000.

### 2.8.4 Imports of Soybeans

In contrast to exports, imports of soybeans from Asia expanded remarkably from 9 million MT to 24 million MT during 1990-2000 and its share attained an impressive level of 50 percent of world's import in 2000.

Japan had remained the largest soybeans importer in Asia, importing about 5 million MT annually. However, her share declined from 50 percent to 20 percent during 1990-2000. Unlike Japan, Thailand exhibited a discernible increasing trend from nil to 1.3 million MT or 5 percent of Asia's share during the corresponding period. India's import of soybeans has been negligible.

**Table 41. Growth Rates and Shares in Imports of Soybeans-1990 to 2000**

| Country/ Continent | Volume ('000 MT) | | | Growth Rate (%) | | Import Share (%) | | |
|---|---|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990-95 | 1995-2000 | 1990 | 1995 | 2000 |
| World | 26,327.0 | 33,296.0 | 48,322.0 | 5.0 | **8.0** | **Share in the World** | | |
| Asia | 9,274.0 | 11,489.0 | 24,247.0 | 4.0 | 16.0 | 35.2 | 34.5 | 50.2 |
| **Surveyed Countries** | | | | | | **Share in Asia** | | |
| India | 0.0 | 29.0 | 0.0 | * | -66.0 | 0.0 | 0.3 | 0.0 |
| Japan | 4,681.0 | 4,813.0 | 4,829.0 | 1.0 | 0.0 | 50.5 | 41.9 | 19.9 |
| Thailand | 0.0 | 203.0 | 1,320.0 | 562.0 | 45.0 | 0.0 | 1.8 | 5.4 |
| Sub-total | 4,681.0 | 5,045.0 | 6,149.0 | 2.0 | 4.0 | 50.5 | 43.9 | 25.4 |
| **Other Countries** | | | | | | | | |
| China | 1,992.0 | 2,876.0 | 12,721.0 | 8.0 | 35.0 | 21.5 | 25.0 | 52.5 |
| Indonesia | 541.0 | 607.0 | 1,278.0 | 2.0 | 16.0 | 5.8 | 5.3 | 5.3 |
| Korea | 1,014.0 | 1,468.0 | 1,492.0 | 8.0 | 0.0 | 10.9 | 12.8 | 6.2 |

Note : * Indeterminate.
Sources: FAO Year Books 1992, 1997 and 2000.

### 2.8.5 Behavior of Import Prices of Soybeans

The level of import prices of soybeans have been stable during 1990-2000. It was almost at the same level during 1990-1995, then declined a little in 1995-2000. Asia's price was marginally higher than that of the world average, yet much cheaper than its export price. Under such a situation, Asian countries could not compete with other exporters in the world.

**Table 42. Import Prices of Soybeans -1990 to 2000**

(US$/ MT)

| Country/ Continent | 1990 | 1995 | 2000 |
|---|---|---|---|
| World | 256 | 260 | 219 |
| Asia | 266 | 275 | 232 |
| **Surveyed Countries** | | | |
| India | * | 255 | * |
| Japan | 271 | 286 | 253 |
| Thailand | * | 296 | 217 |
| Average | 271 | 287 | 246 |
| Other Countries | | | |
| China | 257 | 258 | 218 |
| Indonesia | 270 | 298 | 215 |
| Korea | 249 | 274 | 220 |

Note: * Negligible/nil quantity was imported.
Sources: FAO Year Books 1992, 1997 and 2000.

## 3. Benchmarking Analysis

Benchmarking is a systematic process of comparison of an organization's performance with others to identify areas and methods of improvement. It focuses on creating an apogee level which enables to compare performances between and within industries. Traditionally, ratios of cross-sectional key financial indicators have been used to compare inter-organizational performance. To gauge the potential for improvement of agriculture and food trade competitiveness, the budget on cost of production /value of output etc. of benchmark (BM) farms/ factories have been compared with the corresponding budgets of National average (NA) farms/factories. Broadly, the following ratios have been adopted for the purpose:

i. **Ratios of Productivity of National Average Farms to Benchmark Farms**
ii. **Ratios of Inputs and Output of National Average Farms to Benchmark Farms**
iii. **Ratios of Cost Structure of National Average Farms to Benchmark Farms**

Out of eight commodities mentioned in the section-2, benchmarking analysis has been undertaken in respect of two commodities viz. rice and sugarcane. The choice of these commodities has been enabled by availability of the relevant cross-country data by the concerned exporting countries.

### 3.1 Benchmarking Analysis of Rice (Paddy)

The results of benchmarking analysis of rice (paddy) farms have been presented in the following three sub-sections:

#### 3.1.1 Ratios of Productivity of National Average Farms to Benchmark Farms of Rice (Paddy)

Benchmarking analysis has been undertaken in terms of ratios of certain key indicators of productivity of the national average farms to the benchmark farms. The ratios

(**Table 43**) represent the level of productivity of NA farms relative to those of BM farms of rice (paddy) for 1995 and 2000.

**Table 43. Ratios of Productivity of National Average Farms to Benchmark Farms of Rice (Paddy)**

| Measure | ROC | | India | | Japan | | Philippines | | Thailand | | Vietnam | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 |
| **Value added per hectare** | | | | | | | | | | | | |
| Narrow | 0.6 | 0.6 | 0.2 | 0.3 | 0.8 | 0.8 | 0.8 | 0.7 | 0.7 | 0.8 | 1.1 | 1.0 |
| Broad | 0.9 | 0.9 | 0.3 | 0.3 | 0.8 | 0.9 | 0.7 | 0.7 | 0.7 | 0.8 | 1.1 | 0.9 |
| **Value added per man-day** | | | | | | | | | | | | |
| Narrow | 0.5 | 0.7 | 0.2 | 0.4 | 0.5 | 0.4 | 1.1 | 0.9 | 0.7 | 0.9 | 1.2 | 0.9 |
| Broad | 0.8 | 1.1 | 0.2 | 0.4 | 0.5 | 0.4 | 0.9 | 0.9 | 0.7 | 0.8 | 1.2 | 0.9 |
| **Value added per depreciation** | | | | | | | | | | | | |
| Narrow | 4.0 | 3.1 | 0.6 | 1.0 | 0.6 | 0.6 | 1.7 | 1.5 | 0.7 | 0.8 | .. | .. |
| Broad | 6.0 | 5.0 | 0.8 | 1.0 | 0.7 | 0.6 | 1.5 | 1.5 | 0.7 | 0.8 | .. | .. |
| **Value added per MT** | | | | | | | | | | | | |
| Narrow | 0.7 | 0.6 | 0.4 | 0.5 | 0.8 | 0.7 | 1.2 | 1.0 | 0.5 | 0.6 | 1.1 | 1.0 |
| Broad | 1.0 | 1.0 | 0.4 | 0.5 | 0.9 | 0.9 | 1.0 | 1.0 | 0.5 | 0.6 | 1.1 | 0.9 |
| **Value added as percent of output** | | | | | | | | | | | | |
| Narrow | 0.7 | 0.6 | 0.8 | 1.2 | 0.8 | 0.8 | 1.2 | 1.0 | 1.0 | 1.1 | 1.1 | 1.0 |
| Broad | 1.0 | 1.0 | 1.0 | 1.2 | 0.9 | 0.9 | 1.0 | 1.0 | 1.0 | 1.0 | 1.1 | 1.0 |

Notes: For concepts of 'Benchmark', 'broad' and 'narrow', appendix-I refers.
Sources: Tables 3-1 of respective Country Reports.

The following important points emerge from **Table 43**:

i. Given that benchmark farms/factory (BM) represent 'best' farm/ factory of the respective country, ratios of NA to BM are expected to lie between zero and unity. This has been validated in general by empirical data of various countries, *albeit* with a few exceptions. In case of Vietnam all the ratios for 1995 exceeded the unity which suggest that the selection of benchmark farms for 1995 were not appropriate. Apart from this, the ratio was very large for capital productivity in ROC, which imply that BM farms were highly mechanized with the result that their capital productivity were low.

ii. Ratios of NA to BM for narrow concept in respect of different parameters of productivity have generally been different from the corresponding ratios for the broad concepts. Further, the pattern of differences between narrow concepts and broad concepts also varied across the countries. In ROC and Japan, both high income countries, the ratios of various productivity indicators have been consistently higher for the broad concept than that for the narrow concept which implied that BM farms hired more laborers and/or lease more land than NA farms. In case of the Philippines, Vietnam and Thailand, the patterns were the other way round. In case of India, the ratios were higher for the broad concept than those for the narrow concept in 1995 but were almost equal in 2000.

iii. The trends in ratios of NA to BM for value added per MT of production also varied across the countries. These ratios were (a) less than unity in 1995 but marginally increased in 2000 for India and Thailand, (b) exceeded unity in 1995 but declined to less than unity in 2000 for Vietnam, (c) less than unity in 1995 and further decreased in 2000 in case of Japan, (d) greater than unity but decreased in 2000 in case of the Philippines; and (e) less than unity for the narrow concept while almost equal to one for the broad concept for ROC.

iv. The level and trend of ratios of NA to BM for the percent share of value added to output were: (a) almost the same patterns in case of value added per MT of production for ROC, Japan, the Philippines and Vietnam; (b) less than unity in 1995 but exceeded unity in 2000 for India; and (c) exceeded unity in 1995 and further increased in 2000 for Thailand.

### 3.1.2 Ratios of Various Inputs and Outputs of National Average Farms to Benchmark Farms of Rice (Paddy)

The ratios of expenditures per hectare of respective inputs and of output value at current domestic prices, of national average farms to benchmark farms, for various countries for 1995 and 2000 have been presented in **Table 44**.

**Table 44. Ratios of Inputs / Outputs per hectare of NA to BM Farms of Rice (Paddy)**

| Measure | ROC | | India | | Japan | | Philippines | | Thailand | | Vietnam | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | | | | | | | | | |
| Cash inputs | 0.9 | 0.9 | 0.3 | 0.1 | 1.6 | 1.5 | 0.5 | 0.5 | 0.7 | 0.7 | 0.9 | 0.9 |
| Seeds | 1.0 | 1.0 | 0.6 | 0.6 | 4.5 | 4.2 | 0.5 | 0.6 | 0.6 | 0.6 | 0.7 | 0.7 |
| Fertilizers | 1.0 | 1.0 | 0.5 | 0.4 | 1.0 | 1.1 | 0.5 | 0.5 | 0.7 | 0.8 | 0.7 | 0.9 |
| Irrigation fee | 1.0 | 1.0 | 0.0 | 0.0 | 2.1 | 4.7 | .. | .. | .. | .. | 1.0 | 1.0 |
| Other cash cost | * | * | 0.8 | 0.3 | 2.5 | 2.3 | 0.3 | 0.3 | 0.7 | 0.7 | 0.8 | 0.8 |
| Sub-Total | 2.3 | 2.1 | 0.5 | 0.2 | 1.6 | 1.5 | 0.3 | 0.5 | 0.7 | 0.7 | 0.8 | 0.9 |
| Labor (family) | 1.3 | 1.1 | 0.7 | 1.0 | 1.2 | 2.1 | 1.3 | 1.3 | 1.3 | 1.3 | 1.0 | 1.3 |
| Depreciation | 0.2 | 0.2 | 0.3 | 0.3 | 1.2 | 1.4 | 0.4 | 0.8 | 0.9 | 0.8 | ... | .. |
| Land rent | 1.0 | 1.0 | 0.4 | 0.4 | 1.2 | 1.5 | 0.3 | 0.3 | 0.8 | 0.9 | 1.0 | 0.9 |
| Sub-Total | 0.8 | 0.7 | 0.5 | 0.5 | 1.2 | 1.7 | 0.8 | 0.8 | 1.1 | 1.1 | 1.0 | 1.1 |
| Total cost | 1.2 | 1.1 | 0.5 | 0.3 | 1.3 | 1.6 | 0.4 | 0.6 | 0.9 | 0.9 | 0.9 | 1.0 |
| Output value | 0.9 | 0.9 | 0.3 | 0.3 | 0.9 | 1.0 | 0.6 | 0.6 | 0.7 | 0.7 | 1.0 | 0.9 |
| Margin rate | 0.4 | 0.3 | 0.1 | 0.3 | -0.7 | -1.2 | 1.3 | 0.9 | 0.1 | -0.4 | 1.1 | 0.8 |

Notes: 1. * Other cash cost is zero for benchmark farms.
2. Margin rate = margin (output value-total cost) to output value
Sources: Tables 3-1 of respective Country Reports.

The following important points emerge from **Table 44**:

i. In ROC, ratios of NA to BM were in the range of 0.88-0.89 for all cash inputs, between 2.1-2.3 for all cash costs and between 0.91-0.93 for output value. These levels explain a substantial difference of value added ratios between the narrow and broad concepts. Ratio of NA to BM for family labor exceeded unity but was only in the range of 0.16-0.18 for capital expenditure. This indicates that the BM farms are highly mechanized.

ii. In India, costs incurred by NA farms on various inputs were much less than the corresponding costs by BM farms, particularly of irrigation fee in the range of only 0.01-0.02. It worsened further when ratio of NA farms to BM farms on cost on cash inputs declined from 0.27 in 1995 to 0.12 in 2000 for all cash inputs and from 0.45 to 0.18 for all cash cost. Although expenditure increased for both NA and BM farms, incremental value was higher for BM farms during the corresponding period. The ratio for output remained in the range 0.25-0.27 in the period, thus ratio of NA to BM for value added to output became greater than unity. One positive fact was improvement from 0.65 to 0.97 for family labor in the period.

iii. One may be led to an optical illusion that management of NA farms is inferior as they may be ignoring their field by not irrigating the land properly. In this context, it needs to be clarified that National average (NA) size of paddy farms is 0.9 hectare

as against 10 hectares in case of BM farms. It is also a fact that NA farms are resource poor which constrains their ability to invest in infrastructure such as irrigation facilities and accessibility to superior quality of inputs.

iv. Unlike India, costs of various inputs per unit of area were higher for NA farms than corresponding costs for BM farms in Japan. This explains, to a great extent, high domestic price of rice in Japan.

v. In the Philippines, ratios of NA to BM farms for various inputs, except for family labor, were less than unity. This pattern is consistent with imports of large quantities of rice to the country.

vi. Thailand and Vietnam, both exporters of high quantities of rice, experienced similar pattern of ratios of NA to BM and these ratios were generally close to unity.

### 3.1.3 Cost Structures of National Average Farms and Benchmark Farms of Rice (Paddy)

The cost structures of respective inputs as percent of total cost, both for NA and BM farms, for 1995 and 2000 have been compared and presented in **Tables 45 and 46.**

**Table 45. Cost Structure of Production of Rice (Paddy) in National Average Farms *vis-à-vis* Benchmark Farms- Rice Exporting Countries**

(Percent)

| Measure | India | | | | Vietnam | | | | Thailand | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NA | | BM | | NA | | BM | | NA | | BM | |
| | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | | | | | | | | | |
| All cash inputs | 18 | 22 | 31 | 48 | 48 | 40 | 49 | 42 | 18 | 19 | 25 | 25 |
| Other cash cost | 30 | 24 | 17 | 21 | 15 | 21 | 17 | 24 | 21 | 23 | 26 | 30 |
| Sub-Total | 48 | 46 | 48 | 69 | 63 | 61 | 66 | 66 | 39 | 42 | 51 | 55 |
| **Imputed cost** | | | | | | | | | | | | |
| Labor (family) | 18 | 20 | 13 | 6 | 12 | 22 | 11 | 16 | 39 | 42 | 26 | 29 |
| Depreciation | 4 | 5 | 6 | 4 | 0 | 0 | 0 | 0 | 4 | 3 | 5 | 3 |
| Land rent | 30 | 29 | 33 | 21 | 25 | 17 | 23 | 18 | 18 | 13 | 18 | 13 |
| Sub-Total | 52 | 54 | 52 | 31 | 37 | 39 | 34 | 34 | 61 | 58 | 49 | 45 |
| Total cost | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Margin rate (%) | 34 | 40 | 64 | 40 | 47 | 31 | 41 | 34 | 2 | -6 | 22 | 11 |
| **Value added as percent of output** | | | | | | | | | | | | |
| Narrow | 68 | 72 | 82 | 59 | 67 | 57 | 61 | 56 | 62 | 55 | 60 | 51 |
| Broad | 88 | 87 | 89 | 71 | 75 | 72 | 71 | 73 | 82 | 80 | 81 | 78 |

Notes: 1. Margin Rate is the margin (output value-total cost) as percent of output value.
Sources: Tables 3-1 of respective Country Reports.

**Table 46. Cost Structure of Production of Rice (Paddy) in National Average Farms *vis-à-vis* Benchmark Farms- Other Countries**

(Percent)

| Measure | ROC | | | | Japan | | | | Philippines | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NA | | BM | | NA | | BM | | NA | | BM | |
| | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 |
| Cash cost | | | | | | | | | | | | |
| All cash inputs | 20 | 22 | 27 | 28 | 23 | 23 | 22 | 28 | 33 | 10 | 14 | 12 |
| Other cash cost | 33 | 33 | 0 | 0 | 8 | 9 | 4 | 6 | 21 | 48 | 59 | 58 |
| Sub-Total | 53 | 55 | 27 | 28 | 31 | 32 | 26 | 34 | 54 | 58 | 73 | 70 |
| Imputed cost | | | | | | | | | | | | |
| Labor (family) | 26 | 25 | 23 | 25 | 32 | 31 | 35 | 24 | 33 | 27 | 11 | 13 |
| Depreciation | 4 | 5 | 30 | 31 | 21 | 23 | 21 | 27 | 9 | 12 | 11 | 12 |
| Land rent | 17 | 15 | 20 | 16 | 16 | 14 | 18 | 15 | 4 | 3 | 5 | 5 |
| Sub-Total | 47 | 45 | 73 | 72 | 69 | 68 | 74 | 66 | 46 | 42 | 27 | 30 |
| Total cost | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| Margin rate (%) | 14 | 7 | 32 | 23 | -15 | -28 | 19 | 23 | 47 | 26 | 24 | 19 |
| Value added as percent of output | | | | | | | | | | | | |
| Narrow | 54 | 49 | 82 | 79 | 65 | 59 | 79 | 74 | 83 | 68 | 68 | 67 |
| Broad | 83 | 79 | 82 | 79 | 73 | 70 | 82 | 79 | 92 | 93 | 89 | 90 |

Notes: 1. Margin Rate is the rate of margin (output value-total cost) to output value.
Sources: Tables 3-1 of respective Country Reports.

The following important points emerge from **Tables 45 and 46**:

i. The percent cost structures of respective inputs to total cost both for NA and BM farms in 1995 and 2000 varied significantly across countries. In case of India, the share of the cost of cash inputs was around 20 percent for NA farms while it increased 30 to 50 percent in 1995-2000 for BM farms. On the contrary, the share of other cash cost declined from 30 to 24 percent for NA farms while it increased from 17 to 21 percent for BM farms during the corresponding period. There were significant differences in the share of family labor. The share for NA farms increased from 18 to 20 percent while it decreased from 13 to 6 percent for BM farms.

ii. Cost structures and its trends were, by and large, similar for both NA and BM farms in Vietnam. BM farms selected were rice export farms.

iii. Share of family labor for both NA and BM farms in Thailand has been almost double of the respective shares in India and Vietnam while its share of land rent was much lower compared to those of the other countries. Besides, in case of the benchmark farms the share of cash inputs was relatively smaller while that of other cash costs higher than those of other countries.

iv. In ROC**,** cash costs included only current inputs but not hiring cost of laborers. Depreciation cost at 30 percent was the highest amongst the surveyed countries. While ratio of value added to output for broad concept was almost equal for NA and BM farms, it was smaller for NA farms than BM farm when narrow concept was applied.

v. ROC and Japan, both high income countries, have exhibited similar patterns in the ratios of the costs of production. However, a considerable difference between shares for other cash cost paid to hired laborers has been noticed in their respective NA farms. It was over 30 percent in ROC, less than 10 percent in Japan. Share of depreciation was about 5 percent in ROC while it was about 20 percent in case of Japan.

vi. In case of the Philippines, the share of 'other cash costs' (which is mainly cost of hiring laborers) was close to 60 percent as against only 10 percent 10 percent for BM farms during 1995-2000.

vii. The derived margin rate of 64 percent in 1995 for BM farms in India, might appear on higher side. These BM farms were exporting premier basmati quality of rice which is cultivated only in selected areas of the country but has high demand and thus has high opportunity cost and hence high margin.

### 3.2 Benchmarking Analysis of Sugarcane

The results of benchmarking analysis of sugarcane farms have been presented in the three sub-sections:

#### 3.2.1 Ratios of Productivity of National Average Farms to Benchmark Farms of Sugarcane

The ratios of productivity of NA farms to those of BM farms of sugarcane for 1995 and 2000 have been exhibited in **Table 47**.

**Table 47. Ratios of Productivity of National Average Farms and Benchmark Farms of Sugarcane**

| Measure | India | | Japan | | Philippines | | Thailand | |
|---|---|---|---|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 |
| Value added per hectare | | | | | | | | |
| Narrow | 0.8 | 0.5 | 1.4 | 1.4 | 1.2 | 1.8 | - | 0.9 |
| Broad | 0.9 | 0.6 | 1.4 | 1.4 | 0.9 | 1.1 | - | 1.0 |
| **Value added per man-day** | | | | | | | | |
| Narrow | 0.7 | 0.5 | 0.3 | 0.3 | 1.4 | 2.0 | - | 0.8 |
| Broad | 0.8 | 0.6 | 0.3 | 0.2 | 1.1 | 1.3 | - | 0.9 |
| **Value added per depreciation** | | | | | | | | |
| Narrow | 1.2 | 0.7 | 1.5 | 2.1 | 1.3 | 2.7 | - | 0.8 |
| Broad | 1.3 | 0.9 | 1.5 | 2.0 | 1.1 | 1.6 | - | 1.0 |
| **Value added per MT** | | | | | | | | |
| Narrow | 0.8 | 0.7 | 1.1 | 1.1 | 1.2 | 1.9 | - | 0.9 |
| Broad | 1.0 | 0.9 | 1.1 | 1.0 | 1.0 | 1.2 | - | 1.0 |
| **Value added as percent of output** | | | | | | | | |
| Narrow | 0.8 | 0.7 | 1.1 | 1.1 | 1.2 | 1.9 | - | 0.9 |
| Broad | 1.0 | 0.9 | 1.1 | 1.1 | 1.0 | 1.2 | - | 1.0 |

Note: For concepts of benchmark farms, narrow and broad, appendix may be referred to.
Sources: Tables 3-series of respective Country Reports.

The following important points emerge from **Table 47:**

i. All the ratios of NA to BM farms, except for the broad concept of land productivity, exceed unity in case of the Philippines. From productivity point of view, this implies that NA farms utilize available resources at least as efficiently as BM farms which depend more on hired labor. Besides, ratios of value added per depreciation cases of India in 1995 and Japan in 1995 and 2000, and also value added per hectare in Japan in 1995 and 2000 exceeded unity.

ii. The ratios of NA to BM farms for the narrow concept in respect of different parameters have been generally different from the corresponding ratios for the broad concepts and this behavior varied across countries as stated below:
   (a) In cases of India and Thailand, these ratios have been greater for the broad concept than the narrow concept for all productivity which implies that BM farms hire more laborers and/or lease more land than NA farms; and
   (b) in Japan, the ratios for both concepts have been almost equal.

iii. Temporal behavior of the ratios of NA to BM farms during 1995-2000 also varied across countries. These ratios (a) decreased significantly for all cases in India which indicated BM farms are becoming more and more competitive compared to NA farms; (b) increased considerably for most of cases in the Philippines; (c) except increase in capital productivity, all other productivity remained more or less the same in Japan; and (d) as Thailand furnished the relevant data for the year 2000 only, no temporal comparison could be made. However, the ratios for 2000 were close to unity for most of the parameters.

iv. The ratios of NA to BM farms for value added per MT of production varied across countries. These ratios were (a) less than unity in 1995 and further declined in 2000 for India; (b) around unity during 1995-2000 in case of Japan; and (c) high at 1.9 in terms of the narrow concept while it was a little over unity in broad concept terms in case of the Philippines in 2000.

v. The ratios of NA to BM farms for the percent share of value added to output followed the same patterns as in case of value added per MT of production.

### 3.2.2 Ratios of Various Inputs and Outputs of National Average Farms to Benchmark Farms of Sugarcane

The ratios of expenditure per hectare of respective inputs and of output value at current domestic prices, of national average farms to benchmark farms, for various countries for 1995 and 2000 have been presented in **Table 48**.

The following important points emerge from Table 48:

i. In India, there were considerable differentials in expenditure levels per hectare of NA and BM farms for all types of cash costs. In particular, the costs of fertilizers and irrigation fee per hectare for NA farms were more than double of BM farms. This is mainly due to two reasons. First, NA farms are small, resource-poor and do not have ability to invest in infrastructure like irrigation. They 'purchase' water at higher rates on hourly basis from other private individuals for irrigation purposes. Secondly, NA farms do not follow 'precision farming' practices, that is to say that they tend to apply more fertilizers than what are required

**Table 48. Ratios of Inputs / Outputs per hectare of NA to BM Farms of Sugarcane**

| Measure | India | | Japan | | Philippines | | Thailand | |
|---|---|---|---|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | | | | | |
| All cash inputs | 1.3 | 1.5 | 1.0 | 1.1 | 0.7 | 0.6 | * | 1.0 |
| Seeds | 1.0 | 1.4 | 2.7 | 7.9 | 0.3 | 0.2 | * | 0.8 |
| Fertilizers | 2.4 | 2.3 | 1.3 | 1.0 | 0.8 | 0.8 | * | 0.8 |
| Irrigation fee | 2.1 | 1.9 | 27.6 | 13.0 | 0.6 | 0.6 | * | * |
| Other cash cost | 3.1 | 2.1 | 1.5 | 1.2 | 0.5 | 0.5 | * | 1.2 |
| Sub-Total | 1.8 | 1.7 | 1.2 | 1.2 | 0.6 | 0.5 | * | 1.1 |
| **Imputed cost** | | | | | | | | |
| Labor (family) | 0.5 | 0.6 | 4.1 | 6.2 | * | * | * | 0.7 |
| Depreciation | 0.7 | 0.7 | 1.2 | 0.7 | 0.8 | 0.6 | * | 1.1 |
| Land rent | 1.0 | 1.0 | 1.6 | 1.5 | 1.0 | 1.0 | * | 1.4 |
| Sub-Total | 1.0 | 1.0 | 2.8 | 3.2 | 1.1 | 1.0 | * | 1.2 |
| Total cost | 1.2 | 1.2 | 2.1 | 2.2 | 0.9 | 0.8 | * | 1.1 |
| Output value | 1.0 | 0.7 | 1.3 | 1.3 | 0.9 | 0.9 | * | 1.0 |
| Margin Rate | 0.8 | 0.4 | -1.1 | -3.5 | 0.8 | 1.4 | * | 0.6 |

Notes: 1. * Family labor cost was zero for benchmark farms.

2. Margin = output value-total cost.
Sources: Tables 3-series of respective Country Reports.

ii. A particular aspect of sugarcane farming in India is that small farms spend more on "other cash cost", consisting of hired labor, bullock and machinery, as revealed by high NA to BM ratio at 3.1 in 1995. The corresponding ratio for 2000 declined to 2.1. On the other hand, family labor and depreciation input levels per hectare were much less for NA farms than BM farms.

iii. On temporal behavior of the ratios, these increased for all cash inputs, remained at similar level for total cash cost and declined significantly for output during 1995-2000.This affected the level and pattern of value added ratios.

iv. In Japan the ratio of total cost of NA farms to BM farms was more than 2 times while the corresponding ratio of output was 1.3 during 1995-2000.

v. Unlike India and Japan, ratios of NA to BM farms for all cash costs were less than unity in the Philippines. One unique aspect of Philippine sugarcane farming is that BM farms (export farms) depend entirely on hired labor.

vi. In Thailand**,** ratios of NA to BM farms for cost 'all cash inputs', seeds, fertilizers were around unity while it was 1.1 for the total cost in 2000. The ratio in respect of total cost was higher than that of India but lower than that of Philippines for the corresponding period.

### 3.2.3 Cost Structures of National Average Farms and Benchmark Farms of Sugarcane

The percent cost structures of respective inputs to total cost both for NA and BM farms of sugarcane in 1995 and 2000 varied significantly across countries (Tables 49 and 50).

**Table 49. Cost Structure of Production of Sugarcane for National Average Farms *vis-à-vis* Benchmark Farms**

(Percent)

| Cost /Output | India | | | | Japan | | | | Philippines | | | | Thailand | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | National Average | | Benchmark | | National Average | | Benchmark | | National Average | | Benchmark | | National Average | | Benchmark | |
| | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | | | | | | | | | | | | | |
| All cash inputs | 33 | 36 | 29 | 30 | 14 | 13 | 29 | 27 | 27 | 26 | 32 | 31 | .. | 30 | .. | 34 |
| Other cash cost | 25 | 30 | 9 | 17 | 11 | 13 | 15 | 23 | 27 | 31 | 50 | 51 | .. | 41 | .. | 40 |
| Sub-Total | 58 | 66 | 38 | 47 | 25 | 26 | 44 | 50 | 54 | 57 | 82 | 82 | .. | 71 | .. | 74 |
| Non-cash Cost | - | - | - | - | - | - | - | - | 24 | 20 | - | - | .. | - | .. | - |
| **Imputed cost** | | | | | | | | | | | | | | | | |
| Labor (family) | 11 | 10 | 24 | 23 | 58 | 57 | 29 | 20 | 6 | 7 | 0 | 0 | .. | 2 | .. | 3 |
| Depreciation | 1 | 1 | 2 | 2 | 3 | 3 | 6 | 9 | 13 | 13 | 15 | 15 | .. | 14 | .. | 13 |
| Land rent | 30 | 23 | 36 | 28 | 7 | 7 | 9 | 10 | 3 | 3 | 3 | 3 | .. | 13 | .. | 10 |
| Others | | | | | 7 | 6 | 11 | 11 | | | | | .. | | .. | |
| Sub-Total | 42 | 34 | 62 | 53 | 75 | 74 | 56 | 50 | 22 | 23 | 18 | 18 | .. | 29 | .. | 26 |
| **Total cost** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | .. | **100** | .. | **100** |
| Margin rate | 14 | 7 | 32 | 23 | -20 | -42 | 23 | 20 | 39 | 33 | 39 | 22 | .. | 17 | .. | 23 |
| **Value added as percent of output** | | | | | | | | | | | | | | | | |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Narrow | 54 | 49 | 82 | 79 | 70 | 62 | 66 | 58 | 67 | 62 | 50 | 36 | .. | 39 | .. | 43 |
| Broad | 83 | 79 | 82 | 79 | 83 | 81 | 78 | 77 | 84 | 83 | 80 | 76 | .. | 75 | .. | 74 |

Notes: 1. The same as Table-46.
2. Margin Rate is the margin (output value-total cost) as percentage of output value.
3. Some other costs are included in sub-total of imputed cost for Japan.

Sources: Tables 3-series of respective Country Reports.

The following important points emerge on a perusal of the **Table 49**:

i. The cost structures in terms of the percent shares of various inputs to total cost both for NA and BM farms for 1995 and 2000 varied a great deal across countries. In case of India, two significant differences in labor cost structure between NA and BM farms have been observed: (a) the share of "other cash cost" (mainly hired labor cost) for NA farms was 25-30 percent while it was only 10-17 percent for BM farms; (b) the share of family labor for NA farms was only 10 percent while it was around 23 percent for BM farms. Such a difference has brought about a considerable difference between the narrow and broad concepts of value added as percent of output. During 1995-2000, the share of cash cost increased while that of the imputed cost decreased both for NA and BM farms.

ii. Unlike India, share of labor input in Japan was close to 60 percent for family labor while it was 11-13 percent for "other cash cost" in case of NA farms. Another notable difference was that the share of cash inputs of BM farms was high in the range of 27-29 percent compared to 13-15 percent of NA farms.

iii. In case of the Philippines, share of family labor in respect of BM farms has been nil. It resulted in a very low value added ratio of 50 percent in 1995, which further ebbed to only 36 percent in 2000.

iv. Thailand reported data for 2000 only and thus no temporal comparison could be made.

v. Margin Rate in the range of 33-39 percent for NA farms of the Philippines, for instance, seems to be too high a profit or return.

## 4. OTHER INDICES OF COMPETITIVENESS

In addition to productivity and benchmarking analysis as measures of competitiveness discussed in the preceding sections, some countries have introduced other indicators of competitiveness, notable amongst them are as follows:

**i. Net Protection Coefficient (NPC) (India)**
**ii. Break-Even Point Analysis (Japan)**
**iii. International Comparison of Production Costs (ROC)**

It is noted that conceptual frameworks of the above measures of competitiveness are different. Further, neither any country has applied more than one of the above methods nor any two countries have applied the same method on their respective country data. Therefore, no useful purpose can be served by summarizing them here. The concerned country's reports, as indicated in the parentheses may be referred to for details.

## 5. CORRELATION BETWEEN PRODUCTIVITY AND TRADE PERFORMANCE

India's Report postulates two simple but basic hypotheses on the power of TFP (total factor productivity) to explain trade performance. These hypotheses are as follows:

- **Exportable Hypothesis**
- **Importable Hypothesis**

### 5.1 Exportable Hypothesis

It seems logical to make a hypothesis that with improvement in TFP, the performance of export, *ceteris paribus*, would improve as the commodity gets more competitive in international market. Conversely, lower TFP would dampen the prospects of exports. Let this hypothesis be called as **exportable hypothesis**. Under exportable hypothesis, commodity in question is treated as exportable and competes with the domestically produced commodity at the foreign port.

### 5.2 Importable Hypothesis

Likewise lower TFP, *ceteris paribus*, is expected to encourage imports and higher TFP would discourage imports and let this be referred to as **importable hypothesis**. Under importable hypothesis, the commodity in question is regarded as an import substitute i.e. there is an imported commodity that competes with domestically produced commodity."

The above two hypotheses have been tested on the estimates of TFP and the relevant trade performances of India and also of other countries. It is inferred that overall trade performance of any country can not be fully attributed to changes in TFP alone. The broad trends in international trade need to be viewed in wider perspective of macro level policy measures following liberalization and structural adjustments. Besides, there are other factors which affect trade performance. These factors have been mentioned in the Section-6.

## 6. OTHER FACTORS AFFECTING TRADE PERFORMANCE

Besides productivity, there are some other important factors that impinge on the trade performance. These are given below:

### 6.1 International Factors

- Liberalization of Trade Policies (India)
- Removal of QRs (India)
- Changes in Exchange Rates (India, Malaysia and Thailand)
- Effect of AoA on Productivity (India)
- Minimum Access Volume Under AoA (Japan and Philippines)
- Differentials in Input Prices Across Trading Countries (Malaysia)
- International Technology Transfer (Malaysia)
- International Prices (Malaysia)

### 6.2 Domestic factors

- Price Support Policy (India and Malaysia)
- Market Information For Tradable Commodities (Thailand)
- Export Tax (Malaysia)
- Backward And Forward Linkages (Malaysia)
- Consistent Supply of Raw Materials For Processing Sector (Malaysia)
- Trade Expansion of the Downstream Sectors of Primary Commodities (Malaysia).

The above factors have been discussed in the reports of the countries indicated in the parentheses.

## 7. PROPOSALS FOR SETTING-UP OF A FORMAL MECHANISM FOR FUTURE SURVEYS

The usefulness of the existing survey on 'Agricultural Productivity Index' has been recognized and appreciated by all APO member countries who participated in the Survey.

Accordingly, all these countries have agreed in principle to set up a formal mechanism for future surveys and have given valuable suggestions in their respective country reports for the purpose. Since setting-up of a formal mechanism for future surveys is essentially an administrative matter rather than a technical one, APO may decide the set-up after giving due considerations to views contained in various country reports.

## 8. CONCLUSIONS

Competitiveness is crucial to successful trade. A set of internationally comparable indicators as an aid to measure and sharpen the competitiveness of major agricultural commodities produced and /or traded in APO member countries has been developed. To illustrate competitiveness, productivity and trade performances of eight agricultural commodities namely rice (paddy), sugar, natural rubber, pineapple, palm oil, coconut, maize and soybeans in seven countries viz. Republic of China, India, Japan, Malaysia, Philippines, Thailand and Vietnam have been analyzed. Further, benchmarking analysis has also been undertaken to compare performance of national average farms with 'best' (benchmark) farms to gauge the potential for improvement of agricultural/food trade competitiveness. The choice of these commodities has been guided by factors such as export volume, both existing and its potential in a foreseeable future, national agricultural perspective and food policy, food security concerns of respective countries.

Disaggregated analyses reveal that productivity and prices of commodities do influence shares of exports of individual commodities in various countries in their respective total agriculture and food export. However, these factors alone do not fully explain trade performance of commodities under study as other factors such as productivity of other international competitors, quality or preference for a particular variety of a given commodity, interplay of macro level policy instruments like trade liberalization, tariff and exchange rates etc. also influence movements in international trade.

Benchmarking analysis has brought out existence of considerable potential for improvements of national average farms compared to those of 'benchmark' farms. Lower the ratios of a given performance indicator in respect of national average farm to benchmark farm of respective countries, higher the scope for improvement. There is a case for identifying performance 'shifters' of benchmark farms, especially in cases of low magnitudes of the ratios, so that the methods and practices adopted by benchmark farms can be replicated in national average farms to enable them to be more competitive. Through competition, world class efficiency and expanded markets will be achieved by the domestic producers which would enhance the opportunities for exports of tradable commodities.

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**Annexure-I**

**Shares of Various Commodities in Agriculture and Food Exports, 1990, 1995 and 2000 (%)**

| Country | Year | Rice (milled) | Maize | Coconut (copra) | Sugar (raw) | Pineapple (canned) | Palm Oil | Rubber (sheet) | Soybeans | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| ROC | 1990 | 0.38 | 0.00 | N.C. | N.C. | N.C. | N.C. | N.C. | N.C. | 0.38 |
| | 1995 | 0.71 | 0.00 | N.C. | N.C. | N.C. | N.C. | N.C. | N.C. | 0.71 |
| | 2000 | 0.52 | 0.00 | N.C. | N.C. | N.C. | N.C. | N.C. | N.C. | 0.52 |
| India | 1990 | 7.31 | 0.00 | 0.00 | 0.39 | N.C. | N.C. | 0.00 | 0.00 | 7.70 |
| | 1995 | 22.40 | 0.00 | 0.00 | 1.98 | N.C. | N.C. | 0.03 | 0.00 | 24.41 |
| | 2000 | 10.23 | 0.00 | 0.00 | 1.56 | N.C. | N.C. | 0.13 | 0.25 | 12.17 |
| Japan | 1990 | 0.00 | N.C. | N.C. | 0.05 | N.C. | N.C. | N.C. | 0.02 | 0.07 |
| | 1995 | 0.10 | N.C. | N.C. | 0.07 | N.C. | N.C. | N.C. | 0.01 | 0.18 |
| | 2000 | 0.48 | N.C. | N.C. | 0.05 | N.C. | N.C. | N.C. | 0.01 | 0.54 |
| Malaysia | 1990 | N.C. | N.C. | N.C. | N.C. | N.C. | 37.32 | 20.94 | N.C. | 58.26 |
| | 1995 | N.C. | N.C. | N.C. | N.C. | N.C. | 50.92 | 17.09 | N.C. | 68.01 |
| | 2000 | N.C. | N.C. | N.C. | N.C. | N.C. | 58.85 | 13.57 | N.C. | 72.42 |
| Philippines | 1990 | 0.00 | 0.07 | 40.41 | 9.11 | 11.30 | N.C. | N.C. | N.C. | 60.89 |
| | 1995 | 0.00 | 0.07 | 51.57 | 3.51 | 7.44 | N.C. | N.C. | N.C. | 62.59 |
| | 2000 | 0.01 | 0.03 | 36.43 | 3.38 | 10.13 | N.C. | N.C. | N.C. | 49.98 |
| Thailand | 1990 | 12.39 | 1.85 | N.C. | 8.53 | 2.46 | 0.00 | 8.36 | 0.00 | 33.59 |
| | 1995 | 11.95 | 0.13 | N.C. | 7.76 | 1.42 | 0.07 | 9.96 | 0.00 | 31.29 |
| | 2000 | 10.46 | 0.05 | N.C. | 4.68 | 1.26 | 0.19 | 9.70 | 0.08 | 26.42 |
| Vietnam | 1990 | 37.16 | N.C. | N.C. | N.C. | N.C. | N.C. | 6.77 | N.C. | 43.93 |
| | 1995 | 30.18 | N.C. | N.C. | N.C. | N.C. | N.C. | 10.71 | N.C. | 40.89 |
| | 2000 | 25.05 | N.C. | N.C. | N.C. | N.C. | N.C. | 9.99 | N.C. | 35.04 |

Sources: Country Reports (Part-II Tables 1-2 and 2-3).
N.C. : Not Covered under the Survey

**Annexure-II**

**Shares of Various Commodities in Agriculture and Food Imports, 1990, 1995 and 2000 (%)**

| Country | Year | Rice (milled) | Maize | Coconut (copra) | Sugar (raw) | Pineapple (canned) | Palm C | Rubber (sheet) | Soybeans | Total |
|---|---|---|---|---|---|---|---|---|---|---|
| ROC | 1990 | 0.02 | 11.55 | N.C. | N.C. | N.C. | N.C. | N.C. | N.C. | 11.57 |
| | 1995 | 0.02 | 9.90 | N.C. | N.C. | N.C. | N.C. | N.C. | N.C. | 9.92 |
| | 2000 | 0.03 | 7.42 | N.C. | N.C. | N.C. | N.C. | N.C. | N.C. | 7.45 |
| India | 1990 | 3.27 | 0.00 | 0.00 | 0.74 | N.C. | N.C. | 6.25 | 0.00 | 10.26 |
| | 1995 | 0.00 | 0.00 | 0.00 | 3.69 | N.C. | N.C. | 4.71 | 0.45 | 8.85 |
| | 2000 | 0.15 | 0.11 | 0.00 | 0.26 | N.C. | N.C. | 0.23 | 0.00 | 0.75 |
| Japan | 1990 | 0.01 | N.C. | N.C. | 1.30 | N.C. | N.C. | N.C. | 3.15 | 4.46 |
| | 1995 | 0.03 | N.C. | N.C. | 1.03 | N.C. | N.C. | N.C. | 2.28 | 3.34 |
| | 2000 | 0.50 | N.C. | N.C. | 0.58 | N.C. | N.C. | N.C. | 2.31 | 3.39 |
| Malaysia | 1990 | N.C. | N.C. | N.C. | N.C. | N.C. | 0.28 | 3.74 | N.C. | 4.02 |
| | 1995 | N.C. | N.C. | N.C. | N.C. | N.C. | 0.67 | 4.05 | N.C. | 4.72 |
| | 2000 | N.C. | N.C. | N.C. | N.C. | N.C. | 0.52 | 3.81 | N.C. | 4.33 |
| Philippines | 1990 | 9.39 | 4.26 | 0.00 | 0.04 | 0.00 | N.C. | N.C. | N.C. | 13.69 |
| | 1995 | 3.49 | 1.60 | 0.00 | 6.06 | 0.01 | N.C. | N.C. | N.C. | 11.16 |
| | 2000 | 5.17 | 2.43 | 0.01 | 2.20 | 0.00 | N.C. | N.C. | N.C. | 9.81 |
| Thailand | 1990 | 0.00 | 0.01 | N.C. | 0.11 | 0.00 | 0.05 | 0.00 | 0.00 | 0.17 |
| | 1995 | 0.00 | 0.00 | N.C. | 0.18 | 0.00 | 0.12 | 0.00 | 0.71 | 1.01 |
| | 2000 | 0.00 | 0.06 | N.C. | 0.27 | 0.00 | 0.18 | 0.00 | 4.17 | 4.68 |
| Vietnam | 1990 | 0.00 | N.C. | N.C. | N.C. | N.C. | N.C. | 0.00 | N.C. | 0.00 |
| | 1995 | 0.00 | N.C. | N.C. | N.C. | N.C. | N.C. | 0.00 | N.C. | 0.00 |
| | 2000 | 0.00 | N.C. | N.C. | N.C. | N.C. | N.C. | 0.00 | N.C. | 0.00 |

Sources: Country Reports, Part II Tables 1-2 and 2-3.
N.C. : Not Covered under the Survey

# III. BENCHMARKING IN AGRICULTURE: MEASURING COMPETITIVENESS INDICATORS

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## 1. INTRODUCTION

The quest for competitiveness is a quest for self-improvement and relative improvement of industries, in their regional, state and national boundaries, in the ultimate economic competition viz. international trade. There is a common interest between agricultural commodity and food exporting countries like Australia and members of the Asian Productivity Organization (APO) in boosting the performance of the agricultural sector in the economy. Creating the conditions for sustainable improvements to factor productivity is an important part of the development challenge.

Measuring and monitoring changes in inputs and outputs is basic to an appreciation of the contributions and progress of the food sector within the economy. An attempt has been made to appraise benchmarking as a tool to assess competitiveness of the products of key agricultural industries.

## 2. BENCHMARKING AND BEST PRACTICE

Benchmarking is widely used by firms to monitor and control own-firm process efficiency and to compare efficiency against like firms in pursuit of continuous improvement of processes. Development oriented industry organizations and governments have interests in supply chain competitiveness, which leads to an interest in quality firm level data. Analysis of costs and the performance of competitors (i.e. benchmarking) is a key part of improving food and fibre chain management. The case for process-based benchmarking rests on the proposition that comparison of relative performance is relevant and beneficial to continuous improvement within firms and sustainable development within agricultural industries.

The scope of benchmarking varies a great deal depending upon context. Internal benchmarking, or monitoring own business, is fundamental to sound business management. Referencing own process unit costs against like businesses or like processes extends the methodology to 'best practice benchmarking'. Pressure to improve processes and overall business performance underpins industry competitiveness. The mutual interest of firms, industries and governments in supply chain competitiveness leads to an interest in performance analysis and quality process-based benchmarking at all points of supply chains.

### 2.1 Best Practice Benchmarking

Benchmarking is an internationally accepted business tool for providing knowledge about many aspects of business performance including costs, compared to like competitors or like processes in unlike businesses. Benchmark data is an integral part of competitiveness analysis where the sight is lifted to the known best in the competition with an on-going role in continuous enterprise improvement, the retention of markets under challenge or expansion into new markets. As with any information gathering methodology it is appropriate to be concerned about issues such as

application, process quality and cost, data integrity, interpretation and benefits to data providers and stakeholders.

Though varying in purpose and quality, benchmarking has been conducted in a range of industries in Australian agriculture (RIRDC, 2000). The majority of work is farm based for farmer clients (Holmes & Sackett, 2002). The dairy and pork industries are examples where industry organizations have funded on-farm benchmarking (Dairy Research and Development Corporation, 2000; Australian Pork Limited, 2003). Other industries such as the citrus industry (Barraclough, 1995) and the chicken meat industry (Larkin & Hielbron, 2000) have conducted supply chain and international benchmarking.

To rely solely on own farm/factory data and deny the value of relevant comparison is to ignore the benefits of checking on chain efficiency and the interests of governments in influencing chain competitiveness. Australian farmers and consultants are generally well skilled in individual assessment of options on three core decision-making parameters – expected change to cash flow, profit and loss and assets and liabilities.

Ronan & Cleary (2000) aim at legitimizing a place for benchmarking in farm and industry analysis by differentiating best practice benchmarking from other 'benchmarking.' They define 'best practice' benchmarking as:

- Activity-based, reflecting systemic linkage of enterprise processes to cost areas, efficiency and profit;
- part of the enterprise and farm information system, prompting marginal and whole farm analysis; and
- Providing unambiguous information, displayed clearly and systematically.

Benchmarking is a complement to, not a substitute for, core whole farm/firm analysis – cash flow, profit and loss and assets and liabilities. The case for process based benchmarking at farm level includes adding value to information about enterprise directions and options.

Cleary, Wohlers and Biki (1999) have undertaken multiple regression analysis on income and cost data of dairy benchmarking enterprise and identified the input variables (i.e. performance drivers) that have the highest correlation with profit and inferred that:

> *'The development of effective, practical profit models and identification of key profit drivers in dairying areas is severely constrained by the quality of current industry data. The industry has large quantities of data that are an unsuitable substrate for profit modelling and quantities of good data that are too small to be of widespread use. Key profit drivers identified included Milk Solids Production, grain and concentrate use, labour input and plant repair costs.'*

## 2.2 Agri-Chain Benchmarking and Competitiveness

In Australia, the 'benchmarking in agriculture' studies of the mid-1990s have become agri-food industry studies by the late 1990s. The change is partly a change in terminology and partly a change in methodology. It is a change in favor of consideration of competitiveness in broad sense.

Government, industry and community need to engage constructively in the process to best manage opportunities and threats and may achieve mutually satisfactory outcomes. Industry strategic plans are the vehicles for engagement, visioning the outcomes and mapping the route. The industry plan will highlight what needs to be benchmarked.

Strategic planning requires consideration of a constellation of possibilities. That is, a comprehensive framework to cogently consider directions, options and tasks.

## 3. A Framework to View Industry Development

A framework for industry development used by the South Australian Government with industry and community has been summarized as under:

> *"As rapid economic growth tightens resource constraints, (South-East Asian) governments face a stark choice: either to adhere to long standing goals of agricultural self-sufficiency, thereby restricting the flow of resources from traditional to faster growing parts of the economy (such as manufacturing and services); or else, to allow this restructuring to take its course. A number of factors are pushing governments towards the second option, including: land limitations; rising agricultural production costs; mounting costs of state subsidies and other agricultural assistance; and slowing world demand and falling world prices for many traditional agricultural products"*

Subsistence to Supermarket: Food and Agricultural Transformation in South East Asia, Department of Foreign Affairs and Trade.

In market-driven economies national economic development policies exert pressure on agriculture (and also other sectors) to adjust. Agriculture sector efficiency in a developing economy requires on-going restructuring; the relative shrinkage of agriculture in the economy occurs as other sectors grow faster. Typically, this involves a net exit of farmers and agricultural workers, an aggregation of land units and new capital investment in larger firms. Reducing subsidies and increasing exposure to import competition is a spur to efficiency (Rao, 2002).

In Australia, non-farm industry growth in regions and the availability of off-farm regional employment opportunities for farmers has enabled substantial adjustment within farm businesses to better manage farm risk and income variability, family security and welfare and involuntary exit from agriculture (Barr, 2002). Farm family access to national 'safety-net' welfare programs has also helped farm families to stabilise during a rural industry crisis to better assess options in or out of farming (Cook, Edwards & Ronan, 1994).

Industry and national development are discriminatory, involving gains for some firms and individuals and pains for others. Incomplete indicators do not help in the interpretation of change impacts. Dasgupta (2003) confirms the masking of impacts for the poor in several Asian and African countries. He shows that growth in Gross National Product and the UN Human Development Index can occur while the wealth on an "inclusive investment' or triple bottom line basis is declining:

> "I use the term inclusive investment for a broader definition of wealth and contrast it with the narrower scope of recorded investment (eg Gross National Product). Since a great many services are missing from standard economic accounts, recorded investment could be positive even if inclusive investment were negative. This would happen if the economy accumulated manufactured and human capital but destroyed or degraded natural capital at a fast rate."

> "Economic development in the guise of growth in per capita GNP or improvement in the Human Development Index can come in tandem with a decline in the wealth of some of society's poorest members.'

Market failures and government failures are both capable of diverting the merits of competitive market driven change, incurring economic and social costs. An Australian correspondent in China has recently observed Chinese government concern about the protection of property rights in the adjustment process:

> "At.. annual policy planning meeting, the Communist Party Central Committee identified the protection of property rights as a priority to help improve rural prosperity. The meeting also considered allowing farmers to transfer their rights to land, thus letting some amass large holdings, which have been experimented with in several provinces. Large agricultural holdings would put many of China's farmers in a stronger position to combat competition from foreign imports as the country liberalises its markets in compliance with its membership of the World Trade Organisation" (Hyland, 2003).

## 4. Food Chain Scorecard Analysis

Measurement of 'value added' along food and fiber chains. Scorecard analysis is integral to the SA Government Food Industry Strategy. 'Scorecard' data can be compared or benchmarked based on time series data or cross-sectional data (between regions and States). A scorecard system is presented as integral to monitoring progress in the context of food industry strategies.

Food chain scorecards have been used in Australia to measure the contribution of industries and regions to state performance. Developed by PIRSA (Primary Industries and Resources South Australia) in South Australia the methodology has recently been adopted as an aid to the National Food Industry Strategy in Australia. Food chain scorecards calculate value added along food chains, using state and national data where available and sourcing other data where necessary.

Food industry scorecarding involves the collation of additional firm data to better measure economic progress in regions, states and the national food sector. PIRSA has recently extended food chain scorecarding to embrace environmental and social impacts. A draft report highlights that environmental issues are of international concern. The project objective is to take broad level indicators and apply them at the local industry level. In doing this, it is believed that industry will not only become more aware of its environmental responsibility but it will also have the opportunity to become more environmentally efficient. This direction is consistent with statistical and index-based research by Esty and Porter that economic competitiveness and environmental management are strongly correlated (**Esty & Porter, 2002**, p. 92 and p 96):

> *"The strong association between income and environmental performance also carries important implications. Among other things, it provides powerful corroboration for a policy emphasis on poverty alleviation and the promotion of economic growth as a key mechanism for improving environmental results….Subsidies appear not only to distort trade; they also lead to inefficient production and unnecessary pollution."*

Better measurement of environmental sustainability and community capacity to adjust are seen as priorities in the next stages of food industry planning and development in South Australia. Development opportunities will be scrutinised on economic, environmental and social indicators i.e. their 'triple-bottom-line' impacts within the strategic planning framework.

## 5. Complementarity of Scorecarding and Benchmarking in Food Chain Analysis

Scorecarding features a blending, or balancing, of measurable ('hard') and less measurable (imputed, proxy or 'soft') outcomes. Balanced scorecarding mixes financial and non-financial indicators, with the capacity to simultaneously display economic, environmental and social scores.

Shadbolt and Rawlings (2002) reviewed the corporate origins of balanced scorecarding and applied the method as an aid to strategic planning on dairy farms in New Zealand. They refer to the complementarity of scorecarding and benchmarking:

> "The balanced scorecard can assist the farm business as it enables the business to identify those measures (both core outcomes and performance drivers) that are essential to goal achievement and provides a focus to subsequent benchmarking that will speed up the adoption of best practice". On benefits of scorecarding, they added:
>
> 'The balanced scorecard is a framework for integrating measures derived from strategy, thereby offering the family business not only a measurement but also a management system.'

Development of scorecard indicators opens a wider field for the application of benchmarking in food and fiber supply chains.

## 6. Models of Wealth Creation

Heckscher and Ohlin argue that advanced nations all have the same technology but differ in their endowments of factors of production such as land, labour, capital and other natural resources. They observed nations gaining factor based comparative advantage in industries making intensive use of factors they possessed in abundance, exporting these goods and importing those for which they had a comparative factor disadvantage. Comparative advantage based on factors of production has intuitive appeal. Certainly, national differences in factor costs have played a role in determining trade patterns in many industries. It has been recognised that governments can alter factor advantage either overall or in specific sectors through various forms of intervention such as subsidised interest rates, low wage rates, subsidies, depreciation allowances and export financing.

There has been growing sentiment, however, that comparative advantage based on factors of production is not sufficient to explain patterns of international trade. Much of the world's trade takes place between advanced industrial nations with similar factor endowments. A significant amount of trade also involves exports and imports between different national subsidiaries of multinational firms, a form of trade left out of most theories. Now, factor comparative advantage theory is coming to be seen as useful primarily for explaining broad tends in the patterns of trade rather than whether a nation imports or exports in individual industries.

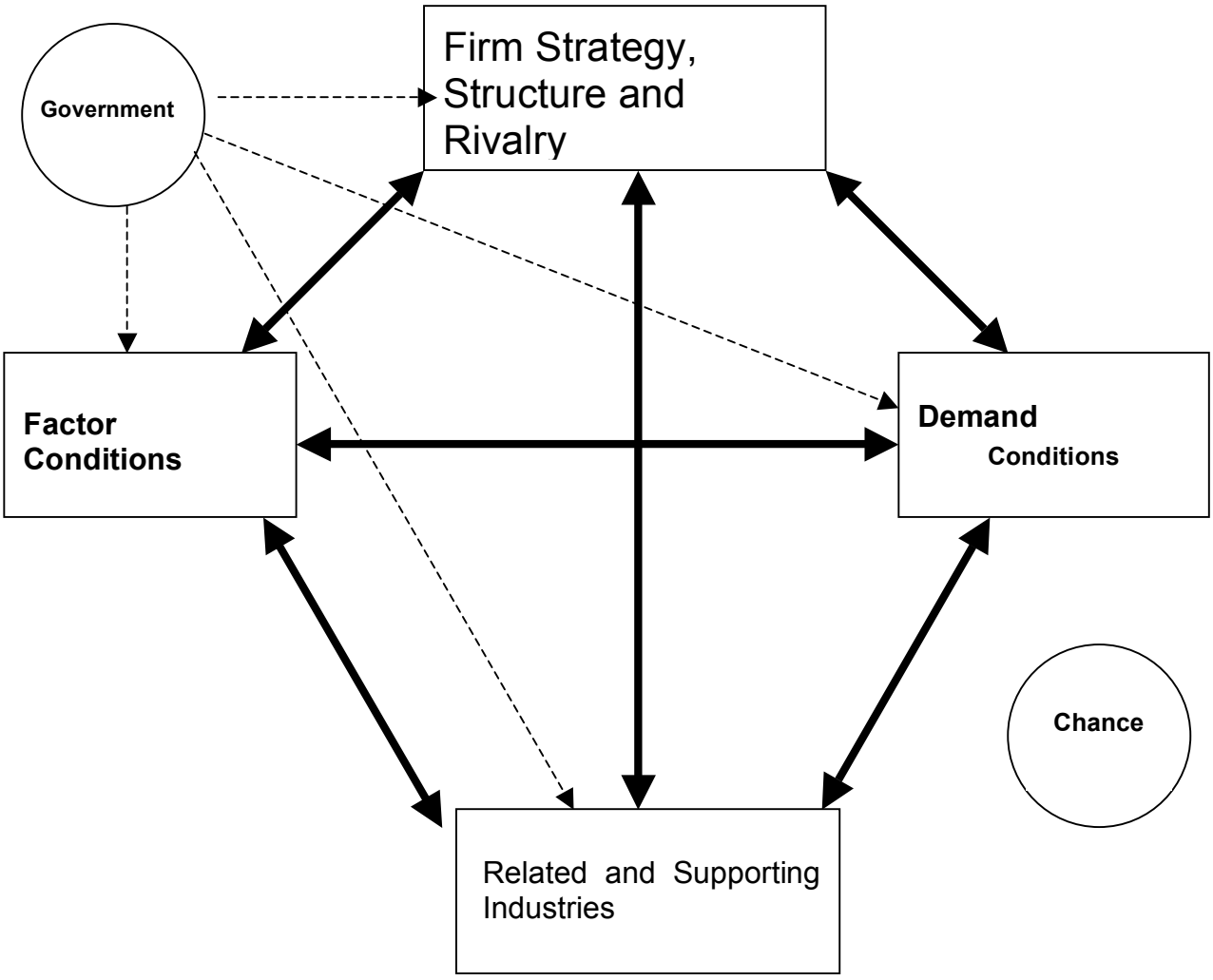
## 6.1 Porter's Model

The central issue is as to why do firms based in particular nations achieve success in distinct segments and industries. The search is for the decisive characters of a nation that allow its firms to create and sustain a competitive advantage in particular fields. That is, what gives rise to the competitive advantage of nations? Porter's (1990) model of international trade competitiveness has given a comprehensive and cogent explanation for the complexities of why some industries/economies are more successful than others in the pursuit of productivity, national wealth and community welfare.

Porter found that firms gain and sustain competitive advantage through improvement, innovation and upgrading. He identified four broad determinants of national competitive advantage that shape the business environment to the benefit or hindrance of a nation's firms:

- Factor Conditions;
- Demand Conditions;
- Related And Supporting Industries; and
- Firm Strategy, Structure and Domestic Rivalry.

**Figure 1: Porter's Model (Porter's "Diamond")**



Besides, chance and the role of government have also been recognized in the model. Porter sees these determinants as the domestic forces that provide firms with the pressures, incentives and capabilities to improve and innovate.

**i. Factor Conditions**

Factor conditions are the inputs necessary to compete in an industry such as labour, arable land, natural resources, capital and infrastructure. Factors can be divided into basic factors and advanced factors. Basic factors are those which are passively inherited or created through moderate investment, including natural resources, climate, and unskilled or semi-skilled labour. Advanced factors are those developed through sustained investment in both human and physical capital such as modern information technologies and communications infrastructure or leading research institutes. The factors most important to modern competition are not inherited but created. Thus, a nation's stock of factors at any particular time is less important than the rate at which they are created, upgraded, and made more specialized for particular industries. States that continually invest in the creation of advanced and specialized factors often translate these investments into industrial success.

**ii. Demand Conditions**

Home demand conditions play an important role in the creation of a State's competitive industries. Firms often succeed in industries where the presence of particularly sophisticated and demanding customers forces them to sharpen their performance at home. A State's firms often gain competitive advantage in industries where the home demand anticipates foreign demand and therefore gives local companies a clearer or earlier picture of emerging buyer needs. It is the quality of demand in particular industry segments that is critical to success, rather than its size.

**iii. Related and Supporting Industries**

The third broad determinant of national advantage is the presence of world-class *related and supporting industries in the country.* Related industries are those that share common technologies, inputs, distribution channels, customers or activities, or provide products that are complementary. World-class related industries can provide firms with sources of technology, ideas, individual and potential competitors that can be advantages in international competition.

States typically are competitive in "clusters" of related and supporting industries. The complex web of interactions within these clusters can provide a major source of competitive advantage throughout the entire economic system. Often such clusters are geographically concentrated, making the interactions closer and more dynamic.

**iv. Firm Strategy, Structure and Rivalry**

The final broad determinant is *firm strategy, structure and rivalry,* which encompasses the conditions in the state that govern how companies are created, organized, and managed, and the nature of domestic rivalry. Many aspects of a state influence ways in which firms are organized and managed. Some of these include social

norms and attitudes towards business, which are often reflected in government policy. These in turn grow out of the educational system, social and religious history, family structures and other unique national conditions. The socio-political environment structure and context tends to have a distinct impact on the kinds of industries in which a State achieves international pre-eminence.

As stated above, two other variables viz. chance and the government can influence the national environment in important ways. Chance events are developments outside the control of firms (and usually the government). These events include pure inventions, breakthroughs in basic technologies, wars, and external political developments. Government at all levels can improve or impede the state's advantage. The actions of government (and the consequences of chance) are best understood through their influence on the four determinants. Chance and government interventions can influence each determinant for better or worse. Porter shows that, while the role of government in creating and sustaining domestic advantage is significant, it is, however, partial. Without the presence of underlying national conditions that support competitive advantage in a particular industry, the best policy intentions of government will fail. Governments can only influence national competitive advantage but do not control it.

## 6.2 The Goal of Government Policy on Wealth Creation

The central role of government policy towards the economy is to deploy a nation's resources (labour and capital) with high and rising levels of productivity. Productivity is the root cause of a nation's standard of living. To achieve productivity growth, an economy must be continually upgrading. This requires continual improvement and innovation in existing industries and the capacity to compete successfully in new industries. Any activity preventing a decline in existing productivity is equally relevant.

Porter believes that proper role of government policy toward domestic industries is to stimulate dynamism and upgrading. Government's aim should be to create an environment in which firms can upgrade competitive advantages in existing industries by introducing more sophisticated technology and methods, and penetrating more advanced segments.

If the first prerequisite for sound government policy toward sustainable industry development is having the appropriate goal (that is, sustainable and continuous productivity enhancement) then, the second is a proper model of the underpinnings of competitive success which can provide a yardstick against which government's industry initiatives can be formulated and measured.

## 6.3 Principles to Guide Government Intervention for Wealth Creation

Government at any level can influence competitive advantage in an industry if its policies influence one or more of the four determinants. At the broadest level a number of principles must guide government policy if it is to enhance domestic competitive advantage rather than detract from it. For Porter, the following eight principles provide a set of benchmarks against which to evaluate any government initiative for industry development:

i. Government actions must be biased toward markets, and toward the private sector. A state's firms themselves must ultimately create and sustain competitive

advantage compared to rivals from other states. At best, governments make erratic decisions about the industries to develop, the technologies to invest in and the competitive advantages that will be most appropriate and achievable. Governments simply cannot be as well tuned with market forces as industry participants. Market institutions such as competition and pricing should be reinforced.

Government's proper role is to amplify the forces within Porters "diamond". For example, by stimulating early demand, confronting industries with the need for frontier technology through symbolic cooperation projects, establishing prizes to highlight and reward quality, encouraging rivalry and so on, the pace of innovation and upgrading is accelerated. However, attempting to manage industry structure, protect home markets or insulate inefficient producers, distributors or retailers in a range of industries from competition, has the effect of dragging down domestic productivity.

ii. Domestic competitive advantage in an industry is relative. Standards for competitive advantage are not set domestically but by firms in other nations. International standards set the minimum policy targets if a state is to upgrade its economy. Incremental improvements in a nation's own historical performance is not enough.

iii. Short-term cost advantages do not lead to competitive advantage; dynamism does. Policies that convey static, short-term cost advantages, but unconsciously undermine innovation and dynamism represent the most common error in government policy toward industry.

iv. Industries must upgrade to create state prosperity. Competitive advantage based on such sources as abundant natural resources, low cost labour, or even a single product new idea is notoriously unstable. Basing competitive advantages on such sources leads firms to price-oriented strategies and price sensitive market segments. These strategies are especially vulnerable to challenge by firms in other nations and also to protectionism. The highest order advantages accrue from steadily rising levels of technology, investments in building close customer relationships and economies of scale growing out of global market pressures.

v. Competitive advantage can be intensely geographically concentrated. Industries and industry clusters frequently concentrate in a region and the bases for competitive advantage are intensely local. This concentration amplifies the forces that upgrade and sustain advantage.

vi. Competitive advantage is created through a long-term process of upgrading human skills, investing in products and processes, building clusters and expanding market access. Too often economic policy in states is concerned with short-term economic fluctuations. At times, the most beneficial policies within the purview of government such as factor creation; competition policy and upgrading demand quality are slow and patient ones.

vii. States gain advantages through differences, not similarities. While there are some broad principles and policies that will benefit almost any state economy, it is a mistake for any state to follow too closely a model of economic development

created by any other state. The task for government is to understand the underlying principles of domestic advantage and translate them into policy initiatives that reflect the state's particular circumstances.

viii. Change is a component of economic growth. Government policy must provide an environment in which an industry can prosper if its firms are innovative and achieve high productivity by international comparison. A diversified economy has room for a range of industries that can provide employment for human resources with different skills and aspirations. Conversely, few industries are so indispensable that the state should guarantee an existence for unproductive domestic competitors. Interventions to arrest decline can prevent resource re-allocation toward more productive pursuits and diminish overall economic development.

Within these broad principles, the contemporary role of government has shown three broad orientations:

- An orientation toward environmental sustainability. In the 1940s and 1950s Australian agricultural policy was focused on expanding the nation's agricultural production and exports. This was part of the post-war reconstruction effort. It is particularly significant that agriculture then contributed more than 80 percent of Australia's exports at that time. Increased farm exports were seen as requisite to financing needed capital imports.

In those years agricultural policy was dominated by marketing and stabilisation schemes for many commodities such as wheat, milk and eggs. These schemes, together with fertiliser subsidies, cheap irrigation water and tax write-offs for land clearing, for example, all encouraged increased farm production through a more intensive use of the environment. In a statement on post-war rural policy for Australia, Prime Minister Chifley listed both land and water conservation as policy issues. But the conservation was for the purpose of increased production. The issue of environmental externalities (or spill overs) arising from the use of land and other environmental resources for commercial agriculture was not on the policy agenda. Subsequently, the subsidies have been largely withdrawn from Australian agriculture. As in other countries, the community's demand for environmental services has been growing. The community at large has claimed an increasing "ownership" of Australia's environmental resources. Of late, owners of the factors of production face challenges over use of environmental resources, which they formerly commanded largely at will.

Key elements of a sustainable environment include:

- Natural environment
    - Clean environment
    - Resource conservation
    - Habitat preservation
    - Recreation amenities
- Built environment

  Planned, to minimize impact on natural environment

It is communities and regions, not governments that are the principal wealth creators in market economies. South Australia is relatively more dependent upon regional communities for its wealth creation than any other mainland Australian State.

Prosperity in future will be based on creating and maintaining a sustainable standard of living and a high quality of life for all citizens. To meet this challenge, a comprehensive new model of governance has emerged which recognizes the value of natural resources and human capital. Embracing economic, social and environmental responsibilities, this approach focuses on the most critical building blocks for ensuring prosperity, the communities and the regions. It emphasizes community-wide and regional collaboration for building prosperous and livable places. Although each community and region has unique challenges and opportunities, the principles outlined above guide an integrated approach to policy and strategy towards all sectors to promote the economic vitality of communities and their regions.

Key elements of a sustainable society include:

- Education and life long learning
- Public health
- Transport
- Social well being
    - Housing
    - Child care
    - Security
    - Welfare safety net

### 6.4 Minimal But Efficient And Effective Government Interventions

Within Porter's four determinants, market failures will inhibit wealth creation. A clear role of Government is to pursue strategies to overcome those impediments with efficient and effective interventions. If Government does not intervene to overcome market failures, the market by itself cannot do so, and economic development will remain inhibited. However, government intervention whenever required must be cost effective. And market failure does not mean that the public should pay for any government intervention. If beneficiaries can clearly be identified, then they should be made to contribute toward the cost of the intervention.

The following framework is a generic approach to analyse the need for government intervention in case of any type of market failure. It involves three sequential steps:

a. Identify the type of market failure.

b. Estimate the magnitude of the market failure using appropriate indicators such as economic, social, environmental etc. to determine if the market failure is significant. If it is so, explore if there is a case for government intervention. If the market failure is minor, there is less likely to be a case for government intervention.

c. Government intervention to correct market failure can be direct or indirect. Direct government intervention results in, for example, government

undertaking to provide goods or services or contracting the private sector to do so. Indirect government intervention to correct market failure seeks to create a suitable environment for the market to operate. The main types of indirect intervention are:

**Suasion**

At times, publicity, moral, social or political pressure may modify the behavior.

**Pure Market Approaches**

The objective here is to create a market by defining property rights to correct the market failure. If property rights cannot be adequately defined and assigned, the next best alternative is to use economic approaches.

**Economic Approaches**

Here, economic instruments are used to send more accurate signals to individuals and groups about the relative costs and benefits of their actions.

**Regulatory Approaches**

If market based solutions as outlined above cannot correct the market failure, governments may need to consider a regulatory approach. A regulatory approach should only be used as the last option. Economically, they are the least efficient and may impose significant costs on the community.

These contemporary government orientations, when overlaid across the Porter model, give the following:

- An overall goal for industry policy;
- A context to develop and explore potential (or existing) strategies for Government intervention in the economy to foster wealth creation;
- A set of criteria against which to evaluate options for government initiatives towards the economy; and
- A process to determine the efficiency and effectiveness of particular options for government interventions to overcome market failures.

Investigation of the potential impediments or market failures in the economic system relevant to the PIRSA portfolio has guided the formation of the following PIRSA strategies within each determinant.

| DETERMINANT | STRATEGY |
|---|---|
| Factor conditions | • Assist communities to make the most of their natural resources, skills knowledge and infrastructure.<br>• Encourage responsible and sustainable use of natural resources.<br>• Provide infrastructure to support the development of primary industries.<br>• Encourage innovation and good management practices in primary industries and their value chains. |

| | |
|---|---|
| Firm Strategy, Structure and Rivalry | • Remove impediments that inhibit primary producers from adjusting to the changing global marketplace.<br>• Encourage primary producers to collaborate or differentiate to win business. |
| Demand Conditions | • Enable consumers to make informed and discerning choices. |
| Related and Supporting Industries | • Encourage the clustering of interdependent businesses.<br>• Provide information to enable businesses to make informed decisions about investing in value adding activities |

PIRSA has used a process for priority setting and evaluation of programs within strategies using market failure, pricing under a 'beneficiary pays' principle, and economic development impact inclusive of market and non-market impacts as key criteria.

## 7. Conclusions

Competitiveness is crucial to successful trade. Successful international trade is a well-trodden route to national wealth and improved living standards. Pressure to lift trade competitiveness for agricultural commodities in APO member countries arises from many sources including population growth and a changing world trade environment. New bilateral, regional and multilateral trade agreements have implications for agricultural competitiveness, rural environments and social well being.

Benchmarking, originally a tool of commerce, is now a popular tool for comparisons ranging from activities on farms, processes in factories and the international competitiveness of industries. Quality industry statistics, intimate knowledge of links in food and fiber chains and methodological consistency are keys to best practice benchmarking yielding data of value for managers or policy makers.

Sustainable development strategies are the only strategies that can yield sustained benefit locally and nationally. Planning for sustainable development needs to consider impacts on a triple bottom line basis, embracing economic, environmental and social indicators. Benchmarking of focused, balanced scorecards presents a route to lift export competitiveness of traditional food and fiber supply chains.

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# IV. COUNTRY REPORTS

## 1. THE REPUBLIC OF CHINA

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### 1. BACKGROUND: SURVEY COMMODITIES AND THEIR TRADE PERFORMANCE

#### 1.1 Rationale, Objectives, Criteria for Selection of Commodities

Agriculture sector commands priority in the Republic of China (ROC), like other countries in Asia and the Pacific region, due to the increasing concern for food security, conservation of natural resources and rural development. The trend of opening up of economies as a result of globalization is exerting more pressure on the sector to improve its productivity. Recognizing the importance of agricultural productivity measurement and analysis, APO conducted a Survey on 'Agricultural Productivity Index'. The survey seeks to develop productivity indices for certain vital tradable commodities among APO member countries to provide a measurement of the efficiency of resource use and a basis for comparative analysis across countries, and to analyze the main sources of the productivity variations.

The selection of commodities under the survey is primarily based on currently exported and potentially exportable commodities. At the same time, imported commodities in which import substitution can be promoted in future have also been considered. On these broad criteria, two commodities namely rice and maize have been surveyed in the ROC for reference period from 1990 to 2000. The productivity indices of rice (paddy) and maize at the farm level and rice (milled) at factory level during 1990-2000 have been illustrated and analyzed.

#### 1.2 Importance of Rice and Maize in ROC's Trade on Agriculture and Food

The importance of a commodity, particularly from trade perspective, can be viewed from its shares of export/import in the total agriculture and food trade of the country. Therefore, the relevant shares of the two commodities selected under the Survey by ROC have been presented in Table1.

**Table 1. Shares of Exports and Imports of Surveyed Commodities in Trade of ROC in Agriculture and Food During 1990-2000**

(Percent)

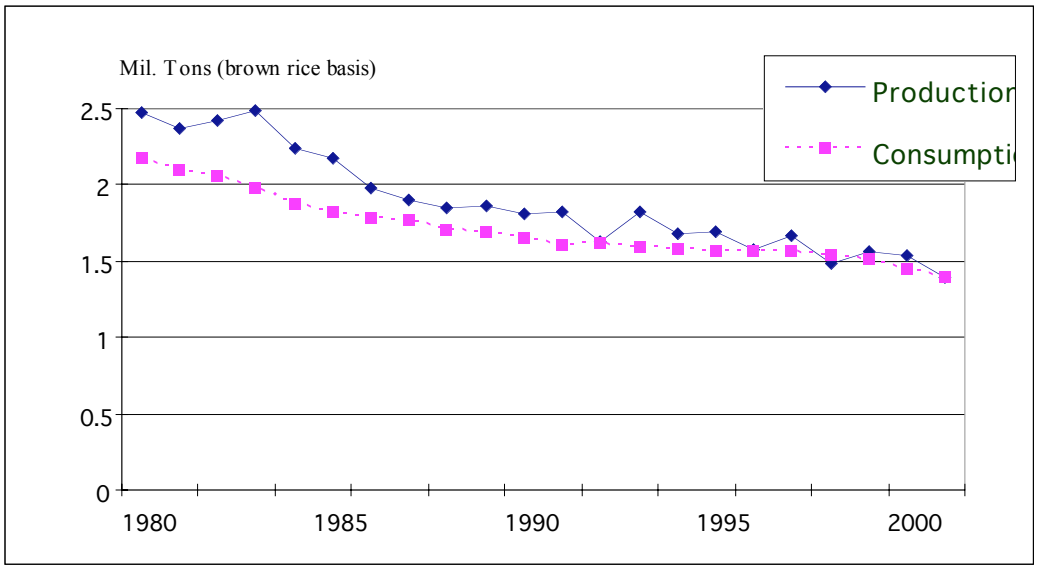
| Crop | Exports | | | Imports | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| Rice (milled) | 0.38 | 0.71 | 0.52 | 0.02 | 0.02 | 0.03 |
| Maize | 0.00 | 0.00 | 0.00 | 11.55 | 9.90 | 7.42 |
| Total | 0.38 | 0.71 | 0.52 | 11.57 | 9.92 | 7.45 |

#### 1.2.1 Rice

Rice is the staple food crop and the only cereal in which ROC is self sufficient. Its production peaked at 3.4 million MT of paddy in 1976. The production has declined to 1.7 million MT in 2001(Figure1) mainly due to decreasing domestic consumption and policy shift to selectively diversify area under rice (paddy) to other crops. Despite the decline, rice continues to be the dominant crop. Of all the farmers in the country, 45 percent of them are involved in rice production, accounting for 38 percent of crop acreage. The value of the production of this commodity at farm level has been estimated at NT$ 32.8 billion in 2001 which constituted 20 percent of total value of crop production and 12.5

percent of total farm production (crops and livestock).

**Figure 1. Rice Production and Consumption in ROC**




Note: Rice consumption includes direct food use, seed, processed foods, industrial use, and residual.

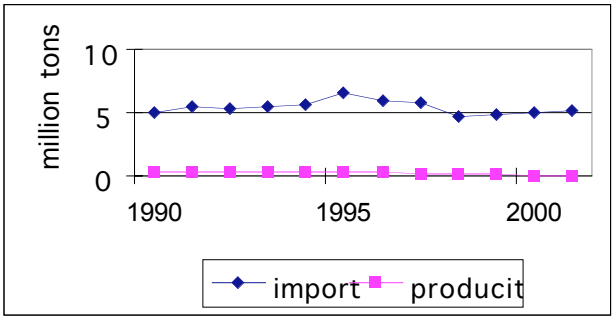
Prices of rice in the country have been ruling at a level much higher than the world price. The export of this commodity has been resorted mainly to dispose government's inventory of old crop. Import of rice has not been allowed for domestic consumption until ROC's entry to the WTO on January 1, 2002.

### 1.2.2 Maize

The self-sufficiency ratio of maize has been low and it became one of the major substitutes for rice under rice diversion program. To increase maize production, a program was launched under which purchase price was guaranteed, besides giving subsidy for diversification to this crop.

Maize has been a major feedstuff for the ROC's livestock industry. The country produced 0.28 million MT of maize in 1990 which peaked at 0.29 million MT in 1994 before gradually declining to 0.22 million MT in 997. The production drastically decreased to the level at 0.12 million MT in 1998 when the price support was withdrawn for the first[1] crop. The production level declined to 0.07 million MT in 2000 and further to a level of less than 60 thousand MT, accounting for only 1.2 percent of total domestic demand in 2001 (Figure 2).

**Figure 2. Maize production and import in ROC**




[1] *There are three maize crops in ROC.*

Import of maize increased from 5 million MT in 1990 to 6.5 million MT in 1995 as production of livestock grew. However, it decreased to 4.9 million MT in 2001 as a result of outbreak of foot and mouth disease in 1997. The country imported maize valued at US$ 586 millions or 8.6 percent of total agricultural and food import in 2001.

## 2. PRODUCTIVITY INDICES OF THE SURVEY COMMODITIES

This section has been divided in the following three sub-sections:

- **Productivity of Raw Crops**
- **Productivity of Tradable Processed Commodities**
- **Benchmarking Analysis**

### 2.1 Productivity of Raw Commodities

The discussions in this section focus on partial and total factor productivity of the national average farms in respect of two commodities selected under the survey namely rice (paddy) and maize**.**

#### 2.1.1 Productivity of Rice (Paddy)

In ROC, two rice (paddy) crops are grown in a year. The first rice (paddy) crop is sown during the period from January to April and the second one is planted during May and September. The first crop generally has higher yield compared to that of the second one due to favorable weather conditions while the second crop face more vagaries of the weather such as typhoon disasters during the growing season. Of the three main varieties of rice (paddy) namely Japonica rice, India rice, glutinous rice produced in the country, Japonica rice (paddy) accounts 85 percent of the total production.
Productivity measures of national average rice (paddy) farms and corresponding annual compound growth rates have been presented in Table 2.

**Table 2. Land and Labor Productivity of Rice (Paddy) in ROC-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 5.01 | 5.70 | 5.61 | 2.60 | -0.33 |
| Labor /Land Ratio (Man-day/ hectare) | 38.32 | 29.46 | 27.88 | -5.13 | -1.10 |
| Labor Productivity (Kg./ man-day) | 130.86 | 193.51 | 201.14 | 8.14 | 0.78 |
| Value Added per hectare (at constant 1995 US $) | 2920.41 | 3420.03 | 3127.92 | 3.21 | -1.77 |
| Value Added per hectare (Index) | 85.39 | 100.00 | 91.46 | 3.21 | -1.77 |
| Value Added per man-day (at constant 1995 US $) | 76.21 | 116.11 | 112.21 | 8.79 | -0.68 |
| Value Added per man-day (Index) | 65.64 | 100.00 | 96.64 | 8.79 | -0.68 |
| Value Added per MT (at constant 1995 US $) | 582.40 | 600.00 | 557.87 | 0.60 | -1.45 |
| Value Added per MT (Index) | 97.07 | 100.00 | 92.98 | 0.60 | -1.45 |

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during 1990-2000, albeit with fluctuations. It recorded growth rate at 2.60 percent per annum during the first half of 1990s compared to (-)0.33 percent per annum during the second half of 1990s. The increase in yield rate during the first half of 1990s has been due to adoption of high yielding varieties, selective diversification of low yielding areas and farm mechanization.

Value added per hectare of rice (paddy) farms (at constant 1995 US $) increased annually at 8.79 percent during 1990-95 but declined at (-)0.68 percent during the second

half of 1990s due to devaluation of NT$ vis-à-vis US$. Value added per MT declined faster compared to value added per hectare during the second half of 1990s.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited a downward trend during the decade of 1990s. It posted a negative growth at (-)5.13 percent per annum during 1990-1995 compared to (-)1.10 percent per annum during 1995-2000. Higher intensity of labor has taken place due to increase in the efficiency of mechanization resulted from improvement in farm machine and the tendency to use more tractors. Labor input for rice (paddy) cultivation decreased from 38 man-days per hectare in 1990 to 30 man-days in 1995 and to 28 man-days in 2000.

### 2.1.1.2 Capital Productivity of Rice (Paddy)

Value added per depreciation posted a negative annual growth rate at (-) 3.56 percent per annum during 1990-1995 against (-)6.48 percent during 1995-2000 (Table 3).

**Table 3. Capital Productivity of Rice (Paddy) in ROC -1990-2000**

(NT$,1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 28.45 | 23.74 | 16.98 | -3.56 | -6.48 |
| Value Added per capital (Index) | 119.87 | 100.00 | 71.54 | -3.56 | -6.48 |

Capital productivity which is the value added per depreciation followed a path of negative growth as most rice (paddy) farms in ROC have purchased rice seedlings and hired labor with machines for field preparation, transplanting, harvesting and drying. According to the report on 1990 agricultural census, 89 percent of farms purchased rice seedling, 81 percent farms hired tractors for field preparation, 87 percent for transplanting and 96 percent for harvesting.

### 2.1.3 Total Factor Productivity of Rice (Paddy)

Total factor productivity (TFP) of rice (paddy), total output and total input indices have been presented in Table 4.

**Table 4. Total Factor Productivity of Rice (Paddy) in ROC -1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 108.44 | 100.00 | 90.18 | -1.61 | -2.05 |
| Total Input | 147.89 | 100.00 | 93.52 | -7.53 | -1.33 |
| Total Factor Productivity | 73.33 | 100.00 | 96.42 | 6.40 | -0.73 |

During 1990-95, the total input decreased faster at (-)7.53 percent per annum whereas total output declined at (-)1.61 percent per annum with the result that TFP increased at 6.40 percent per annum. The faster decline in the total input has been mainly due to selective diversification of low yielding areas and intensive farm mechanization which consequently reduced the number of man-days per hectare. However, this could not be sustained during the second half of 1990s and TFP posted a

negative growth at (-)0.73 percent per annum.

### 2.1.2 Productivity of Maize

In ROC, three maize crops are grown in a year. The first two crops are sown during the same period as rice (paddy) crops are sown, the third one is sown after the month of September.

#### 2.1.2.1 Land and Labor Productivity of Maize

Productivity measures of national average maize farms and corresponding annual compound growth rates have been presented in Table 5.

**Table 5. Land and Labor Productivity of Maize in ROC-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 4.33 | 4.61 | 4.58 | 1.25 | -0.12 |
| Labor /Land Ratio (Man-day/ hectare) | 38.42 | 21.30 | 17.28 | -11.13 | -4.10 |
| Labor Productivity (Kg./ man-day) | 112.75 | 216.36 | 265.13 | 13.92 | 4.15 |
| Value Added per hectare (at constant 1995 US $) | 2279.80 | 2124.39 | 2143.06 | -1.40 | 0.18 |
| Value Added per hectare (Index) | 107.32 | 100.00 | 100.88 | -1.40 | 0.18 |
| Value Added per man-day (at constant 1995 US $) | 59.34 | 99.73 | 124.05 | 10.94 | 4.46 |
| Value Added per man-day (Index) | 59.50 | 100.00 | 124.38 | 10.94 | 4.46 |
| Value Added per MT (at constant 1995 US $) | 526.31 | 460.97 | 467.88 | -2.62 | 0.30 |
| Value Added per MT (Index) | 114.17 | 100.00 | 101.50 | -2.62 | 0.30 |

Land productivity of maize in physical quantity terms has shown an upward trend during 1990-2000, albeit with fluctuations. It recorded a growth rate at 1.25 percent per annum during 1990-95 which turned negative at (-)0.12 percent per annum during 1995-2000.

Value added per hectare of maize farms decreased marginally at (-)1.40 percent per annum during 1990-95 before posting a positive growth at 0.18 percent per annum during the second half of 1990s. The movements in value added per MT have been similar to those of value added per hectare.

Value added per man day (at constant 1995 US $) has exhibited an upward trend throughout the decade of 1990s. It increased at 10.94 percent annually during the first half of 1990s but growth decelerated to 4.46 percent per annum during the second half of 1990s.

As in case of rice (paddy) cultivation, Labor to land ratio (man-day/hectare) exhibited a downward trend during the decade of 1990s. It posted a negative growth at (-)11.13 percent per annum during the first half of 1990s compared to (-)4.10 percent per annum during the second half of 1990s. This has been possible mainly due to high level of farm mechanization and cultivators rely more on hired machines for field preparations, harvest and drying in ROC. Labor input for maize cultivation decreased from 38.4 man-days per hectare in 1990 to 21.3 man-days in 1995 and to 17.3 man-days in 2000.

#### 2.1.2.2 Capital Productivity of Maize

Value added per depreciation posted annual growth rate at 4.45 percent during 1990-1995 which turned negative to (-)2.24 percent during 1995-2000 (Table 6).

**Table 6. Capital Productivity of Maize in ROC-1990-2000**

(NT$, 1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 32.83 | 40.81 | 36.43 | 4.45 | -2.24 |
| Value Added per capital (Index) | 80.44 | 100.00 | 89.27 | 4.45 | -2.24 |

Like rice (paddy) cultivation, maize in ROC is cultivated on small but highly mechanized farms which rely more on hired machines for field preparations, harvesting and drying. As substitution effect between labor and capital has been taking place, there is more consumption of capital and this explains negative growth rate in capital productivity during the second half of 1990s.

**2.1.2.3 Total Factor Productivity of Maize**

Total Factor Productivity (TFP) of maize increased from 58.71 in 1990 to 108.58 in 2000. The growth has been faster at 11.24 percent per annum during the first half of 1990s compared to 1.66 percent per annum during the second half of 1990s (Table 7).

**Table 7. Total Factor Productivity of Maize in ROC-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 104.44 | 100.00 | 27.35 | -0.87 | -22.84 |
| Total Input | 177.90 | 100.00 | 25.19 | -10.88 | -24.10 |
| Total Factor Productivity | 58.71 | 100.00 | 108.58 | 11.24 | 1.66 |

During 1990-95, the total input decreased faster at (-)10.88 percent per annum whereas total output declined at (-)0.87 percent per annum with the result that TFP increased at 11.24 percent per annum. The faster decline in the total input has been mainly due to intensive farm mechanization which consequently reduced the number of man-days per hectare. However, this could not be sustained during the second half of 1990s and TFP posted a marginal growth at 1.66 percent per annum.

## 2.2 Productivity of Processed Commodities

As processed rather than raw crops are traded in international market, it is important to discuss productivity of processed commodities. As reliable data are available in respect of rice (milled), behavior of productivity of this processed commodity has been discussed in this sub-section.

### 2.2.1 Productivity of Rice (Milled)

Productivity indices of rice (milled) production have been presented in Table 8.

**Table 8. Labor and Capital Productivities of Rice (Milled) in ROC-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per worker | 67.70 | 100.00 | 84.05 | 8.11 | -3.42 |
| Value Added per depreciation | 90.67 | 100.00 | 76.84 | 1.98 | -5.13 |

The number of rice mills has decreased from 1951 in 1991 and to about 800 in 2000 mainly due to the decline in production of rice (paddy) and introduction of automatic milling equipments. Hsu (1994) indicated that the utilization rates of rice mills have been below 30 percent. According to the Industrial and Commercial Census (1996), the scale of operations of rice mills varied a great deal. The top ten percent of rice mills accounted for about 70 percent of total production value.

#### 2.2.1.1 Labor and Capital Productivity of Rice (Milled)

Value added per worker increased at 8.11 percent annually during the first half of 1990s. However, the growth turned negative at (-) 3.42 percent per annum during the second half of 1990s. The movements in value added per depreciation have also been similar to those of value added per worker. It posted a growth rate at 1.98 percent per annum during the 1990-95 before turning negative to (-)5.13 percent per annum during 1995-2000. This indicates that higher level of modernization of rice mills has taken place during the second half of 1990s compared to that during the first half of 1990s.

#### 2.2.1.2 Total Factor Productivity of Rice (Milled)

Total factor productivity (TFP) of rice mills in ROC exhibited an upward trend during 1990-2000, albeit with fluctuations (Table 9).

**Table 9. Total Factor Productivity of Rice (Milled) in ROC-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 76.56 | 100.00 | 71.47 | 5.49 | -6.50 |
| Total Input | 107.15 | 100.00 | 91.35 | -1.37 | -1.79 |
| Total Factor Productivity | 71.45 | 100.00 | 78.24 | 6.95 | -4.79 |

It posted a positive growth rate at 6.95 percent per annum during 1990-95. The growth in TFP turned negative at (-)4.79 percent per annum during the second half of 1990s. This has happened due to the fact that total output declined faster than the total input.

### 2.3 Benchmarking Analysis

In addition to investigating levels and trends of various measures of productivity of selected raw crops / tradable processed commodities, benchmarking[2] analysis has been undertaken in respect of rice (paddy) farms in ROC to compare and contrast performance of national average farms with those of benchmark (best) farms. The choice of this commodity is enabled by availability of quality data of this crop.

[2] Appendix on 'Concepts, Definitions and Limitations' refers.

### 2.3.1 Benchmarking Analysis of Rice (Paddy) Farms

Benchmarking analysis of rice (paddy) farms in the ROC has been undertaken from following three perspectives:

a. Comparison of Productivity of National Average (NA) Farms with Benchmark Farms (BM);
b. Comparison of Inputs and Output of National Average Farms with Benchmark Farms; and
c. Comparison of Cost Structure of Production of National Average Farms with Benchmark Farms

#### 2.3.1.1 Comparison of Productivity of National Average (NA) Farms and Benchmark Farms (BM)

To compare performance of NA farms with that of BM farms, the ratios of certain key indicators of productivity of the national average farms to the benchmark farms of rice (Paddy) in the ROC for 1995 and 2000 have been presented in Table 10.

**Table 10. Ratios of Productivity of National Average Farms to Benchmark Farms of Rice (Paddy) in ROC**

| Measure | 1995 | 2000 |
|---|---|---|
| **Value added per hectare** | | |
| Narrow | 0.6 | 0.6 |
| Broad | 0.9 | 0.9 |
| **Value added per man-day** | | |
| Narrow | 0.5 | 0.7 |
| Broad | 0.8 | 1.1 |
| **Value added per depreciation** | | |
| Narrow | 4.0 | 3.1 |
| Broad | 6.0 | 5.0 |
| **Value added per MT** | | |
| Narrow | 0.7 | 0.6 |
| Broad | 1.0 | 1.0 |
| **Value added as percent of output** | | |
| Narrow | 0.7 | 0.6 |
| Broad | 1.0 | 1.0 |

Notes: For concepts of 'Benchmark', 'broad' and 'narrow', Appendix refers.

The following important points emerge from Table 10:

i. Given that benchmark farms/factory (BM) represent 'best' farm/ factory of the respective country, ratios of NA to BM are expected to lie between zero and unity. This has been validated in general by empirical data, *albeit* with a few exceptions. The ratios for capital productivity have been very large, which imply that BM farms were highly mechanized with the result that their capital productivity were low.
ii. Ratios of NA to BM for narrow concept in respect of different parameters of productivity have generally been different from the corresponding ratios for the broad concepts. The ratios of various productivity indicators in ROC, a high income country, have been consistently higher for the broad concept than that for the narrow concept which implied that BM farms hired more laborers and/or lease more land than NA farms.
iii. The trends in ratios of NA to BM for value added per MT of production have been

less than unity for the narrow concept while these are equal to one for the broad concept.

iv. The level and trend of ratios of NA to BM for the percent share of value added to output have followed almost the same pattern in case of value added per MT of production.

#### 2.3.1.2 Ratios of Various Inputs and Outputs of National Average Farms to Benchmark Farms of Rice (Paddy)

The ratios of expenditures per hectare of respective inputs and of output value at current domestic prices, of national average farms to benchmark farms, for various countries for 1995 and 2000 have been presented in Table 11.

It emerges from Table 11 that in ROC, ratios of NA to BM have been around 0.9 for all cash inputs, between 2.1-2.3 for all cash costs and between 0.91-0.93 for output value. These levels explain a substantial difference of value added ratios between the narrow and broad concepts. Ratio of NA to BM for family labor exceeded unity but was only around 0.2 for capital expenditure. This indicates that the BM farms in ROC are highly mechanized.

**Table 11. Ratios of Inputs / Outputs per hectare of NA to BM Farms of Rice (Paddy) in ROC**

| Measure | 1995 | 2000 |
|---|---|---|
| **Cash cost** | | |
| Cash inputs | 0.9 | 0.9 |
| Seeds | 1.0 | 1.0 |
| Fertilizers | 1.0 | 1.0 |
| Irrigation fee | 1.0 | 1.0 |
| Other cash cost | * | * |
| Sub-Total | 2.3 | 2.1 |
| Labor (family) | 1.3 | 1.1 |
| Depreciation | 0.2 | 0.2 |
| Land rent | 1.0 | 1.0 |
| Sub-Total | 0.8 | 0.7 |
| Total cost | 1.2 | 1.1 |
| Output value | 0.9 | 0.9 |
| Margin rate | 0.4 | 0.3 |

Notes: 1. * Other cash cost is zero for benchmark farms.

2. Margin rate = margin (output value-total cost) to output value

#### 2.3.1.3 Cost Structures of National Average Farms and Benchmark Farms of Rice (Paddy)

The cost structures of respective inputs as percent of total cost, both for NA and BM farms, for 1995 and 2000 have been presented in Table 12.

The following important points emerge from Table 12:

i. The percent cost structures of respective inputs to total cost both for NA and BM farms in 1995 and 2000 varied significantly across countries.

ii. In ROC, cash costs included only current inputs but not hiring cost of laborers. Depreciation cost at 30 percent for BM farms has been quite high. While ratio of value added to output for broad concept has been equal for NA and BM farms, it was smaller for NA farms than BM farm when narrow concept was applied.

iii. Share of depreciation in NA farms has been about 5 percent while it was about 30 percent in case of BM farms.

**Table 12. Cost Structure of Production of Rice (Paddy) in National Average Farms *vis-à-vis* Benchmark Farms in ROC**

(Percent)

| Measure | NA | | BM | |
|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | |
| All cash inputs | 20 | 22 | 27 | 28 |
| Other cash cost | 33 | 33 | 0 | 0 |
| Sub-Total | 53 | 55 | 27 | 28 |
| Labor (family) | 26 | 25 | 23 | 25 |
| Depreciation | 4 | 5 | 30 | 31 |
| Land rent | 17 | 15 | 20 | 16 |
| Sub-Total | 47 | 45 | 73 | 72 |
| Total cost | 100 | 100 | 100 | 100 |
| Margin rate (%) | 14 | 7 | 32 | 23 |
| **Value Added as percent of Output** | | | | |
| Narrow | 54 | 49 | 82 | 79 |
| Broad | 83 | 79 | 82 | 79 |

Note: Margin Rate is the rate of margin (output value-total cost) to output value.

## 3. ANALYSIS OF THE TRADE PERFORMANCE AND PRODUCTIVITY

### 3.1 Correlation between Trade performance and Productivity

The volume of rice (brown rice weight) produced in ROC has been in the range of 1.54 to 1.81 million MT during 1990-2000 as against its consumption of 1.49 to 1.66 million MT during the corresponding period. As domestic consumption has been almost equal to its production, rice exported by ROC constituted only 1 percent of Asia's share. Even export of this level has been possible to dispose surplus stocks piled up mainly during pre-1990s period. At the same time, import of rice has been prohibited by the Government to protect domestic rice producers. In the absence of any significant volume of trade of rice, no inference can be drawn on correlation between trade performance and productivity indices.

Maize is produced in the country mainly as animal feed and accounts for less than two percent of the total domestic demand. ROC, therefore, resorts to import of this commodity and accounts for 12-15 percent of total import of this commodity to Asia during 1990s. Considering huge gap between domestic demand and production, it is not expected that productivity indices would explain the movements in trade of this commodity.

### 3.2 Factors Affecting Trade Performance and Productivity

#### 3.2.1 Price Support

To ensure food security, the Food Stabilization Fund was established in 1974 to purchase rice from farmers at guaranteed prices. At present, farmers sell specified quantities of rice to the government under two different purchase programs at prices which exceed world market prices. With high price levels, inefficient farmers also continue to produce rice which adversely affects rice productivity.

#### 3.2. 2 Diversification Program

To achieve self sufficiency in production of crops like maize, sorghum and

soybeans and also to prevent oversupply of rice, farmers are encouraged to diversify areas under rice (paddy) to other crops by instruments of subsidies, guaranteed prices of crops like maize, sorghum and soybeans. As a result of this conscious diversification policy, area coverage under rice (paddy) has disproportionately declined compared to its production which suggests selective diversification of areas with lower yield rates. In the ultimate analysis, yield rate of rice (paddy) increased significantly from 5.01 MT per hectare in 1990 to 5.61 MT per hectare in 2000.

### 3.2.3 Farmland Utilization Adjustment Program

In addition to diversification program, the Utilization and Adjustment Plan for Paddy Fields and Uplands for Adjusting was launched in July 1997 to ensure compliance of WTO rules including reduction in domestic production subsidies and allowing the Minimum Access Volume (MAV). Under the program, farmers are encouraged to set rice (paddy) land aside as fallow and compensated for the loss, to plant green manure crops, to rotate the rice crop to other crops.

### 3.2.4 Promotion of Quality Rice Production

To meet increasing demand for quality rice arising from increase in income, rice millers have been encouraged to contract farmers for producing quality rice(paddy) to produce quality rice (milled) which meets Chinese National Standards (CNS) labeling. There have been nine varieties of quality rice introduced by the experiment stations. The planted acreage of quality rice has increased considerably and it accounted for about 60 percent of total rice acreage in the year 2000. Of late, ‘organic rice’ without chemical fertilizers has been introduced which command higher prices, usually more than two times of the ordinary rice.

### 3.2.5 Farm Mechanization Program

Agriculture sector in ROC has experienced labor scarcity and therefore, there is a need for farm mechanization. To promote this, Agricultural Mechanization Loan Fund was set up in 1979 to provide loan to farmers for purchase of agricultural machinery. Considerable progress in farm mechanization, particularly in rice and maize farming, has been accomplished. The significant progress in rice harvesting significantly contributed to labor saving. With the innovation, paddy could be harvested and delivered directly to silos in bulk instead of in packing bags.

### 3.2.6 Automation of Agriculture

In 1991, the government initiated a ten year program called 'Automation of Agriculture', combining computer controlled technology and agricultural mechanization through optimization process. Under the program, the automation system of rice processing including drying, husking, polishing, storing and packaging has been promoted. With the technological improvement, labor requirements in rice (milled) production can be reduced significantly.

### 3.2.7 Research and Extension

Agricultural research is the basic source of agricultural technology progress. There are a number of agricultural research institutes in ROC including the Botanical Institute of the Academia Sinica, Agricultural Research Institute and seven district agricultural improvement stations responsible for regional adaptive experiments. New technologies including new varieties of seeds are applied in actual farming through agricultural extension services provided by the district agricultural improvement stations and by the extension network of the farmers' associations.

### 3.2.8 Part Time Farming

Given the small sizes of rice (paddy) and maize farms coupled with farm mechanization and increasing demand of labor in non-agricultural sectors, part-time farmers cultivate the farms. This is considered as a bottleneck for productivity growth. Farmers, who earn sufficient income from off-farm jobs, either let their land remain fellow or opt for part-time farming. They do not sell or rent their land to other farmers due to fear

of losing their land. To improve agriculture growth and productivity, formulation of a suitable land transfer / tenure system is crucial.

### 3.3 Macroeconomic Performance

ROC posted a growth rate of 5.4 percent during 1990-2001 which is impressive given the Asian Financial Crisis in the late 1990s. NT dollars was devalued by 20 percent in 1998 against the US dollar, and appreciated slightly as the economy performed well in 1999 and 2000. Per capita GNP increased from US$9,672 in 1990 to US$12,864 in 2000. During the corresponding period, agriculture GDP decreased by 0.2 percent per annum. GDP per worker in non-agricultural sector in real terms posted an annual growth rate at 4.4 percent, higher than 3.4 percent in agriculture. The gap in labor productivity induced continuation of out-migration of farm labor and increase in farm wages. The developments discouraged multi-cropping and labor-intensive production methods. The share of agricultural labors in the total employment decreased from 12.8 percent in 1990 to 7.8 percent in 2000. In addition, increased demand for land by the non-agriculture sector pushed up the prices of land. Thus, the economic development led to significant substitution of labor and land by fixed capital in agriculture. Both rice and maize farming have become highly mechanized.

## 4. PROSPECTS FOR FUTURE DEVELOPMENT OF RICE AND MAIZE

As rice is a major staple food in ROC, its cultivators have been protected by the ban on import of this commodity. However, the country has set MAV at 144,720 MT (brown rice basis) for 2002 under WTO. This is about eight percent of domestic consumption during the base period 1990-1992. To avoid oversupply of rice in the domestic market, it was targeted to increase the fallow land to at least 32 thousand hectares. However, rice production during 2002 did not decline as planned and thus caused a drastic fall in prices of rice (paddy) and rice (milled).

Imports of rice quota has been fixed at 144,72 MT (brown rice basis) and an out-quota tariff rate set at NT$45/Kg. To protect domestic producers against import of rice, the Farmland Utilization Adjustment Program has been launched. It is imperative that future rice policy emphasize qualitative improvements rather than quantitative growth.

It is interesting to note that rice policy encourages farmers to diversify from rice to other crops on one hand, incentives in the form of guaranteed rice price to produce more rice are extended on the other. This is somewhat incompatible and needs to be addressed by the government.

To increase productivity of rice, the government will continue to play an important role in increasing productivity by designing suitable land tenure system to facilitate enlarging size of rice farms, by promoting quality aspects to increase value added of rice production.

Maize, the major feedstuff, mainly depend on imports. The cost of domestic production of maize in ROC is significantly higher compared to the import price. During the negotiations for WTO membership, the government maize purchase program has been adjusted to comply with WTO access commitments, which resulted in drastic decrease in maize production. To protect domestic maize producers against import competition, they need to be given maize price support.

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# 2. INDIA

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## 1. BACKGROUND: SURVEYED COMMODITIES AND THEIR TRADE PERFORMANCE

### 1.1 Rationale of the Survey and Criteria for Commodity Selection

Agriculture is the life blood of Indian economy where economic growth is substantially influenced by growth of agriculture sector. A high level of growth of agriculture is essential both for achieving the objective of food security at macro and micro levels and also to alleviate poverty levels. While approximately one-fifth of the GDP is contributed by agriculture sector, almost two-third of the country's population is dependent on this sector.

Given the globalization and ongoing reforms under WTO regime, more pressure is being exerted on agriculture to improve its productivity performance so as to enable agricultural commodities to compete in international market. The objective of the present "Survey on Agriculture Productivity Index" is to develop a set of internationally comparable benchmark which can illustrate competitiveness of major agricultural commodities produced in APO member countries. The criterion for selection of commodities is whether they are exported or have potential for export in foreseeable future. The commodities that are presently imported but for which import substitution could be promoted in future have also been considered.

On this broad criterion, India selected six commodities namely rice (paddy), sugarcane, rubber (natural), coconut, maize and soybeans under the survey. While rice has been selected as it is the main agriculture export commodity, sugar and rubber have been covered under the Survey as these are import substitutable. The remaining three commodities have been surveyed to improve their productivity to meet domestic demand. At present, their shares of exports / imports in total agriculture and food trade are negligibly little.

### 1.2 Importance of the Selected Commodities and their Shares in the Total Agriculture Economy

Indicators of importance of a commodity in the overall agriculture sector of the economy could be allocation of land as a percentage of total coverage of land for agriculture (crop husbandry) and its share in the PV (Production Value due to Agriculture) at constant prices. To get an idea of importance of the crops selected under the Survey, figures of area covered, PV, annual compound growth rates (CGR) in respect of these commodities have been presented in Table1.

**Table 1. Area, PV (Production Value) and Growth of Surveyed Commodities**

(Million hectare, Million Rs., Percent)

| Crop | 1990 | | | | 2000 | | | | CGR | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Area | | PV | | Area | | PV | | Area | PV |
| | Absolute | Share | Absolute | Share | Absolute | Share | Absolute | Share | | |
| Rice (Paddy) | 42.69 | 22.98 | 391630 | 20.29 | 44.36 | 23.03 | 458320 | 19.22 | 0.38 | 1.58 |
| Sugarcane | 3.69 | 1.99 | 151770 | 7.86 | 4.32 | 2.24 | 188890 | 7.92 | 1.59 | 2.21 |
| Rubber (Natural) | 0.48 | 0.26 | 5880 | 0.30 | 0.56 | 0.29 | 11760 | 0.49 | 1.71 | 7.18 |
| Coconut | 1.48 | 0.79 | 31330 | 1.62 | 1.84 | 0.95 | 50430 | 2.12 | 2.23 | 4.88 |
| Maize | 5.90 | 3.18 | 28210 | 1.46 | 6.56 | 3.41 | 36590 | 1.53 | 1.07 | 2.64 |
| Soybeans | 2.56 | 1.38 | 19170 | 0.99 | 6.42 | 3.33 | 40010 | 1.68 | 9.63 | 7.64 |
| All-India | 185.74 | 100.00 | 1929890 | 100.00 | 192.62 | 100.00 | 2384380 | 100.00 | 0.36 | 2.14 |

Sources: 1. "National Accounts Statistics 2002", July 2002, Ministry of Statistics and Programme Implementation, New Delhi.
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Notes: 1. PV is at constant (1993-94) prices.
2. Area is Gross Cropped Area.
3. CGR denotes annual compound growth rate.

Another perspective to view importance of selected commodities could be their shares of exports/ imports in the total agriculture and food trade. The relevant shares have been presented in Table 2.

**Table 2. Shares of Exports and Imports of Surveyed Commodities in Agriculture and Food Trade of India during 1990-2000**

(Percent)

| Crop | Exports | | | Imports | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| Rice (milled) | 7.31 | 22.40 | 10.23 | 3.27 | 0.00 | 0.15 |
| Sugar (raw) | 0.39 | 1.98 | 1.56 | 0.74 | 3.69 | 0.26 |
| Rubber (sheet) | 0.00 | 0.03 | 0.13 | 6.25 | 4.71 | 0.23 |
| Coconut (copra) | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Maize | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.11 |
| Soybeans | 0.00 | 0.00 | 0.25 | 0.00 | 0.45 | 0.00 |
| Total | 7.70 | 24.41 | 12.17 | 10.26 | 8.85 | 0.75 |

### 1.2.1 Rice (Paddy)

The area covered under paddy accounted for 22.98 percent of the gross cropped area in 1990 which increased to 23.03 percent in 2000 and posted a nominal annual growth rate of 0.38 percent. In terms of PV at constant prices, the share of paddy to the total PV due to agriculture marginally decreased from 20.29 percent in 1990 to 19.22 percent in 2000. However, a higher growth rate at 1.58 percent has been achieved in PV during the decade of 1990s compared to 0.38 percent in area during the corresponding period (Table 1). In terms of volume of production, it increased from 111.44 million MT in 1990 to 127.31 million MT in 2000, registering an annual growth rate of 1.34 percent.

The share of export of rice in the total agriculture and food exports increased from 7.31 percent in 1990 to 22.40 percent in 1995 before declining to 10.23 percent in 2000. It surged in 1995 due to removal of QRs in that year, the first year of AoA under

WTO, when India was able to export 1365.65 million MT compared with 384.03 million MT in 1994.

### I.2.2 Sugarcane

The area covered under sugarcane accounted for about 2.00 percent of the gross cropped area in 1990 which increased to 2.24 percent in 2000 and posted an annual growth rate of 1.59 percent. In terms of PV at constant prices, its share increased from 7.86 percent in 1990 to 7.92 percent in 2000. However, a higher growth rate at 2.21 percent has been achieved in PV during the decade of 1990s compared to 1.59 percent in area during the corresponding period (Table 1). In terms of volume of production, it increased from 241.05 million MT in 1990 to 300.32 million MT in 2000, registering an average annual compound growth rate of 2.22 percent.

India is not a regular player in the international market in so far as sugar is concerned. Depending upon cycles of surplus and deficit, export/import takes place The share of exports of sugar in the total agriculture and food exports increased from 0.39 percent in 1990 to 1.98 percent in 1995 before declining to 1.56 percent in 2000. The share of imports during the corresponding years were 0.74 percent, 3.69 percent and 0.26 percent respectively.

### 1.2.3 Rubber (Natural)

The area planted under natural rubber (NR) accounted for a low of 0.26 percent of the gross cropped area in 1990 which marginally increased to 0.29 percent in 2000 and registered a nominal annual growth rate of 1.71 percent. In terms of PV at constant prices, its share increased from 0.30 percent in 1990 to 0.49 percent in 2000. However, a higher growth rate at 7.18 percent has been achieved in PV during the decade of 1990s compared to 1.71 percent in area during the corresponding period (Table 1). During the decade of 1990s, the production increased from 329.60 thousand MT in 1990 to 630.41 thousand MT in 2000 at an annual growth rate of 6.70 percent.

India has been a net importer of natural rubber (NR) as the domestic production has been in deficit compared to its demand (consumption). The share of its imports in the total agriculture and food imports has, however, declined from 6.25 percent in 1990 to 4.71 percent in 1995 and further to 0.23 percent in 2000.

### I.2.4 Coconut

The area covered under coconut plantation accounted a low of 0.79 percent of the gross cropped area in 1990 which increased to 0.95 percent in 2000 and registered an annual growth rate of 2.23 percent. However, its share in the total production value under agriculture increased from 1.62 percent in 1990 to 2.12 percent in 2000. However, a higher growth rate at 4.88 percent has been achieved in PV during the decade of 1990s compared to 2.23 percent in area during the corresponding period (Table 1). In terms of volume of production, it increased from 9.73 billion nuts in 1990 to 12.60 billion nuts in 2000, registering an average annual compound growth rate of 2.62 percent.

The international trade of coconut has been either negligible or nil during the decade of 1990s.

### 1.2.5 Maize

The area covered under maize accounted for 3.18 percent of the gross cropped area in 1990 which marginally increased to 3.41 percent in 2000 and posted an annual growth rate of 1.07 percent. In terms of PV at constant prices, its share increased from 1.46 percent in 1990 to 1.53 percent in 2000. However, a higher growth rate at 2.64 percent has been achieved in PV during the decade of 1990s compared to 1.07 percent in area during the corresponding period (Table 1). In terms of volume of production, it

increased from 8.96 million MT in 1990 to 12.07 million MT in 2000, registering an annual growth rate of 3.02.

The share of maize in the total agriculture and food imports has been negligible in 1990 and1995 which marginally increased to 0.11 percent in 2000.

### 1.2.6 Soybeans

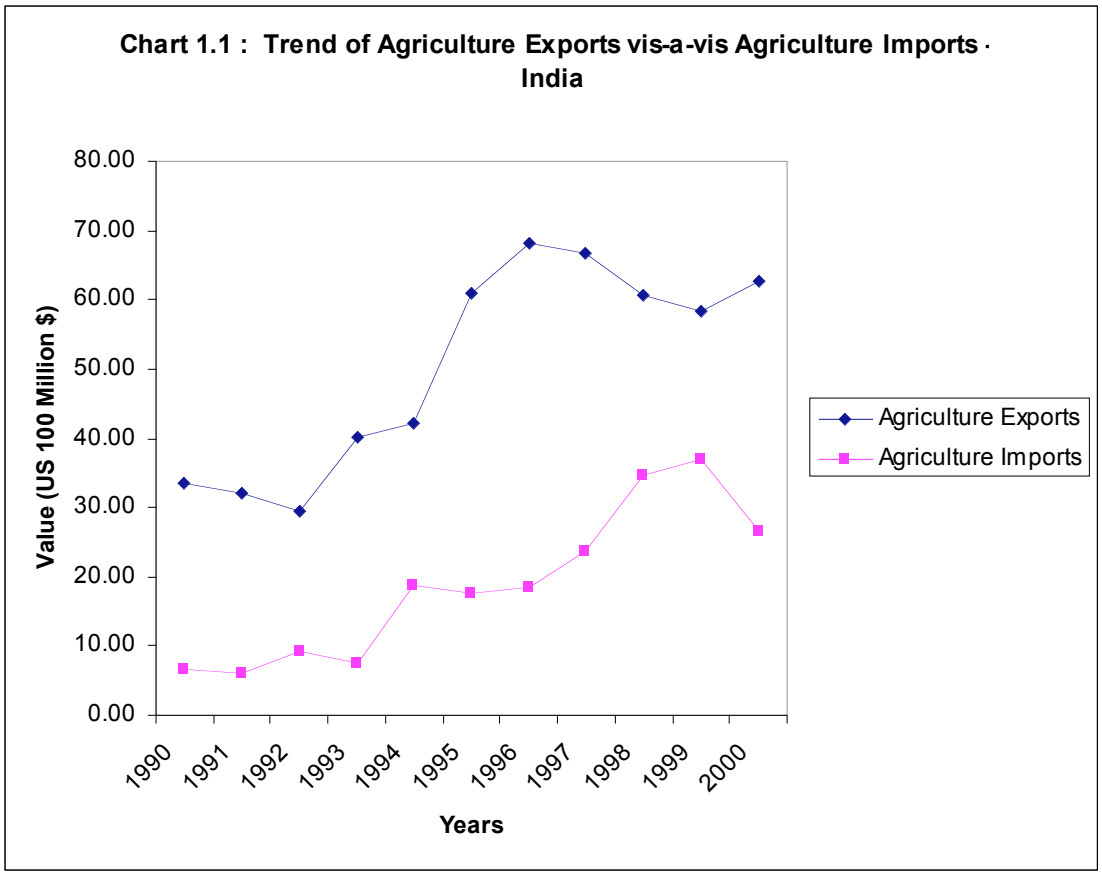
The area covered under Soybeans accounted for 1.38 percent of the gross cropped area in 1990 which increased to 3.33 percent in 2000 and registered an average annual compound growth rate of 9.63 percent. In terms of PV at constant prices, its share increased from a low of 0.99 percent in 1990 to 1.68 percent in 2000. However, a lower growth rate at 7.64 percent has been achieved in PV during the decade of 1990s compared to 9.63 percent in area during the corresponding period (Table 1). In terms of volume of production, it more than doubled from 2.60 million MT in 1990 to 5.27 million MT in 2000, registering an annual growth rate of 7.32 percent

The international trade of soybeans has been either negligible or nil during the decade of 1990s.

## 1.3 Trends in Export/Import of the Surveyed Commodities

The values of India's exports on agriculture and food have been higher than the outgo on imports during the decade of 1990s as may be seen from the **Chart 1.1**. The disaggregated analysis of the commodity-wise and year-wise details indicate that inflow on account of exports from agriculture are spread over a larger number of commodities while the imports are confined to a fewer commodities.

The total value of agricultural exports from India as a percentage of total Indian exports has generally fluctuated between 17 percent and 21 percent during 1990 to 1998. However, it started declining from 1999 and fell to a low of 14.23 percent in 2000. The value of imports of agricultural commodities has generally shown a rising trend, albeit with fluctuations, particularly on account of imports of edible oils.




Their share in total imports has increased from 2.79 percent in 1990 to 8.17 percent in 1998 and then started declining to 7.46 percent in 1999, 5.29 percent in 2000 but again increased to 6.67 percent in 2001. While the share of agricultural exports in total exports has declined, that of imports has increased during 1990 to 2001. The gap, however, is still in favor of exports. In 2001, the agriculture exports exceeded the imports by over US $ 2.8 billion.

Commodity wise details of trade of the surveyed commodities are discussed in the following sub-sections.

### 1.3.1 Rice (Milled)

The share of India in the export of rice as a percentage of world export of this commodity is about four percent. Although India exports rice to about 80 countries, major markets for Indian rice are Saudi Arabia, Kuwait, UK, Belgium, USA and West Africa. It is the most important commodity in the foodgrains group whose share in the export of cereals has generally remained between 75 percent and 96 percent from 1990 to 2000. It was low at 75 percent in 2000 and further declined to 64 percent in 2001. Upto 1994, the share of basmati[1] rice was much higher than that of non-basmati rice. But position changed from 1995 when the share of non-basmati rice in total value of export of cereals started increasing. This continued till 1998. In 1999, again the share of exports of basmati rice was higher than that of non-basmati rice in value terms, though the gap between the two was narrower than that in the years 1990 to1994. This implies that at least in physical terms exports of non-basmati rice have gained importance and have the potential of outstripping the exports of basmati rice in terms

[1] *It is an aromatic or scented premier quality rice.*

of value also. This is not surprising because the total production of basmati rice in the country is approximately 1.30 million MT as against the production of approximately 88.38 million MT of non-basmati rice (in 1999). The trend of export of both basmati and non-basmati rice show a significant upward slope, albeit with fluctuations. The rise and fall of exports of cereals by India largely depends upon availability of surpluses in domestic market and the international price competitiveness.

The imports of rice have been generally low and reached a peak of 102.38 thousand MT in 1992 and have been fluctuating since then. In 2000, a quantity of 13.19 thousand MT was imported at a value of US $ 3.89 million. The imports are likely to decline in the coming years because rice production has been growing in the country at around 3 percent per annum from 1995 to 1999 which is higher than the rate of growth of population.

### 1.3.2 Sugar

India is not a regular player in the international market in so far as sugar is concerned. However, due to regular cycles of surplus and deficit of sugar production in the country, India offer a prominent market for importers of this commodity as happened in 1994, 1998 and 1999, for instance. Exports of sugar has fluctuated over the last eleven years' period. Generally the exports and imports of sugar are allowed keeping in view the domestic demand-supply position. The imports of sugar were generally very low and had a declining trend during 1990 to 1993. In 1993, the country imported sugar worth US $ 0.14 million only. However, there was sudden surge in the imports in 1994 when 1.39 million MT of sugar worth US $ 727.14 million was imported. Then, there was a period of low imports in next three years before it reached a level of 0.90 million MT valued at US $ 264.13 million in 1998 and 1.18 million MT valued at US $ 256.34 million in 1999. The spurt in import of sugar was a private sector response to low international price and liberal government policy rather than a conscious effort to bridge domestic demand -supply gap. However, import of sugar drastically declined to 30.40 thousand MT worth US $ 6.81 million in 2000.

India exported 673 thousand MT of sugar valued at US $ 245.39 million in 1996 which is the highest quantity exported during the eleven years period from 1990 to 2000. The country exported only 16.86 thousand MT valued at US $ 5.88 million in 1999 and 347.44 thousand MT valued at US $ 98.23 million in 2000.

### 1.3.3 Rubber (Natural)

India has been net importer of natural rubber (NR) as the domestic production has been in deficit compared to its demand (consumption). It imported 49.69 thousand MT of NR valued at US $ 42.49 million in 1990. However, the volume of import of this commodity has been fluctuating during last eleven years from 1990 to 2000. It reached a peak of 51.64 thousand MT valued at US $ 83.24 million in 1995, trough of 8.09 thousand MT valued at US $ 8.67 million in 1994 and 8.69 thousand MT valued at US $ 6.48 million in 2000.

As in case of import, no trend in the export of NR has emerged during the period from 1990 to 2000. There was no export of this commodity in 1990. A quantity of 5.83 thousand MT valued at US $ 3.79 million in 1991 was exported which dipped to a low level of 0.19 thousand MT valued at US $ 0.15 million in 1993. However, with the approval of a scheme for export promotion of NR with incentives to exporters of NR for quality improvement, certification, packaging and transportation, a modest quantity of 13.36 thousand MT valued at US $ 8.18 million has been exported in the year 2000. It is expected that export of NR from India will get a boost and India's presence in the export market of NR will be felt.

### 1.3.4 Copra

The export of copra was very low in 1990 when only 0.02 thousand MT was exported. It was almost nil or negligible in the next five years. In 1996, only 0.20 thousand MT was exported which again declined in the next three years until 1999. In 2000, 0.40 thousand MT valued at US $ 0.13 million was exported. There has been no significant import of copra to India during any of the years from 1990 to 2000.

### 1.3.5 Maize

India exports maize, maize seeds and maize flour to Malaysia, UAE, Sri Lanka and occasionally to Kuwait, Iran and South Africa. India's maize export was almost negligible until 1992. However, 26.67 thousand MT of maize valued at US $ 3.08 million was exported in 1993 which increased to 55.36 thousand MT valued at US $ 10.46 million in 1996 but again declined to 1.61 thousand MT in 1997, 2.06 thousand MT in 1998 and 1.27 thousand MT in 1999 before increasing to 42.47 thousand MT valued at US $ 5.97 million in 2000.

India also imports maize for animal feed and its import for poultry and animal feed manufacturers is allowed at Zero percent duty. The import was negligible during the period from 1990 to 1997. However, 1.44 thousand MT valued at US $ 0.20 million was imported which increased to an all time high of 204.53 thousand MT valued at US $ 26.24 million in 1999. The quantity of import decreased to 28.92 thousand MT valued at US $ 3.23 million in the following year. In the light of the fact that maize is an important animal feed, particularly for poultry which is expanding coupled with the fact that its import by manufacturers of animal feed is allowed at zero percent duty, import of maize to India is likely to increase in foreseeable future.

### 1.3.6 Soybeans

Export of Soybeans from India has either been nil or negligible during the period from 1990 to 1996. A quantity 11.50 thousand MT valued at US $ 3.24 million was exported in 1997 which again declined substantially during the next two years before increasing to 75.02 thousand MT valued at US $ 15.67 million in 2000.

The import of Soybeans has been nil or negligible during ten out of eleven years from 1990 to 2000. Only in 1995, a significant quantity of 29.45 thousand MT valued at US $ 7.52 million was imported.

India imported about 50 percent of the total availability of edible oils in the country in 2001 to bridge the gap between domestic demand and production. Despite this, the import of soybeans has not been of significant quantity mainly due to availability of low priced substitute such as palm oil. The fact that earlier India imported rapeseed but later on switched over to palm oil, for instance, demonstrates the effect of substitutability within the oilseeds group. Given highly elastic nature of demand for edible oils, behavior of international prices will, to a great extent, determine the quantum of future imports.

## 2 PRODUCTIVITY INDICES AND BENCHMARKING

This section has been divided into the following three sub-sections:

- **Productivity Indices of Raw Commodities;**
- **Productivity Indices of the tradable Processed Commodities; and**
- **Benchmarking Analysis**

### 2.1 Productivity Indices of Raw Commodities

In this section, productivity of land, labor, capital and also their combined effect i.e. TFP (total factor productivity) at national level in respect of all the six commodities selected under the survey viz. rice (paddy), sugarcane, natural rubber, coconut, maize and soybeans has been analyzed.

### 2.1.1 Productivity of Rice (Paddy)

Productivity measures of national average rice (paddy) farms and corresponding compound annual growth rates have been presented in Table 3.

**Table 3. Land and Labor Productivity of Rice (Paddy) in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 2.61 | 2.70 | 2.87 | 0.64 | 1.26 |
| Labor /Land Ratio (Man-day/ hectare) | 101.24 | 103.61 | 74.80 | 0.46 | -6.31 |
| Labor Productivity (Kg./ man-day) | 25.78 | 26.02 | 38.37 | 0.18 | 8.08 |
| Value Added per hectare (at constant 1995 US $) | 408.04 | 326.03 | 363.56 | -4.39 | 2.20 |
| Value Added per hectare (Index) | 125.15 | 100.00 | 111.51 | -4.39 | 2.20 |
| Value Added per man-day (at constant 1995 US $) | 4.03 | 3.15 | 4.86 | -4.83 | 9.08 |
| Value Added per man-day (Index) | 128.08 | 100.00 | 154.45 | -4.83 | 9.08 |
| Value Added per MT (at constant 1995 US $) | 156.32 | 120.96 | 126.68 | -5.00 | 0.93 |
| Value Added per MT (Index) | 129.23 | 100.00 | 104.73 | -5.00 | 0.93 |

#### 2.1.1.1 Land and Labor Productivity of Rice (Paddy)

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during the decade of 1990s. It recorded a growth rate at 1.26 percent per annum during the second half of 1990s compared to 0.64 percent per annum during the first half of 1990s. The value added per hectare in constant 1995 US $ terms has decreased from US $ 408.04 in 1990 to US $ 326.03 in 1995 before increasing to US $ 363.56 in 2000. This may be seen in the backdrop of steep devaluation of Indian rupee vis-à-vis US dollar by 46 percent during the period 1990-95. Value added per MT increased at slower pace compared to rate of increase in value added per hectare during the second half of 1990s which validates the fact that land productivity has increased during this period..

The labor productivity in terms of value added per man day in constant 1995 US $ terms increased from US$3.15 in 1995 to US$4.86 in 2000 at 9.08 percent annually, though a negative growth rate of (-) 4.83 percent per annum was posted during the first half of 1990s. The index of labor productivity has increased from 128.08 in the year 1990 to 154.45 in the year 2000. Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited downward trend during the second half of 1990s, though it increased marginally at 0.46 percent per annum during the first half of 1990s. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization.

#### 2.1.1.2 Capital Productivity of Rice (Paddy)

Capital productivity which is the value added per depreciation, posted a negative annual growth rate at (-)5.23 percent per annum during the first half of 1990s against (-) 9.61 percent during the second half of 1990s (Table 4).The index of capital productivity has declined from 130.84 in 1990 to 60.35 in 2000.

**Table 4. Capital Productivity of Rice (Paddy) in India-1990-2000**

(Rs., 1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 44.44 | 33.97 | 20.50 | -5.23 | -9.61 |
| Value Added per capital (Index) | 130.84 | 100.00 | 60.35 | -5.23 | -9.61 |

It is noted that productivity of labor and capital in real rupee terms have moved in the opposite directions during the decade of 1990s. While the labor productivity has exhibited an increasing trend, the capital productivity has shown a declining trend. This indicates that there is an effect of substitution between the two factors of production namely labor and capital. As the agriculture sector moves towards farm mechanization, there is higher consumption of capital goods like tractors and other machines, which substitute human labor.

### 2.1.1.3 Total Factor Productivity of Rice (Paddy)

Total factor productivity (TFP) of rice (paddy), total output and total input indices have been presented in Table 5.

**Table 5. Total Factor Productivity of Rice (Paddy) in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 92.57 | 100.00 | 115.88 | 1.56 | 2.99 |
| Total Input | 97.25 | 100.00 | 88.69 | 0.56 | -2.37 |
| Total Factor Productivity | 95.18 | 100.00 | 130.65 | 0.99 | 5.49 |

TFP index has shown an upward trend which increased from 95.18 in 1990 to 130.65 in 2000. It posted a nominal annual growth rate at 0.99 percent during the first half of 1990s compared to 5.49 percent during the second half of the decade.

It is noted that the land productivity, labor productivity and TFP of rice (paddy) have improved faster during the second half of 1990s compared to the performance achieved during the first half of 1990s. This may be seen in the backdrop of the fact that the year 1995 has been the pacesetter in the international trade of agriculture when Agreement on Agriculture (AoA) negotiated under the Uruguay Round came into effect.

### 2.1.2 Productivity of Sugarcane

Productivity measures of national average sugarcane farms and corresponding compound annual growth rates have been presented in Table 6.

**Table 6. Land and Labor Productivity of Sugarcane in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 65.33 | 67.73 | 69.52 | 0.73 | 0.52 |
| Labor /Land Ratio (Man-day/ hectare) | 151.66 | 189.34 | 173.25 | 4.54 | -1.76 |
| Labor Productivity (Kg./ man-day) | 430.73 | 357.74 | 401.26 | -3.65 | 2.32 |

| | | | | | |
|---|---|---|---|---|---|
| Value Added per hectare (at constant 1995 US $) | 1515.70 | 1149.19 | 1300.07 | -5.39 | 2.50 |
| Value Added per hectare (Index) | 131.89 | 100.00 | 113.13 | -5.39 | 2.50 |
| Value Added per man-day (at constant 1995 US $) | 9.99 | 6.07 | 7.50 | -9.49 | 4.33 |
| Value Added per man-day (Index) | 164.66 | 100.00 | 123.64 | -9.49 | 4.33 |
| Value Added per MT (at constant 1995 US $) | 23.20 | 16.97 | 18.70 | -6.07 | 1.97 |
| Value Added per MT (Index) | 136.76 | 100.00 | 110.23 | -6.07 | 1.97 |

### 2.1.2.1 Land and Labor Productivity of Sugarcane

Land productivity of sugarcane in physical quantity terms has shown an upward trend during the decade of 1990s. A moderate growth rate at 0.73 percent per annum during the first half of 1990s further ebbed to 0.52 percent per annum during the second half of 1990s. The value added per hectare in constant 1995 US $ terms has decreased from US $ 1515.70 in 1990 to US $ 1149.19 in 1995 before increasing to US $ 1300.07 in 2000 (**Table 6**). This may be seen in the backdrop of steep devaluation of Indian rupee vis-à-vis US dollar by 46 percent during the period 1990-95. Value added per MT increased at slower pace compared to rate of increase in value added per hectare during the second half of 1990s which validates the fact that land productivity has increased during this period.

The labor productivity in terms of value added per man day in constant 1995 US $ terms decreased from US $ 9.99 per man-day in 1990 to US $ 6.07 per man-day in 1995 and then increased to US $ 7.50 per man-day in 2000. Likewise, the index of labor productivity has fluctuated between 164.66 in the year 1990 (with base 1995=100) and 123.64 in the year 2000. Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited downwards trend during the second half of 1990s, though it increased at 4.54 percent per annum during the first half of 1990s. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization.

### 2.1.2.2 Capital Productivity of Sugarcane

Capital productivity of sugarcane followed a path of negative growth rate throughout the reference period. The growth rate of (-) 7.18 percent per annum during the first half of 1990s further ebbed to (-) 8.29 percent during the second half of 1990s (**Table 7**).

**Table 7. Capital Productivity of Sugarcane in India-1990-2000**

(Rs., 1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 222.91 | 153.57 | 99.63 | -7.18 | -8.29 |
| Value Added per capital (Index) | 145.15 | 100.00 | 64.88 | -7.18 | -8.29 |

The index of capital productivity in real rupee terms has declined from 145.15 in 1990 to 64.88 in 2000.

### 2.1.2.3 Total Factor Productivity of Sugarcane

Total factor productivity (TFP) of sugarcane**,** total output and total input indices have been presented in **Table 8**.

**Table 8. Total Factor Productivity of Sugarcane in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity(Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 88.98 | 100.00 | 99.28 | 2.36 | -0.14 |
| Total Input | 74.03 | 100.00 | 108.05 | 6.20 | 1.56 |
| Total Factor Productivity | 120.20 | 100.00 | 91.89 | -3.61 | -1.68 |

The TFP has exhibited downward trend and its index (with base 1995=100) declined from 120.20 in 1990 and 91.89 in 2000. The negative annual growth rate at (-) 3.61 percent during the first half of 1990s improved to (-) 1.68 percent during the second half of 1990s. The decline in TFP during 1990s was more pronounced during the first half of the decade due to higher growth in input prices compared to that of output.

### 2.1.3 Productivity of Rubber (Natural)

Productivity measures of national average Rubber (Natural) farms and corresponding annual growth rates (Table 9) are being discussed for the period 1993-2000 and not for 1990-2000, as data for this crop could be obtained for 1993-2000.

**Table 9. Land and Labor Productivity of Rubber in India-1993-2000**

(1995=100, Percent)

| Measure of Productivity | 1993 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1993-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 1.29 | 1.42 | 1.58 | 5.18 | 2.08 |
| Labor /Land Ratio (Man-day/ hectare) | 225.00 | 227.00 | 212.00 | 0.44 | -1.36 |
| Labor Productivity (Kg./ man-day) | 5.71 | 6.26 | 7.44 | 4.72 | 3.49 |
| Value Added per hectare (at constant 1995 US $) | 1074.94 | 2229.96 | 1164.41 | 44.03 | -12.19 |
| Value Added per hectare (Index) | 48.20 | 100.00 | 52.22 | 44.03 | -12.19 |
| Value Added per man-day (at constant 1995 US $) | 4.78 | 9.82 | 5.49 | 43.39 | -10.98 |
| Value Added per man-day (Index) | 48.63 | 100.00 | 55.91 | 43.39 | -10.98 |
| Value Added per MT (at constant 1995 US $) | 836.22 | 1568.02 | 738.64 | 36.94 | -13.98 |
| Value Added per MT (Index) | 53.33 | 100.00 | 47.11 | 36.94 | -13.98 |

#### 2.1.3.1 Land and Labor Productivity of Rubber (Natural)

Land productivity of rubber (natural) has shown an upward trend during 1993-2000. It recorded a growth rate at 5.18 percent per annum during 1993-95 which decelerated to 2.08 percent per annum during the second half of the decade. The value added per hectare in constant 1995 US$ terms has increased from US $ 1074.94 in 1993 to US $ 2229.96 in 1995 but declined to US $ 1164.41 in 2000 (**Table 9**). This may be seen in the backdrop of steep devaluation of Indian rupee vis-à-vis US dollar by 46 percent during the period 1990-95. An impressive growth rate at 36.94 percent in value added per MT terms has been recorded during 1993-95 which decreased to (-) 13.98 percent per annum during the second half of 1990s. This is explained by the record high

prices of rubber in international market in 1995 which could not be sustained in post-1995 period.

The labor productivity in terms of value added per man day in constant 1995 US $ terms increased from US $ 4.78 per man-day in 1993 to US $ 9.82 per man-day in 1995 before declining to US $ 5.49 per man-day in 2000. The index of labor productivity has moved from 48.63 in 1993 to 55.91 in 2000 (with base 1995=100). Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited downward trend during the second half of 1990s, though it increased marginally at 0.44 percent per annum during the first half of 1990s. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization.

### 2.1.3.2 Capital Productivity of Rubber (Natural)

Value added per depreciation posted a negative annual growth rate at (-) 36.44 percent per annum during 1993-95 against 1.07 percent during the second half of 1990s (**Table 10**).

**Table 10. Capital Productivity of Rubber (Natural) in India-1993-2000**

(Rs., 1995=100, Percent)

| Measure of Productivity | 1993 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1993-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 22.94 | 9.27 | 9.77 | -36.44 | 1.07 |
| Value Added per capital (Index) | 247.53 | 100.00 | 105.46 | -36.44 | 1.07 |

The index of capital productivity has declined from 247.53 in 1993 to 100 in 1995 but increased to 105.46 in 2000.

It is noted that productivity of labor and capital of NR in real rupee terms have moved in the opposite directions until 1995 only. However, their movement has been in the same direction during post-995 period. Thus, effect of substitution between labor and capital has been observed during pre-995 period.

### 2.1.3.3 Total Factor Productivity of Rubber (Natural)

Total factor productivity (TFP) of Rubber (Natural), total output and total input indices have been presented in **Table 11**.

**Table 11. Total Factor Productivity of Rubber in India-1993-2000**

(1995=100, Percent)

| Measure of Productivity(Index) | 1993 | 1995 | 2000 | Annual Growth Rate (Percent) During | |
|---|---|---|---|---|---|
| | | | | 1993-1995 | 1995-2000 |
| Total Output | 67.33 | 100.00 | 163.80 | 21.87 | 10.37 |
| Total Input | 94.96 | 100.00 | 110.75 | 2.62 | 2.06 |
| Total Factor Productivity | 70.91 | 100.00 | 147.90 | 18.75 | 8.14 |

The TFP index has increased from 70.91 in 1993 to 147.90 in 2000. The growth rate in the TFP at 18.75 percent per annum during 1993-95 decelerated to 8.14 percent per annum during the second half of 1990s mainly due to non-sustainability of high price of rubber that ruled in international market in 1995.

### 2.1.4 Productivity of Coconut

Productivity measures of national average rice (paddy) farms and corresponding compound annual growth rates have been presented in **Table 12**.

#### 2.1.4.1 Land and Labor Productivity of Coconut

Land productivity of coconut has increased from 6.60 thousand nuts per hectare in 1990 to 7.07 thousand nuts per hectare in 1995 before declining to 6.85 thousand nuts per hectare in 2000. It recorded a growth rate at 1.39 percent per annum during the first half of 1990s compared with (-)0.63 percent per annum during second half of the decade. The value added per hectare of national average coconut orchards in constant 1995 US $ terms has decreased from US $ 1016.79 in 1990 to US $ 594.58 in 1995 and further to US $ 291.18 in 2000. Value added per MT decreased at (-) 12.76 percent per annum during the second half of 1990s compared to (-) 11.40 percent per annum during the first half of 1990s.

**Table 12. Land and Labor Productivity of Coconut in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity ('000 nuts/hectare) | 6.60 | 7.07 | 6.85 | 1.39 | -0.63 |
| Labor /Land Ratio (Man-day/ hectare) | 110.00 | 128.00 | 103.00 | 3.08 | -4.25 |
| Labor Productivity (Kg./ man-day) | 59.96 | 55.20 | 66.48 | -1.64 | 3.79 |
| Value Added per hectare (at constant 1995 US $) | 1016.79 | 594.58 | 291.18 | -10.18 | -13.31 |
| Value Added per hectare (Index) | 171.01 | 100.00 | 48.97 | -10.18 | -13.31 |
| Value Added per man-day (at constant 1995 US $) | 9.24 | 4.65 | 2.83 | -12.86 | -9.45 |
| Value Added per man-day (Index) | 198.99 | 100.00 | 60.86 | -12.86 | -9.45 |
| Value Added per MT (at constant 1995 US $) | 154.17 | 84.15 | 42.53 | -11.40 | -12.76 |
| Value Added per MT (Index) | 183.21 | 100.00 | 50.54 | -11.40 | -12.76 |

The labor productivity in terms of value added per man day in constant 1995 US$ terms followed a path of negative growth throughout the decade of 1990s. It decreased from US $ 9.24 per man-day in 1990 to US $ 2.83 per man-day in 2000 and corresponding index decreased from 198.99 in 1990 (with the year 1995=100) to 60.86 in 2000. Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited downward trend during the second half of 1990s, though it increased at 3.08 percent per annum during the first half of 1990s. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization.

#### 2.1.4.2 Capital Productivity of Coconut

Value added per depreciation posted a negative annual growth rate at around (-) 10.4 percent per annum throughout the decade of 1990s (**Table 13**).

**Table 13. Capital Productivity of Coconut in India-1990-2000**

(Rs., 1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 40.45 | 23.40 | 13.47 | -10.37 | -10.46 |
| Value Added per capital (Index) | 172.86 | 100.00 | 57.56 | -10.37 | -10.46 |

The capital productivity in real rupee terms has shown a declining trend and its index had a free fall from 172.86 in 1990 to 57.56 in 2000.

### 2.1.4.3 Total Factor Productivity of Coconut

The TFP index has exhibited a long term upward trend during the decade of 1990s, albeit with fluctuations. It moved from 106.37 in 1990 to 115.00 in 2000 and posted a growth rate at 2.83 percent per annum during the second half of 1990s compared to (-) 1.23 percent during the first half of 1990s. This turnabout took place during post-995 period due to increase in total output in contrast to decline in input index.

**Table 14. Total Factor Productivity of Coconut in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 76.51 | 100.00 | 105.25 | 5.50 | 1.03 |
| Total Input | 71.93 | 100.00 | 91.52 | 6.81 | -1.76 |
| Total Factor Productivity | 106.37 | 100.00 | 115.00 | -1.23 | 2.83 |

### 2.1.5 Productivity of Maize

Productivity measures of national average maize farms and corresponding compound annual growth rates have been presented in **Table 15**.

**Table 15. Land and Labor Productivity of Maize in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 1.52 | 1.59 | 1.84 | 0.99 | 2.91 |
| Labor /Land Ratio (Man-day/ hectare) | 54.89 | 74.14 | 60.50 | 6.20 | -3.98 |
| Labor Productivity (Kg./ man-day) | 27.65 | 21.51 | 30.42 | -4.90 | 7.18 |
| Value Added per hectare (at constant 1995 US $) | 219.42 | 203.03 | 220.71 | -1.54 | 1.68 |
| Value Added per hectare (Index) | 108.07 | 100.00 | 108.71 | -1.54 | 1.68 |
| Value Added per man-day (at constant 1995 US $) | 4.00 | 2.74 | 3.65 | -7.29 | 5.90 |
| Value Added per man-day (Index) | 145.97 | 100.00 | 133.21 | -7.29 | 5.90 |
| Value Added per MT (at constant 1995 US $) | 144.56 | 127.32 | 119.91 | -2.51 | -1.19 |
| Value Added per MT (Index) | 113.54 | 100.00 | 94.18 | -2.51 | -1.19 |

### 2.1.5.1 Land and Labor Productivity of Maize

Land productivity of maize has shown an upward trend during the decade of 1990s. It recorded a growth rate at 2.91 percent per annum during the second half of 1990s compared to nominal growth at 0.99 percent per annum during the first half of 1990s.

The value added per hectare in constant 1995 US $ terms has exhibited fluctuations during the reference period. It was US $ 219.42 per hectare in 1990 which decreased to US $ 203.03 per hectare in 1995 before increasing to US $ 220.71 per hectare in 2000 (**Table 15**). Likewise, the index of land productivity has fluctuated from 108.07 in 1990 (with base 1995=100) to 108.71 in 2000. Value added per MT decreased at (-) 2.51 percent per annum during pre-1995 period but the rate of decline decelerated to (-) 1.19 percent during post-1995 period.

The labor productivity in terms of value added per man day (at constant 1995 US $) decreased from US $ 4.00 per man-day in 1990 to US $ 2.74 per man-day in 1995 before increasing to US $ 3.65 per man-day in 2000. The index of labor productivity has fluctuated between 145.97 in 1990 and 133.21 in the year 2000 (with base 1995=100).

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited downwards trend during the second half of 1990s, though it increased at 6.20 percent per annum during the first half of 1990s. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization.

### 2.1.5.2 Capital Productivity of Maize in India

Value added per depreciation posted a negative annual growth rate at (-) 9.22 percent per annum during the first half of 1990s and rate of decline slowed down to (-) 5.01 percent during the second half of 1990s (Table 16).

**Table 16. Capital Productivity of Maize in India-1990-2000**

(Rs., 1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 54.86 | 33.81 | 26.16 | -9.22 | -5.01 |
| Value Added per capital (Index) | 162.24 | 100.00 | 77.35 | -9.22 | -5.01 |

The index of capital productivity in real rupee terms has declined from 162.24 in 1990 to 77.35 in 2000.

While the labor productivity in real terms has increased during post-1995 period, the capital productivity has declined during the corresponding period. This shows an effect of substitution between two factors of production namely labor and capital during this period which is taking place due to farm mechanization through higher consumption of capital goods like tractors and other machinery.

### 2.1.5.3 Total Factor Productivity of Maize in India

Total factor productivity (TFP) of maize, total output and total input indices have been presented in **Table 17**.

**Table 17. Total Factor Productivity of Maize in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 134.51 | 100.00 | 132.71 | -5.76 | 5.82 |
| Total Input | 93.91 | 100.00 | 104.57 | 1.26 | 0.90 |
| Total Factor Productivity | 143.23 | 100.00 | 126.91 | -6.93 | 4.88 |

The TFP has exhibited fluctuations and posted a positive growth rate at 4.88 percent per annum during the post-1995 period compared to (-) 6.93 percent per annum

It is noted that the land productivity, labor productivity and TFP of maize have improved faster during post-1995 period compared to the performance of corresponding indicators during pre-1995 period. This may be seen in the backdrop of the fact that the year 1995 has been the pacesetter in the international trade of agriculture when Agreement on Agriculture (AoA) negotiated under the Uruguay Round came into effect.

### 2.1.6 Productivity of Soybeans

Productivity measures of national average soybeans farms and corresponding growth rates have been presented in **Table 18**.

**Table 18. Land and Labor Productivity of Soybeans in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 1.01 | 1.01 | 0.82 | -0.05 | -4.08 |
| Labor /Land Ratio (Man-day/ hectare) | 47.05 | 61.07 | 46.10 | 5.35 | -5.47 |
| Labor Productivity (Kg./ man-day) | 21.56 | 16.57 | 17.82 | -5.13 | 1.46 |
| Value Added per hectare (at constant 1995 US $) | 341.51 | 209.24 | 110.90 | -9.33 | -11.92 |
| Value Added per hectare (Index) | 163.21 | 100.00 | 53.00 | -9.33 | -11.92 |
| Value Added per man-day (at constant 1995 US $) | 7.26 | 3.43 | 2.41 | -13.94 | -6.83 |
| Value Added per man-day (Index) | 211.82 | 100.00 | 70.21 | -13.94 | -6.83 |
| Value Added per MT (at constant 1995 US $) | 336.61 | 206.75 | 134.98 | -9.29 | -8.17 |
| Value Added per MT (Index) | 162.81 | 100.00 | 65.29 | -9.29 | -8.17 |

#### 2.1.6.1 Land and Labor Productivity of Soybeans

Land productivity of soybeans has declined at (-) 4.08 percent during the second half of 1990s while it remained almost constant during the first half of 1990s. The value added per hectare of national average soybeans farms has decreased from US $ 341.51 per hectare in 1990 to US $ 209.24 per hectare in 1995 and further to US $ 110.90 per hectare in 2000. Value added per MT posted a negative growth rate at (-) 9.29 percent per annum during the first half of 1990s compared to (-) 8.17 percent per annum during the second half of 1990s.

The labor productivity in terms of value added per man day (at constant 1995 US $) witnessed a downward trend during 1990s. It was US $ 7.26 per man-day in 1990 which decreased to US $ 3.43 per man-day in 1995 and further to US $ 2.41 per man-day in 2000.Likewise, the index of labor productivity has declined from 211.82 in the year 1990 (with base year 1995=100) and 70.21 in the year 2000.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited downwards trend during the second half of 1990s, though it increased at 5.35 percent per annum during the first half of 1990s. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization.

#### 2.1.6.2 Capital Productivity of Soybeans

Value added per depreciation posted a negative annual growth rate at (-) 2.78 percent per annum during the first half of 1990s against (-) 12.73 percent during the second half of 1990s (Table 19).

**Table 19. Capital Productivity of Soybeans in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 43.52 | 37.79 | 19.13 | -2.78 | -12.73 |
| Value Added per capital (Index) | 115.16 | 100.00 | 50.63 | -2.78 | -12.73 |

The index of capital productivity in real rupee terms has declined from 115.16 in 1990 to 50.63 in 2000.

### 2.1.6.3 Total Factor Productivity of Soybeans

Total factor productivity (TFP) of soybeans, total output and total input indices have been presented in **Table 20**.

**Table 20. Total Factor Productivity of Soybeans in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 57.01 | 100.00 | 89.17 | 11.89 | -2.27 |
| Total Input | 43.69 | 100.00 | 123.51 | 18.01 | 4.31 |
| Total Factor Productivity | 130.51 | 100.00 | 72.20 | -5.19 | -6.31 |

The TFP has exhibited declining trend and posted a negative growth rate at (-) 6.31 percent per annum during pre-1995 period compared to (-) 5.19 percent per annum during post-1995 period. During the second half of 1990s, index of total input increased while that of total output declined and this explains sharper decline in TFP during the corresponding period.

## 2.2 Productivity Indices of the Tradable Processed Forms of the Commodities

In the previous section, behavior of productivity indices of selected raw crops at farm level (except in case of natural rubber where farm and factory activities are interwoven) was discussed. In the context of international trade, processed rather than raw crops are traded. Therefore, importance of productivity of rice (milled) and copra, for instance, can not be overemphasized. In this section, behavior of productivity of two processed commodities viz. rice (milled) and copra have been discussed as authentic relevant data could be obtained in respect of these two commodities.

### 2.2.1 Productivity of Rice (Milled)

Productivity of rice (milled) has been presented in Table 21.

**Table 21. Labor and Capital Productivities of Rice (Milled) in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per worker (at constant 1995 US $) | 6453.10 | 19311.14 | 31068.60 | 24.51 | 9.98 |
| Value Added per worker (Index) | 33.42 | 100.00 | 160.88 | 24.51 | 9.98 |
| Value Added per depreciation (Absolute at constant 1995 US $) | 1074.91 | 1831.94 | 1584.03 | 11.25 | -2.87 |
| Value Added per depreciation (Index) | 58.68 | 100.00 | 86.47 | 11.25 | -2.87 |

#### 2.2.1.1 Labor and Capital Productivity of Rice (Milled)

Value added per worker in constant US$ terms of rice (milled) has shown an upward movement during the decade of 1990s. It posted an impressive growth rate at 24.51 percent per annum during the first half of 1990s compared to 9.98 percent during the second half of 1990s.

Value added per depreciation posted a negative annual growth rate at (-) 2.87 percent per annum during the second half of 1990s against 11.25 percent during the first half of 1990s. As the processing sector moves towards modernization/ technology upgradation, it is increasingly becoming capital intensive and consequently there is higher consumption of capital goods like improved machines which substitute human labor.

#### 2.2.1.2 Total Factor Productivity of Rice (Milled)

Total factor productivity (TFP) of rice (milled), total output and total input indices have been presented in **Table 22**.

**Table 22. Total Factor Productivity of Rice (Milled) in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 84.92 | 100.00 | 93.07 | 3.32 | -1.43 |
| Total Input | 133.14 | 100.00 | 93.36 | -5.56 | -1.36 |
| Total Factor Productivity | 63.78 | 100.00 | 99.69 | 9.41 | -0.06 |

TFP of rice (milled) in India exhibited upward trend during the first half of 1990s and posted an impressive growth rate at 9.41 percent during this period. However, it marginally declined at (-) 0.06 percent during the second half of 1990s (Table 22). As the movement and level of changes in total output and total input were similar during the second half of 1990s, TFP remained almost constant during the corresponding period.

### 2.2.2 Productivity of Copra

Productivity of copra has been presented in Table 23.

**Table 23. Labor and Capital Productivities of Copra in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per worker (at constant 1995 US $) | 1240.04 | 1938.33 | 3385.74 | 9.34 | 11.80 |
| Value Added per worker (Index) | 63.97 | 100.00 | 174.67 | 9.34 | 11.80 |
| Value Added per depreciation (at constant 1995 US $) | 1.71 | 2.28 | 3.39 | 5.92 | 8.23 |
| Value Added per depreciation (Index) | 75.00 | 100.00 | 148.47 | 5.92 | 8.23 |

#### 2.2.2.1 Labor and Capital Productivity of Copra

Value added per worker in constant US$ terms of copra has shown an upward movement during the decade of 1990s. It posted a high growth rate at 9.34 percent per

annum during the first half of 1990s which further improved to 11.80 percent during the second half of 1990s.

Value added per depreciation also registered a positive growth rate at 5.92 percent per annum during the first half of 1990s compared to 8.23 percent per annum during the first half of 1990s.

#### 2.2.2.2 Total Factor Productivity of Copra

Total factor productivity (TFP) of copra**,** total output and total input indices have been presented in **Table 24**.

**Table 24. Total Factor Productivity of Copra in India-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 77.32 | 100.00 | 168.55 | 5.28 | 11.01 |
| Total Input | 94.06 | 100.00 | 91.84 | 1.23 | -1.69 |
| Total Factor Productivity | 82.20 | 100.00 | 183.53 | 4.00 | 12.91 |

The TFP index followed a path of positive growth throughout the reference period. It posted a growth at 4.00 percent per annum during the first half of 1990s which increased remarkably to 12.91 percent per annum during the second half of 1990s. This has happened mainly due to increase in total output in contrast to decline in total input during post-1995 period.

### 2.3 Benchmarking

Competitiveness is crucial to successful trade. The role of performance indicators as an aid to measure and sharpen the competitiveness of agriculture commodities, therefore, assumes importance. Benchmarking focuses on creating a *masterpiece*[2] which enables to compare performances between and within industries.

There could be two alternative approaches to selection of farms/ factories for benchmarking. The first one is selection of EOU (Export Oriented Units) and the other being large size farms/factories. In this survey, the second alternative is adopted under which certain large size farms/factories have been selected for the purpose. The average size of operational holdings of such farms is higher at above 10 hectares compared to all-India average size of holdings (all crops under the survey) at 1.57 hectares.

For the purpose of benchmarking, the *partial* productivity of large size farms/factories (hereafter referred to as **benchmark** farms/factories) have been compared with the corresponding national average productivity for the year 2000 by estimating level of inefficiency. The inefficiency, as defined by this author, is (1-e) *100, where 'e' denotes the ratio of value added in respect of national average farms to that of the corresponding benchmark farms. In the limiting case, the productivity at national level could be equal to that of benchmark farm. In that event, inefficiency will be zero as the value of 'e' would be unity. The crop specific inefficiencies are discussed in the following sub-sections.

### 2.3.1 Rice (Paddy)

[2] *The expression used by Mr. Glenn Ronan in his presentation in the Symposium on Agricultural Productivity Index (Phase-III) held at Bangkok from16-18 December, 2003.*

Value added by national average rice (paddy) farms vis-à-vis those by benchmark farms have been presented in Table 25.
It is observed that the national average farms have been operating at sub-optimal level compared to the benchmark farms. The level of inefficiency in national average farms in terms of value added per hectare, for instance, has been high at 67 percent in 2000. Thus, there exists a potential to obtain a substantially higher 'value added' in respect of national average farms under paddy cultivation.

**Table 25. Inefficiency in National Average Farms Compared to the Benchmark Farms under Paddy Cultivation – 2000**

(Rs, Percentage)

| Value Added (Broad) | National Average Farms (Average Farm Size = 0.87 hectare | Benchmark Farms (Average Farm Size = 10.00 hectare) | Inefficiency |
|---|---|---|---|
| Per hectare | 13769.79 | 41913.79 | 67.15 |
| Per MT | 4798.20 | 9679.86 | 50.43 |
| Per Man-day | 184.09 | 461.86 | 60.14 |
| Per Depreciation | 29.64 | 30.56 | 3.01 |

Source : Table 3-1, Part-II Statistical Data of this Report.

### 2.3.2 Sugarcane

Value added by national average sugarcane farms vis-à-vis those by benchmark farms have been presented in Table 26.

**Table 26. Inefficiency in National Average Farms Compared to the Benchmark Farms under Sugarcane Cultivation – 2000**

(Unit: Rs, Percentage)

| Value Added (Broad) | National Average Farms (Average Farm Size = 0.81 hectare) | Benchmark Farms (Average Farm Size = 10.00 hectare) | Inefficiency |
|---|---|---|---|
| Per hectare | 49240.34 | 82045.65 | 39.98 |
| Per MT | 708.31 | 824.58 | 14.10 |
| Per Man-day | 284.22 | 496.04 | 42.70 |
| Per Depreciation | 142.46 | 164.45 | 13.37 |

Source : Table 3-4, Part-II Statistical Data of this Report.

It is observed that the national average farms have been operating at sub-optimal level compared to the benchmark farms. The level of inefficiency in national average farms in terms of value added per hectare, for instance, has been high at about 40 percent in 2000.Thus, there exists a potential to obtain a substantially higher 'value added' in respect of national average farms under sugarcane cultivation.

### 2.3.3 Rubber (Natural)

Value added by national average rubber (natural) farms vis-à-vis those by benchmark farms have been presented in Table 27.
It is observed that the national average farms have been operating at sub-optimal level compared to the benchmark farms. The level of inefficiency in national average farms in terms of value added per hectare, for instance, has been high at 53 percent in 2000.Thus, there exists a potential to obtain a substantially higher 'value added' from land and labor in respect of national average farms under natural rubber cultivation. It is noted that value added per depreciation for benchmark natural rubber farms is lower that

that for national average farms. The reason for this can be traced to substitution of labor for capital by BM farms as a result of farm mechanization and technology upgradation.

**Table 27. Inefficiency in National Average Farms Compared to the benchmark Farms under Natural Rubber Cultivation-2000**

(Unit: Rs, Percentage)

| Value Added (Broad) | National Average Farms (Average Farm Size = 0.50 hectare) | Benchmark Farms (Average Farm Size = 20.00 hectare) | Inefficiency |
|---|---|---|---|
| Per hectare | 44102.09 | 94802.40 | 53.48 |
| Per MT | 27976.12 | 45144.00 | 38.03 |
| Per Man-day | 208.03 | 611.63 | 65.99 |
| Per Depreciation | 5.84 | 3.18 | -83.65 |

Source : Table 3-5, Part-II Statistical Data of this Report.

### 2.3.4 Coconut

Value added by national average coconut orchard vis-à-vis those by benchmark farms have been presented in Table 28.

**Table 28. Inefficiency in National Average Farms Compared to the Benchmark Farms under Coconut Cultivation – 2000**

(Rs, Percentage)

| Value Added (Broad) | National Average Farms (Average Farm Size = 0.20 hectare) | Benchmark Farms (Average Farm Size = 15.00 hectare) | Inefficiency |
|---|---|---|---|
| Per hectare | 11028.49 | 29456.00 | 62.56 |
| Per Nut | 1.61 | 1.93 | 16.58 |
| Per Man-day | 107.07 | 297.54 | 64.01 |
| Per Depreciation | 7.50 | 19.38 | 61.30 |

Source : Table 3-6, Part-II Statistical Data of this Report.

It is observed that the national average orchards have been operating at sub-optimal level compared to the benchmark farms. The level of inefficiency in national average orchards in terms of value added per hectare, for instance, has been high at 63 percent in 2000. Thus, there exists a potential to obtain a substantially higher 'value added' in respect of national average farms under coconut cultivation.

In the context of productivity, it may be pertinent to add here that although the available data suggest higher productivity in case of large size farms, there is no causal relation between the two parameters. At best, this is a case of pseudo correlation. Based on the experience of this author, it may be stated that size of the farm influences the level of productivity through education and availability of resources. As large size cultivators are generally more educated and are comparatively richer, their level of awareness of the latest technology and command on resources is higher. As a result, they manage their farms in a better way by timely application of quality inputs and use of better technology which influences the productivities. This holds good for all the selected crops.

### 2.3.5 Maize

Value added by national average maize farms vis-à-vis those by benchmark farms have been presented in Table 29.

**Table 29. Inefficiency in National Average Farms Compared to the Benchmark Farms under Maize Cultivation – 2000**

(Rs, Percentage)

| Value Added (Broad) | National Average Farms (Average Farm Size = 0.51 hectare) | Benchmark Farms (Average Farm Size = 10.00 hectare) | Inefficiency |
|---|---|---|---|
| Per hectare | 8359.35 | 18617.91 | 55.10 |
| Per MT | 4541.78 | 4835.82 | 6.08 |
| Per Man-day | 138.17 | 335.88 | 58.86 |
| Per Depreciation | 31.83 | 30.15 | -5.57 |

Source : Table 3-2, Part-II Statistical Data of this Report.

It is observed that the national average farms have been operating at sub-optimal level compared to the benchmark farms. The level of inefficiency in national average farms in terms of value added per hectare, for instance, has been high at about 55 percent in 2000.Thus, there exists a potential to obtain a substantially higher 'value added' from land and labor in respect of national average farms under maize cultivation.

It is noted that value added per depreciation for benchmark maize farms is lower that that for national average farms. The reason for this can be traced to substitution of labor for capital by BM farms as a result of farm mechanization.

### 2.3.6 Soybeans

Value added by national average maize farms vis-à-vis those by benchmark farms have been presented in Table 30.

**Table 30. Inefficiency in National Average Farms Compared to the Benchmark Farms under Soybeans Cultivation – 2000**

(Unit : Rs, Percentage)

| Value Added (Broad) | National Average Farms (Average Farm Size = 0.55 hectare) | Benchmark Farms (Average Farm Size = 10.00 hectare) | Inefficiency |
|---|---|---|---|
| Per hectare | 4200.24 | 13824.03 | 69.62 |
| Per MT | 5112.56 | 7899.44 | 35.28 |
| Per Man-day | 91.11 | 346.03 | 73.67 |
| Per Depreciation | 17.82 | 38.61 | 53.85 |

Source : Table 3-3, Part-II Statistical Data of this Report.

It is observed that the national average farms have been operating at sub-optimal level compared to the benchmark farms. The level of inefficiency in national average farms in terms of value added per hectare, for instance, has been high at about 70 percent in 2000.Thus, there exists a potential to obtain a substantially higher 'value added' in respect of national average farms under soybeans cultivation.

### 2.3.7 Rice (Milled)

Value added by national average rice (milled) factories vis-à-vis those by benchmark factories have been presented in Table 31.

**Table 31. Inefficiency in National Average Factories Compared to the Benchmark Factories of Rice –2000**

(Rs. '000, Percentage)

| Value Added (Broad) | National Average Mills | Benchmark Mills | Inefficiency |
|---|---|---|---|
| Per Ton | 4.25 | 12.80 | 66.80 |
| Per Depreciation | 60.00 | 106.68 | 43.76 |

Source: Table 4-1, Part-II Statistical Data of this Report.

It is observed that national average rice (milled) factories have been operating at sub-optimal level compared to the benchmark factories. The level of inefficiency in national average factories in terms of value added per MT, for instance, has been high at 67 percent in 2000.Thus, there exists a potential to obtain a substantially higher 'value added' in respect of national average rice mills.

### 2.3.8 Copra

Value added by national average copra factories vis-à-vis those by benchmark factories have been presented in Table 32.

**Table 32. Inefficiency in National Average Factories Compared to the Benchmark Factories of Copra –2000**

(Rs. '000, Percentage)

| Value Added (Broad) | National Average | Benchmark factories | Inefficiency |
|---|---|---|---|
| Per MT | 4.28 | 13.13 | 67.45 |
| Per Depreciation | 0.13 | 0.07 | -91.04 |

Source : Table 4-2, Part-II Statistical Data of this Report.

It is observed that national average copra factories have been operating at sub-optimal level compared to the benchmark factories. The level of inefficiency in national average factories in terms of value added per MT, for instance, has been high at 67 percent in 2000.There exists a potential to obtain a substantially higher 'value added' in respect of national average copra producing factories. However, negative inefficiency in respect of value added per unit of depreciation suggests that benchmark factories resort to higher level of mechanization and modernization compared to national average farms.

## 2.4 Determinants of Efficiency

### 2.4.1 Comparison of Cost of Cultivation of National Average Farms and Benchmark Farms in Selected Crops (paddy, maize, soybeans and sugarcane) -2000

The national average farms in India have been operating at sub-optimal levels compared to the corresponding benchmark farms as has been noted in the sub-paragraph 2.3. On undertaking disaggregated analysis, the following important points emerge (Charts 2.1 to 2.5 refer) in case of representative (average) costs of cultivation of paddy, maize, soybeans and sugarcane for the year 2000:

- The benchmark farms tend to spend higher expenditure on inputs such as irrigation, labor and also rent on land.
- The benchmark farms are able to attract skilled/experienced laborers by offering them higher wages.

- It does not make an economic sense to cut cost of cultivation by resorting to 'second rated' inputs (both physical and human).
- The costs of cultivation per hectare of benchmark farms are higher compared to those of national average farms.
- The higher expenditure incurred by the benchmark farms is more than offset by higher 'value added' by them. This is accomplished mainly through higher land productivity and also better quality of their produce which ultimately command higher prices (Tables 3-1 to 3-4 of Part-II of this report refer).

**Chart 2.1 : Comparison of Costs of Inputs Incurred by National Average Farms and Benchmark Farms - 2000**
(Representative Cost of Cultivation of Paddy, Maize, Soybeans and Sugarcane)

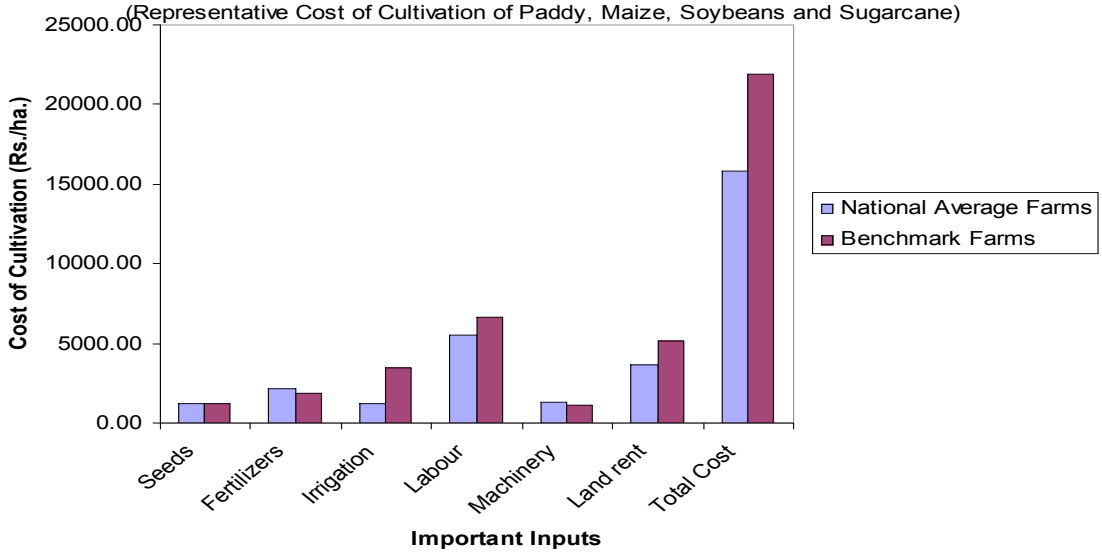



**Chart 2.2 : Distribution of Input Costs - National Average Farms-2000**
(Representative Cost of Cultivation of Paddy, Maize, Soybeans and Sugarcane)

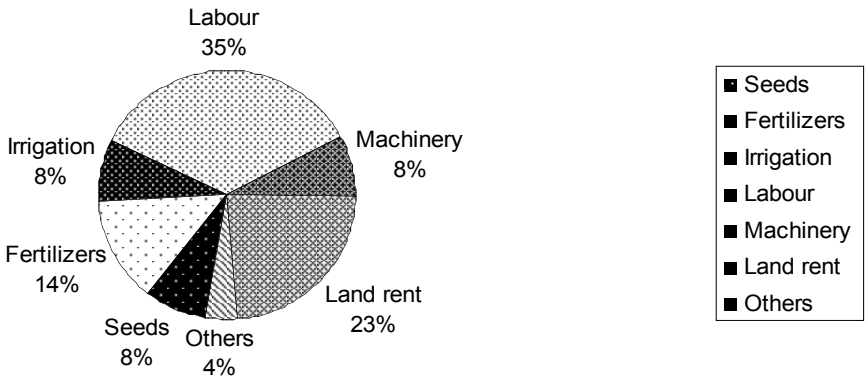
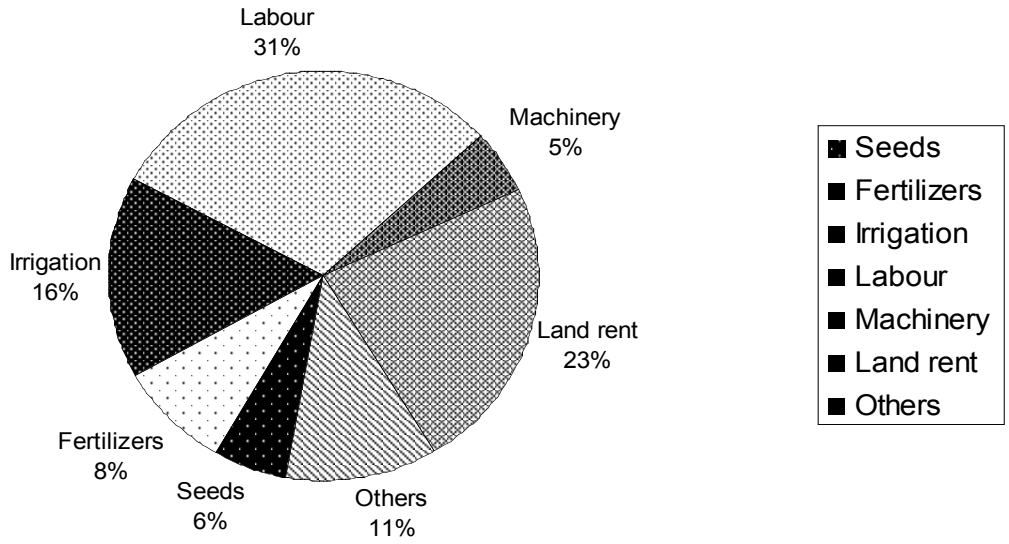


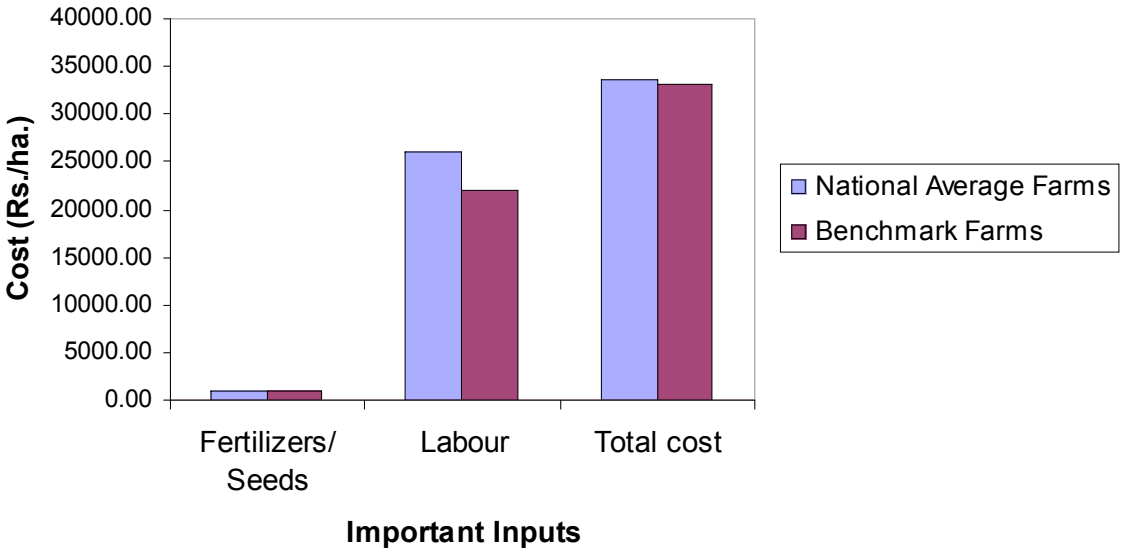
**Chart 2.3 : Distribution of Input Costs - Benchmark Farms - 2000**
(Representative Cost of Cultivation of Paddy, Maize, Soybeans and Sugarcane)




### 2.4.2 Comparison of Cost of Production of National Average Farms and Benchmark Farms - Natural Rubber in 2000

The process of production of natural rubber including tapping is labor intensive and labor input accounts for more than two-third of the total cost of cultivation of the crop.

**Chart 2.4 : Comparison of Cost of Inputs Incurred by National Average Farms and Benchmark Farms on Cultivation of Natural Rubber - 2000**



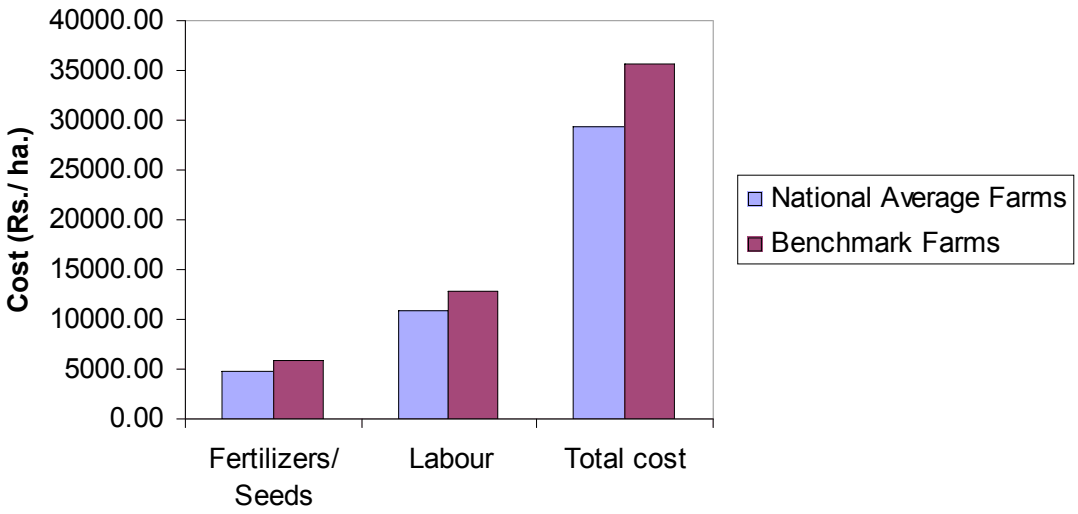
On undertaking disaggregated analysis, the following points emerge for the year 2000:

- Although the total cost of cultivation per unit of area incurred by national average farms is comparable with benchmark farms, the national average farms incur higher expenditure on labor inputs.
- The wage rates to labor paid by the benchmark farms are higher compared to those paid by the national average farms. However, the benchmark farms utilize labor, an important ingredient in the tapping process, in more cost-effective manner.
- It does not make an economic sense to cut cost of tapping by resorting to unskilled or semi-skilled human labor.
- The benchmark farms are more efficient as they are able to achieve higher land productivity and their produce commands better price which is mainly due to better quality of the commodity.

### 2.4.3 Comparison of Cost of Production of National Average Farms and Benchmark Farms - Coconut in 2000

The labor input required in the process of production of coconut is high and accounts for more than one-third of the total cost of the production.

**Chart 2.5 : Comparison of Cost of Inputs Incurred by National Average Farms and Benchmark Farms on Cultivation of Coconut - 2000**




On undertaking disaggregated analysis, the following points emerge for the year 2000 :

- The benchmark orchards of coconut incur higher costs per unit of area compared to that of national average orchards.
- The benchmark orchards have been able to attract skilled/experienced laborers by offering them higher wages.
- The benchmark orchards incur higher expenditure on fertilizers and insecticides.
- It does not make an economic sense to cut cost of cultivation by resorting to 'second rated' inputs (both physical and human).

- Higher expenditure incurred by the benchmark farms is more than offset by higher 'value added' by them. This is accomplished mainly through higher land productivity and also better quality of their produce which ultimately command higher prices.

### 2.5 Other Indices of Competitiveness

There are several indicators which measure competitiveness of any given commodity, group of commodities or a particular sector of the economy. Some of important indicators for the purpose are Nominal Protection Coefficient (NPC), Effective Protection Coefficient (EPC), Producer Subsidy Equivalent (PSE), Net Present Value (NPV), Index of Terms of Trade (ITT) and Classical Welfare Analysis (CWA). However, in this paper only Nominal Protection Coefficient (NPC) has been discussed as it has inter-related discussions later in the Section-3.

#### 2.5.1 NPC

NPC, a simplified measure of comparative advantage, measures the divergence of domestic price from international prices and determines the level of competitiveness in export and import of the relevant commodities.

It is defined as

$$NPC_k = p_k^d / p_k^b$$

Where $NPC_k$ = Net Protection Coefficient of $K^{th}$ commodity ;
$p_k^d$ = Domestic wholesale price of $K^{th}$ commodity; and
$p_k^b$ = Border price (cif or fob) of $K^{th}$ commodity.

NPC can be estimated under two main hypotheses viz. importable hypothesis and exportable hypothesis. Under importable hypothesis, the commodity in question is regarded as an import substitute i.e. there is an imported commodity that competes with the domestically produced commodity. Here, the relevant price of the commodity is international price inclusive of international transportation costs between the exporting and importing countries and the port clearance charges. If this commodity competes in the regional market, transportation costs to that market, various other marketing costs and trader's margin are to be included in this price. The measure enables to judge whether a particular commodity is an efficient import substitute.

Under exportable hypothesis, the commodity in question is treated as an exportable and competes with the domestically produced commodity at a foreign port. The relevant border or reference price under this hypothesis takes into account the transportation costs (both domestic and international), port clearance charges, marketing costs and trader's margin and processing costs necessary to make the commodity tradable. This measure reveals whether export of a particular commodity is competitive. The NPC based competitiveness of various commodities selected under the survey has been discussed in section 3.3.3.

## 3. PRODUCTIVITY AND TRADE PERFORMANCE

### 3.1 Correlation Between Productivity and Trade Performance

The trade performance in terms of volume of various commodities exported/ imported vis-à-vis their productivity indices are presented in Table 33.

Some broad analysis on the relationship between trade performance and total factor productivity(TFP) has been undertaken and the following points emerge:

- It seems logical to make a hypothesis that with improvement in TFP, the performance of export, *ceteris paribus*, would improve as the commodity gets more competitive in international market. Conversely, lower TFP would dampen the prospects of exports. Let this hypothesis be called as **exportable hypothesis**. Under exportable hypothesis, commodity in question is treated as exportable and competes with the domestically produced commodity at the foreign port. The relevant border or reference price under this hypothesis is obtained considering the transportation costs (both domestic and international), port clearance charges, marketing costs and trader's margin and also processing costs necessary to make a commodity tradable. This exportable hypothesis is validated by the performance of export of rice and soybeans during pre-1995, maize and copra during the post-1995 and also of natural rubber during the period 1993 to 2000.

**Table 33. Trade Performance vis-à-vis Productivity Indices of Various Commodities**

(Export/import : '000 MT, TFP: 1995=100)

| Crop/Commodity | Measure | 1990 | 1995 | 2000 |
|---|---|---|---|---|
| Rice | Export | 527.47 | 4914.01 | 1531.28 |
| | Import | 66.06 | 0.08 | 13.19 |
| | TFP | 63.78 | 100.00 | 99.69 |
| Maize | Export | 0.00 | 18.75 | 42.47 |
| | Import | 0.01 | 0.11 | 28.92 |
| | TFP | 143.23 | 100.00 | 126.91 |
| Soybeans | Export | 0.35 | 0.07 | 75.02 |
| | Import | 0.00 | 29.45 | 0.13 |
| | TFP | 130.51 | 100.00 | 72.20 |
| Sugar | Export | 26.98 | 284.16 | 347.44 |
| | Import | 12.10 | 150.63 | 30.40 |
| | TFP | 120.20 | 100.00 | 91.89 |
| Natural Rubber | Export | 0.19* | 1.13 | 13.36 |
| | Import | 19.95* | 51.64 | 8.69 |
| | TFP | 70.91* | 100.00 | 147.90 |
| Copra | Export | 0.23 | 0.00 | 0.40 |
| | Import | 0.00 | 0.00 | 0.00 |
| | TFP | 82.20 | 100.00 | 183.53 |

Notes: 1. TFP of maize, Soybeans and sugarcane at farm level has been taken as proxy for their respective processed commodities at factory level.
2. * Figures pertain to the year 1993.

- Although TFP of rice has remained almost constant during the period from 1995 to 2000, the volume of export of rice has significantly declined during this period. Thus, TFP is not an explanatory variable to explain changes in volume of exports of a given commodity. The performance of trade in rice does not support the hypothesis that improvement in TFP would result in higher volumes of export.
- Likewise lower TFP, *ceteris paribus*, is expected to encourage imports and higher TFP would discourage imports and let this be referred to as **importable hypothesis**. Under importable hypothesis, the commodity in question is regarded as an import substitute i.e. there is an imported commodity that competes with domestically produced commodity. The available estimates of TFP and the relevant performance of imports of rice, maize, soybeans and sugar during pre-1995 period support **importable hypothesis**.

- In case of maize, import has increased in the year 2000 compared to that in the year 1995 despite improvement in the index of TFP during the corresponding period. This is mainly due to increase in domestic demand of feed for livestock and poultry. The trade policy of the Government to allow manufacturers of animal feed to import maize at zero percent duty is the main contributory factor for spurt in import of this commodity.

Thus, India's (and for that matter any country's) overall trade performance can not be fully attributed to changes in total productivity indices (or TFP) alone. The broad trends in international trade need to be viewed in wider perspective of macro level policy measures following liberalization and structural adjustments.

### 3.2 Effect of Agricultural/ Food Policies relating to the Survey Commodities

The agricultural/ food policies relating to various commodities can be discussed under the following four sub-sections:

- **Production Promotion;**
- **Price Support Policy;**
- **Infrastructure, Research and Extension; and**
- **Trade Policies**

#### 3.2.1. Production Promotion

The production broadly depends upon two factors namely area and yield (land productivity). Empirical evidence of the past four decades suggests that land under agriculture sector (net area sown) in India has remained at around 142 million hectares. However, area coverage under various crops within the agriculture sector keeps on changing in response to exogenous policy instruments and other relevant factors. There is, however, no reason to believe that it will increase substantially in short to medium run at the cost of non-agriculture sector. In this situation, only way to promote production is to increase land productivity. For this purpose, the Government of India have launched several initiatives, notable among them are:

**a. Input Subsidies**
**b. Agriculture Credit**
**c. Crop Insurance**

**a. Input Subsidies**

Fertilizer is an important input that leads to, *ceteris paribus*, increase in production level. However, in India, preponderant proportions of farmers are resource poor and are not in a position to pay full price of fertilizers. Therefore, the Government provide subsidy on fertilizers to enable them to apply this input to enhance production level. Table 34 shows fertilizer subsidies vis-à-vis other agriculture related subsidies during 1990 to 2001.

**Table 34. Explicit Subsidies Relating to Agriculture in India**

(Rs. Billion, percentage)

| Year | Food Subsidy | Fertilizer Subsidy | Food Subsidy As % of GDP | Fertilizer Subsidy As % of GDP |
|---|---|---|---|---|
| 1990 | 24.50 | 43.89 | 0.48 | 0.86 |
| 1995 | 49.60 | 62.35 | 0.46 | 0.58 |
| 2000 | 120.60 | 138.00 | 0.64 | 0.73 |
| 2001 | 176.12 | 141.70 | 0.84 | 0.68 |
| CGR (1990-95) | 15.15 | 7.27 | | |
| CGR (1995-2001) | 23.52 | 14.66 | | |
| CGR (1990-2001) | 19.64 | 11.24 | | |

Sources : 1. Report of the High Level Committee on Long-Term Grain Policy, Ministry of Consumer Affairs, Food & Public Distribution, New Delhi.
2. Economic Survey (various issues), Ministry of Finance, New Delhi.

Note: CGR denotes average annual compound growth rate.

It may be seen from Table 34 that the expenditure on food subsidies was Rs.24.50 billion in 1990 which expanded to Rs. 49.60 billion in 1995 and Rs. 176.12 billion in 2001. The growth in subsidy on fertilizers during pre-1995 period has been low at 7.27 percent per annum compared to 14.66 percent in the post-1995 period. Though India's AMS is much below the permissible *de-minimum* limits or even negative, subsidies of both food and fertilizer have grown faster in the post WTO period compared to their respective growth during pre-1995 period. This does not support the general perception that the subsidies in the post WTO era have been reduced.

**b. Agriculture Credit**

Indian agriculture is characterized, *inter-alia*, by predominance of small and *marginal* farmers. They, being resource poor, have low literacy levels which in turn make them susceptible to exploitation by village money lenders who extend loans to farmers at a very high rate of interest. To ensure availability of credit to the faming sector at reasonable rate of interest, need has been felt to take steps to set up rural credit institutions. Towards this objective, an innovative mechanism for facilitating access to short term credit to farmers entitled "Kisan[3] Credit Card" was introduced in 1998. The scheme is being implemented by 27 commercial banks, 373 District Central Cooperative Banks/ State Cooperative Banks and 196 Regional Rural Banks throughout the country. The fact that over Rs. 434 billion credit to more than 20 million farmers has been sanctioned so far shows the popularity and spread of the scheme in the country.

**c. Crop Insurance**

The risk taking potential of Indian farmers is very low as most of them are resource poor. This coupled with the fact that about 62 percent of Indian agriculture is rainfed and only 38 percent area under agriculture is irrigated make the farmers vulnerable to vagaries of weather. To provide a cover to them against possible losses suffered by them due to crop failure on account of natural calamities such as drought, flood, cyclone, hailstorm, fire, pest/disease, a scheme named "National Agricultural Crop Insurance" Scheme was introduced in the country in 1999. The scheme is available to all farmers regardless of their land holding or indebtedness and covers all foodgrains crops (cereals, millets and pulses), oilseeds, annual horticultural/ commercial crops in respect of which past data on land productivity for reasonable number of years are available. This is necessary to assess damage/ loss, if any, for settlement of insurance claims.

[3] *It is a Hindi word which means farmer.*

These broad measures help promoting production and productivity of various agriculture crops.

### 3.2.2 Price Support Policy

The main objective of the Government's price support policy for agricultural commodities is to ensure remunerative prices to the growers for their produce with a view to encourage higher investment and production and also to safeguard the interests of consumers by making available supplies at reasonable prices. The price policy mainly aims at the following:

- To provide **Income Support System to farmers** and also to assure them of certain level of prices to enable them to invest in new technology;
- To provide **signals to farmers to enable them to allocate their resources** and decide what to produce and how much;
- To **stabilize prices** to protect farmers from undue fluctuations; and
- To **provide food to all** at reasonable prices.

It seeks to provide a surplus and incentive to all efficient farmers and also does justice to consumers in the sense to enable them to buy food and other agriculture commodities at affordable prices. Towards this end, Government announces each season procurement/ minimum Support Prices (MSP) for 25 major agricultural commodities. Of these, 5 commodities namely paddy, maize, soybeans, copra and sugarcane are covered under this survey. The natural rubber, the sixth commodity covered under this survey, is not included in the MSP regime.

In fact, MSP is a bottom line which is in vogue in a large number of the countries in the World, albeit in different forms. For instance, some of the developed countries give support for not producing while others extend such support in the form of subsidy.

### 3.2.3 Infrastructure, Research and Extension

#### a. Infrastructure

The availability of appropriate infrastructure services is a pre-condition to rapid economic development in all sectors and agriculture is no exception. Accordingly, the Government accord great importance to growth and development of infrastructure sectors such as telecommunications, power, railways, roads, ports, airports. Development of efficient, low cost, quality infrastructure services require high upfront costs and long gestation periods. Infrastructure services are often monopolistic in nature and calls for huge investments. There are some infrastructure areas such as rural infrastructure where there are large gaps between demand and supply and the private sector cannot be expected to participate in a big way. Therefore, the Government continues to occupy the commanding heights in infrastructure development in such areas. In other areas like telecommunications, power and transportation, the private sector can play a greater role while the government facilitates investment. Besides, a number of other major initiatives have been taken by the Government of India in recent years for development of infrastructure which are expected to work as catalysts in improving the agriculture sector.

#### b. Research

The Government of India in the Ministry of Agriculture has laid emphasis, *inter-alia*, on research in agriculture which is carried out by an apex institution "Indian Council of Agriculture Research" (ICAR). The research relating to crop husbandry is focused on crop improvement, crop production and crop protection.

### c. Extension

Agriculture Extension promotes agricultural development by providing the extension functionaries and the farmers with information, training and other extension support on a continuous basis on improved production technologies. The Directorate of Extension, a nodal agency at the national level, implements the extension programs and activities through its technical units. To recognize special efforts made by different organizations in improving productivity of various crops, a scheme on National Productivity Awards has been initiated. Under the scheme, awards are conferred, through National Productivity Council, to various units in 14 fields of agriculture including crop husbandry and horticulture development.

## 3.2.4 Sustainable Agriculture

India lay emphasis on promoting technically sound, environmentally non-degrading and sustainable use of country's natural resources. Of late, there has been a practice amongst a large section of farming community to apply excessive chemical fertilizers to increase productivity. This may lead to achievement of higher land productivity in short run but deteriorates soil structure in the long run besides adversely affecting the quality of farm produce. To improve soil condition in general and also to improve quality of produce, "National Institute of Organic Farming" (NIOF) has been established in India.

It is theorized that land productivity may come down in the short run. However, the losses in volume terms may get offset through better prices of the organic produce. In the long run, however, land productivity is expected to increase. In fact, switching over to organic farming presents a case of trade off between short term losses and long term gains. Given better quality of farm produce as a result of organic farming, it is expected that its demand would increase which may brighten the prospects of selected exports.

## 3.2.5 Trade Policies

India initiated major reforms in the trade policy in 1991 which aimed at creating an environment for achieving rapid increase in exports, raising its share in world exports to achieve higher economic growth. These reforms cover a wide spectrum of trade dimensions and are discussed under the following sub-sections:

- **Liberalization**
- **AoA**
- **Export Promotion**
- **NAP (National Agriculture Policy)**

### i. Liberalization

The basic thrust of reforms is on outward orientation, promotion of export, moving away from quantitative restrictions (QRs) and improving competitiveness of Indian commodities in the global market. India made a paradigm shift in its export policy in 1991 when it accelerated the trade liberalization process. For most of the period prior to 1991, agriculture remained one of the most protected sectors in the Indian economy. In food grains, the major thrust of the policy during this period was towards import substitution and attaining self-sufficiency. For most other agricultural products, trade has been perceived as a residual, both for exports and imports. The difference between actual domestic production and estimated domestic consumption has determined the surplus available for exports. The government regulated the trade flows through canalization, export ceilings or outright export prohibitions. The basic objective of this trade policy regime was to stabilize the domestic prices for agricultural items. A large proportion of India's agriculture production enters the domestic market either in form of

consumption goods or intermediate goods. Exports, if not regulated, can exert influence on the domestic prices of these commodities.

In 1991, import licensing for all products, except those on the banned, restricted and state monopoly lists, was abolished so that any item not on the negative lists could be freely imported. However, the trade liberalization drive of 1991 left most agricultural imports outside its domain. Even after signing the Uruguay Round Agreement in 1994, India maintained QRs on a large number of agricultural commodities. Between 1997 and 1999, QRs from 620 consumer food products were removed. By April 2001, QRs were removed from all remaining agricultural products.

The Ninth Five Year Plan (1997-2002) has paid considerable attention to the export policy and explicitly states thus:

> *"... exports can no longer be viewed merely as an exogenous variable determined outside the planning system and would have to be planned for in a careful and realistic manner during the Ninth Plan."*

The Ninth Five Year Plan considered that given the current economic situation where policy instruments available to country to regulate foreign trade are declining, the exchange rate has emerged as the major trade policy instrument. It pointed out that the exchange rate not only affects the degree of price competitiveness of domestic tradable in comparison to international markets but also determines the relative profitability of tradable vis-à-vis non-tradable in the domestic economy. According to the plan document, bulk of Indian exports relies principally on price competitiveness and depreciation of the currency is likely to benefit these commodities.

The Approach Paper to the Tenth Five Year Plan (2002-2007) emphasizes the importance of the external sector but recognizes that the period of very high growth in world trade is coming to an end. To meet the challenge of a recessionary global economy, India would accelerate its domestic reforms to create conditions for competitive advantage by domestic and foreign-invested enterprises. However, what seems to be a major shift from India's long standing objective of self reliance in food grains, the Approach Paper suggests:

> *"Announce a policy renouncing the use of export restrictions on agricultural commodities. Domestic shortages should be met by imports but not by imposing export controls."*

**ii. AoA**

India signed the Uruguay Round (UR) Agreement on 15th April 1994 at Marrakesh. This treaty introduced agricultural trade in the WTO for the first time. The aim of this Agreement was to eliminate physical controls on agricultural trade by replacing them with bound tariff rates. It was further agreed that these tariff rates would be gradually reduced over a period of time. The overall objective was to provide a framework for the long-term reform of agricultural trade. The Agreement on Agriculture (AoA) came into effect from 1 January 1995. This marked the beginning of a new era of agricultural trade policy in India.

The AoA required the conversion of all non-tariff barriers into tariffs. For this conversion, India opted for 'Bound Ceiling Rates' at 100 percent for primary agricultural products, 150 percent for processed foods and 300 percent for edible oils. To remove an anti-export bias, a number of measures have been taken to increase the efficiency of resource allocation. Imports of capital goods, raw materials and other components have been de-licensed, tariffs on such imports have been reduced substantially and tariff

categories have been reclassified for the sake of simplification. As a result, almost all goods can now be freely imported and exported.

### iii. Export Promotion

The impetus for accelerated growth in agricultural exports is envisaged through enhanced infrastructure support and by building up a conducive policy environment. In recent years, though most of the export promotion measures carried out prior to 1991 have been abolished, a number of other policy changes have been introduced to make agricultural exports more viable. Market determined exchange rate policy has removed the constraint of overvalued exchange rate and increased the competitiveness of Indian agricultural exports. Lowering of import duties on capital goods particularly for greenhouse equipment and plant and machinery necessary for food processing industries as well as easier availability of credit for exports have also helped. **Table 35** shows some export promotion schemes currently being implemented by the government.

**Table 35. Export Promotion Schemes for Agriculture**

| Scheme | Activity |
|---|---|
| Indian Brand Equity Fund | Promoting the image and marketing of generic Indian Brands for exports |
| Extreme Focus Product | Promoting commodities with high export growth potential |
| Indian Trade Promotion | Promoting exports and imports and upgrading technology, undertaking publicity, organizing export development programs etc. |
| Promotion of specified commodities | Developing and exporting coir, tea, coffee, rubber, spices and tobacco through respective Designated Commodity Boards. |
| Marine Products Export | Developing the marine products industry with special reference to exports. |
| Agricultural and Processed Food Products Export form Development Authority | Focusing on agricultural and horticultural exports including marketing of processed food. |
| Market Development Assistance | To undertake market research and participate in trade fairs. |

Source: Discussions with officials of the Ministry of Commerce, Government of India.

A Market Access Initiative scheme has also been launched for promoting export enhancement studies.

### iv. NAP

The National Agricultural Policy (NAP), presented to the Parliament in 2000, lays emphasis, *inter-alia*, on agricultural exports. It envisages creation of a favorable economic environment and supportive public management system for promotion of agricultural exports. NAP also provides for diversification of agricultural produce and increase in value added with a view to enable farmers to earn incremental income from export. Apart from price competitiveness of agricultural products, other factors affecting export performance such as quality, health and bio-safety are also addressed. Export of horticultural produce and marine products have received special emphasis in this policy.

### 3.3 Effect of International Factors

The effect of international factors on trade performance is discussed under the following sub-sections:

- **Changes in National Trade Patterns; and**
- **Changes in Exchange Rate**

#### 3.3.1 Changes in National Trade Patterns

The year 1995 represents a watershed in the history of global agricultural trade policy. The Agreement on Agriculture (AoA) negotiated under the Uruguay Round came into effect from 1995 which has proved to be pacesetter for international trade. Therefore, it is imperative to appraise broad trade performance of agriculture vis-à-vis total trade during post-1995 period separately.

**a. Exports**

India's agricultural exports since 1995 has shown volatility as may be seen from Table 36.

**Table 36. Growth of Agriculture Exports vis-à-vis Total Exports During 1995 to 2000 - India**

(US $ Million, Percentage )

| Year | Agriculture Exports | Total Exports | Percentage of Agriculture Exports | Annual Growth (%) | |
|---|---|---|---|---|---|
| | | | | Agriculture Exports | Total Exports |
| 1995 | 6098.98 | 31794.91 | 19.18 | 44.80 | 59.29 |
| 1996 | 6806.00 | 33469.76 | 20.33 | 11.61 | 5.27 |
| 1997 | 6684.54 | 35006.41 | 19.10 | -1.78 | 4.59 |
| 1998 | 6063.86 | 33218.39 | 18.25 | -9.29 | -5.11 |
| 1999 | 5842.06 | 36714.81 | 15.91 | -3.66 | 10.53 |
| 2000 | 6273.50 | 44075.54 | 14.23 | 7.38 | 20.05 |

Source : Table1-2, Part-II (Statistical Data).

The share of agricultural exports in total exports from India has come down to about 16 percent by 1999 from over 20 percent in 1996. Its share further declined to 14.2 percent in 2000. However, a positive feature of agriculture exports in 2000 is that the rate of growth during 2000 turned positive at over 7 percent from negative growth rates during preceding three years *viz.*1997 to 1999. It could be accomplished mainly due to increase in exports of non-traditional commodities like vegetables, meat preparation, sesamum, and nigerseeds.

It is noteworthy that the annual growth rate of agriculture exports and also total exports from India in 1995 was disproportionately high at 44.8 percent and 59.3 percent respectively mainly due to the fact that intra-developing countries trade had started increasing from 1995. As a result, India allowed export of rice (other than Basmati) in 1995 to meet the demand from other co-developing countries. Out of all agriculture exports in 1995, this commodity accounted for 18.2 percent. Once the base of export has become broad in 1995, it was not expected to achieve that level of growth rates in subsequent years.

Share of top 8 export commodities has fluctuated between 64.26 percent and 78.03 percent between 1995 and 2001. It has significantly declined and touched a trough of 64.26 percent in 2000 as may be seen from table 3.5. The declining share of these commodities in the total export is mainly due to low level of exports of rice.

**Table 37. Share of Major Agricultural Exports in Total Agricultural Exports During 1995 to 2000 - India**

(Percentage)

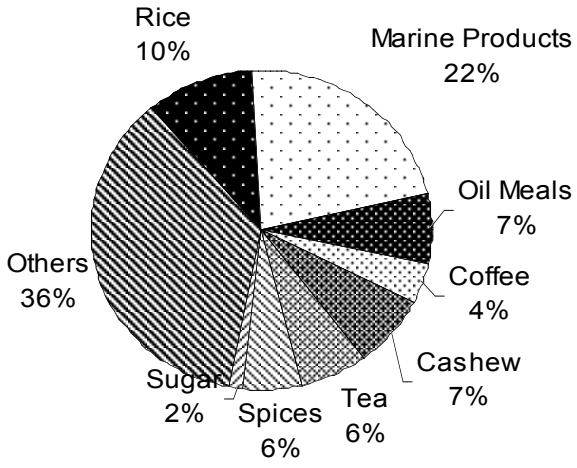
| Commodity | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|
| **1. Rice, of which** | 22.40 | 13.13 | 13.57 | 24.62 | 12.35 | 10.23 | 10.73 |
| i. Rice Basmati (Aromatic) | 4.17 | 5.16 | 6.78 | 7.36 | 7.03 | 7.52 | 6.24 |
| ii. Rice(Other than Basmati) | 18.22 | 7.97 | 6.78 | 17.26 | 5.32 | 2.71 | 4.49 |
| 2. Marine Products | 16.58 | 16.59 | 18.06 | 17.12 | 20.24 | 22.22 | 19.64 |
| 3. Oil Meals | 11.51 | 14.47 | 13.83 | 7.61 | 6.47 | 7.13 | 7.63 |
| 4. Coffee | 7.37 | 5.90 | 6.83 | 6.77 | 5.67 | 4.13 | 3.69 |
| 5. Cashew | 6.06 | 5.32 | 5.63 | 6.38 | 9.70 | 7.15 | 6.03 |
| 6. Tea | 5.74 | 4.29 | 7.55 | 8.88 | 7.05 | 6.24 | 5.80 |
| 7. Spices | 3.89 | 4.98 | 5.67 | 6.40 | 6.98 | 5.65 | 5.02 |
| 8. Sugar | 2.48 | 3.56 | 0.98 | 0.07 | 0.07 | 1.50 | 5.86 |
| Share in Total Agricultural Exports | 76.03 | 68.24 | 72.13 | 77.85 | 68.54 | 64.26 | 64.40 |

Source : Director General Commercial Intelligence and Statistics, Ministry of Commerce, Kolkata.
Note : Commodities have been arranged in descending order of their respective share of exports in 1995.

The share of major agriculture exports in total agriculture exports in 2000 may be seen in **Chart 3.1**.

**Chart 3.1 : Share of Major Agriculture Exports in Total Agriculture Exports - 2000**

Note : 'Others' includes a large number of commodities w hose individual contribution is very small.




One positive feature of India's agricultural exports is that its exports markets are well diversified. India exports to a large number of countries spanning practically all continents except Latin America.

**b. Imports**

India's agricultural imports have displayed an upward trend from 1995 to 1999. However, it declined in 2000 when agriculture commodities worth US $ 2645.85 million compared to US $ 3707.99 million in the previous year was imported. The growth rate in agriculture imports exhibited extreme fluctuations and varied between minus 29 percent to 46 percent during the period from 1995 to 2000 as may be seen from **Table 38.**

**Table 38. Growth of Agriculture Imports vis-à-vis Total Imports from India during 1995 to 2000**

(US $ Million, Percentage)

| Year | Agriculture Imports | Total Imports | Share of Agriculture Imports | Annual Growth | |
|---|---|---|---|---|---|
| | | | | Agriculture Imports | Total Imports |
| 1995 | 1760.87 | 36675.30 | 4.80 | -6.88 | 27.99 |
| 1996 | 1862.70 | 39132.47 | 4.76 | 5.78 | 6.70 |
| 1997 | 2363.88 | 41484.49 | 5.70 | 26.89 | 6.01 |
| 1998 | 3462.44 | 42388.67 | 8.17 | 46.49 | 2.18 |
| 1999 | 3707.99 | 49738.08 | 7.46 | 7.09 | 17.34 |
| 2000 | 2645.85 | 49974.75 | 5.29 | -28.65 | 0.48 |

Source : Table1-2, Part-II (Statistical Data).

The percentage share of agriculture imports in total imports has also shown high volatility. It is noted that agricultural imports showed a significant negative rate of growth during 2000, the first year when the impact of removal of QRs have been felt.

The share of top 8 commodities that were imported from 1995 to 2000 varied between 68.19 percent in 1997 to 83.04 percent in 1995 as may be seen from **Table 39.**

**Table 39. Share of Major Agricultural Imports in Total Agricultural Imports during 1995 to 2000 – India**

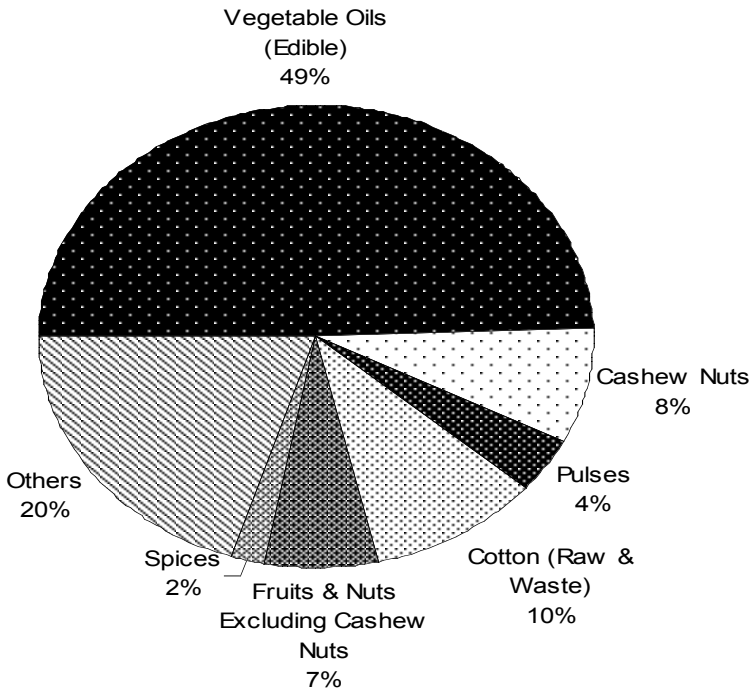
(Unit: Percentage)

| Commodity | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|---|---|---|
| 1. Vegetable Oils (Edible) | 38.40 | 44.30 | 31.47 | 52.10 | 50.08 | 49.45 | 39.84 |
| 2. Cashew Nuts | 12.90 | 10.40 | 8.73 | 6.65 | 7.46 | 7.95 | 2.65 |
| 3. Pulses | 11.64 | 13.46 | 13.60 | 4.87 | 2.21 | 4.12 | 19.42 |
| 4. Cotton (Raw & Waste) | 8.85 | 0.48 | 0.92 | 2.62 | 7.80 | 9.80 | 12.62 |
| 5. Fruits & Nuts Excluding Cashew Nuts | 5.62 | 6.90 | 6.55 | 4.60 | 3.68 | 6.60 | 4.68 |
| 6. Sugar | 3.67 | 0.05 | 5.35 | 7.63 | 6.91 | 0.26 | 0.20 |
| 7. Spices | 1.26 | 1.47 | 1.54 | 2.05 | 1.83 | 2.10 | 3.07 |
| 8. Oil Seeds | 0.61 | 0.07 | 0.03 | 0.06 | 0.10 | 0.06 | 0.01 |
| Share in Total Agriculture | 83.04 | 77.12 | 68.19 | 80.58 | 80.07 | 80.35 | 82.49 |

Source : Director General Commercial Intelligence and Statistics, Ministry of Commerce, Kolkata.
Note : Commodities have been arranged in descending order of their respective share of imports in 1995.

**Chart 3.2 : Share of Major Agriculture Imports in Total Agriculture Imports - 2000**

Note : 'Others' includes a large number of commodities w hose individual contribution is very small.




As may be seen from Chart 3.2, half of the total agriculture imports into the country in 2000 have been accounted for by edible oils which are necessitated as domestic production is a little less than half of domestic demand and the supply-demand gap is met by imports.

### 3.3.2 Changes in Exchange Rate

The exchange rate of the rupee against the US dollar continued to be broadly market determined. During 1999, the exchange rate market displayed reasonable stability, with the rupee depreciating by about 2.9 percent from the annual average of Rs.42.07 per US dollar in 1998 to Rs.43.33 in 1999. In contrast, the year 2000 witnessed significant downward pressures on the rupee-dollar rate from mid-May 2000. The foreign exchange markets experienced considerable uncertainty with the rupee depreciating by 6.7 percent between end-April and end-October 2000 from Rs.43.655 per US dollar to Rs.46.775. Since November 2000, the situation had shown large improvement and the foreign exchange markets were relatively stable. Overall, the rupee depreciated against the US dollar by 5.15 percent to Rs.45.68 per US dollar in 2000 and by 3.19 percent to Rs.47.19 per US dollar in 2001.

The world economy experienced one of the worst shocks in the aftermath of September 11, 2001 events in the United States. Foreign exchange markets in India also became volatile, with the rupee showing a depreciation of 1.3 percent vis-à-vis the US dollar during the 10-day period of September 10-20, 2001. Adverse external developments after September 11 and their effect on India in financial markets necessitated a quick response to provide appropriate liquidity and overall comforts to the markets. In order to

stabilize domestic financial markets, the Reserve Bank of India (The Central Bank of the Country) announced some measures during the period September 15-25, 2001. These measures had the desired effect of moderating possible panic reactions and reducing volatility in financial markets, particularly in foreign exchange.

The exchange rate has emerged as a major trade policy instrument in the country's economy and has not only affected the degree of price competitiveness of domestic tradable in comparison to international markets but also the relative profitability of tradable vis-à-vis non-tradable in the economy. Exchange rate is one of important factors that influence level of exports/imports. With the depreciation in rupees vis-à-vis US dollars in the decade of nineties, India's export have become, *ceteris paribus*, more competitive and imports more expensive. This is important as bulk of Indian exports relies primarily on price competitiveness. In fact market determined exchange rate policy has removed the constraint of overvalued exchange rate and increased competitiveness of Indian agriculture exports. However, India's export and import performance can not be fully attributed to changes in exchange rates alone. The broad trends in international trade need to be viewed in wider perspective of macro level policy measures following liberalization and structural adjustments.

### 3.3.3 Prices and NPC

In the era of globalization and accessibility to international market, commodity prices have assumed greater importance in determining the volume of trade. It is, therefore, imperative to study the behavior of commodity prices. In this section, an attempt has been made to examine general behavior of global prices of food articles compared to those of domestic prices during post WTO regime i.e. during 1995 to 2000. Then commodity specific total 'cost of delivering' to a common port of an importing country has been discussed.

The international price indices of basic food articles vis-à-vis those of domestic prices in India during 1995 to 2000 are presented in the Table 40.

**Table 40. International and Domestic Price Indices of Basic Food Items During 1995 to 2000**

| Year | Index of Domestic Prices (1993=100) | Index of International Prices (1990=100) |
|---|---|---|
| 1995 | 122.2 | 113.7 |
| 1996 | 137.3 | 127.5 |
| 1997 | 141.4 | 113.6 |
| 1998 | 159.4 | 99.7 |
| 1999 | 165.4 | 84.1 |
| 2000 | 170.5 | 83.7 |

Sources: 1. IMF, as quoted in the Reports of CACP, Ministry of Agriculture, Government of India, New Delhi, 2002.
2. http://eaindustry.nic.in

It may be seen from the **Table 40** that the indices of domestic and international prices of basic food articles have moved in the opposite directions during the period from 1996 to 2000. While domestic prices have moved up steadily, international prices had a free fall over the last four years. A significantly low level of international prices is not in harmony with the prediction of many who expected increase in agricultural prices in the post-WTO regime. However, the prediction of upward price movement did not come true mainly because of the following two reasons :

- Reduction in support to agriculture by the developing countries did not take place as envisaged; and
- Supplies of commodities were above normal level as a result of good harvests.

**a. Rice**

To determine international competitiveness of rice, NPC[4] (Nominal Protection Coefficient) for the years from 1995 to 2000 have been presented in the **Table 41.**

**Table 41. Prices of Rice and NPC-1995- 2000 (Under Exportable Hypothesis)**

(US $ Per MT)

| S. No. | Year | Reference International Price | | | Reference Domestic Price | | | NPC |
|---|---|---|---|---|---|---|---|---|
| | | Price (Thailand) | Transportation Cost* | Total | FOB Price | Transportation Cost# | Total | |
| 1 | 1995 | 456.11 | 28.10 | 484.22 | 246.37 | 28.01 | 274.38 | 0.57 |
| 2 | 1996 | 509.58 | 32.62 | 542.20 | 278.06 | 32.54 | 310.59 | 0.57 |
| 3 | 1997 | 426.26 | 34.66 | 460.93 | 260.41 | 34.58 | 294.99 | 0.64 |
| 4 | 1998 | 420.82 | 35.39 | 456.22 | 245.90 | 35.32 | 281.22 | 0.62 |
| 5 | 1999 | 253.77 | 37.53 | 291.30 | 256.01 | 37.46 | 293.47 | 1.01 |
| 6 | 2000 | 226.36 | 36.60 | 262.96 | 238.62 | 36.54 | 275.15 | 1.05 |

Sources: 1. All India Rice Exporters' Association, New Delhi (For prices)
2. Kandla Port Trust, "Scale of Rates", India ( For transportation Costs)
Notes: * Indicates international transportation charges from Bangkok to Ivory coast.
# Indicates international transportation charges from Kandla to Ivory coast.

The cost of delivering rice (which includes its price, transportation cost etc.) for India and Thailand, for instance, to a common port of an importing country, in this case Ivory Coast, has been worked out. The export competitiveness here is assessed for 'Parmal' variety in Delhi market and international prices of Thai white rice. As may be seen from the Table 41, the NPC values have remained well below unity during the period from 1995 to 1998. However, it has *marginal*ly exceeded unity in the years 1999 and 2000 which suggests that India may be loosing its competitiveness in export of 'Parmal' rice. It may, however, be clarified that this conclusion may not hold good for 'Basmati' rice, a premier aromatic quality for which there is a separate market segment in the Middle east, particularly Saudi Arabia, Kuwait and UAE.

**b. Sugar**

The behaviors of international, domestic prices of sugar and NPC during 1995-2000 under importable hypothesis have been presented in Table 42.

It may be seen from the **Table 42** that value of NPC in case of sugar exceeded unity from the years 1997 and 2000 which shows that it makes an economic sense to import sugar to India.

[4] *Defined in sub-section 2.5.1*

**Table 42. Prices of Indian Sugar and NPC-1995-2000 (Under Importable Hypothesis)**

(US $ Per MT)

| S.No. | Year | Reference International Price | | | Reference Domestic Price | | | NPC |
|---|---|---|---|---|---|---|---|---|
| | | Price | Transportation Cost* | Total | FOB Price | Transportation Cost# | Total | |
| 1 | 1995 | 396.75 | 28.10 | 424.85 | 343.17 | 5.71 | 348.88 | 0.82 |
| 2 | 1996 | 366.75 | 32.62 | 399.37 | 341.92 | 5.94 | 347.86 | 0.87 |
| 3 | 1997 | 316.00 | 34.66 | 350.66 | 359.18 | 5.36 | 364.53 | 1.04 |
| 4 | 1998 | 255.25 | 35.39 | 290.64 | 313.69 | 4.97 | 318.66 | 1.10 |
| 5 | 1999 | 200.50 | 37.53 | 238.03 | 303.92 | 5.06 | 308.99 | 1.30 |
| 6 | 2000 | 207.12 | 36.60 | 243.72 | 297.33 | 5.04 | 302.37 | 1.24 |

Sources: 1. Furnished by Indian Sugar Mills Association, New Delhi (For prices).
2. Kandla Port Trust, "Scale of Rates", India ( For transportation costs).
Notes: * Indicates freight charges from US gulf to Kandla port.
# Indicates handling and transportation charges.

### c. Rubber (Natural)

The behaviors of international, domestic prices of natural rubber (NR) and NPC during 1995-2000 under importable hypothesis have been presented in Table 43.

**Table 43. Prices of Natural Rubber and NPC-1995-2000 (Under Importable Hypothesis )**

(US $ Per MT)

| S.No. | Year | Reference International Price | | | Reference Domestic Price | | | NPC |
|---|---|---|---|---|---|---|---|---|
| | | Price (Malaysia) | Transportation Cost* | Total | Price | Transportation Cost# | Total | |
| 1 | 1995 | 1469.66 | 28.10 | 1497.76 | 1412.86 | 5.71 | 1418.57 | 0.95 |
| 2 | 1996 | 1234.08 | 32.62 | 1266.70 | 1245.35 | 5.94 | 1251.30 | 0.99 |
| 3 | 1997 | 832.62 | 34.66 | 867.28 | 873.25 | 5.36 | 878.61 | 1.01 |
| 4 | 1998 | 658.43 | 35.39 | 693.82 | 629.43 | 4.97 | 634.39 | 0.91 |
| 5 | 1999 | 595.43 | 37.53 | 632.96 | 656.59 | 5.06 | 661.65 | 1.05 |
| 6 | 2000 | 619.75 | 36.60 | 656.35 | 613.18 | 5.04 | 618.22 | 0.94 |

Sources: 1. Furnished by Rubber Board, Kottayam (For prices).
2. Kandla Port Trust, "Scale of Rates", India ( For transportation costs).
Notes: * Indicates freight charges from Kula Lumpur to an Indian port.
# Indicates handling and transportation charges.

It may be seen from the **Table 43** that value of NPC in case of natural rubber has been less than unity during post WTO regime except in the years 1997 and 1999. This shows that natural rubber is not import competitive in India. However, given the fact that supply (total domestic production) falls short of demand of this commodity in India, efforts have been made to increase production and land productivity of this commodity by making investment in the research and development (R&D). With R&D efforts coupled with increase in area coverage in non-traditional areas in north-eastern part of the country, the gap between demand and domestic production has narrowed down. It is expected that the country will move from import to export of this commodity in near future.

### d. Copra

The behaviors of international prices, domestic prices of copra in India and NPC during 1995-2000 under exportable hypothesis have been presented in Table 44.

**Table 44. Prices of Copra and NPC-1995-2000 (Under Exportable Hypothesis)**

(US $ Per MT)

| S.No. | Year | Reference International Price | | | Reference Domestic Price | | | NPC |
|---|---|---|---|---|---|---|---|---|
| | | Price | Transportation Cost* | Total | Price | Transportation Cost# | Total | |
| 1 | 1995 | 439 | 28.43 | 467.43 | 106.43 | 28.01 | 134.44 | 0.29 |
| 2 | 1996 | 489 | 29.51 | 518.51 | 122.54 | 32.54 | 155.07 | 0.30 |
| 3 | 1997 | 434 | 33.64 | 467.64 | 110.87 | 34.58 | 145.45 | 0.31 |
| 4 | 1998 | 411 | 31.84 | 442.84 | 109.58 | 35.32 | 144.90 | 0.33 |
| 5 | 1999 | 462 | 33.38 | 495.38 | 102.24 | 37.46 | 139.70 | 0.28 |
| 6 | 2000 | 355 | 33.41 | 388.41 | 49.91 | 36.54 | 86.45 | 0.22 |

Sources: 1. Furnished by Coconut Development Board, Cochin (For prices).
2. Kandla Port Trust, "Scale of Rates", India (For transportation costs).
Notes : * Indicates freight charges from International to an Indian port.
# Indicates freight handling and transportation charges.

It may be seen from the Table 44 that value of NPC in case of copra has been consistently less than unity which shows that Indian copra is quite competitive.

**e. Maize**

The behaviors of international prices of US maize, domestic prices in India and NPC during 1995-2000 under importable hypothesis have been presented in **Table 45**.

**Table 45. Prices of Maize and NPC-1995-2000 (Under Importable Hypothesis)**

(US $ Per MT)

| S.No. | Year | Reference International Price | | | Reference Domestic Price | | | NPC |
|---|---|---|---|---|---|---|---|---|
| | | Price (US Gulf) | Transportation Cost* | Total | Price | Transportation Cost# | Total | |
| 1 | 1995 | 183.20 | 28.43 | 211.63 | 123.03 | 5.71 | 128.74 | 0.61 |
| 2 | 1996 | 216.70 | 29.51 | 246.21 | 127.02 | 5.94 | 132.97 | 0.54 |
| 3 | 1997 | 158.26 | 33.64 | 191.91 | 113.81 | 5.36 | 119.16 | 0.62 |
| 4 | 1998 | 135.87 | 31.84 | 167.71 | 114.26 | 4.97 | 119.22 | 0.71 |
| 5 | 1999 | 91.88 | 33.38 | 125.26 | 121.67 | 5.06 | 126.73 | 1.01 |
| 6 | 2000 | 83.71 | 33.41 | 117.12 | 101.36 | 5.04 | 106.40 | 0.91 |

Sources: 1. Furnished by importers of Maize (For prices).
2. Kandla Port Trust, "Scale of Rates", India ( For transportation costs).
Notes: * Indicates freight charges from US gulf to Kandla port.
# Indicates handling and transportation charges.

It may be seen from the **Table 45** that value of NPC is less than unity in all the years except in 1999.This shows that importing maize to India is generally not a viable proposition at present. However, given the fact that maize is an important animal feed, particularly for poultry and the fact that import of maize by manufacturers of animal feed is allowed at zero percent duty, its import to India has a good future potential.

**f. Soybeans**

The behaviors of international prices, domestic prices of soybeans and NPC during 1995-2000 under importable hypothesis have been presented in **Table 46**.

**Table 46. Prices of Indian Soybeans and NPC-1995-2000 (Under Importable Hypothesis)**

(US $ Per MT)

| S.No. | Year | Reference International Price | | | Reference Domestic Price | | | NPC |
|---|---|---|---|---|---|---|---|---|
| | | Price (US Gulf) | Transportation Cost* | Total | FOB Price | Transportation Cost # | Total | |
| 1 | 1995 | 307.68 | 53.72 | 361.40 | 256.89 | 5.00 | 261.89 | 0.72 |
| 2 | 1996 | 301.10 | 51.59 | 352.69 | 287.26 | 5.25 | 292.51 | 0.83 |
| 3 | 1997 | 283.42 | 51.36 | 334.78 | 257.23 | 5.50 | 262.73 | 0.78 |
| 4 | 1998 | 222.15 | 44.99 | 267.15 | 203.49 | 5.60 | 209.09 | 0.78 |
| 5 | 1999 | 204.82 | 43.93 | 248.75 | 216.88 | 5.80 | 222.68 | 0.90 |
| 6 | 2000 | 173.99 | 43.54 | 217.54 | 164.84 | 6.00 | 170.84 | 0.79 |

Sources: 1. Furnished by importers of Soybeans (For prices).
2. Kandla Port Trust, "Scale of Rates", India ( For transportation costs).
Notes: * Indicates freight charges from US gulf to Kandla port.
# Indicates handling and transportation charges.

It may be seen from the **Table 46** that value of NPC in case of soybeans has been less than unity during the post WTO regime which shows that soybeans is not import competitive in so far as India is concerned. Given the shortage of edible oils in the country, more concerted efforts to enhance land productivity and increase in area coverage under the crop have been made. A technology mission on oilseeds including soybeans has been launched to increase production and productivity of this crop.

## 3.4 Effect of Other Factors

### 3.4.1 Macroeconomic Performance

The Indian economy recorded an overall growth of 5.4 percent in 2001 which is supported by a growth rate of 5.7 percent in agriculture and allied sectors, 3.3 percent in industry and 6.5 percent in services. This marks some recovery over low growth of 4 percent in 2000. The acceleration of overall GDP growth rate is basically due to a significant improvement in value added in the agriculture and allied sectors from a negative growth rate of (-) 0.2 percent in 2000. However, the average annual growth rate during the Ninth Five Year Plan (1997-2002) was 5.4 percent. Indian economy has been resilient in the face of several external shocks during this period such as the East Asian crisis of 1997 and the oil price increase of 2000.

The brief overview of macro-economic performance of the economy is discussed under the following sub-sections:

- **Agriculture and Food**
- **Industry**
- **Financial and other Services**

#### i. Agriculture and Food

The foodgrains output in 2001 was 212 million MT, an increase of more than 12 million MT over the previous year. The downtrend in oilseeds during the preceding two years viz. 1999 and 2000 has been reversed in the year 2001 and the country harvested 20.5 million MT of oilseeds – higher by over 2 million MT compared to the previous year. This impressive performance of various crops could be accomplished mainly due to better spatial distribution of monsoon rainfall, timely supply of inputs, flow of credit and better management of the sector. With foodgrains, commercial crops exhibiting an improved performance and other sub-sectors of agriculture like animal husbandry, fisheries etc. maintaining steady rates of

growth, the overall growth rate for agriculture and allied sector could overtake the overall GDP growth rate in the year 2001. This is important after near stagnation in 1999 and negative growth of 0.2 percent in 2000.

**ii. Industry**

The significant slowdown of industrial growth witnessed in 2000, as measured by the Index of Industrial Production (IIP), continued with greater intensity in 2001. There was a distinct deceleration in growth of manufactured exports and slowdown in growth rates of core and infrastructure industries. The overall industrial growth in terms of the IIP during April-December 2001 was only 2.3 percent compared to 5.8 percent during the corresponding period of the previous year.

Since industry generates demand for agriculture goods, industrial slowdown adversely affects the profitability of agriculture products through subdued demand and consequently subdued price regime prevails.

**iii. Financial and other Services**

Financial and other services have performed well in the year 2001. The average annual rate of inflation in terms of the Wholesale Price Index (WPI) increased significantly from 3.3 percent in 1999 to 7.1 percent in 2000 due to a substantial rise in administered prices of petroleum products. During 2001, the inflation rate declined in terms of the WPI.

India's Balance of Payments (BoP) remained reasonably comfortable in both 2000 and 2001. The current account deficit as a percentage of GDP declined from 1.1 percent in 1999 to about 0.5 percent in 2000 due to a dynamic export performance and sustained buoyancy in invisible receipts. However, in the year 2001, exports have been almost stagnant in US dollar terms.

The exchange rate of the rupee in terms of the major currencies of the world remained reasonably stable during the year 2001, despite occasional fluctuations caused by normal market forces of supply and demand. Foreign exchange reserves (including gold and SDR) reached a record level of nearly US$50 billion at the end of January 2002, which is equivalent to almost 10 months of estimated imports for the current year.

## 4.1 Likely Changes in Internal and External Conditions

The Agreement on Agriculture (AoA) concluded in the Uruguay Round brought for the first time trade in agriculture under multilateral discipline of WTO. Because of its sensitive nature, both from economic and socio-political perspectives, national Governments, whether developed or developing have put in place complex support and regulatory systems for the development of domestic agriculture as well as exports. Under the WTO regime, the changes that have taken place/ likely to take place in future are discussed under the following sub-sections:

- **Removal of QRs and Tariffication Process**
- **Food Security**
- **Global Scenario**

### 4.1.1 Removal of QRs and Tariffication Process

In pursuance of obligation under AoA, India has removed quantitative restrictions (QRs) from 620 consumer food products between 1997 and 1999 and have eliminated such restrictions on all agricultural products with effect from April 2001. Further, India has fixed bound tariff rates at 100 percent for primary, 150 percent for processed commodities and 300 percent for certain types of edible oils. With the elimination of all

QRs on agricultural products, there exists a perception that removal of QRs would lead to a scenario where Indian market might get swamped by cheaper agricultural imports. Given the fact that India's tariff ceilings bindings are at a very high level compared to the current level of applied rates, India's agricultural imports can be managed through tariff mechanism even in the absence of any QRs.

One major concern associated with the opening up of the Indian agriculture is that it will get exposed to a large price fluctuations which characterize the world commodity market. It was theorized that the AoA would induce greater price stability by increasing the depth of the world commodity market. This has, however, not been found to have occurred so far. The world price volatility, if transmitted through open cross border trade, will increase the domestic price instability in India. This may alter the risk perception of Indian farmers and can have serious production implications.

The process of opening up of Indian agriculture and its integration with the world economy has begun. India have accorded greater access to foreign competition in its market. For instance, import of palm oil to India increased from 1.6 million MT in 1998 to 2.9 million MT in 1999 and 3.1 million MT in 2000. Given the fact that composition of demand within edible oilseeds group is price elastic, availability of cheaper imported palm oil in the country has contributed to crashing of prices of coconut by about 49 percent between 1999 and 2000. Thus, removal of QRs has had both positive and negative impact. It made edible oils available at highly competitive prices to consumers on one hand and increased the risk perception of farmers on the other hand. In the ultimate analysis, removal of QRs adversely affected TFP of some commodities such as coconut/copra in the short run.

### 4.1.2 Food Security

Food 'security' is covered under the AoA's 'non-trade concerns'. According to definition given at the World Food Summit at Rome in 1996,

> *"Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preference for an active and healthy life."*

This definition emphasizes following three critical dimensions of food security:

- There must be a **physical supply** of the desired food in sufficient quantity.
- There must also be an **economic access** e.g. the right to livelihood. So the issue of purchasing power is closely linked to food security.
- There must be **stability in supply** which in a globalize scenario will include access to global food market.

India lay emphasis on food security mainly because of her concerns for political independence, uncertainty and risk.

### 4.1.3 Global Scenario

According to an estimate of FAO, about 790 million people in developing countries and another 34 million people in developed and transition economies were suffering from undernourishment during 1995-97. Of these, 200 million food insecure people live in India.

The views of various countries on food security differ depending upon their respective national interests. Countries which are large exporters of agricultural products including grains present the view that increased liberalization in agricultural trade is the best way to ensure global food security. On the other hand, countries which have a large protected agricultural sector emphasize the role of national food self-sufficiency in

pursuit of food security. The issue of accessing global food market has several dimensions. To purchase food from the international market, the importing countries must have adequate foreign exchange. One school of thought is that the high level of export subsidies given by some developed countries on their agro-exports artificially reduced the prices in the market. This adversely affects the competitiveness of the developing countries, which in turn reduces their ability to earn foreign exchange from exports. There is, therefore, a linkage between food security in terms of economic access and the present subsidy regime in the developed countries. Viewed in this perspective, food security in the developing countries can be improved if the developed countries go for massive reductions in their agricultural subsidies. It will, however, have some adverse impact on the net food-importing developing countries (NFIDC) as this reduction in subsidies may result in an increase in food prices.

Globalization process has enabled India, like many other countries, to offer ample opportunities in agriculture sector- both as an exporter of certain commodities in which it is surplus and as an importer of certain other commodities like oilseeds in which it is deficient. As a surplus producing state of rice, for instance, India has penetrated in rice markets of certain co-developing countries. On the other hand, it has imported such commodities as palm oil to the tune of about 3.1 million MT in 2000 from Indonesia and Malaysia etc. to meet the domestic demand.

### 4.2 Future Outlook

According to the model developed by FAPRI (Food and Agriculture Policy Research Institute), world crop area is projected to increase by 14 million hectares by the year 2009, with oilseeds accounting for 70 percent increase. Among foodgrains, wheat accounts for most of the increase followed by maize. Area under rice is projected to decline during the projection period due to urbanization and profitability of substitute crops. Unlike grains, soybeans, sunflower and peanut are projected to bring additional area into production. Soybean and sunflower account for more than 90 percent of the increase. Further, additional area and yield growth through technological improvements is projected to increase world grain production by more than 13 percent. Maize is projected to record the highest growth with more than 16 percent. Many developing countries with land constraints are likely to depend on the world market to meet their increasing domestic demand arising out of increased income and population growth and they are projected to be a primary growth market for world grain trade.

World crop trade is projected to increase by 550 million MT during the projection period i.e. upto 2009 with United States capturing 49 percent of the expanded market. Following this expansion of the market, grain prices are projected to increase by 35 percent by 2009. The increase in the world crop trade reflects increasing specialization occurring in the world agriculture. Increased market access and land scarcity in many Asian economies induce them to import grain and other oilseeds to meet their feed demand. Developing Asia remains fastest growing market for maize in the current decade. World grain trade is projected to grow by more than 23 percent in the next decade.

### 5.1 Proposal for Setting Up a Formal Mechanism for Future Survey

The coverage of the present “Survey on Agriculture Productivity Index” is fairly comprehensive and calls for wide spectrum of data/ information which is not confined to one but four Ministries/ Organizations mentioned below:

- The Directorate of Economics & Statistics (DES), Ministry of Agriculture, Government of India, New Delhi;
- The Coconut Development Board, Cochin (Kerala);

- The Rubber Board, Kottayam (Kerala); and
- The Ministry of Statistics and Programme Implementation, Government of India, New Delhi.

Based on the recent experience of this correspondent in undertaking the present assignment, it is stated that the APO Survey is unconventional and as such data requirement is not met straightway from the aforesaid sources. It calls for detailed discussions with the concerned organizations to curl out the data of interest. Besides, some primary data are also required to be collected by the correspondent to meet the needs of the Survey. For this purpose, APO may identify an experienced survey Correspondent in each APO Member country who has background in both agriculture and Statistics disciplines. An Agricultural Statistician may be carefully selected to undertake similar Surveys in future.

### 5.2 Limitations of the Survey

All out efforts have been made to capture data/ information to reflect the real situation, to the extent possible, prevailing on the ground. However, the Survey has following limitations:

a. A large part of data included in the present survey are from "secondary" sources. However, the primary data are based more on "enquiry" method rather than following any standard sampling technique. Besides, respondents covered under the enquiry have not been selected from any given sampling frame. In this situation, it allows the possibility of occurrence of strong positive Hawthorne[5] effect in the survey data since it is well known that enquiry estimates have got tremendous potential to be much more elastic than the data collected on the basis of random sampling. In the ultimate analysis, this affects the reliability of the results.

b. To make an assessment of quality of estimates generated, it is imperative to estimate coefficient of variation (CV) and standard error (SE). However, this was not possible for the reason of the sample being small.

c. The data collected during the Survey, *prima-facie*, suggest the existence of causal relationship between productivity, especially of processed commodities and the size of operations. It may, therefore, be imperative to test a statistical hypothesis whether economy of scale affects level of productivities. However, it could not be undertaken in this survey due to constraints of relevant time-series data but may be considered in future surveys.

d. The short duration crops, *ceteris paribus*, are more competitive compared to long duration crops. The land productivities across various countries, strictly speaking, may not be comparable if duration (gestation period) of crops in different countries are different. This is all the more important when the opportunity costs of land and labor are high. This dimension may be considered in future surveys.

e. Most of data presented in this survey pertain either to agriculture year (July to June) or financial year (April to March). While all data on area, production, productivity and cost of cultivation of various crops relate to agriculture year, data on exports, import, national economic indicators like GDP relate to financial year. Still further, data on average prices and labor force relate to calendar year (January to December). Scientifically speaking, these data can not be said to have a common reference period. However, in the analysis, it has been

[5] *It connotes a situation in which inappropriate settings lead to distortion in results. This term has origin in well known "Hawthorne experiments" which demonstrated that productivity of workers can be enhanced significantly by improving working environment. A corollary of this is that an improper setting attain sub-optimal efficiency.*

assumed that all data pertain to the same reference period namely calendar year and accordingly all data have been presented as if these pertain to calendar year.

## 6. Summary and Conclusions

India selected six commodities namely rice (paddy), sugarcane, rubber (natural), coconut, maize and soybeans under the "Survey on Agriculture Productivity Index" to develop a set of internationally comparable indicators which can illustrate competitiveness of agricultural commodities in international trade.

In India, the earnings from agricultural exports have been higher than the outgo on agricultural imports. There has been a substantial increase in agriculture exports from India in the year 1995 when AoA came into effect and Quantitative Restrictions (QRs) were removed. The agriculture exports increased to US $ 6.10 billion in 1995 from US $ 4.21 billion in 1994, recording an impressive growth rate at 44.80 percent. In 2000, agriculture exports exceeded the corresponding imports by over US$ 3.63 billion. The value of imports of agricultural commodities has generally shown a rising trend until 1999 which is mainly on account of imports of edible oils.

Indian agriculture had been one of the most protected sectors of the economy until 1991. She made a paradigm shift in her export policy and slowly started the trade liberalization process in 1991. When India signed AoA under WTO in January 1995, removal of QRs and the process of tariffication got accelerated. During the post-1995 period, India and other co-developing countries have become important markets for agricultural exports.

To explore the existence of correlation between trade performance and productivity, two hypotheses have been postulated. The first one, referred to as exportable hypothesis, hypothesizes that with improvement in Total factor Productivity (TFP), the performance of export, *ceteris paribus*, would improve as the commodity gets more competitive in international market. Conversely, lower TFP would dampen the prospects of exports. Under this hypothesis, commodity in question has been treated as exportable and competes with the domestically produced commodity at the foreign port. The exportable hypothesis has been validated by the performance of export of rice and soybeans during pre-1995, maize and copra during the post-1995 and also of natural rubber during the period 1993 to 2000. Under the second hypothesis, called as importable hypothesis, it is postulated that lower TFP, *ceteris paribus*, would encourage imports and higher TFP would discourage imports. Under this hypothesis, the commodity in question is regarded as an import substitute i.e. there is an imported commodity that competes with domestically produced commodity. The estimates of TFP and the relevant performance of imports of rice, maize, soybeans and sugar during pre-1995 period support importable hypothesis. However, there have been other cases which do not support either of the two hypotheses. Thus, India's trade (and for that matter any other country's) performance can not be fully explained by changes in TFP alone. The broad trends in international trade are greatly influenced by interplay of macro level policy instruments such as trade liberalization, structural adjustments, tariff and exchange rates etc., besides TFP of the country of import/ export and also those of other international competitors.

Benchmarking analysis has brought out that the benchmark farms generally incur higher costs per hectare of cultivation compared to those of national average farms as they attract skilled/experienced laborers by offering them higher wages, spend higher expenditure on inputs such as irrigation, land, technology and modernization of plants and machinery. The higher expenditure incurred by the benchmark farms is more than offset by higher 'value added' by them which is accomplished mainly through higher land

productivity and also better quality of their produce which ultimately command higher prices.

Inefficiencies in varying degrees exist in national average farms/factories. As bulk of Indian exports relies on price competitiveness, it would make an economic sense to improve productivity to achieve lower cost per unit of production. To achieve this, 'efficiency shifters' such as hiring of skilled labor, investment in irrigation, land, technology and modernization of plants and machinery by benchmark farms/factories need to be replicated by national average farms/ factories. It is an optical illusion to be efficient by cutting the cost of cultivation per unit of area by applying sub-standard inputs or applying them at sub-optimal level as it adversely affects cost per unit of production. It is, therefore, recommended that national average farms/factories resort to 'efficiency shifters' to realize a promising future Indian agriculture offers.

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**ACRONYMS**

| | |
|---|---|
| AMS | Aggregate Measure of Support |
| ANRPC | Association of Natural Rubber Producing Countries |
| AoA | Agreement on Agriculture |
| ASI | Annual Survey of Industries |
| BAAC | Bank of Agriculture and Agricultural Cooperatives |
| BM | Benchmark |
| BoP | Balance of Payment |
| BPL | Below Poverty Line |

| | |
|---|---|
| CET | Centre of Excellence for Training |
| CGR | (Average Annual) Compound Growth Rate |
| CIF | Cost, Insurance and Freight |
| CPO | Crude Palm Oil |
| DEP | Department of Export Promotion |
| DES | Directorate of Economics & Statistics, (Ministry of Agriculture) |
| DLW | Diesel Locomotive Works |
| DRCS | Domestic Resource Cost Ratios |
| EOU | Export Oriented Units |
| EPCs | Export Promotion Councils |
| EU | Economic Union |
| FAO | Food and Agriculture Organization |
| FAPRI | Food and Agriculture Policy Research Institute |
| FCI | Food Corporation of India |
| FELCRA | Federal Land Consolidation and Rehabilitation Authority |
| FELDA | Federal Land Development Authority |
| FFB | Fresh Fruit Branches |
| FoB | Free on Board |
| GDCF | Gross Domestic Capital Formation |
| GFCF | Gross Fixed Capital Formation |
| GNP | Gross National Product |
| ha | Hectare |
| HP | Horse Power |
| ICAR | Indian Council of Agriculture Research |
| ICOR | Incremental Capital Output Ratio |
| IIP | Index of Industrial Production |
| IMF | International Monetary Fund |
| ITT | Index of Terms of Trade |
| LITS | Low Intensity Tapping System |
| MOF | Marketing Organization of Farmers |
| MPOB | Malaysian Palm Oil Board |
| MRB | Malaysian Rubber Board |
| MSP | Minimum Support Prices |

| | |
|---|---|
| MT | Metric Tonnes |
| MUV | Manufactures Unit Value |
| N.A. | National Average, Not Applicable |
| NAFED | National Agricultural Cooperative Marketing Federation |
| NAP | National Agriculture Policy |
| NAS | National Accounts Statistics |
| NC | Not Covered |
| NFIDC | Net Food Importing Developing Countries |
| NGOs | Non-Governmental Organization |
| NIC | National Industrial Classification |
| NPC | Nominal Protection Coefficient |
| NR | Natural Rubber |
| NSSO | National Sample Survey Organization (India) |
| OECD | Organization of Economic Cooperation and Development |
| OER | Oil Extraction Rate |
| ORRAF | Office of the Rubber Replanting Aid Fund |
| PSE | Producers Support Estimate |
| PV | Production Value |
| ROC | Republic of China |
| Rs. | Indian Rupees |
| S&D | Special and Differential (Treatment under WTO) |
| SDA | Smallholders' Development Authority |
| SDR | Special Drawing Rights |
| SEBs | State Electricity Boards |
| SPS | Sanitary and Phyto-Sanitary |
| TFP | Total Factor Productivity |
| TPDS | Targeted Public Distribution System |
| UR | Uruguay Round |
| VOA | Value of Output from Agriculture (Crop Husbandry) |
| WPI | Wholesale Price Index |
| WTO | World Trade Organization |

# 3. JAPAN

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## 1. Background: Survey Commodities and Their Trade Performance

### 1.1 Introduction: Rationale of Survey and Criteria for Commodity Selection

In the context of food security, Japan assign high priority to agriculture sector, although the contribution of this sector to Japanese GDP has declined from 1.7 percent in 1990 to 1.1 percent in 2000. The level of overall food self-sufficiency in calorie terms at 40 percent in 2002 has been the lowest amongst industrialised nations. The country has been net importer of agriculture and food products and trade balance on this account has been consistently negative during the decade of 1990s. Imports of agriculture and food products exceeded the corresponding exports by US$ 50.01 billion in the year 2000.

APO conducted a survey on `Agricultural Productivity Index' in selected APO member countries to measure Productivity of selected tradable commodities to provide policy makers and agricultural traders a tool for comparative analysis across countries in Asia. In so far as Japan is concerned, three commodities namely rice, sugar and soybeans have been selected under the Survey. Rice, nutritious and healthy, has been a staple food for Japanese and thus is very important. It commands the highest share in Japanese agriculture in terms of its value of output. As level of self sufficiency of sugar and soybeans have been low at 34 percent and 5 percent respectively in fiscal year 2002, domestic production of these commodities need to be promoted. In this context, it is useful to provide some measures of productivity / competitiveness of rice, sugar and soybeans which in turn would indicate the efficiency of resource use and provide a basis for comparative analysis across industries and countries in the region.

### 1.2. Importance of the Surveyed Commodities In National Agriculture / Food Supply / Economy

The importance of a commodity, particularly from trade perspective, can be viewed by its share in the export and import in the agriculture and food trade. The relevant shares of various commodities selected under the survey in Japan have been presented in Table1.

**Table 1. Shares of Exports and Imports of Surveyed Commodities in Agriculture and Food Trade of Japan During 1990-2000**

(Percent)

| Crop | Exports | | | Imports | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| Rice (milled) | 0.00 | 0.10 | 0.48 | 0.01 | 0.03 | 0.50 |
| Sugar (raw) | 0.05 | 0.07 | 0.05 | 1.30 | 1.03 | 0.58 |
| Soybeans | 0.02 | 0.01 | 0.01 | 3.15 | 2.28 | 2.31 |
| Total | 0.07 | 0.18 | 0.54 | 4.46 | 3.34 | 3.39 |

#### 1.2.1 Rice (Paddy)

Rice contributes a quarter of total value of Japanese agricultural production and

a third of total value of crop production. The importance of rice in Japan can be viewed from the fact that taxes and salaries were often linked with rice in the medieval period and is considered indispensable from the point of view of food security of the country. In terms of calorie intake, Japanese take about 25 percent of calorie from rice. Humid and hot summer in the country is also congenial for rice (paddy) cultivation. Three quarter of farms cultivate rice (paddy) as farmers often produce it for self consumption. Terraced paddy fields not only prevent flood but also provide beautiful landscape.

### 1.2.2 Sugar

Japan produce sugar from sugar beet and sugarcane. While sugar beet is grown in the northernmost big island of the Japanese archipelago, the southernmost provinces lead the production of sugarcane. Sugar beet is grown once in a few years in rotation with potatoes, autumn corn and beans. Soil fertility is maintained and conserved for commodities rooted in shallow layer of land such as corn, since sugar beet is rooted in deep layer. Sugarcane is grown as a main crop in the areas where other crops are not profitable due to geographic / economic conditions. Local sugar manufacturers and refineries heavily depend on this crop.

### 1.2.3 Soybeans

Japan has deficit in the production of soybeans. To achieve self sufficiency of this crop and also to develop an alternative crop for plantation on paddy fields, soybeans cultivation is encouraged. This also serves to prevent over production of rice (paddy). The level of production of soybeans in 2000 has exceeded the target set by the government for the year 2010. However, its prices have declined due to non-conforming to quality standards demanded by consumers. This will be more problematic as total production is expected to further expand.

## 1.3 Exports / Imports of the Surveyed Commodities

Japan has been the single largest net importer of agricultural and food products in the world. Import of agriculture and food products to Japan has increased from US$ 40.0 billion in 1990 to US$ 52.9 billion in 2000. At the same time, exports have also increased from US$ 2.4 billion and US$ 2.8 billion during the corresponding period.

### 1.3.1 Rice

Japan has been following a policy of self-reliance due to its concern for food security. However, in 1993 the country imported 2,590 thousand MT of rice which was necessitated due to heavy damage to rice production as a result of unusually cold and rainy summer. Since 1995, Japan has been importing rice due to obligation of Minimum Access Volume (MAV) under AoA (Agreement on Agriculture). The quantity fixed under MAV was 379 thousand tons (in terms of polished rice) in 1995 with a proviso to increase it annually by 76 thousand MT. From 1$^{st}$ April 1999, Quantitative Restrictions (QRs) were replaced by tariffication. The incremental quantum of MAV was then halved to 38 thousand MT per annum. This was envisaged to be further reduced to 682 thousand MT from 2000 until the time a new agreement under WTO agricultural negotiations comes into force.

The annual quantity of rice exported by Japan has been low at less than 0.1 percent of the total agriculture and food export in normal circumstances. However, it increases substantially when rice is exported as food aid. The main consumers of exported rice have been Japanese diaspora in countries like the Republic of China, Hong Kong, Singapore and the United States. As the target group of exported rice has been high income group Japanese diaspora, superior quality of rice has been exported to meet their demand for quality. The prices of exported rice have been 3.5 to 6 times of

locally produced rice.

### 1.3.2 Sugar

Japan is deficit in domestic production of sugar. To meet the domestic demand of this commodity, 1.7 million MT was imported in 1990 which marginally declined to 1.6 million MT in 2000 due to decrease in its consumption. Tariff on imported sugar has been reduced in a phased manner from 41.5 yen / kilogram in 1990 to 10.0 yen / kilogram in 1998 and finally abolished in 2000.

The share of import of sugar in the total agriculture and food import has been about 1 percent compared to 0.1 percent in case of export.

### 1.3.3 Soybeans

Japan has annually imported around five million tonnes of soybeans during the decade of 1990s. It accounts for about 3 percent of total imports on account of agriculture and food while export of this commodity has been nil. No tariff is imposed on import of soybeans. More than 95 percent of demand for soybeans in Japan is met by imports.

## 2. Measured Productivity Indices of the Surveyed Commodities

This section has been divided in the following three sub-sections:

- Productivity Indices of Crops (Raw)
- Productivity Indices of Tradable Processed Commodities
- Benchmarking Analysis

### 2.1 Productivity Indices of Raw Crops

Land, labour, capital and total factor Productivity of the national average farms in respect of the following crops (raw) have been investigated in this sub-section:

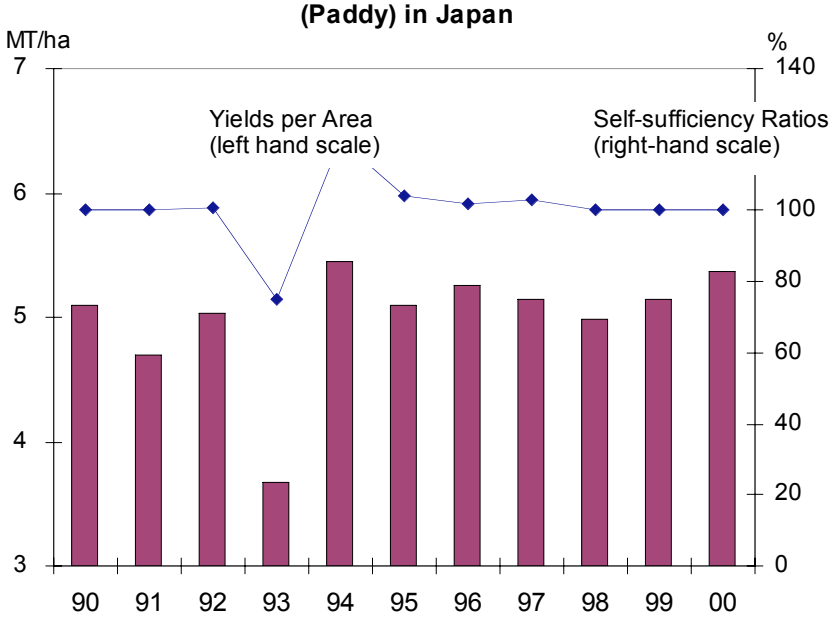
- Rice (Paddy);
- Sugarcane;
- Sugar Beet; and
- Soybeans

### 2.1.1 Productivity of Rice (Paddy)

#### 2.1.1.1 Land and Labour Productivity of Rice (Paddy)

Land productivity of rice (paddy) in physical quantity terms has shown a declining trend, albeit at low negative growth rate of (-) 0.68 percent per annum during 1990-95. This has been caused due to severe damage to the crop in 1993 as a result of exceptional cold and rainy summer. Except 1993, the land productivity has been robust during 1990s (Figure 1).

**Figure 1. Yield Rates and Self-Sufficiency Ratios of Rice (Paddy) in Japan**




Source: Ministry of Agriculture, Forestry and Fisheries "Statistics on Crop", "Food Balance Sheet "
Note: The source of data for yields is different from that used in tables on production indices (Tables 5 and 6).

1990-2000 and corresponding compound annual growth rates have been presented in Table 2.

**Table 2. Land and Labor Productivity of Rice (Paddy) in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 5.33 | 5.15 | 5.39 | -0.68 | 0.92 |
| Labour /Land Ratio (Man-day/ hectare) | 57.00 | 48.86 | 42.70 | -3.03 | -2.66 |
| Labour Productivity (Kg./ man-day) | 93.51 | 105.40 | 126.23 | 2.42 | 3.67 |
| Value Added per hectare (at constant 1995 US $) | 10244.20 | 11666.60 | 8978.61 | 2.63 | -5.10 |
| Value Added per hectare (Index) | 87.81 | 100.00 | 76.96 | 2.63 | -5.10 |
| Value Added per man-day (at constant 1995 US $) | 179.72 | 238.76 | 210.27 | 5.85 | -2.51 |
| Value Added per man-day (Index) | 75.27 | 100.00 | 88.07 | 5.85 | -2.51 |
| Value Added per MT (at constant 1995 US $) | 1921.99 | 2265.36 | 1665.79 | 3.34 | -5.96 |
| Value Added per MT (Index) | 84.84 | 100.00 | 73.53 | 3.34 | -5.96 |

Value added per hectare of rice (paddy) farms increased annually at 2.63 percent during the first half of 1990s but declined at (-) 5.10 percent per annum during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s mainly due to subdued prices caused by shift in taste/consumption pattern, especially of younger generation, from rice to Italian pasta, bread and noodles as staple food.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, declined faster at negative (-) 3.03 percent per annum during the first half of 1990s

compared to (-) 2.66 percent during the second half of 1990s. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanisation. Lower rate of decline in this ratio during the second half of 1990s compared to that in the first half of 1990s shows investment in farm mechanisation has decelerated.

Value added per man day (at constant 1995 US $) increased at 5.85 percent annually from US$180 in 1990 to US$239 in 1995. It declined to US$210 in 2000 at annual rate of (-) 2.51 percent. However, this level of US$210 is quite high and makes Japanese rice less competitive in the international market.

### 2.1.1.2 Capital Productivity of Rice (Paddy)

Value added per depreciation posted an annual growth rate at 8.89 percent during 1990-1995 against (-) 4.30 percent during1995-2000 (Table 3).

**Table 3. Capital Productivity of Rice (Paddy) in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 3.08 | 4.72 | 3.79 | 8.89 | -4.30 |
| Value Added per capital (Index) | 65.33 | 100.00 | 80.29 | 8.89 | -4.30 |

This trend mirrors the changes in economic conditions due to recession in 1995. As more than 60 percent of rice producing farmers in Japan depends heavily on non-farming income, they have not exhibited any willingness to take risk in making investment in the wake of recession.

### 2.1.1.3 Total Factor Productivity Rice (Paddy)

Total factor productivity (TFP) of rice (paddy) increased at a nominal rate of 0.40 percent per annum during the first half of 1990s but declined at (-)2.64 percent per annum during the second half of 1990s (Table 4).

**Table 4. Total Factor Productivity of Rice (Paddy) in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity(Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 118.51 | 100.00 | 71.76 | -3.34 | -6.42 |
| Total Input | 120.88 | 100.00 | 82.04 | -3.72 | -3.88 |
| Total Factor Productivity | 98.04 | 100.00 | 87.46 | 0.40 | -2.64 |

This has happened due to the fact that total output declined faster at (-)6.42 percent per annum compared to decline at (-)3.88 percent per annum in total input during the second half of 1990s.

### 2.1.2 Productivity of Sugarcane

### 2.1.2.1 Land and Labour Productivity

Land and labour Productivity of national average sugarcane farms and corresponding compound annual growth rates have been presented in Table 5.

**Table 5. Land and Labor Productivity of Sugarcane in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 66.89 | 74.83 | 64.95 | 2.27 | -2.79 |
| Labour /Land Ratio (Man-day/ hectare) | 176.99 | 132.51 | 122.29 | -5.62 | -1.59 |
| Labour Productivity (Kg./ man-day) | 377.94 | 564.70 | 531.13 | 8.36 | -1.22 |
| Value Added per hectare (at constant 1995 US $) | 8840.38 | 13650.33 | 10726.82 | 9.08 | -4.71 |
| Value Added per hectare (Index) | 64.76 | 100.00 | 78.58 | 9.08 | -4.71 |
| Value Added per man-day (at constant 1995 US $) | 49.95 | 103.01 | 87.72 | 15.58 | -3.16 |
| Value Added per man-day (Index) | 48.49 | 100.00 | 85.15 | 15.58 | -3.16 |
| Value Added per MT (at constant 1995 US $) | 132.16 | 182.42 | 165.16 | 6.66 | -1.97 |
| Value Added per MT (Index) | 72.45 | 100.00 | 90.54 | 6.66 | -1.97 |

Land productivity of sugarcane in physical quantity terms has increased from 66.89 MT/ hectare in 1990 to 74.83 MT/hectare in 1995, registering an annual growth rate at 2.27 percent during 1990-95. However, it declined to (-) 2.79 percent per annum during the second half of 1990s, achieving a level of 64.95 MT/ hectare in 2000.

Value added per hectare of sugarcane increased at 2.27 percent per annum during the first half of 1990s but declined at (-) 2.79 percent during the second half of 1990s. Value added per MT increased at 6.66 percent per annum during the first half of 1990s but declined during the second half of 1990s at (-) 1.97 percent per annum. Unlike the case of rice (paddy), movements of value added per hectare and value added per MT of sugarcane have followed similar trends during the decade of 1990s. This shows that prices of sugarcane have been fairly stable.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, declined at (-) 5.62 percent per annum during the first half of 1990s compared to (-) 1.59 percent during the second half of 1990s. Lower rate of decline in this ratio during the second half of 1990s compared to that in the first half of 1990s shows investment in farm mechanization has decelerated.

Value added per man day (at constant 1995 US $) increased at 15.58 percent annually from US$50 in1990 to US$103 in 1995. However, it declined to US$88 in 2000 at (-) 3.16 percent per annum.

### 2.1.2.2 Capital Productivity of Sugarcane

Value added per depreciation posted a growth rate at 12.79 percent per annum during 1990-1995 against (-) 2.55 percent per annum during1995-2000 (Table 6).

**Table 6. Capital Productivity of Sugarcane in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 12.78 | 23.33 | 20.51 | 12.79 | -2.55 |
| Value Added per capital (Index) | 54.79 | 100.00 | 87.90 | 12.79 | -2.55 |

### 2.1.2.3 Total Factor Productivity of Sugarcane

Total factor productivity (TFP) increased at a nominal annual rate at 6.80 percent during the first half of 1990s but declined at (-) 1.72 percent during the second half of 1990s (Table 7).

**Table 7. Total Factor Productivity of Sugarcane in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity(Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 121.49 | 100.00 | 84.04 | -3.82 | -3.42 |
| Total Input | 168.79 | 100.00 | 91.68 | -9.94 | -1.72 |
| Total Factor Productivity | 71.98 | 100.00 | 91.67 | 6.80 | -1.72 |

This has happened due to the fact that total output declined faster at (-) 3.42 percent per annum compared to (-) 1.72 percent decline in total input during the second half of 1990s.

### 2.1.3 Productivity of Sugar Beet

Besides sugarcane, sugar beet is also used as raw material for production of sugar. It is, therefore, imperative to analyze performance of this crop also.

#### 2.1.3.1 Land and Labor Productivity of Sugar Beet

Productivity measures of national average sugar beet farms and corresponding compound annual growth rates have been presented in Table 8.

**Table 8. Land and Labor Productivity of Sugar Beet in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 57.57 | 56.92 | 52.92 | -0.23 | -1.45 |
| Labor /Land Ratio (Man-day/ hectare) | 26.25 | 24.16 | 20.70 | -1.64 | -3.05 |
| Labor Productivity (Kg./ man-day) | 2193.14 | 2355.72 | 2556.52 | 1.44 | 1.65 |
| Value Added per hectare ( at constant 1995 US $) | 4996.91 | 6703.59 | 4022.00 | 6.05 | -9.71 |
| Value Added per hectare (Index) | 74.54 | 100.00 | 60.00 | 6.05 | -9.71 |
| Value Added per man-day (at constant 1995 US $) | 190.36 | 277.44 | 194.30 | 7.82 | -6.88 |
| Value Added per man-day (Index) | 68.61 | 100.00 | 70.03 | 7.82 | -6.88 |
| Value Added per MT (at constant 1995 US $) | 86.80 | 117.77 | 76.00 | 6.29 | -8.39 |
| Value Added per MT (Index) | 73.70 | 100.00 | 64.53 | 6.29 | -8.39 |

Unlike sugarcane, land productivity of sugar beet in physical quantity terms has monotonously declined during the decade of 1990s. It ebbed from 57.57 MT/ hectare in 1990 to 56.93 MT/hectare in 1995 and further to 52.92 MT/ hectare in 2000. The rate of decline at (-) 1.45 per annum was steeper during 1995-2000 compared to (-) 0.23 per annum during 1990-95.

Value added per hectare of sugar beet farms increased annually at 6.05 percent during the first half of 1990s but declined at (-) 9.71 percent during the second half of 1990s. Value added per MT posted an annual rate at 6.29 percent during the first half of 1990s but declined during the second half of 1990s at (-) 8.39 percent per annum. Movements of value added per hectare and value added per MT of both sugarcane and sugar beet have followed similar trends during the decade of 1990s.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, declined annually at negative (-) 1.64 percent during the first half of 1990s compared to (-) 3.05 percent during the second half of 1990s. Faster decline in this ratio during the second half of 1990s compared to that in the first half of 1990s shows investment in farm mechanization has accelerated.

Value added per man day (at constant 1995 US $) increased at 7.82 percent

annually from US$190 in 1990 to US$277 in 1995. It declined to US$194 in 2000 at (-) 6.88 percent per annum.

### 2.1.3.2 Capital Productivity of Sugar Beet

Value added per depreciation posted an annual growth rate at 16.09 percent during 1990-1995 against (-) 6.71 percent during1995-2000 (Table 9).

**Table 9. Capital Productivity of Sugar beet in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 3.82 | 8.05 | 5.69 | 16.09 | -6.71 |
| Value Added per capital (Index) | 47.42 | 100.00 | 70.65 | 16.09 | -6.71 |

Depreciation value in sugar beet production constantly decreased between 1990, 1995 and 2000 while that in sugar cane production stagnated between 1995 and 2000 after the large decrease between 1990 and 1995. This trend seems to show that scale expansion reached to the upper limit of appropriate size for growing sugar cane. Additional capital, such as large-scale machines, would have been necessary when enlarging cultivated area. However, capital productivity of both commodities worsened between 1995 and 2000 owing to decreased value added.

### 2.1.3.3 Total Factor Productivity of Sugar Beet

Total factor productivity (TFP) increased at (-) 3.86 percent per annum during the first half of 1990s but declined faster at (-)6.68 percent during the second half of 1990s (Table 10).

**Table 10. Total Factor Productivity of Sugar Beet in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity(Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 105.68 | 100.00 | 66.18 | -1.10 | -7.93 |
| Total Input | 127.70 | 100.00 | 93.50 | -4.77 | -1.34 |
| Total Factor Productivity | 82.76 | 100.00 | 70.78 | 3.86 | -6.68 |

This has happened due to the fact that total output declined faster at (-) 7.93 percent per annum compared to (-)1.34 percent decline in total input during the second half of 1990s.

### 2.1.3 Productivity of Soybeans

### 2.1.3.1 Land and Labour Productivity of Soybeans

Productivity measures of national average Soybeans farms and corresponding compound annual growth rates have been presented in Table 11.

**Table 11. Land and Labor Productivity of Soybeans in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 2.07 | 2.44 | 2.30 | 3.34 | -1.17 |
| Labour /Land Ratio (Man-day/ hectare) | 37.00 | 29.05 | 19.36 | -4.72 | -7.79 |
| Labour Productivity (Kg./ man-day) | 55.95 | 83.99 | 118.79 | 8.47 | 7.18 |
| Value Added per hectare (at constant 1995 US $) | 2786.79 | 4823.52 | 3586.96 | 11.60 | -5.75 |
| Value Added per hectare (Index) | 57.78 | 100.00 | 74.36 | 11.60 | -5.75 |
| Value Added per man-day (at constant 1995 US $) | 75.32 | 166.04 | 185.25 | 17.13 | 2.21 |
| Value Added per man-day (Index) | 45.36 | 100.00 | 111.57 | 17.13 | 2.21 |
| Value Added per MT (at constant 1995 US $) | 1346.28 | 1976.85 | 1559.55 | 7.99 | -4.63 |
| Value Added per MT (Index) | 68.10 | 100.00 | 78.89 | 7.99 | -4.63 |

As in case of sugarcane, land productivity of soybeans in physical quantity terms increased during 1990-95 but declined during 1995-2000. It from 2.07 MT/ hectare in 1990 to 2.44 MT/hectare in 1995 before declining to 2.30 MT/ hectare in 2000. It changed at an annual rate of 3.34 percent and (-) 1.17 percent during 199095 and 1995-2000 respectively.

Value added per hectare of soybeans farms increased annually at 11.60 percent during the first half of 1990s but declined at (-) 5.75 percent during the second half of 1990s. Value added per hectare increased between 1990 and 1995 and then, decreased between 1995 and 2000. The reason of the former trend was chiefly due to the increase of the yield per ha while that of the latter trend was mainly owing to the fallen prices of soybeans as a result of rapid increase in soybean production.

Value added per MT posted an annual rate at 7.99 percent during the first half of 1990s but declined during the second half of 1990s at (-) 4.63 percent per annum. Movements of value added per hectare and value added per MT of soybeans have followed similar trends during the decade of 1990s. This shows that prices have been robust during the corresponding period.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, declined annually at (-) 4.72 percent during the first half of 1990s compared to (-)7.79 percent during the second half of 1990s. Faster decline in this ratio during the second half of 1990s compared to that in the first half of 1990s shows investment in farm mechanization has accelerated.

Value added per man day (at constant 1995 US $) increased at 17.13 percent annually from US$75 in 1990 to US$166 in 1995. This further increased to US$185 in 2000 but growth decelerated to 2.21 percent per annum.

### 2.1.3.2 Capital Productivity of Soybeans

Value added per depreciation posted an annual growth rate at 17.85 percent during 1990-1995 and remained almost unaltered during 1995-2000 (Table 12).

**Table 12. Capital Productivity of Soybeans in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 2.77 | 6.30 | 6.30 | 17.85 | 0.01 |
| Value Added per capital (Index) | 43.99 | 100.00 | 100.03 | 17.85 | 0.01 |

Depreciation value constantly decreased between 1990, 1995 and 2000. This may be because capital was efficiently utilised by expanding cultivated area. Capital productivity however did not improve between 1995 and 2000 owing to the decreased value added.

### 2.1.1.3 Total Factor Productivity of Soybeans

Total factor productivity (TFP) increased at 9.84 percent per annum during the first half of 1990s but declined faster at (-)1.86 percent during the second half of 1990s (Table 13).

**Table 13. Total Factor Productivity of Soybeans in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 169.37 | 100.00 | 148.16 | -10.00 | 8.18 |
| Total Input | 270.84 | 100.00 | 162.75 | -18.07 | 10.23 |
| Total Factor Productivity | 62.54 | 100.00 | 91.03 | 9.84 | -1.86 |

This has happened due to the fact that total input increased faster at 10.23 percent per annum compared to 8.18 percent increase in total output during the second half of 1990s.

## 2.2 Productivity Indices of the Tradable Processed Form of Commodity

In so far as tradable processed form of commodity is concerned, productivity Indices of only one commodity namely rice (milled) is being discussed as appropriate disaggregated data in respect of other tradable commodity viz. sugar are not available.

### 2.2.1 Productivity of Rice (Milled)

### 2.2.1.1 Labour and Capital Productivity of Rice (Milled)

Productivity indices of polished rice have been presented in Table14.

**Table 14. Labour and Capital Productivity of Rice (Milled) in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per worker (Absolute at constant 1995 US $) | 190083.00 | 248984.00 | 623940.00 | 5.55 | 20.17 |
| Value Added per worker (Index) | 76.34 | 100.00 | 250.59 | 5.55 | 20.17 |
| Value Added per depreciation (Absolute at constant 1995 US $) | 0.12 | 0.25 | 0.43 | 15.81* | 11.46** |
| Value Added per depreciation (Index) | 50.00 | 100.00 | 177.00 | 14.87* | 12.10** |

Note: Conceptually figures marked with asterisk (*) ought to be equal; so should be in the case of figures with double asterisks (**). However, differences have crept in due to rounding off.

During 1990-1995, value added per worker increased at 5.55 percent annually from US$190083 to US$248984. It further steeply increased to US$ 623940 at 20.17 percent per annum which is quite high. Value added per depreciation has increased at an annual rate of 15.81 percent during 1990-95 which has decelerated to 11.46 percent during 1995-2000. This indicates higher level of mechanisation/ modernisation of rice mills has place at during the second half of 1990s compared to that in the first half of 1990s. However, average horsepower per factory has remained unaltered during the 1993-2000 as revealed by the survey conducted by the Food Agency of Japan on rice mills.

### 2.2.1.2 Total Factor Productivity of Rice (Milled)

Total factor productivity (TFP) of rice (milled) increased at 1.32 percent annually during the first half of 1990s. However, the rate of increase accelerated at 12.03 percent per annum during the second half of 1990s (Table 15).

**Table 15. Total Factor Productivity of Rice (Milled) in Japan-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 118.00 | 100.00 | 180.00 | -3.26 | 12.47 |
| Total Input | 126.00 | 100.00 | 102.00 | -4.52 | 0.40 |
| Total Factor Productivity | 93.65 | 100.00 | 176.47 | 1.32 | 12.03 |

This has happened due to the fact that total output increased faster at 12.47 percent per annum compared to an annual increase at 0.40 percent in total input during the corresponding period.

## 2.3 Benchmarking Analysis

To compare and contrast performance of national average farms /factories with those of benchmark (best) farms /factories, benchmarking analysis of rice (paddy) has been undertaken. This analysis has not been undertaken in respect of other crops selected under the survey due to constraint of non-availability of quality data.

### 2.3.1 Benchmark Analysis of Rice (Paddy) Farms

Benchmarking analysis of rice (paddy) farms in Japan has been undertaken from the following three perspectives:

- Comparison of Productivity of National Average (NA) Farms and Benchmark Farms (BM)

- Comparison of Inputs and Output of National Average Farms and Benchmark Farms
- Comparison of Cost Structure of Production of National Average Farms and Benchmark Farms

#### 2.3.1.1 Comparison of Productivity of National Average (NA) Farms and Benchmark Farms (BM)

To compare performance of NA farms with that of BM farms, the ratios of certain key indicators of productivity of the national average farms to the benchmark farms of rice (Paddy) in Japan for 1995 and 2000 have been presented in Table-16.

**Table 16. Ratios of Productivity of National Average Farms to Benchmark Farms of Rice (Paddy) in Japan**

| Measure | 1995 | 2000 |
|---|---|---|
| **Value added per hectare** | | |
| Narrow | 0.76 | 0.78 |
| Broad | 0.83 | 0.88 |
| **Value added per man-day** | | |
| Narrow | 0.48 | 0.37 |
| Broad | 0.53 | 0.43 |
| **Value added per depreciation** | | |
| Narrow | 0.61 | 0.56 |
| Broad | 0.66 | 0.63 |
| **Value added per MT** | | |
| Narrow | 0.83 | 0.73 |
| Broad | 0.90 | 0.87 |
| **Value added as percent of output** | | |
| Narrow | 0.82 | 0.80 |
| Broad | 0.89 | 0.89 |

The following important points emerge from Table-16:

i. Given that benchmark farms (BM) farms represent 'best' farm of the country, ratios of NA to BM farms are expected to lie between zero and unity. This has been validated by empirical data.

ii. Ratios of NA to BM for narrow concept in respect of different parameters of productivity have been generally different from the corresponding ratios for the broad concepts. In Japan, a high income country, the ratios of various productivity indicators have been consistently higher for the broad concept than that for the narrow concept which implies that BM farms hire more laborers and/or lease more land than NA farms.

iii. The ratios of NA to BM for value added per MT of production have been less than unity in 1995 which further decreased in 2000**.**

iv. The level and trend of ratios of NA to BM farms for the percent share of value added to output were almost the same patterns in case of value added per MT of production.

Now, the ratios of expenditure per hectare of respective inputs and of output value at current domestic prices, of national average farms to benchmark farms, for 1995 and 2000 have been presented in Table-17.

**Table 17. Ratios of Inputs / Outputs per hectare of NA to BM Farms of Rice (Paddy) in Japan**

| Measure | 1995 | 2000 |
|---|---|---|
| **Cash cost** | | |
| Cash inputs | 1.57 | 1.53 |
| Seeds | 4.46 | 4.15 |
| Fertilizers | 0.96 | 1.08 |
| Irrigation fee | 2.10 | 4.73 |
| Other cash cost | 2.53 | 2.28 |
| Sub-Total | 1.57 | 1.53 |
| Labour (family) | 1.23 | 2.09 |
| Depreciation | 1.24 | 1.39 |
| Land rent | 1.23 | 1.49 |
| Sub-Total | 1.23 | 1.71 |
| Total cost | 1.33 | 1.62 |
| Output value | 0.93 | 0.98 |

Notes: Margin rate = margin (output value-total cost) to output value

The following important points emerge from Table 17:

- NA farms have been consistently incurring higher costs on various inputs, except fertilizer cost in 1995. This shows that BM farms adopt 'precision farming' practices by applying various inputs more judiciously, assuming per unit price of input does not change with quantity purchased.
- Higher costs of various inputs per unit of area for NA farms than corresponding costs for BM farms explains, to a great extent, high domestic price of rice in Japan.

The distribution of cost over various items of expenditure of NA farms vis-à-vis that of BM farms have been presented in Table 18.

The following important points emerge from Table 18:

i. The share of family labor in respect of NA farms has been around 31-32 percent while it decreased from 35 percent in 1990 to 24 percent in 2000 for BM farms.
ii. Share of other cash costs paid to hired laborers has been low at 6 percent for BM farms compared to 9 percent for NA farms in 2000. In contrast, higher share of depreciation for BM farms at 27 percent in 2000 compared to 23 percent in NA farms during the corresponding period indicate higher level of farm mechanization by BM farms.

**Table 18. Cost Structure of Production of Rice (Paddy) in National Average Farms *vis-à-vis* Benchmark Farms- Japan**

(Percent)

| Measure | National Average | | Benchmark | |
|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 |
| All cash inputs | 23 | 23 | 22 | 28 |
| Other cash cost | 8 | 9 | 4 | 6 |
| Sub-Total | 31 | 32 | 26 | 34 |
| Labour (family) | 32 | 31 | 35 | 24 |
| Depreciation | 21 | 23 | 21 | 27 |
| Land rent | 16 | 14 | 18 | 15 |
| Sub-Total | 69 | 68 | 74 | 66 |
| **Total cost** | 100 | 100 | 100 | 100 |
| Margin rate (%) | -15 | -28 | 19 | 23 |
| **Value added as percent of output** | | | | |
| Narrow | 65 | 59 | 79 | 74 |
| Broad | 73 | 70 | 82 | 79 |

Notes: Margin Rate is the rate of margin (output value-total cost) to output value.

### 2.4 Other Indices of Competitiveness- Break-Even Point

The break-even point (BEP) is the point at which sales are equal to costs and thus 'no profit, no loss' accrues. It is an indicator of business stability. Lower the BEP, higher the stability of the business. The technique of BEP has been employed in the *Annual Report on Food, Agriculture and Rural Areas in Japan*, FY 2002. The BEP ratio is estimated by 'break-even point sales turnover' divided by 'actual sales turnover'. The BEP sales turnover is 'fixed costs' divided by 'marginal profit ratio'.

On the basis of data collected under 'Statistics Surveyed by Sections of Agricultural Management', earnings and expenses of various agricultural commodities in Japan have been computed. The results show that the businesses of large-scale farms were generally more stable than that of small scale farms. However, costs exceeded sales, regardless of size of the farm, during 1995-2000 due to steep fall in prices of the commodities. Data also revealed that it is unprofitable for large scale farms with 15.0 hectares or more in some areas to continue in the business. However, the situation may vary across regions and BEP tool has potential to compare and contrast the competitiveness of farm management of different regions.

## 3. Analysis on the Trade Performance and Productivity Indices of the Survey Commodities

### 3.1 Correlation between Productivity and Trade Performance

The prices of Japanese commodities ruled at much higher level than those of the World during the decade of 1990s (Table 19).

**Table 19. International Comparison of Wholesale Prices- 1990-2000**

(Price: US$/MT)

| Commodity | 1990 | | 1995 | | 2000 | | Relative Prices (Ratio) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Japan | World | Japan | World | Japan | World | 1990 | 1995 | 2000 |
| Rice | 2720 | 284 | 4250 | 319 | 2961 | 253 | 9.6 | 13.3 | 11.7 |
| Sugar | 1215 | 276 | 1637 | 296 | 1178 | 187 | 4.4 | 5.5 | 6.3 |
| Soybeans | 1669 | 219 | 2541 | 221 | 2227 | 176 | 7.6 | 11.5 | 12.7 |

The wholesale prices in the country have been more than 4 to 6 times of the world prices in case of sugar and 10 to 13 times in case of rice during 1990-2000. Similarly, the prices of soybeans have also been exorbitant compared to that of the world prices during the corresponding period. High domestic prices made Japanese commodities less competitive in the international market. The volumes of import of sugar and soybeans have been determined by the gap between domestic demand and domestic availability and not by levels of productivity. In this scenario, no conclusion can be drawn on the relationship between trade performance and productivity of the commodities covered under the survey. In any case, the need for improving productivity can not be undermined.

### 3.2 Effect of Agriculture and Food Policy Relating to the Surveyed Commodities

#### 3.2.1 Price Support / Control

The costs of production of sugarcane and sugar beet in Japan are high. To ensure that farmers continue to grow these crops so that sugar industry get raw material regularly, farmers are supported in the form of subsidies. As prevailing domestic prices of sugar in Japan are higher than the imported commodity, the Agriculture and Livestock Industries Corporation generates funds by selling imported sugar. The funds so generated together with subsidies extended by the government are paid to sugarcane cultivators. This amount works out to be almost equal to the total value of output of sugarcane and sugar beet crops.

As in case of sugarcane/sugar beet, the cost of production of soybeans in Japan has been higher than the market prices. To cover this gap, soybeans cultivators are subsidised in accordance with the pre-determined objective formula which, *inter-alia*, depends upon price of the commodity in previous year. In addition, fund is generated by soybeans producers and the government to stabilise production of soybeans. Subsidies constitute about 70 percent of gross revenue of soybeans. High level of subsidy shows the government's policy to become self-reliant, at least in the medium to long run. In the absence of subsidy, a large number of soybeans cultivators may not cultivate soybeans.

#### 3.2.2 Infrastructure, Research and Extension

The government lay emphasis on undertaking agricultural research. New stress resilient varieties of rice with better quality and taste are being developed. Although these new varieties would be of superior quality, it may not increase yield rate.

Techniques of direct seeding and high-tech agricultural machines are being introduced to save labour input, besides taking measures to improve sugar content in sugar beet crops. In case of sugarcane, mechanisation is being promoted at various stages of the production process. New high yielding varieties with high content of sugar are being developed and diffused.

More nutritious and tastier varieties of soybeans are under development to meet demand of consumers. However, this may not have any impact on export of the commodity as demand of these varieties abroad is rather limited.

#### 3.2.3 Trade Policy

No tariff is imposed on imported sugar and soybeans. Rice import has been

liberalised since 1999 under the Minimum Access Volume.

### 3.3 Effect of Business Performance of the Processing / Trading Sectors

### 3.3.2 Trading Sectors (market integration, diversification, sales promotion etc.)

'Prefecture council for promoting exports of Japan-brand agricultural, forestry and fisheries products' has been established in May 2003 to promote exports of agricultural products. It seeks a new market to export special local foods, besides reducing trade barriers. 'Committee on developing international markets for Japanese foods', set up in JETRO (Japan External Trade Organisation) in July 2003, explored the potential of new markets in East Asian countries to export Japanese foods. The Ministry of Agriculture, Forestry and Fisheries support private sector on exporting Japanese foods. These activities would enable traders to export more Japanese foods. However, it may not be possible in short to medium run to surpass production of sugarcane /sugar beet and soybeans beyond domestic demand.

### 3.4 Effect of International Factors

As large gap between prices of agricultural commodities in Japan and those of the world continue to prevail, no other international factor has been able to influence agriculture trade of Japan except the exchange rate. Strong value of dollar vis-à-vis Yen induces exporters to improve their performance in terms of export of Japanese agricultural commodities.

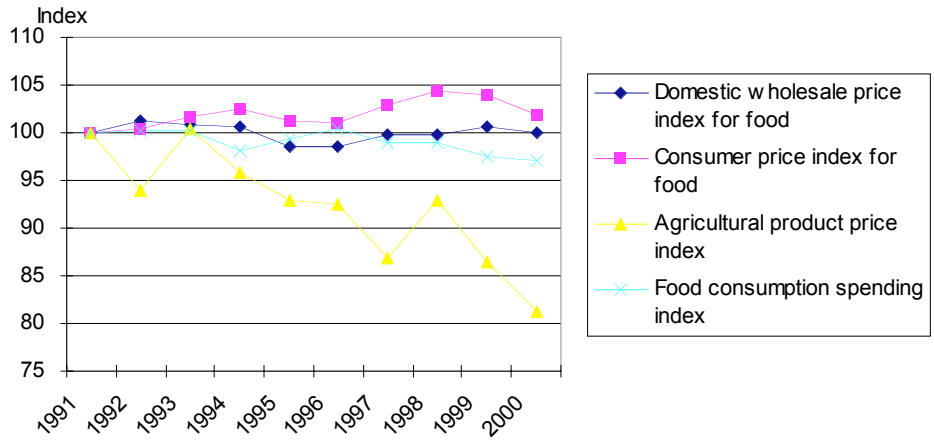
### 3.5 Effect of Other Factors

### 3.5.1 Macro-economic Performance

During the last three years of the decade of 1990s, Japanese economy has been in a deflationary phase as revealed by GDP deflator. Disaggregated analysis show that the fall in prices has been higher in goods than in services. Amid this trend, the consumer price index for food products has been falling since 1999; while domestic wholesale prices have been more or less flat (Figure 2).

Sale prices of agricultural commodities at the producer stage have continued to decline since 1993, particularly during 1998-2000. Furthermore, the difference between the consumer price index for food products and the sale price index for agricultural products has widened during the second half of 1990s.

**Figure 2. Indices related to Food Supply (1991=100)**




Source: Ministry of Agriculture, Forestry and Fisheries "Annual Report on Food, Agriculture and Rural Areas in Japan, FY2002"

The quality standards of Japanese food products, a non-price measure, have

been set high, although the volume of exports of Japanese agriculture and food products has been quite low. Besides, export inspection of all commodities is undertaken.

## 4. Prospect of Future Development / Potential of the Survey Commodities

### 4.1. Likely Changes in Internal And External Environment

The Ministry of Agriculture, Forestry and Fisheries, Japan aims to establish "the Ideal State of Rice Production System" by the year 2010 to enable rice (paddy) farmers to earn decent income. A roadmap "Framework for Rice Policy Reform" has been drawn in December 2002 to achieve this objective. As soybeans is also cultivated in tandem on paddy fields, the productivity of rice (paddy) and soybeans are expected to exhibit upward trend in near future.

Agricultural policy reforms in Japan are being expedited after witnessing deadlock in the WTO negotiations and failure of reaching an agreement with Mexico under FTA in October 2003. The Ministry has started revising the Basic Plan on Food, Agriculture and Rural Areas, a foundation of agricultural policies, and decided to review the plan quinquennially. Through these reforms, Japanese agriculture is expected to be more competitive in years to come.

### 4.2 Role of the Government in Exploiting Future Potential of the Surveyed Commodities

In the wake of privatisation, farmers and farmers' organisations in Japan, not the government, will play an important role in adjusting supply-demand of rice from fiscal year 2008. In essence, this will be a 'bottom up' approach as against the existing 'top down' approach to the policy framework wherein farmers and farmers' organisations would participate in decision making. Thus, there will be a paradigm shift in the broad policy of Japan to induce participation of the private sector in the process of reforms. The role of the government would be one of facilitator to enable farmers to compete in international markets.

### 4.3 Strengthening International Cooperation

Various APO members have country-specific issues and problems and call for country-specific remedial plans for improving agricultural Productivity. Nevertheless, there would be some common goals and interests among them and APO may take a lead to bring all member countries to a common platform and jointly participate in WTO negotiations. This will be an effective way to compete with two large negotiators, namely the United States and EU.

## 5. Proposal for Setting-up of A Formal Mechanism for Future Surveys

To conduct survey on 'Agricultural Productivity Indices' on a fixed periodicity, the following steps are suggested:

i. A standard comprehensive manual, outlining the systematic procedure /methodology for estimation of parameters of interest be drawn up which will be followed by all APO member countries.
ii. Researchers (country correspondents) may be identified for a specified period to ensure adoption of common concepts, definitions and procedures. This would allow not only scientific comparisons across countries but conduct of the survey would also be more efficient.
iii. Each APO member country may be entrusted with the responsibility of collecting and collating data in respect of one identified commodity. This APO member country would also estimate productivity indices of that particular commodity in

respect of one other main exporting country, who is not a member of APO.

iv. APO office would review the country reports to be submitted by APO member countries and would finalise the same after reconciliation of data with the concerned country, if necessary. The report/data so finalised would be fed back to APO member countries.

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# 4. MALAYSIA

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## 1. BACKGROUND: Survey Commodities and Their Trade Performance

### 1.1 Introduction: Rationale of Survey and Criteria for Commodity Selection

The share of agriculture sector in the Malaysian GDP has decreased from 15.2 percent in 1990 to 8.6 percent in 2000. Nevertheless, the sector remains significant from national perspective as it employs 17.8 percent of the labour force. Export earnings, mostly from palm oil, saw logs, sawn timber and rubber, exhibited an upward trend during the period 1990-1999 and increased from US$4.36 billion in 1990 to US$ 7.12 billion in 1999 before declining to US$4.35 billion in 2000.

The agriculture sector in Malaysia is characterized by a dualistic structure where large plantation companies and small farmers co-exist. The plantation companies, mainly involved in the cultivation of perennial crops such as oil palm, rubber and cocoa, are professionally managed. Small farmers, mainly engaged in the cultivation of food crops, are not so well-managed. To enhance farm productivity, extensive R&D and extension services are rendered

APO conducted a survey on `Agricultural Productivity Index' in selected APO member countries to measure productivity of selected tradable commodities to provide policy makers and agricultural traders a tool for comparative analysis across countries in Asia. In so far as Malaysia is concerned, two commodities namely palm oil and rubber (sheet) has been selected under the Survey. The choice of these two commodities has been enabled by their export orientation, although imports of these commodities have been in the range of 4 to 5 percent of their total agriculture and food imports.

### 1.2.1 Importance of the Surveyed Commodities In Malaysian Agriculture

The importance of a commodity, particularly from trade perspective, can be viewed from its shares of exports/imports in the total agriculture and food trade of the country. Therefore, the relevant shares of the two commodities selected under the Survey by Malaysia have been presented in Table1.

**Table 1. Shares of Exports and Imports of Surveyed Commodities in Trade of Malaysia in Agriculture and Food during 1990-2000**

(Percent)

| Commodity | Exports | | | Imports | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| Rubber (sheet) | 20.94 | 17.09 | 13.57 | 3.74 | 4.05 | 3.81 |
| Palm Oil | 37.32 | 50.92 | 58.85 | 0.28 | 0.67 | 0.52 |
| Total | 58.26 | 68.01 | 72.42 | 4.02 | 4.72 | 4.33 |

### 1.2.1 Rubber

The historical development of the rubber industry dates back to 1877 when rubber was first planted on an experimental basis in Kuala Kangsar, (Peninsular Malaysia) by H.N. Ridley (known as the Father of the Rubber Industry) in Malaysia. Due to favorable climatic

and soil conditions, rubber was planted on a commercial scale in early 1900s by diversifying area under coffee. Rubber had been the main contributor of agriculture GDP of the country until the 1960s. However, this position has been taken over by palm oil from 1970s

Area covered under the natural rubber in Malaysia has been 1.4 million hectares or 25 percent out of a total of 5.7 million hectares under the agriculture in 2000. The rubber industry has provided employment to about 203,000 registered small holders and 18,898 estate workers in the country in 2001. In 2000, the country produced 0.73 million MT against the domestic consumption of 0.37 million MT. The bulk of the domestic consumption is used by the downstream industries such as latex products (69.1 percent), tyre (13.3 percent), general rubber goods (12.3 percent), industrial rubber goods (3.9 percent) and footwear (1.4 percent). About 85 percent of the total rubber production has been contributed by the small holders while the remaining 15 percent by large plantation companies.

### 1.2.2 Palm Oil

Palm oil was introduced in the country in 1970s on an experimental basis by using seedlings from West Africa. The share of palm oil in agriculture GDP has been progressively increasing and it occupies the commanding position in Malaysian agriculture.

Area covered under the palm oil in the country has been 3.4 million hectares or 59 percent out of a total of 5.7 million hectares under the agriculture in 2000. The palm oil provides employment to about 390818 or 22.8 percent of the total employment in the agriculture sector. In 2000, the country produced 10.37 million MT of crude palm oil (CPO). In contrast to rubber, major producers of palm oil are large plantation companies (estate sector) who cultivate about 90 percent of the total area under the crop while small holders cultivate the remaining 10 percent. It accounted for 64 percent of total agricultural exports in 2002. Besides the CPO, palm kernel, a by-product of palm fruit, is processed into palm kernel oil (PKO) and palm kernel cake.

The palm oil industry is supported by nationwide network of refineries and mills to further process the CPO into other related palm products such as palm olein, palm stearin, oleo chemicals which give more value to the palm oil products. In 2000, there have been 46 palm oil refineries with a processing capacity of 14.6 million MT of CPO and 350 palm oil mills with a processing capacity of 66 million MT of fresh fruit branches (FFB).

## 1.3 Trends in Export/Import of the Surveyed Commodities

### 1.3.1 Rubber

The exports of rubber by Malaysia have declined both in volume and value terms during the decade of 1990s. It decreased from 1.13 million MT valued at US$912.7 million in 1990 to 0.9 million MT valued at US$589.6 million in 2000, mainly due to continuous diversification of area under rubber to oil palm cultivation as palm oil cultivation offers higher economic returns, has a shorter maturity period and large plantation companies have played a leading role in this diversification. Nonetheless, rubber industry still contributes significantly in terms of supply of raw materials to downstream industries, especially to latex and pharmaceutical industries.

### 1.3.2 Palm Oil

In contrast to rubber, the export of palm oil has increased from 5.65 million MT valued at US$1.63 billion in 1990 to 8.14 million MT valued at US$2.56 billion in 2000. It posted an annual growth rate at 4.6 percent in value terms which is remarkable in view of devaluation of currency (RM) against US Dollars and the fact that seventeen other close substitutes within the oils group compete with palm oil. The main reasons for this performance are as under:

i. Palm oil is used as an edible oil and an industrial commodity widely traded in the international market;
ii. Its cultivation offers a high economic returns and is less labour intensive compared to rubber; and
iii. It requires less maintenance and less prone to disease.

## 2. MEASURED PRODUCTIVITY INDICES OF THE SURVEYED COMMODITIES

This section has been divided in the following three sub-sections:

- Productivity of Raw Crops
- Productivity of Tradable Processed Commodities

### 2.1 Productivity of Raw Commodities

The discussions in this sub-section focus on partial and total factor productivity of the national average farms in respect of two commodities selected under the survey namely rubber and palm oil.

#### 2.1.1 Productivity of Rubber

Productivity measures of national average rubber farms and corresponding annual compound growth rates have been presented in Table 2.

**Table 2. Land and Labor Productivities of Rubber in Malaysia-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 1.42 | 1.39 | 1.54 | -0.52 | 2.13 |
| Labour Productivity (Kg./ man-day) | 0.44 | 0.43 | 0.48 | -0.66 | 2.34 |
| Value Added per hectare (at constant 1995 US $) | 1633.09 | 1931.08 | 1213.19 | 4.28 | -8.88 |
| Value Added per hectare (Index) | 84.57 | 100.00 | 62.82 | 4.28 | -8.88 |
| Value Added per man-day (at constant 1995 US $) | 0.51 | 0.60 | 0.38 | 4.13 | -8.69 |
| Value Added per man-day (Index) | 85.06 | 100.00 | 63.49 | 4.13 | -8.69 |
| Value Added per MT (at constant 1995 US $) | 1154.13 | 1393.28 | 787.79 | 4.82 | -10.78 |
| Value Added per MT (Index) | 82.84 | 100.00 | 56.54 | 4.82 | -10.78 |

##### 2.1.1.1 Land and Labor Productivity of Rubber

Land productivity of rubber farms in physical quantity terms has shown an upward trend during 1991-2000, albeit with fluctuations. It recorded a moderate growth rate at 2.13 percent per annum during the second half of 1990s compared to (-)0.52 percent per annum during 1991-95.

Value added per hectare of natural rubber in Malaysia increased from US$ 1633 in 1991 to US$1931 in 1995 before falling to US$ 1213 in 2000. Value added per man-day also exhibited similar trend. It increased from US$ 0.51 in 1991 to US$ 0.60 in 1995 before declining to US$ 0.38 in 2000. The reason for declining productivity is that large plantation companies have been diversifying to palm oil with the result that more than 85 percent of the total area under the crop is now cultivated by small holders whose propensity to invest in technology and buy superior inputs is low. This has adversely affected quality of the commodity. In this kind of scenario, a large number of small holders let the land remain fellow and some of them seek temporary employment elsewhere.

##### 2.1.1.2 Capital Productivity of Rubber

The capital investment in rubber cultivation is mainly for the acquisition of labour saving apparatus used in tapping such as RRIMFLOW which is a technical device used to

control both the flow of latex and tapping frequency and ultimately achieves saving in cost of labour.

Index of capital productivity for the rubber recorded a declining trend. It ebbed from 107.9 in 1990 to 56.7 in 2000 and posted a negative growth rate at (-) 1.89 percent per annum during 1991-1995 against (-) 10.74 percent during 1995-2000 (Table 3).

**Table 3. Capital Productivity of Rubber in Malaysia-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 47.82 | 44.30 | 25.10 | -1.89 | -10.74 |
| Value Added per capital (Index) | 107.95 | 100.00 | 56.66 | -1.89 | -10.74 |

The decline in capital productivity has been due to inadequate investment as a result of switch over of large plantation companies from rubber cultivation which resulted in low yield rate besides prevalence of non-remunerative price regime.

### 2.1.1.3 Total Factor Productivity of Rubber

Total Factor Productivity (TFP) of rubber total output and total input indices have been presented in Table 4.

**Table 4. Total Factor Productivity of Rubber in Malaysia-1991-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Total Output | 99.60 | 100.00 | 61.60 | 0.10 | -9.24 |
| Total Input | 109.08 | 100.00 | 94.70 | -2.15 | -1.08 |
| Total Factor Productivity | 91.30 | 100.00 | 65.10 | 2.30 | -8.23 |

TFP posted a positive growth rate at 2.30 percent per annum during 1991-95. However, it declined at (-) 8.23 percent per annum during the second half of 1990s from 91.3 in 1991 to 65.1 in 2000, mainly due to sharp decline in the total output compared to total input. The reason of decline in output has been indicated in sub-paragraph 2.1.1.2.

### 2.1.2 Productivity of Palm Oil

Productivity measures of national average palm oil farms and corresponding annual compound growth rates have been presented in Table 5.

**Table 5. Land and Labor Productivity of Palm Oil**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 18.53 | 18.93 | 19.14 | 0.43 | 0.22 |
| Labour /Land Ratio (Man-day/ hectare) | 216.12 | 215.99 | 216.09 | -0.01 | 0.01 |
| Labour Productivity (Kg./ man-day) | 85.74 | 87.64 | 88.57 | 0.44 | 0.21 |
| Value Added per hectare (at constant 1995 US $) | 503.67 | 1472.18 | 719.57 | 23.93 | -13.34 |
| Value Added per hectare (Index) | 34.21 | 100.00 | 48.88 | 23.93 | -13.34 |
| Value Added per man-day (at constant 1995 US $) | 2.33 | 6.82 | 3.33 | 23.94 | -13.35 |

| | | | | | |
|---|---|---|---|---|---|
| Value Added per man-day (Index) | 34.19 | 100.00 | 48.85 | 23.94 | -13.35 |
| Value Added per MT (at constant 1995 US $) | 27.18 | 77.77 | 37.60 | 23.40 | -13.53 |
| Value Added per MT (Index) | 34.95 | 100.00 | 48.34 | 23.40 | -13.53 |

### 2.1.2.1 Land and Labor Productivity of Palm Oil

Land and labor productivity of palm oil in terms of value added per hectare and per man-day (at constant 1995 US$ prices) increased considerably during the first half of 1990s while these indicators declined during the second half of 1990s. A high annual growth at about 24 percent, both in value added per hectare and value added per man-day, during 1990-95 sent strong signals for diversification from other crops, mainly rubber, to palm oil. However, these productivity indicators witnessed negative growth rates at (-) 13 percent during 1995-2000, which adversely affected comparative advantage in domestic agriculture market but might enhance its international competitiveness.

### 2.1.2.2 Capital Productivity of Palm Oil

Capital investment for palm oil cultivation is required mainly for the acquisition of tractors and trailers for the transportation of the fresh fruit branches (FFB).

Value added per depreciation declined at an annual rate of (-) 13.40 percent per annum during the second half of 1990s compared to growth rate at 20.11 percent per annum during the first half of 1990s (Table 6).

**Table 6. Capital Productivity of Palm Oil in Malaysia-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 18.41 | 46.01 | 22.40 | 20.11 | -13.40 |
| Value Added per capital (Index) | 40.01 | 100.00 | 48.69 | 20.11 | -13.40 |

Of late, Indonesia has emerged as a strong competitor of palm oil and has resulted in relatively over-supply of the commodity. This has led to free fall of the prices during 1995-2000, particularly during 1998-2000 which in turn explains low value added per capital.

### 2.1.2.3 Total Factor Productivity of Palm Oil

Total Factor Productivity (TFP) of palm Oil, total output and total input indices have been presented in Table 7.

**Table 7. Total Factor Productivity of Palm Oil in Malaysia-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 29.30 | 100.00 | 66.00 | 27.83 | -7.97 |
| Total Input | 79.20 | 100.00 | 128.21 | 4.77 | 5.10 |
| Total Factor Productivity | 36.99 | 100.00 | 51.48 | 22.00 | -12.44 |

The index of TFP increased from 37.0 in 1990 to 51.5 in 2000 for the palm oil farms. Notwithstanding conscious policy and strategy of implementation of farm mechanization programs, improvement in plant genetics, good farm agronomic management practices and

use of biotechnology, TFP declined during second half of 1990s. The reasons for this decline have been indicated in the preceding sub-section.

### 2.2 Productivity of the Tradable Processed Commodities

Due to constraint of non-availability of disaggregated data of processed commodities, partial factor productivity has not been discussed. However, total factor Productivity (TFP) of processed rubber and palm oil are discussed hereunder:

#### 2.2.1 TFP of Processed Rubber

The TFP of the processed rubber recorded a declining trend during 1991-2000. Its index declined from 128.7 in 1991 to 59.5 in 2000 (1995=100) mainly due to the disproportionate increase in the cost of production compared to the prices of the processed products as a result of weak demand in the international market.

#### 2.2.2 TFP of Palm Oil

The TFP index of processed palm oil has decreased from 100 in 1995 to 23.8 in 2000. Such a low level of TFP in 2000 has been due to crashing of prices caused by over supply of oils and fats in the global market consequent upon emergence of other suppliers like Indonesia.

## 3. ANALYSIS ON THE TRADE PERFORMANCE AND PRODUCTIVITY INDICES

### 3.1 Correlation Between Productivity Indices and Trade Performance

Malaysia was the leading exporter of rubber in the world in 1990 and accounted for 35 percent of the share of Asia. However, rubber export from Malaysia ebbed significantly from 1.3 million MT in 1990 to 0.8 million MT in 2000 and its share dropped down to only 16 percent, less than half of its 1990 share in Asia. At the same time, TFP of both natural rubber and processed rubber also exhibited declining trends.

The country has been the leading exporter of palm oil also with about three quarters of Asia's share in 1990 and has exhibited an upward trend in export of this commodity throughout the decade of 1990s. However, TFP of raw palm oil first increased during the first half of 1990s before declining during the second half of 1990s. Likewise, the TFP of processed palm oil also decreased during the second half of 1990s.

It is noted that movements in trade of rubber and its TFP have been in the same direction while these two parameters have moved in the opposite directions in case of palm oil. Thus, Malaysia's trade performance is not fully explained by relative movements in the productivity of the corresponding commodities as other factors such as national agriculture and trade policy, prices, exchange rates, productivity of other competing countries, macro economic performance etc. also influence trade performance.

### 3.2 Effects of National Agricultural Policy on Production

There are a number of policy instruments which influence production of the commodities. The notable among them are as follows:

- Subsidies
- Price Instability and Price Support
- Research and Extension
- Policy on Supply of Raw Material to Industry

#### 3.2.1 Subsidies

Inputs subsidies are extended to both rubber and palm oil cultivators. In case of rubber cultivation, the small holders are given a sum of RM 7,000 (US$1,842) per hectare as subsidy to enable them to off-set the replanting cost. In case of larger plantation

companies, a replanting cess @ 9.92 sen per kg. of output produced is payable. Likewise, small holders are given a subsidy @ RM1,000 (US$263) per hectare for replanting palm oil. In case of larger plantation companies or millers, they are required to pay a cess @ RM11(US$2.90) per MT of crude palm oil (CPO) produced which is channeled back to MPOB to finance the research activities to bring about improvements in plant genetic, biotechnology which would ultimately result in higher yield and /or quality output.

### 3.2.2 Price Instability and Price Support

The instability in the prices is caused, *inter-alia*, by the availability of close substitutes. Crude palm oil, for instance, competes with 17 other different types of edible oils in the market. To sustain stability in prices, the focus of business development is towards the full commercialization along the value chain through backward and forward integration.

Due to the volatility of the commodities prices in the international market, some form of price support scheme has been extended to protect the interests of the industry. In case of rubber, if price falls to less than RM1.50 per kilogram, the Government reimburses the small holders @30 sen per kilogram.

Besides the price support scheme, agricultural credit is also extended to the farmers by the financial institutions. During the Eighth Malaysia Plan (2001-2005), an outlay of RM2.8 billion (US$736.8 million) has been allocated for loans to farmers. In addition, a soft loan amounting to RM60 million (US$15.8 million) has been earmarked for the farmers to facilitate the replanting of palm oil and also diversifying acreage from rubber to palm oil. Similarly, a special RM80 million (US21 million) fund has been allocated to further promote the use of Low Intensity Tapping System (LITS) to increase productivity and reduce labour input for small holders.

### 3.2.3 Research and Extension

At the macro level, the Ministry of Agriculture (MOA) and the Ministry of Primary Industries (MPI) provide necessary institutional support in terms of infrastructural development to enable rural population to lead a better quality of working life. From an economic perspective, the provision of such an infrastructure development is expected to hasten the development of the agriculture sector as one of the main pillars of economic development.

Research institutions such as MRB and MPOB have already been established to meet the research needs of rubber and oil palm industries. From the perspective of extension services, Rubber Industry for Smallholders' Development Authority (RISDA) was established during 1950s to provide the necessary technical extension services to small holders at the farm level. Similarly Federal Land Development Authority (FELDA) and Federal Land Consolidation and Rehabilitation Authority (FELCRA) have been set up to meet the needs of the extension services of the smallholders of palm oil at the farm level.

On analyzing the cost structure, it is observed that the bulk of the cost of production goes to labour. With high labour cost, there is need to mechanize production process to achieve reduction in cost.

### 3.2.4 Policy on Supply of Raw Material to Industry

To ensure uninterrupted supply of raw materials to the downstream domestic industries, export taxes are levied on both rubber and palm oil so that entire production of these commodities is not exported. The export tax @ 3.85 sen per kilogram of rubber exported is levied to finance the relevant research activities. Depending upon the prevailing prices, the export duty on crude palm oil varies in the range of as high as RM247 (US$65) if price increases to RM1,500 (US$394.70) per MT and low at zero if price drops to less than RM500 (US$131.50) per MT.

It has been noted that the area under rubber cultivation has been declining over the years which may adversely affect supply of raw materials for the rubber products industry. According to one estimate, at least one million hectare of area under rubber will be required to meet the demand of rubber industry.

To ensure uninterrupted and consistent supply of the commodities to the processing industries, it is imperative that continuous technical innovation takes place to ensure that the quality of yield at the upstream level is more resilient. As both crops are required to be processed within 24 hours of their harvest, failing which the quality gets adversely affected, the need for logistical support to transport the raw materials from the farm to the factory can hardly be emphasized.

### 3.3 Effects of International Factors on Changes in National Trade Patterns

A number of international factors impinge upon pattern of national trade, notable among them are briefly discussed in the following sub-sections:

- International Prices and Trade Performance of Competing Exporters
- Differentials in Wages and Input Prices among Trading Countries
- Exchange Rates
- Economic Crisis
- Technical/Management Capacity

#### 3.3.1 International Prices and Trade Performance of Competing Exporters

The prices of rubber have generally been subdued during the decade of 1990s, except during 1995 and 1996. This behavior of prices is mainly due to surplus supply in the international market. In case of palm oil, the prices exhibited an upward trend during 1990-1998 and then started declining during 1999-2000. The prices were lowest at RM 753 per MT in 1990 and peaked at RM 2486.50 per MT in 1998 before steeply declining to RM 1514 in 1999 and RM 1030 per MT in 2000. High price that prevailed in 1998 is explained, to some extent, by devaluation of currency during that year.

Malaysia, Indonesia, Thailand, Sri Lanka, India and Papua New Guinea accounted for 78 percent of the worlds' total rubber production in 1999. Even though these 6 countries are the main producers of rubber, they are not price setters in the international market. The Association of Natural Rubber Producing Countries (ANRPC) has been established to regulate and monitor the production of rubber by the member countries with a view to match demand and supply and set favorable price. However, the result has not been fruitful due to poor enforcement and monitoring of production of member countries by ANRPC.

There is a lack of coordination in major palm oil producing countries and stiff competition with 17 different types of oil in the world market resulting in over supply of oil in the international market. Under such a situation, competition will focus more on expanding the product base at the downstream level in order to add more values to the product so as to capture a wider market.

#### 3.3.2 Differentials in Wages and Input Prices among Trading Countries

Malaysia, Thailand and Indonesia have been the leading producers of rubber and oil palm. As both commodities require high labour inputs and with Malaysia moving towards industrialization at a very fast pace, competition for labour is expected to be intense among various sectors of the economy. Under such a situation, wages for agriculture laborers are expected to increase. In contrast, Indonesia experiences labour surplus. The wage differentials between Malaysia and Indonesia have led many Malaysia plantation companies to invest in Indonesia to take advantage of the cheaper labour cost.

The trade balance on account of agricultural and food has been favorable in Malaysia. However, import of non-agricultural items is on increase as Malaysia is moving towards industrialisation.

Notwithstanding declining trend in production of natural rubber due to lesser area planted, export at the downstream level has increased over the years (Table 8).

**Table 8. Export Value of Natural Rubber, Rubber-Based Products and Rubber-wood Products in Malaysia -1990 – 2000**

(RM Billion)

| Years | Natural Rubber | Rubber-Based Products | Rubber-wood Products | Total |
|---|---|---|---|---|
| 1990 | 3.03 | 1.67 | 0.39 | 5.09 |
| 1991 | 2.69 | 2.13 | 0.58 | 5.40 |
| 1992 | 2.36 | 2.49 | 0.77 | 5.62 |
| 1993 | 2.13 | 2.99 | 1.09 | 6.21 |
| 1994 | 2.93 | 3.35 | 1.59 | 7.87 |
| 1995 | 4.00 | 3.87 | 1.95 | 9.82 |
| 1996 | 3.70 | 4.20 | 2.41 | 10.31 |
| 1997 | 2.95 | 4.27 | 2.64 | 9.86 |
| 1998 | 2.83 | 6.49 | 3.71 | 13.03 |
| 1999 | 2.34 | 6.03 | 4.29 | 12.66 |
| 2000 | 2.58 | 5.69 | 5.10 | 13.37 |

Sources: Malaysian Rubber Board, Malaysian Timber Industry Board, Department of Statistics.

The pattern of above data indicates that the future national trade in rubber is likely to shift towards the export of rubber-based products and rubber-wood products with lesser export of natural rubber.

Similarly, the changes in the national trade pattern of palm oil industry indicate the likelihood of further expansion of the palm oil based products at the downstream industries as the oil palm industry is expected to continue to be the revenue earner within the agriculture sector in future.

### 3.3.3 Exchange Rates

The exchange rate of the domestic currency ranged between RM 2.5 to RM 2.7 per US Dollar until 1997. It was devalued in 1998 when the exchange rate deteriorated to a low at RM 3.92 per US Dollar. However it stabilized at RM 3.80 per US Dollar in 1999. In any case, devaluation affected the movements in trade patterns.

### 3.3.4 Economic Crisis

Asian economic crisis in 1997 affected the trade pattern of several ASEAN countries including Malaysia. The impact has resulted in a trade deficit due to the weakening of the domestic currency against the US Dollars.

The agriculture sector has undergone major structural changes after witnessing economic crisis. The government policy emphasized to achieve a balanced growth of agriculture sector vis-à-vis other sectors of the economy, achieve self-sufficiency in food production, boost domestic food production to control outgo on account of import of food

items. To accomplish this, fellow land is being revitalized for agricultural purposes and various incentives, both fiscal and financial, are given to promote agriculture.

### 3.3.5 Technical Capacity

Malaysia has high comparative advantage in terms of R&D, technical and management capabilities of rubber and palm oil due to historical reasons. Although many of the plantation companies have invested in Indonesia, the technical and management capabilities are retained in Malaysia. Therefore, planning and R&D activities are carried out in Malaysia while the technology transfer takes place at their plantations in Indonesia.

## 4. Prospects for Future Developments - Changes in Internal and External Conditions

The internal conditions induce sustained diversification of area under rubber to palm oil cultivation. The advantages of palm oil cultivation over rubber cultivation are that it offers higher economic returns, have a shorter maturity period and requires less labour. Thus, future generation of farmers are expected to have a bias towards palm oil cultivation compared to rubber.

The cultivation of rubber is expected to be guided mainly from the concern of self-reliance. As Malaysia possesses strong rubber technology, based upon its track record, the country has a potential to be a resource centre for any country interested to venture into rubber cultivation.

As both the commodities have multiple uses at the downstream level, to generate more value added along the supply chain, there is a need to broaden the product base by creating more commercial uses for the product by various research institutions. New products such as enriched margarine and oil blends including products from the blending of palm oil with goat milk have been developed, besides being a traditional source of food ingredients.

## 5. Proposal for Setting up a Formal Mechanism for Future Surveys

A databank containing all the key productivity indices of the commodities of interest can be built by APO. Subsequently, APO may initiate an action plan to enter into a Memorandum of Understanding (MOU) with the Heads of National Productivity Organisation (NPO) to make it mandatory for APO member countries to furnish key productivity indices of the identified commodities. While doing so, emphasis should be laid on standardization of concepts and definitions to make meaningful comparisons across countries. Arrangements may also be made to regularly update databank.

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# 5. PHILIPPINES

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## 1. BACKGROUND: SURVEY COMMODITIES AND THEIR TRADE PERFORMANCE

### 1.1 Rationale, Objectives, Criteria for Selection of Commodities

In the wake of the ongoing globalization and the resultant increased market access, various countries seek to be competitive in the international market to improve their trade performance. The Asian Productivity Organization (APO) spearheaded a Survey in APO member countries on Agricultural Productivity Index. The main objective of the Survey is to develop a set of internationally comparable indices which can illustrate the competitiveness of major agricultural commodities traded by the APO member countries.

Total factor productivity (TFP) has been widely applied in growth studies of various sectors of the economy such as agriculture, manufacturing and industry. As economic growth is often explained in terms of the productivity of factors of production or TFP, the survey seeks to focus on analysis of productivity of selected agricultural commodities in which competitiveness is demonstrated through trade.

While the selection of commodities under the survey is primarily based on currently exported and potentially exportable commodities, imported commodities in which import substitution can be promoted in future have also been considered. On this broad criteria, five commodities namely rice, maize (yellow), coconut (copra), sugarcane (raw), and pineapple (canned) have been surveyed in the Philippines.

### 1.2 Importance of the Surveyed Commodities in the Philippines Economy

Rice, sugarcane, coconut and maize have been traditionally the top four crops in the Philippines in terms of gross value added (GVA) in agriculture. Pineapple is a non-traditional commodity which provides a significant share to GVA in agriculture. The importance of a commodity, particularly from trade perspective, can be viewed by its share in the exports and imports in the agriculture and food trade. The relevant shares of the surveyed commodities in the Philippines have been presented in Table 1.

**Table 1. Shares of Exports and Imports of the Surveyed Commodities in the Philippines Trade in Agriculture and Food during 1990-2000**

(Percent)

| Commodity | Exports | | | Imports | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| **Rice (milled)** | 0.00 | 0.00 | 0.01 | 9.39 | 3.49 | 5.17 |
| **Maize** | 0.07 | 0.07 | 0.03 | 4.26 | 1.60 | 2.43 |
| **Coconut (copra)** | 40.41 | 51.57 | 36.43 | 0.00 | 0.00 | 0.01 |
| **Sugar (raw)** | 9.11 | 3.51 | 3.38 | 0.04 | 6.06 | 2.20 |
| **Pineapple (canned)** | 11.30 | 7.44 | 10.13 | 0.00 | 0.01 | 0.00 |
| **Total** | 60.89 | 62.59 | 49.98 | 13.69 | 11.16 | 9.81 |

### 1.3 Trends in Exports and Imports of the Surveyed Commodities

The rankings of the surveyed commodities in the agriculture and food trade of the Philippines during 1990, 1995 and 2000 are presented in Table 2.

**Table 2. Ranking of Surveyed Commodities in Agriculture and Food Trade of Philippines**

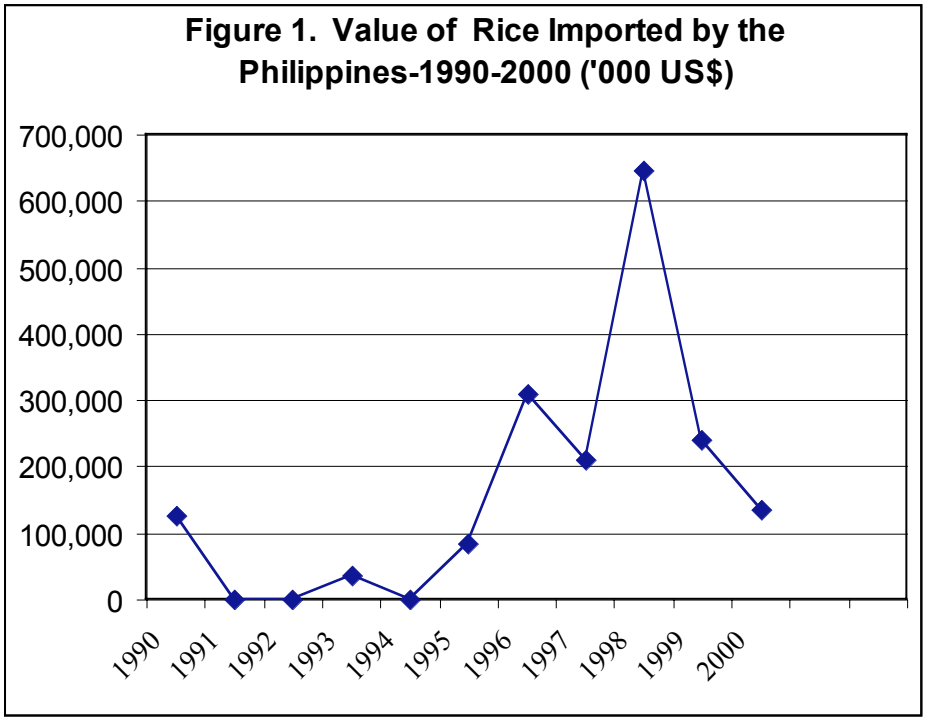
| Commodity | 1990 | 1995 | 2000 |
|---|---|---|---|
| **Imports** | | | |
| Rice | 4th | 3rd | 4th |
| Maize | 8th | - | 8th |
| **Exports** | | | |
| Coconut products | | | |
| Copra | 10th | - | - |
| Coconut oil | 1st | 1st | 1st |
| Desiccated coconut | 8th | 8th | 7th |
| Sugar | 5th | 10th | 8th |
| Pineapple and pineapple products | 6th | 5th | 3rd |

*Note: '-' indicates that the Commodity does not belong to the top ten exports/imports.*

While rice and maize figure amongst the leading agricultural imports, coconut products, sugar and pineapple have been amongst the Philippines' top ten agricultural exports (Table 2).

### 1.3.1 Rice (Paddy)

The Philippines has been a net importer of rice. The value of rice imported by the Philippines during the decade of 1990s has been exhibited in Figure 1. Large imports have been necessitated as domestic production fell short of food and buffer stock requirements due to drought, flashflood and typhoons. In 1996, rice imports

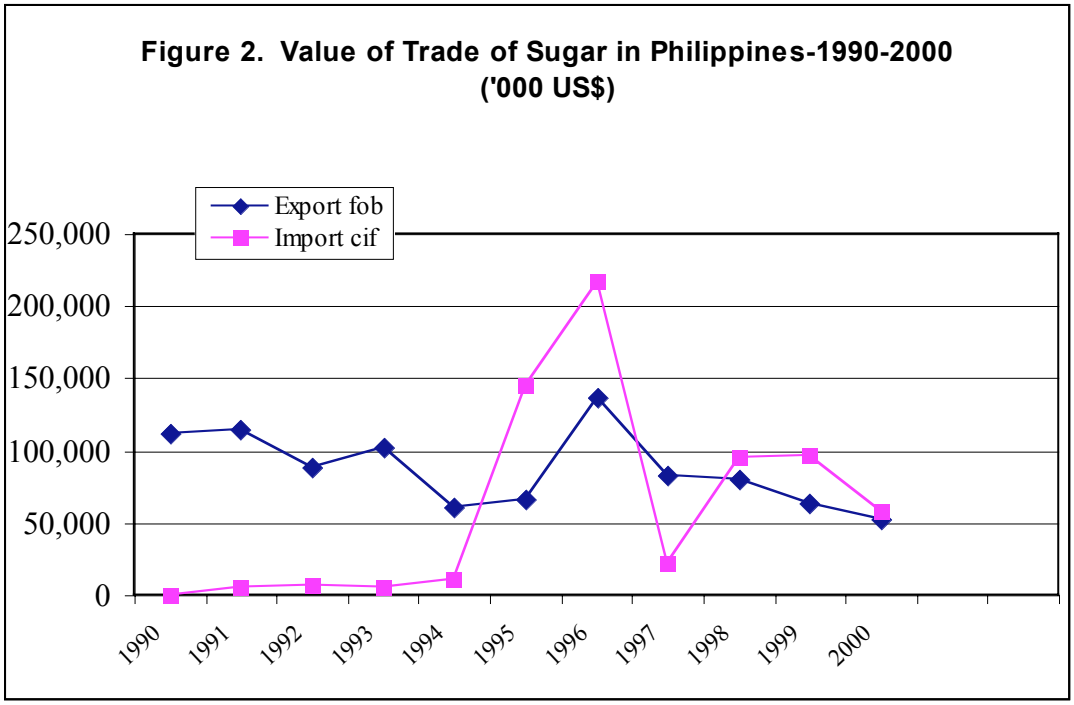


reached almost 867 thousand MT valued at US$308.9 million, more than double the 1995 level. Total rice imports scaled up further to 2.4 million MT valued at US$ 646.6 million in 1998, the highest till then and ranked the first among the top ten agricultural imports of the Philippines. The country gets imported rice mainly from India, Thailand and Vietnam. The U.S. is also a major trading partner in rice, usually under the arrangement of the Public Law 480 (PL 480) commodity loan.

### 1.3.2 Sugar

Raw sugar has been amongst the top ten agricultural exports of the Philippines and was the only country in Asia who was allocated import quota by the US. The country was a net sugar exporter till 1994 but became a net importer due to shortfalls in domestic production and increasing domestic consumption, as a result of expansion of industrial use such as beverages and manufactured food. Both raw and refined sugars are imported. The value of sugar imported by the Philippines during the decade of 1990s has been exhibited in Figure 2.

**Figure 2. Value of Trade of Sugar in Philippines-1990-2000 ('000 US$)**



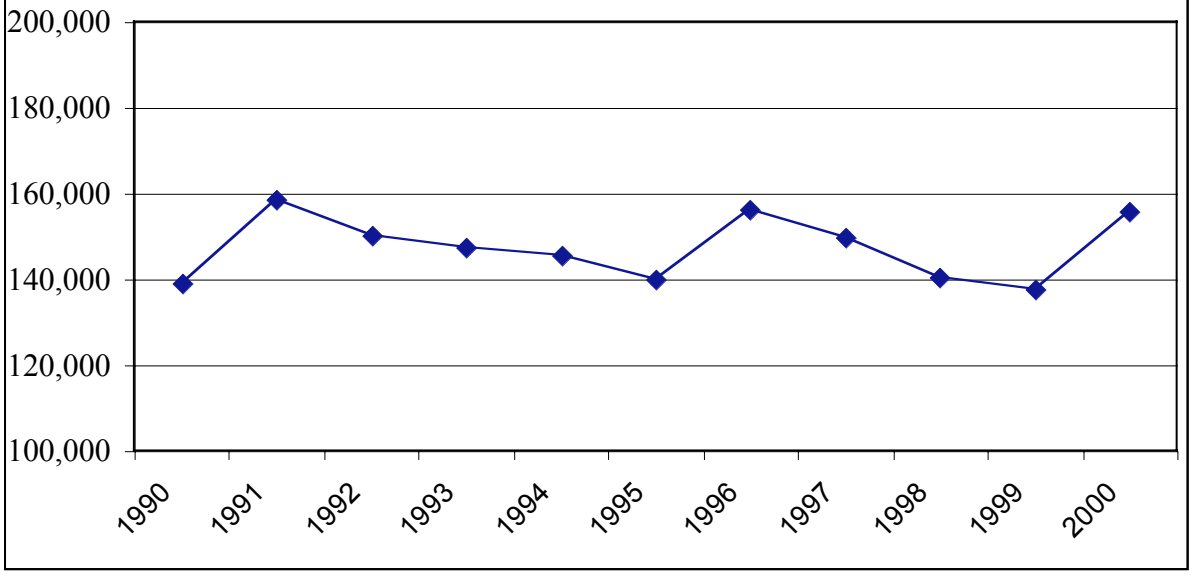

The major importers of the commodity to the Philippines are Australia, Brazil, South Korea, South Africa and Thailand.

### 1.3.3 Pineapple

Pineapple and its products constitute one of the top ten agricultural exports of the country. The share of the export of the canned pineapple in the total export of pineapple is the highest at 57 percent followed by juice at 17 percent, fresh fruit 16 percent and dried and concentrates at 11 percent.

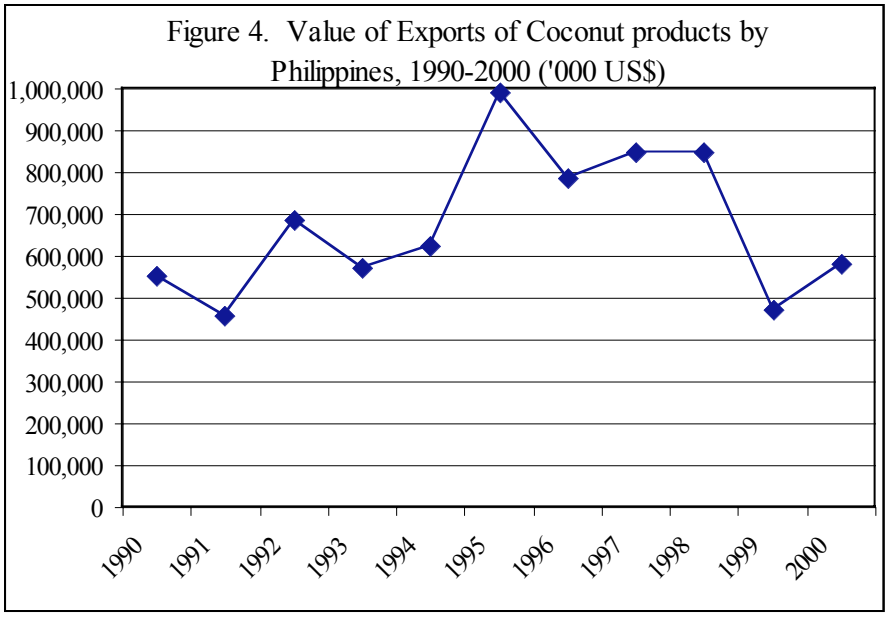
Values of pineapple exported by the Philippines during the decade of 1990s fluctuated (Figure 3). In 2000, 1.61 million MT valued at US$155.95 million of pineapple and its products was exported compared with 1.20 million MT valued at US$138.87 in 1990. The leading markets for pineapple products are Japan, the Netherlands, South Korea and USA.

**Figure 3. Value of Exports of Pineapple- Philippines, 1990-2000 ('000 US $)**




### 1.3.4 Coconut Products

Value of exports of coconut products by the Philippines has been declining in recent years (Figure 4).

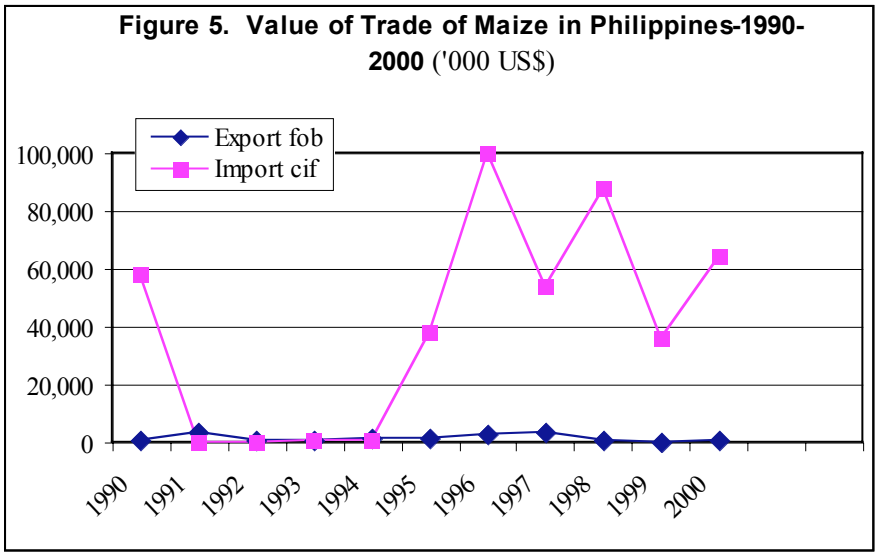



This can be attributed to low productivity of coconut and the changing composition of the country's coconut product exports including shift from copra to coconut oil (CNO). Non-traditional or higher value added coconut product exports such as oleo-chemicals and green coconut have increased. The major markets for CNO are the Malaysia, the Netherlands and U.S.

### 1.3.5 Maize

The Philippines is a net importer of maize as is seen from Figure 5. The country's maize imports include those for feed and seed purposes.

**Figure 5. Value of Trade of Maize in Philippines-1990-2000** ('000 US$)




Maize is imported to Philippines to meet the shortfalls in domestic supply relative to the demand from livestock. During the decade of 1990s, the country turned from maize exporter to net importer. From 1995 onwards the country imported large volumes of yellow maize, mainly due to growth in the hog and poultry industries. The import situation can be viewed from the yellow maize-livestock linkage which has put pressure on both producers of maize and feed millers due to rapid growth in the livestock industry.

The major trading markets of maize are Argentina, China, Thailand and U.S. The country also exports maize seeds to Indonesia and Thailand.

## 2. PRODUCTIVITY INDICES AND BENCHMARKING OF THE SURVEYED COMMODITIES

This section has been divided in the following three sub-sections:

- Productivity of Raw Crops
- Productivity of Tradable Processed Commodities
- Benchmarking Analysis

### 2.1 Productivity of Raw Commodities

The discussions in this section focus on partial and total factor productivity of the national average farms in respect of five commodities selected under the survey namely rice (paddy), sugarcane, pineapple, coconut and maize**.**

### 2.1.1 Productivity of Rice (Paddy)

Productivity measures of national average rice (paddy) farms and corresponding annual compound growth rates have been presented in Table 3.

**Table 3. Land and Labor Productivity of Rice (Paddy) in Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 2.80 | 2.76 | 2.99 | -0.36 | 1.61 |
| Labour /Land Ratio (Man-day/ hectare) | 55.89 | 85.27 | 86.14 | 11.14 | 0.20 |
| Labour Productivity (Kg./ man-day) | 50.10 | 32.37 | 34.71 | -10.35 | 1.41 |
| Value Added per hectare (at constant 1995 US $) | 471.03 | 737.38 | 647.16 | 11.86 | -2.58 |
| Value Added per hectare (Index) | 63.88 | 100.00 | 87.76 | 11.86 | -2.58 |
| Value Added per man-day (at constant 1995 US $) | 8.43 | 8.65 | 7.52 | 0.65 | -2.76 |
| Value Added per man-day (Index) | 97.46 | 100.00 | 86.94 | 0.65 | -2.76 |
| Value Added per MT (at constant 1995 US $) | 168.23 | 267.17 | 216.44 | 12.26 | -4.12 |
| Value Added per MT (Index) | 62.97 | 100.00 | 81.01 | 12.26 | -4.12 |

### 2.1.1.1 Land and Labor Productivity of Rice (Paddy)

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during 1991-2000, albeit with fluctuations. It recorded a moderate growth rate at 1.61 percent per annum during the second half of 1990s compared to (-) 0.36 percent per annum during 1991-95. The country experienced a rice crisis in 1995 as a result of the El Nino occurrence in 1994 and La Nina in the second half of 1995. Yield recovered in succeeding years as a result of expansion in irrigated area**.**

Value added per hectare of rice (paddy) farms (at constant 1995 US $) increased annually at 11.86 percent during 1991-95 but declined at (-) 2.58 percent during the second half of 1990s due to sharp devaluation of Pesos vis-à-vis US Dollars. Value added per MT declined faster compared to value added per hectare during the second half of 1990s.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited an upward trend during 1991-2000, though growth decelerated during the second half of 1990s. It posted high growth at 11.14 percent per annum during 1991-1995 compared to a nominal growth at 0.20 percent per annum during 1995-2000. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization.

Labor requirement in paddy farms have increased due to intensive care of crops especially in irrigated farms and those planted to HYVs (high yielding varieties). The total number of man-days per hectare from land preparation to harvesting (hired, paid in kind, imputed family labor and exchange labor) in 1995 was 85.27 man-days compared to 55.89 in 1991, 86.14 man-days in 2000. Low labor use coupled with low mechanization partially explains low productivity of rice. Higher rate of decline in labor productivity during 1991-1995 is partly attributed to the lower paddy output during the rice crisis in 1995.

Value added per man day (at constant 1995 US $) increased at 0.65 percent annually from US$8.43 in 1991 to US$8.65 in 1995 before declining to US$7.52 in 2000 at annual rate of (-) 2.76 percent.

### 2.1.1.2 Capital Productivity of Rice (Paddy)

Value added per depreciation posted a negative annual growth rate at (-) 6.87 percent per annum during 1991-1995 against (-) 14.87 percent during 1995-2000 (Table 4).

**Table 4. Capital Productivity of Rice (Paddy) in Philippines-1991-2000**

(Peso,1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 31.23 | 23.49 | 10.50 | -6.87 | -14.87 |
| Value Added per capital (Index) | 132.95 | 100.00 | 44.70 | -6.87 | -14.87 |

Capital productivity which is the value added per depreciation followed a path of negative growth. In rice farming, the present pool of implements and machines are mainly used for land preparation, pump irrigation, spraying and threshing. Farms in the Philippines continue to be mechanized at sub-optimal level, its rating of 0.3 HP per hectare (horsepower) is below the UNDP's recommendation of 0.5 HP per hectare for developing countries (Sanvictores, 1998).

### 2.1.1.3 Total Factor Productivity Rice (Paddy)

Total factor productivity (TFP) of rice (paddy), total output and total input indices have been presented in Table 5.

**Table 5. Total Factor Productivity of Rice (Paddy) in Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Total Output | 83.15 | 100.00 | 78.39 | 4.72 | -4.75 |
| Total Input | 44.00 | 100.00 | 147.14 | 22.78 | 8.03 |
| Total Factor Productivity | 188.98 | 100.00 | 53.28 | -14.71 | -11.83 |

Total factor productivity followed a declining trend throughout the reference period, 1991-2000, with high negative growth at (-) 14.71 percent per annum during 1991-1995. During this period, the positive annual growth in total output index largely due to increased output prices was overrun by high growth in total input as factor prices increased. Although growth in the total input decelerated during the second half of 1990s, it was still positive. At the same time, total output declined and consequently TFP declined at (-) 11.83 percent per annum during the second half of 1990s.The declining TFP of paddy farms in the Philippines reinforces the findings of a study of TFP of rice producing regions in the country by Gordo (2001).

### 2.1.2 Productivity of Sugarcane

Productivity measures of national average sugarcane farms and corresponding annual compound growth rates have been presented in Table 6.

**Table 6. Land and Labor Productivity of Sugarcane in Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 61.23 | 49.40 | 55.33 | -5.23 | 2.29 |
| Labour /Land Ratio (Man-day/ hectare) | 69.80 | 69.80 | 69.80 | 0.00 | 0.00 |
| Labour Productivity (Kg./ man-day) | 877.22 | 707.73 | 792.69 | -5.23 | 2.29 |
| Value Added per hectare (at constant 1995 US $) | 1130.73 | 1458.62 | 1021.00 | 6.57 | -6.89 |
| Value Added per hectare (Index) | 77.52 | 100.00 | 70.00 | 6.57 | -6.89 |
| Value Added per man-day (at constant 1995 US $) | 16.19 | 20.90 | 14.63 | 6.59 | -6.89 |
| Value Added per man-day (Index) | 77.46 | 100.00 | 70.00 | 6.59 | -6.89 |
| Value Added per MT (at constant 1995 US $) | 18.47 | 29.53 | 18.45 | 12.45 | -8.97 |
| Value Added per MT (Index) | 62.54 | 100.00 | 62.50 | 12.45 | -8.97 |

### 2.1.2.1 Land and Labour Productivity of Sugarcane

The yield of the national average sugarcane farms fluctuated during the decade of 1990s. The depressed yield at 49.40 MT per hectare in 1995 was caused by a prolonged drought started in 1994. Besides, application of fertilizer at sub-optimal level and poor drainage contributed to low yields (Duff, 1997). A moderate growth rate in labor productivity at 2.29 percent per annum was recorded during the second half of 1990s compared to (-) 5.23 percent per annum during 1991-95.

Value added per hectare of sugarcane farms (at constant 1995 US $) increased annually at 6.57 percent during 1991-95 but declined at (-) 6.89 percent during the second half of 1990s due to sharp devaluation of Pesos vis-à-vis US Dollars. Value added per MT declined faster compared to value added per hectare during the second half of 1990s.

Labor to land ratio (man-day/hectare) shows no movement during 1991-2000 as constant number of man-days per hectare has been assumed, although the wage rates varied during the reference years.

### 2.1.2.2 Capital Productivity of Sugarcane

Value added per depreciation posted negative annual growth rate at (-) 10.69 percent during 1991-1995 against (-) 11.96 percent during 1995-2000 (Table 7).

**Table 7. Capital Productivity of Sugarcane in Philippines-1991-2000**

(Peso, 1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 33.96 | 21.61 | 11.43 | -10.69 | -11.96 |
| Value Added per capital (Index) | 157.15 | 100.00 | 52.89 | -10.69 | -11.96 |

Data of national average farms for sugarcane are based on a probability survey where the sample was mostly of small sized farms with low investment on farm equipment. This explains declining trend in value added per depreciation during 1991-2000.

### 2.1.2.3 Total factor Productivity of Sugarcane

Total factor productivity (TFP) declined at (-) 9.62 percent annually during the 1991-95 against (-) 16.95 percent during the second half of 1990s (Table 8).

**Table 8. Total Factor Productivity of Sugarcane in Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity(Index) | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Total Output | 98.59 | 100.00 | 58.78 | 0.36 | -10.08 |
| Total Input | 65.78 | 100.00 | 148.82 | 11.04 | 8.28 |
| Total Factor Productivity | 149.88 | 100.00 | 39.50 | -9.62 | -16.95 |

This has happened due to steep decline at (-) 10.08 percent per annum in the total output and increase in total input at 8.28 percent during the second half of 1990s. The movements in the partial productivity are reflected in the general declining trend in the TFP.

### 2.1.3 Productivity of Pineapple

Land and labor productivity of national average pineapple (fresh) orchards and corresponding annual compound growth rates have been presented in Table 9.

**Table 9. Land and Labor Productivity of Pineapple in Philippines-1995-2000**

(1995=100, Percent)

| Measure of Productivity | 1995 | 2000 | Annual Growth Rate During 1995-2000 |
|---|---|---|---|
| Land Productivity (MT/hectare) | 3.96 | 3.63 | -2.15 |
| Labour /Land Ratio (Man-day/ hectare) | 87.56 | 87.57 | 0.00 |
| Labour Productivity (Kg./ man-day) | 45.19 | 41.43 | -2.15 |
| Value Added per hectare (at constant 1995 US $) | 4649.00 | 4544.00 | -0.57 |
| Value Added per hectare (Index) | 100.00 | 97.74 | -0.57 |
| Value Added per man-day (at constant 1995 US $) | 53.09 | 51.89 | -0.57 |
| Value Added per man-day (Index) | 100.00 | 97.74 | -0.57 |
| Value Added per MT (at constant 1995 US $) | 1174.88 | 1252.48 | 1.61 |
| Value Added per MT (Index) | 100.00 | 106.60 | 1.61 |

### 2.1.3.1 Land and Labor Productivity of Pineapple

Land productivity of pineapple in physical quantity terms has shown a downward trend during 1995-2000 and posted a negative growth rate at (-) 2.15 percent per annum during the period. The decline in yield rate, especially in 1996, was mainly due to aberrant weather conditions.

Value added per MT of pineapple orchards (at constant US $ prices) increased marginally at 1.61 percent during 1995-2000 which is impressive, given the devaluation of pesos by 72 percent during the second half of 1990s.

### 2.1.3.2 Capital Productivity of Pineapple

Value added per depreciation declined during 1995-2000 and posted an annual negative growth at (-) 14.75 percent during 1995-2000 (Table 10).

**Table 10. Capital Productivity of Pineapple in Philippines-1995-2000**

(Percent, 1995=100)

| Measure of Productivity | 1995 | 2000 | Annual Growth Rate During 1995-2000 |
|---|---|---|---|
| Value Added per depreciation (at constant 1995 domestic prices) | 433.00 | 228.71 | -14.75 |
| Value Added per capital (Index) | 100.00 | 52.82 | -14.75 |

### 2.1.3.3 Total Factor Productivity of Pineapple

Total factor productivity (TFP) of pineapple declined at (-) 11.29 percent per annum during 1995-2000 (Table 11).

**Table 11. Total Factor Productivity of Pineapple in Philippines-1995-2000**

(Percent, 1995=100)

| Measure of Productivity(Index) | 1995 | 2000 | Annual Growth Rate During 1995-2000 |
|---|---|---|---|
| Total Output | 100.00 | 82.91 | -4.58 |
| Total Input | 100.00 | 133.89 | 7.57 |
| Total Factor Productivity | 100.00 | 61.92 | -11.29 |

The negative growth in the TFP during 1995-2000 was due to faster growth in the total input at 7.57 percent per annum in contrast to fall in the total output at (-)4.58 percent per annum during the corresponding period.

### 2.1.4 Productivity of Coconut

Productivity measures of national average coconut orchards and corresponding annual compound growth rates have been presented in Table 12.

**Table 12. Land and Labor Productivity of Coconut in the Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 3.65 | 4.13 | 4.17 | 3.14 | 0.19 |
| Labour /Land Ratio (Man-day/ hectare) | 37.42 | 41.16 | 42.28 | 2.41 | 0.54 |
| Labour Productivity (Kg./ man-day) | 97.54 | 100.34 | 98.62 | 0.71 | -0.35 |
| Value Added per hectare (at constant 1995 US $) | 205.28 | 259.94 | 212.73 | 6.08 | -3.93 |
| Value Added per hectare (Index) | 78.97 | 100.00 | 81.84 | 6.08 | -3.93 |
| Value Added per man-day (at constant 1995 US $) | 5.48 | 6.32 | 5.03 | 3.63 | -4.46 |
| Value Added per man-day (Index) | 86.71 | 100.00 | 79.59 | 3.63 | -4.46 |
| Value Added per MT (at constant 1995 US $) | 56.24 | 62.94 | 51.01 | 2.85 | -4.11 |
| Value Added per MT (Index) | 89.36 | 100.00 | 81.05 | 2.85 | -4.11 |

### 2.1.4.1 Land and Labor Productivity of Coconut

Land productivity of coconut in physical quantity terms has shown an upward trend during 1991-2000, although the growth decelerated during the second half of 1990s. It recorded a moderate growth rate at 0.19 percent per annum during the second half of 1990s compared to 3.14 percent per annum during 1991-95.

Deceleration in growth in the yield of coconut can be traced to old bearing trees. Besides, subdued prices of coconut products in the world market as a result of competing oil products has led the situation in which farmers apply inputs at sub-optimal level to cut the cost of production.

Value added per hectare of coconut increased annually at 6.08 percent during 1991-95 but declined at (-) 3.93 percent during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited an upward trend during 1991-2000, though growth decelerated during the second half of 1990s. It posted high growth at 2.41 percent per annum during 1991-1995 compared to a nominal rate at 0.54 percent per annum during 1995-2000. Higher the ratio, lower the intensity of labor.

### 2.1.4.2 Capital Productivity of Coconut

Value added per depreciation posted negative growth rate at (-) 11.17 percent per annum during 1991-1995 which marginally improved to (-)10.95 percent during1995-2000 (Table 13).

**Table 13. Capital Productivity of Coconut in the Philippines-1991-2000**

(Peso, 1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 42.9 | 26.7 | 15.0 | -11.17 | -10.95 |
| Value Added per capital (Index) | 160.61 | 100.00 | 56.00 | -11.17 | -10.95 |

The capital productivity of the national average coconut orchards exhibited a downward trend throughout the reference period of 1991-2000 but it marginally slowed down during 1995-2000. As against growth rate at (-) 11.2 percent per annum during 1991-1995, it posted growth (-)10.95 percent during 1995-2000.

### 2.1.4.3 Total Factor Productivity of Coconut

Total factor productivity (TFP) exhibited a declining trend during 1991-2000. It posted a negative annual growth at (-) 13.39 percent during the 1991-95 which further ebbed to (-) 19.13 percent during the second half of 1990s (Table 14).

**Table 14. Total Factor Productivity of Coconut in Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Total Output | 112.37 | 100.00 | 67.72 | -2.87 | -7.50 |
| Total Input | 63.23 | 100.00 | 195.85 | 12.14 | 14.39 |
| Total Factor Productivity | 177.72 | 100.00 | 34.58 | -13.39 | -19.13 |

This has happened due to steep decline at (-) 7.50 percent per annum in the total

output and increase in total input at 14.39 percent per annum during the second half of 1990s.The trends of yield and partial productivity indices are factored in the movement of the TFP index of national average farms. The TFP exhibited downward trend during 1991-2000 and the rate of decline accelerated during the second half of 1990s.

### 2.1.5 Productivity of Maize

Productivity measures of national average maize farms and corresponding annual compound growth rates have been presented in Table 15.

**Table 15. Land and Labor Productivity of Maize in the Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 1.69 | 2.21 | 2.78 | 6.94 | 4.70 |
| Labour /Land Ratio (Man-day/ hectare) | 49.25 | 50.39 | 52.31 | 0.57 | 0.75 |
| Labour Productivity (Kg./ man-day) | 34.32 | 43.86 | 53.15 | 6.33 | 3.92 |
| Value Added per hectare (at constant 1995 US $) | 187.71 | 457.84 | 424.15 | 24.97 | -1.52 |
| Value Added per hectare (Index) | 41.00 | 100.00 | 92.64 | 24.97 | -1.52 |
| Value Added per man-day (at constant 1995 US $) | 3.81 | 9.09 | 8.11 | 24.28 | -2.26 |
| Value Added per man-day (Index) | 41.91 | 100.00 | 89.22 | 24.28 | -2.26 |
| Value Added per MT (at constant 1995 US $) | 111.07 | 207.17 | 152.57 | 16.86 | -5.93 |
| Value Added per MT (Index) | 53.61 | 100.00 | 73.65 | 16.86 | -5.93 |

#### 2.1.5.1 Land and Labor Productivity of Maize

Land productivity of maize in physical quantity terms has shown an upward trend during 1991-2000. It recorded a significant growth rate at 6.94 percent per annum during 1991-95 which decelerated to 4.70 percent per annum during 1995-2000. A stronger protection accorded to more politically sensitive commodities such as rice and sugar has resulted in decreasing relative price of maize vis-à-vis rice and sugar. This adversely affected interests of farmers to grow maize in lieu of the other two crops. Another contributory factor to declining average yields is an uneven distribution of modern varieties of seed, technology utilization rates in major yellow maize producing regions.

Value added per hectare of maize farms increased annually at 24.97 percent during 1991-95 but declined to (-) 1.52 percent during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s.

Value added per man day (at constant 1995 US $) increased at 24.28 percent annually from US$3.81 in 1991 to US$9.09 in 1995 before declining to US$8.11 in 2000. It posted a negative annual growth at (-) 2.26 percent per annum during 1995-2000.

#### 2.1.5.2 Capital Productivity of Maize

Value added per depreciation posted annual growth rate at 4.03 percent during 1991-1995 which turned negative to (-) 13.93 percent during 1995-2000 (Table 16).

**Table 16. Capital Productivity of Maize in the Philippines-1991-2000**

(Peso, 1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 21.94 | 25.70 | 12.14 | 4.03 | -13.93 |
| Value Added per capital (Index) | 85.37 | 100.00 | 47.24 | 4.03 | -13.93 |

The positive growth in capital productivity during 1991-95 can be attributed to higher growth rate in the value added per hectare due to higher rate of yield improvement during the period. The mechanization in maize farms is generally low compared to neighboring maize growing Asian countries. Machines for plowing and threshing are usually custom-hired and the depreciation costs are mainly on account of small farming equipment.

### 2.1.5.3 Total Factor Productivity of Maize

TFP declined at (-) 11.13 percent annually during the second half of 1990s in contrast to positive growth at 1.49 percent per annum during 1991-95 (Table 17).

**Table 17. Total Factor Productivity of Maize in the Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Total Output | 58.81 | 100.00 | 69.89 | 14.19 | -6.91 |
| Total Input | 62.40 | 100.00 | 126.10 | 12.51 | 4.75 |
| Total Factor Productivity | 94.25 | 100.00 | 55.42 | 1.49 | -11.13 |

This has happened due to steep decline in the total output at (-) 6.91 percent per annum and increase in the total input at 4.75 percent during the second half of 1990s.

## 2.2 Productivity of Processed Commodities

As processed rather than raw crops are traded in international market, it is important to discuss productivity of processed commodities. As reliable data are available in respect of rice (milled), sugar, pineapple (canned) and copra, behavior of productivity of these processed commodities have been discussed in this sub-section.

### 2.2.1 Productivity of Rice (Milled)

Productivity indices of rice (milled) have been presented in Table 18.

**Table 18. Productivity of Rice (Milled) in the Philippines-1991-2000**

(US$, 1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Value Added per worker (Absolute at constant 1995 US $) | 2513.00 | 3076.00 | 2356.00 | 5.18 | -5.19 |
| Value Added per worker (Index) | 81.70 | 100.00 | 76.59 | 5.18 | -5.19 |
| Value Added per depreciation (Absolute at constant 1995 US $) | 0.15 | 0.14 | 0.10 | -1.71 | -6.51 |
| Value Added per depreciation (Index) | 107.14 | 100.00 | 71.43 | -1.71 | -6.51 |

### 2.2.1.1 Labor and Capital Productivity of Rice (Milled)

Value added per worker increased at 5.18 percent annually from US$2513 to US$3076 before declining to US$ 2356 in 2000. The negative growth rate at (-) 5.19 percent per annum during the second half of 1990s is quite significant. Value added per depreciation has also decreased at (-) 1.71 percent during 1991-95 which further declined at (-) 6.51 percent during 1995-2000. This indicates that higher level of mechanization/ modernization of rice mills have taken place during the second half of 1990s compared to that in the first half of 1990s.

### 2.2.1.2 Total Factor Productivity of Rice (Milled)

Total factor productivity (TFP) of rice (milled) in the Philippines exhibited downward trend during 1991-2000. The rate of decline in TFP was almost of the same order during the second half of 1990s as during the period 1991-1995 (Table 19), although movements in the indices of total output has been different from that of total input.

**Table 19. Total Factor Productivity of Rice (Milled) in the Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Total Output | 102.41 | 100.00 | 73.24 | -0.59 | -6.04 |
| Total Input | 68.33 | 100.00 | 122.71 | 9.99 | 4.18 |
| Total Factor Productivity | 149.88 | 100.00 | 59.69 | -9.62 | -9.81 |

The total output declined faster at (-) 6.04 percent per annum during the second half of 1990s compared to (-) 0.59 percent per annum during 1991-95. In contrast, total input increased during 1991-2000, though the rate of growth decelerated to 4.18 percent per annum during the second half of 1990s compared to 9.99 percent during 1991-1995.

### 2.2.2 Productivity of Sugar (Raw)

Labor and capital productivity of national average sugar (raw) factories and corresponding annual compound growth rates have been presented in Table 20.

**Table 20. Labor and Capital Productivity of Sugar (Raw) in the Philippines-1995-2000**

(1995=100, Percent)

| Measure of Productivity | 1995 | 2000 | Annual Growth During 1995-2000 |
|---|---|---|---|
| Value Added per worker (Absolute at constant 1995 US $) | 1.02 | 0.78 | -5.22 |
| Value Added per worker (Index) | 100.00 | 76.47 | -5.22 |
| Value Added per depreciation (Absolute at constant 1995 US $) | 0.60 | 0.63 | 0.98 |
| Value Added per depreciation (Index) | 100.00 | 105.00 | 0.98 |

### 2.2.2.1 Labor and Capital Productivity of Sugar (Raw)

Value added per worker decreased from US$1.02 in 1995 to US$0.78 in 2000 at (-) 5.22 percent per annum. Value added per depreciation, however, increased at 0.98 percent per annum during 1995-2000 which indicates that modernization of sugar mills has taken place.

BM sugar mills with capacity exceeding 5000 TCD (tons cane per day) have larger scale of operations, have higher volume of output and number of employees compared with the national average sugar mills with capacity less than 5000 TCD. The

processing cost per MT of BM sugar mills was about one third higher compared to that of the average sugar mill. As such, with the same per unit (MT) ex-mill price of sugar, the net revenue has been higher for the average sugar mill.

#### 2.2.2.2 Total Factor Productivity of Sugar (Raw)

Total factor productivity (TFP) of sugar (raw) in the Philippines exhibited downward trend during 1995-2000 (Table 21).

**Table 21. Total Factor Productivity of Sugar (Raw) in the Philippines-1995-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1995 | 2000 | Annual Growth During 1995-2000 |
|---|---|---|---|
| Total Output | 100.00 | 106.08 | 1.19 |
| Total Input | 100.00 | 121.94 | 4.05 |
| Total Factor Productivity | 100.00 | 86.99 | -2.75 |

Faster growth in the total input at 4.05 percent per annum compared to 1.19 percent per annum in the total output during 1995-2000 has led to negative growth in TFP during the corresponding period.

### 2.2.3 Productivity of Pineapple (Canned)

Due to data limitations, performance of pineapples (canned) could be measured in respect of BM factories only. Labor and capital productivity of these factories alongwith corresponding annual compound growth rates have been presented in Table 22.

**Table 22. Labor and Capital Productivity of Pineapple (Canned) for BM Factories in the Philippines-1995-2000**

(1995=100, Percent)

| Measure of Productivity | 1995 | 2000 | Annual Growth During 1995-2000 |
|---|---|---|---|
| Value Added per worker (Absolute at constant 1995 US $) | 12192.00 | 11138.00 | -1.79 |
| Value Added per worker (Index) | 100.00 | 91.35 | -1.79 |
| Value Added per depreciation (Absolute at constant 1995 US $) | 0.29 | 0.26 | -2.16 |
| Value Added per depreciation (Index) | 100.00 | 89.66 | -2.16 |

#### 2.2.3.1 Labor and Capital Productivity of Pineapple (Canned)

Growth in pineapple output is contributed largely by the plantation farms dominated by two multinational corporations. A preponderate proportion of the processed pineapple is shipped to the U.S. and Japan, the owners of these multinational companies.

Value added per worker and value added per capital in real terms decreased during 1995-2000. The corresponding labor and capital productivity indices have also demonstrated negative growth.

#### 2.2.3.2 Total Factor Productivity of Pineapple (Canned)

Total factor productivity (TFP) of Pineapple (Canned) in the Philippines exhibited downward trend during 1995-2000 (Table 23).

**Table 23. Total Factor Productivity of Pineapple (Canned) in Philippines-1995-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1995 | 2000 | Annual Growth During 1995-2000 |
|---|---|---|---|
| Total Output | 100.00 | 84.66 | -3.28 |
| Total Input | 100.00 | 119.29 | 3.59 |
| Total Factor Productivity | 100.00 | 70.97 | -6.63 |

Since index of total output has shown negative growth in contrast to positive growth in input during 1995-2000, TFP has posted a negative growth during the corresponding period.

### 2.2.4 Productivity of Copra

Labor and capital productivity of National average copra factories alongwith corresponding annual compound growth rates have been presented in Table 24.

**Table 24. Labor and Capital Productivity of Copra in the Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Value Added per worker (Absolute at constant 1995 US $) | 24.04 | 37.73 | 30.52 | 11.93 | -4.15 |
| Value Added per worker (Index) | 63.72 | 100.00 | 80.89 | 11.93 | -4.15 |
| Value Added per depreciation (Absolute at constant 1995 US $) | 0.81 | 0.75 | 0.43 | -1.91 | -10.53 |
| Value Added per depreciation (Index) | 108.00 | 100.00 | 57.33 | -1.91 | -10.53 |

#### 2.2.4.1 Labor and Capital Productivity of Copra

Value added per worker increased from US$24.04 in 1991 to US$37.73 in 1995 before declining to US$30.52 in 2000. The negative growth rate at (-) 4.15 percent per annum during the second half of 1990s is quite significant. Value added per depreciation declined at (-) 1.91 percent per annum during 1991-95 compared with (-) 10.53 percent per annum during 1995-2000.

#### 2.2.4.2 Total Factor Productivity of Copra

Total factor productivity (TFP) of Copra in the Philippines exhibited downward trend during 1991-2000 (Table 25).

**Table 25. Total Factor Productivity of Copra in Philippines-1991-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1991 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1995 | 1995-2000 |
| Total Output | 80.69 | 100.00 | 59.46 | 5.51 | -9.88 |
| Total Input | 62.83 | 100.00 | 137.51 | 12.32 | 6.58 |
| Total Factor Productivity | 128.43 | 100.00 | 43.24 | -6.06 | -15.44 |

However, the decline in the TFP was faster at (-)15.44 percent per annum during the second half of 1990s compared to (-) 6.06 percent per annum during 1991-95. This has happened due to an upward trend in the total input in contrast to downward trend in the total output during 1991-2000.

## 2.3 Benchmarking Analysis

In addition to investigating levels and trends of various measures of productivity of selected raw crops / tradable processed commodities, benchmarking[1] analysis has been undertaken in respect of some of the surveyed commodities (depending upon availability of data) to compare and contrast performance of national average farms /factories with those of benchmark (best) farms /factories.

### 2.3.1 Benchmarking Analysis of Rice (Paddy) Farms

Benchmarking analysis of rice (paddy) farms in the Philippines has been undertaken from following three perspectives:

a. Comparison of Productivity of National Average (NA) Farms with Benchmark Farms (BM);
b. Comparison of Inputs and Output of National Average Farms with Benchmark Farms; and
c. Comparison of Cost Structure of Production of National Average Farms with Benchmark Farms.

#### a. Comparison of Productivity of National Average (NA) Farms and Benchmark Farms (BM)

To compare performance of NA farms with that of BM farms, the ratios of certain key indicators of productivity of the national average farms to the benchmark farms of rice (Paddy) in the Philippines for 1995 and 2000 have been presented in Table 26.

**Table 26. Ratios of Productivity of National Average Farms to Benchmark Farms of Rice (Paddy) in the Philippines**

| Measure | 1995 | 2000 |
|---|---|---|
| **Value added per hectare** | | |
| Narrow | 0.78 | 0.66 |
| Broad | 0.65 | 0.66 |
| **Value added per man-day** | | |
| Narrow | 1.06 | 0.91 |
| Broad | 0.89 | 0.91 |
| **Value added per depreciation** | | |
| Narrow | 1.74 | 1.48 |
| Broad | 1.46 | 1.48 |
| **Value added per MT** | | |
| Narrow | 1.22 | 1.03 |
| Broad | 1.03 | 1.03 |
| **Value added as percent of output** | | |
| Narrow | 1.22 | 1.01 |
| Broad | 1.03 | 1.03 |

The following important points emerge from Table 26:

[1] Appendix on 'Concepts, Definitions and Limitations' refer.

i. Given that benchmark farms (BM) represent 'best' farm of the country, ratios of NA to BM are expected to lie between zero and unity. However, there have been a few exceptions. The ratios of NA to BM farms for value added per depreciation, value added per MT of production and value added per as percent of output besides value added per man-day for narrow concept for 1995 have been greater than unity.

ii. Ratios of NA to BM farms in respect of different parameters of productivity have been generally higher for narrow concept than the corresponding ratios for the broad concepts in 1995 which implies that NA farms hire more laborers and/or lease more land than BM farms during that period.

iii. The level and trend of ratios of NA to BM farms for value added as percent share of output have been almost the same as in case of value added per MT of production.

**b. Comparison of Inputs and Output of National Average Farms and Benchmark Farms of Rice (Paddy)**

The ratios of expenditure per hectare of respective inputs and of output value at current domestic prices, of national average farms to benchmark farms, in the Philippines for 1995 and 2000 have been presented in Table 27.

**Table 27. Ratios of Inputs / Outputs per Hectare of NA to BM Farms of Rice (Paddy) in Philippines**

| Measure | 1995 | 2000 |
|---|---|---|
| **Cash Cost** | | |
| Cash inputs | 0.49 | 0.48 |
| Seeds | 0.52 | 0.61 |
| Fertilizers | 0.53 | 0.53 |
| Irrigation fee | - | - |
| Other cash cost | 0.29 | 0.28 |
| Sub-Total | 0.32 | 0.48 |
| Labor (family) | 1.29 | 1.29 |
| Depreciation | 0.38 | 0.80 |
| Land rent | 0.34 | 0.33 |
| Sub-Total | 0.75 | 0.82 |
| Total cost | 0.44 | 0.58 |
| Output value | 0.63 | 0.64 |
| Margin rate | 1.25 | 0.88 |

It is seen from Table 27 that the ratios of NA to BM farms for various inputs, except for family labor, were less than unity in the Philippines. Higher ratios of family labor indicate that BM farms are more professionally managed and rely more on open market labor force than the family labor.

**c. Comparison of Cost Structures of National Average Farms and Benchmark Farms of Rice (Paddy)**

The cost structures of respective inputs as percent of total cost, both for NA and

BM farms of rice (paddy), for 1995 and 2000 have been compared and presented in Table 28.

**Table 28. Cost Structure of Production of Rice (Paddy) in National Average Farms *vis-à-vis* Benchmark Farms in the Philippines**

(Percent)

| Cost/Output | NA | | BM | |
|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | |
| All cash inputs | 32 | 10 | 14 | 12 |
| Other cash costs | 21 | 48 | 59 | 58 |
| Sub-Total | 53 | 58 | 73 | 70 |
| **Imputed cost** | | | | |
| Labor (family) | 33 | 27 | 11 | 13 |
| Depreciation | 9 | 12 | 11 | 12 |
| Land rent | 4 | 3 | 5 | 5 |
| Sub-Total | 46 | 42 | 27 | 30 |
| **Total cost** | 99 | 100 | 100 | 100 |
| Margin rate (%) | 47 | 26 | 24 | 19 |
| **Value added as percent of output** | | | | |
| Narrow | 83 | 68 | 68 | 67 |
| Broad | 92 | 93 | 89 | 90 |

It emerges from Table 28 that the share of the cost of cash inputs declined from 32 percent in 1995 to 10 percent in 2000 for NA farms while it decreased from 14 percent to 12 percent for BM farms during the corresponding period. In contrast, the share of other cash costs increased from 21 percent to 48 percent for NA farms during 1995-2000 while it marginally declined from 59 percent to 58 percent for BM farms during the corresponding period. For BM farms, the share for other cash costs on hiring laborers were close to 60 percent but for family labor it was only 10 percent.

### 2.3.2 Benchmarking of Sugarcane

#### a. Ratios of Productivity of National Average Farms to Benchmark Farms of Sugarcane

The ratios of productivity of NA farms to those of BM farms of sugarcane for 1995 and 2000 have been exhibited in Table 29.

**Table 29. Ratios of Productivity of National Average Farms and Benchmark Farms of Sugarcane in the Philippines**

| Measure | 1995 | 2000 |
|---|---|---|
| **Value added per hectare** | | |
| Narrow | 1.16 | 1.83 |
| Broad | 0.92 | 1.12 |
| **Value added per man-day** | | |
| Narrow | 1.44 | 2.03 |
| Broad | 1.14 | 1.25 |
| **Value added per depreciation** | | |
| Narrow | 1.33 | 2.66 |
| Broad | 1.06 | 1.63 |
| **Value added per MT** | | |
| Narrow | 1.24 | 1.87 |
| Broad | 0.98 | 1.15 |
| **Value added as percent of output** | | |
| Narrow | 1.23 | 1.88 |
| Broad | 0.98 | 1.15 |

The following important points emerge from Table 29:

i. With a few exceptions, various ratios of NA to BM farms exceed unity. From productivity point of view, this implies that NA farms utilize available resources at least as efficiently as BM farms which depend more on hired labor.

ii. The ratios of NA to BM farms for the narrow concept in respect of different parameters have generally been different from the corresponding ratios for the broad concepts.

iii. The ratios of NA to BM farms increased considerably during 1995-2000 in most cases which indicate that the gap between NA and BM farms is widening during the corresponding period.

iv. The ratio of NA to BM farms for value added per MT has been high at 1.9 in terms of narrow concept in 2000 while it was a little over unity for broad during the corresponding year.

v. The ratios of NA to BM farms for the value added per MT followed the same pattern as in case of value added as percent of output.

### b. Ratios of Various Inputs and Outputs of National Average Farms to Benchmark Farms of Sugarcane

The ratios of expenditure per hectare of respective inputs and of output value at current domestic prices, of national average farms to benchmark sugarcane farms, have been presented in Table 30.

**Table 30. Ratios of Inputs / Outputs per hectare of NA to BM Farms of Sugarcane in the Philippines**

| Cost /Output | 1995 | 2000 |
|---|---|---|
| **Cash cost** | | |
| All cash inputs | 0.71 | 0.63 |
| Seeds | 0.30 | 0.20 |
| Fertilizers | 0.82 | 0.82 |
| Irrigation fee | 0.55 | 0.60 |
| Other cash cost | 0.47 | 0.47 |
| Sub-Total | 0.57 | 0.53 |
| **Imputed cost** | | |
| Labor (family) | * | * |
| Depreciation | 0.78 | 0.64 |
| Land rent | 1.00 | 1.00 |
| Sub-Total | 1.07 | 0.98 |
| Total cost | 0.86 | 0.76 |
| Output value | 0.85 | 0.89 |
| Margin Rate | 0.84 | 1.35 |

**** : Labor (family) cost for BM farms was zero.***

It is seen from Table 30 that ratios of NA to BM farms for all cash costs were less than unity in the Philippines. One unique aspect of the Philippine sugarcane farming is that BM farms (export farms) depend entirely on hired labor.

**c. Cost Structures of National Average Farms and Benchmark Farms of Sugarcane**

The percent cost structures of respective inputs to total cost both for NA and BM farms of sugarcane in 1995 and 2000 have been compared and presented in Table 31.

The following important points emerge on perusal of Table 31:

i. The cost structures of NA farms in terms of the percent shares of various inputs to total cost varied a great deal from those of BM farms. The share of "other cash cost" (mainly hired labor cost) for NA farms was 27-31 percent while it was about 50 percent for BM farms.

ii. The share of family labor has been in the range of 6-7 percent for NA farms while it has been nil for BM farms. It resulted in a low value added ratio for BM farms at 50 percent in 1995, which further ebbed to 36 percent in 2000. Such a difference has brought about a considerable difference between narrow and broad concepts of value added as percent of output.

iii. Margin Rate for NA sugarcane farms of the Philippines in the range of 33-39 percent has been impressive.

**Table 31. Cost Structure of Production of Sugarcane for National Average Farms *vis-à-vis* Benchmark Farms in Philippines**

(Percent)

| Measure | National Average | | Benchmark | |
|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | |
| All cash inputs | 27 | 26 | 32 | 31 |
| Other cash cost | 27 | 31 | 50 | 51 |
| Sub-Total | 54 | 57 | 82 | 82 |
| Non-cash Cost | 24 | 20 | . . | . . |
| **Imputed cost** | | | | |
| Labor (family) | 6 | 7 | 0 | 0 |
| Depreciation and interest on operating capital | 13 | 13 | 15 | 15 |
| Land rent | 3 | 3 | 3 | 3 |
| Sub-Total | 22 | 23 | 18 | 18 |
| Total cost | 100 | 100 | 100 | 100 |
| Margin rate | 39 | 33 | 39 | 22 |
| **Value added as percent of output** | | | | |
| Narrow | 67 | 62 | 50 | 36 |
| Broad | 84 | 83 | 80 | 76 |

### 2.3.3 Benchmarking Analysis of Pineapple

#### a. Ratios of Productivity of National Average Farms to Benchmark Farms of Pineapple

The ratios of productivity of NA farms to those of BM farms of pineapple for 1995 and 2000 have been exhibited in Table 32.

**Table 32. Ratio of Productivity of National Average Farms to Benchmark Pineapple Farms in Philippines**

| Measure | 1995 | 2000 |
|---|---|---|
| **Value added per hectare** | | |
| Narrow | 0.79 | 0.60 |
| Broad | 0.79 | 0.61 |
| **Value added per man-day** | | |
| Narrow | 0.85 | 0.65 |
| Broad | 0.85 | 0.66 |
| **Value added per depreciation** | | |
| Narrow | 1.15 | 0.89 |
| Broad | 1.15 | 0.89 |
| **Value added per MT** | | |
| Narrow | 0.97 | 0.94 |
| Broad | 0.98 | 0.96 |
| **Value added as percent of output** | | |
| Narrow | 0.98 | 0.94 |
| Broad | 0.99 | 0.96 |

The following important points emerge from Table 32:

i. Ratios of NA to BM farms in respect of different measures of productivity for the narrow concept have been of the same order as of broad concept.
ii. The trends in ratios of NA to BM for various indicators of productivity ebbed in 2000 compared to those in 1995 which indicates that the gap between NA and BM farms is widening. This is understandable, given the fact that pineapple BM farms are dominated by MNCs who invest in technology.
iii. Except for the ratios of value added per depreciation in 1995, all the ratios were less than unity. Thus, NA farms were less efficient from various aspects of productivity, except consumption of capital, than those of BM orchards.
iv. The level and trend of ratios of NA to BM farms for the percent share of value added to output has been almost similar to those of value added per MT.

**b. Inputs and outputs of National Average vs. Benchmark Farms**

The ratios of expenditures per hectare of respective inputs and of output value at current domestic prices, between national average and benchmark farms, in respect of the Philippines have been presented in Table 33.

**Table 33. Ratios of Inputs and Outputs of National Average to Benchmark Pineapple Farms in Philippines**

| Measure | 1995 | 2000 |
|---|---|---|
| **Cash costs** | | |
| All cash inputs | 0.91 | 0.91 |
| Seeds | 0.93 | 0.93 |
| Fertilizers | 0.88 | 0.88 |
| Irrigation fee | 0.67 | 0.67 |
| Other cash cost | 0.86 | 0.80 |
| Sub-Total | 0.90 | 0.88 |
| **Imputed cost** | | |
| Labor (family) | 1.14 | 1.14 |
| Depreciation | 0.68 | 0.67 |
| Land rent | 1.00 | 1.00 |
| Sub-Total | 1.10 | 1.10 |
| Total cost | 0.93 | 0.92 |
| Output value | 0.81 | 0.64 |
| Margin | 0.77 | 0.58 |

Note: Margin=output value-total cost.

The following important points emerge from Table 33 :

i. The ratios of NA to BM orchards of various cash costs are around 0.9 except
ii. For irrigation fee which is only 0.67. This shows that the BM orchards assign higher priority to irrigation compared to NA orchards.
iii. For imputed costs, ratios of NA to BM orchards have been different by different factors of production. It exceeded unity for labor (family), less than unity for capital and unity for land.

**c. Cost Structures of National Average Farms vs. Benchmark Farms of Pineapple**

The percent cost structures of respective inputs to total cost, both for NA and BM orchards of pineapple for 1995 and 2000 have been presented in Table 34.

**Table 34. Structure of Cost of Production of Pineapple for National Average vs. Benchmark Farms in Philippines**

(Percent)

| Measure | National Average | | Benchmark | |
|---|---|---|---|---|
| | 1995 | 2000 | 1995 | 2000 |
| **Cash cost** | | | | |
| All cash inputs | 55 | 54 | 56 | 55 |
| Other cash costs | 25 | 23 | 26 | 25 |
| Sub-Total | 80 | 77 | 82 | 80 |
| **Imputed cost** | | | | |
| Labor (family) | 11 | 12 | 9 | 10 |
| Depreciation | 7 | 9 | 7 | 8 |
| Land rent | 2 | 2 | 2 | 2 |
| Sub-Total | 20 | 23 | 18 | 20 |
| Total cost | 100 | 100 | 100 | 100 |
| Margin rate (%) | 74 | 77 | 78 | 84 |
| **Value added as percent of output** | | | | |
| Narrow | 79 | 82 | 81 | 87 |
| Broad | 86 | 87 | 87 | 91 |

Note: Margin rate is the margin (output value-total cost) as percent of output value.

The following points emerge from the Table 34:

i. The cost structure of NA farms has followed the same pattern as BM orchards and this pattern has not changed during 1995-2000. The share of the cost of cash inputs, for instance, declined from 80 percent in 1995 to 77 percent in 2000 for NA orchards while it decreased from 82 percent to 80 percent for BM orchards during the corresponding period.

ii. The margin rate and value added ratios are marginally higher for BM orchards than NA orchards.

### 2.3.4 Benchmarking of Rice (Milled)

National Food Authority (NFA) in the Philippines is the nodal agency entrusted with the responsibility to issue licenses to rice mills. Rice mills have been categorized into the single type pass and the double type pass. The first category includes *kiskisan* and cono rice mills while the second category includes rubber roll and compressed mills. The rubber roll mills are more efficient in producing better quality rice with less percentage broken, higher head and milling recovery rates. The numbers of kiskisan, cono and compressed mills have been decreasing while the number of rubber roll mills has been increasing.

Benchmark mills have large volume and trading activities and have achieved lower fixed costs due to economy of scale. However, their variable costs are higher. Net revenues of BM mills have far exceeded those of the average factory mills. It follows that the benchmark mills have higher real absolute levels of labor and capital productivity and the gap between benchmark factory and average factory have been large due to scale of operations.

**Table 35. Ratio of Performance of Benchmark Rice Mills to Average Rice Mills in the Philippines during 1995-2000**

| S.No. | Parameter | Ratio of Benchmark to National Average Mills During | |
|---|---|---|---|
| | | 1995 | 2000 |
| 1 | Number of Rice Mills | 3.29 | 5.04 |
| 2 | Volume of Output | 168.55 | 177.69 |
| 3 | Number of Employees | 69.00 | 42.22 |
| 4 | **Processing Cost (per MT)** | | |
| | a. Variable cost | 27.13 | 38.21 |
| | b. Fixed cost | 0.31 | 0.18 |
| | c. Total Cost | 15.16 | 13.04 |
| 5 | **Revenue** | | |
| | a. Gross Revenue (Per MT) | 17.84 | 10.60 |
| | b. Net Revenue (Per MT) | 35.66 | 6.25 |
| 6 | **Productivity** | | |
| | a. Labor Productivity (Value added per worker) | 16.40 | 12.45 |
| | b. Capital Productivity (Value added per capital) | 51.88 | 38.04 |

The absolute levels of labor productivity indices for the reference years for the benchmark mills were only about two thirds those of average factory mills (not shown in the table).

### 2.3.5 Benchmarking of Sugar (Raw)

The capacity utilization of sugar mills in the Philippines is about 60 percent due to shortage of cane supply which leaves the mills idle for 17 percent of the time which is equivalent to about 34 days per milling season (Amarra, undated). The average sugar recovery rate at 80.68 percent which is below the world average of 85 percent. The sucrose content of sugar is affected by delays in bringing the cane from the field to the sugar mills. This can be addressed by rationalizing delivery schedules, zoning and investment in technology. In the Philippines, the incentive to invest in such technology is constrained to some extent by the revenue sharing between the millers and planters, which on average, is 65-35 percent in favor of the planters.

**Table 36. Ratio of Performance of Benchmark Sugar Mills to Average Sugar Mills in the Philippines during 1995-2000**

| **S. No.** | **Parameter** | **Ratio of Benchmark to National Average Mills During** | |
|---|---|---|---|
| | | **1995** | **2000** |
| 1 | **Volume of Output** | 1.76 | 1.43 |
| 2 | No. of employees | 2.00 | 1.60 |
| 3 | **Processing cost** | | |
| | a. Variable cost | 1.37 | 1.37 |
| | b. Fixed cost | 1.37 | 1.37 |
| | c. Total Cost | 1.37 | 1.37 |
| 4 | **Revenue** | | |
| | Gross revenue, | 1.00 | 1.00 |
| | Net Revenue | 0.71 | 0.83 |
| 5 | **Productivity** | | |
| | Labor productivity (Value added per worker) | 0.43 | 0.57 |
| | Capital productivity(Value added/capital/MT) | 0.63 | 0.66 |

## 3. PRODUCTIVITY AND THE TRADE PERFORMANCE

### 3.1 Correlation between Productivity Indices and Trade Performance

During the decade of 1990s, the Philippines imported substantial quantities of rice, except during 1991 and 1992 when modest quantities of this commodity were exported. Imports have been necessitated to bridge the gap between domestic demand and production. The declining growth of the total factor productivity for paddy, for instance, partly explains the reason of the Philippines being a net rice importer. However, there are other economic and physical factors which explain trade performance of a commodity

The volume of exports of sugar slowed down by 50 percent, from 274 thousand MT of raw sugar equivalent in 1991 to 139 thousand MT in 2000. Imports, however, accelerated over the corresponding period from 13.3 thousand MT in 1991 to 217 thousand MT in 2000. The declining trend in TFP of sugarcane is reflected in the trade performance of raw sugar where volume of export has been shrinking in contrast to expansion in imports.

Similarly TFP of both pineapple (fresh) and pineapple (canned) have exhibited declining trends. The comparative advantage of canned pineapple from the Philippines is also dwindling as shown by the declining share of the country's exports to total world exports. Nevertheless, the value of exports of this commodity has shown a long term upward trend during the decade of 1990s, albeit with fluctuations.

The TFP of coconut orchards exhibited a declining growth during 1991-2000. Similar declining trend has also been observed in the TFP for copra during 1995-2000. Copra exports have declined in recent years due to the shift in focus from traditional exports such as copra to higher value added coconut products.

The TFP for maize farms has exhibited a positive but downtrend trend during 1991-1995. In 1991, the country exported about 20 thousand MT valued at US$3.4 million of yellow maize resulting from the expanded maize production programs. Export prospects, however, was short-lived and from 1995 onwards the country imported large volumes of yellow maize.

From the above discussions, it is inferred that productivity is an important factor that influence trade performance. However, it alone can not explain the trade performance of a given commodity for there are other factors such as trade policy, National Agriculture Policy, macro economic performance, relative performance of other countries that have bearing on the overall trade performance.

### 3.2 Effects of Agriculture and Food Policy

#### 3.2.1 Production Promotion

To improve production and yield of paddy (rice), intensified use of HYVs, irrigation and credit facilities under a nationwide rice production program with input subsidies had been launched in the Philippines. The *Masagana 99* rice program included a package of improved technology involving HYVs, appropriate application of fertilizer, subsidies for seeds and fertilizer, infrastructure support primarily irrigation facilities, farm to market roads and access to agricultural credit. Other rice production promotion programs include Rice Action Program, Grains Enhancement Productivity Program (1991-1994), *Gintong Ani* Program (1995-1997), Rice *MakaMasa* Program (1998-1999); and the *Ginintuang Masaganang Ani* (2000 to present).

Likewise, maize production programs include a package of HYVs, irrigation, input assistance on seeds, fertilizer, pesticide and marketing services, backed by a supervised credit scheme. Farmers have diversified from white to yellow maize and

other crops. However, input subsidies in maize production have been reduced in a phased manner from 1995 which may impinge on the growth of the yellow maize sector.

### 3.2 .2 Price Support /Control

National Food Authority (NFA), the government marketing agency for grains, undertakes the paddy procurement and rice distribution operations in the Philippines. These operations, governed by a support price and ceiling price, aim at stabilizing farm and retail prices and strike a balance between the interests of producers and consumers. However, the Government's price intervention policy in rice has been found to be biased towards consumers (Librero and Tidon, 1996) and has impeded growth of the rice sector.

NFA rice procurement includes direct purchases of paddy from producers. NFA has not been able to fully achieve its objective of price stabilization primarily because of budget constraints. At the same time, the paddy farmers have not been able to take advantage of the price premium as they are not able to meet quality standard of moisture content not exceeding 14 percent due to inadequate drying facilities at the farm level. Low farm prices for paddy can also be attributed partly to ineffective management of imports. Untimely arrivals, usually late shipments received during the lean season just before the harvest of wet season paddy contribute to depressed prices.

The domestic maize industry is highly protected and the domestic prices have been ruling at a level higher than the world prices. Price protection is manifested in government intervention through the NFA's procurement and distribution operations. It sets support price at the farm level. Due to the limited volume of maize handled by the NFA, the price intervention system has limited effect in raising maize farm prices to levels that would induce farmers to continue growing the crop or to produce more.

### 3.2.3 Infrastructure, Marketing and Research

A key element to the growth of agriculture is development of irrigation. According to National Irrigation Administration (NIA), only 44 percent of potential area is serviced by various irrigation systems, leaving a wide opportunity for development. Investment in irrigation have received tremendous economic and political pressure The Agriculture and Fisheries Modernization Act (AFMA) of 1997 put emphasis on irrigation and have earmarked 30 percent of its outlays for the purpose. The construction, installation and rehabilitation of community irrigation system are part of the current rice program, *Ginintuang Masaganang Ani* (GMA).

Farm prices are affected by weak marketing system. A large portion of yellow maize output, for instance, is in the southern part of the country while the feed millers and livestock producers are confined in the Luzon island. The dispersed location of production and consumption areas have been aggravated by weak infrastructure links, lack of bulk handing and monopoly in inter-island shipping. These result in high marketing costs. The cost of marketing and distribution of yellow maize in the Philippines is higher by about 66 percent compared to that in Thailand (Rosegrant and Gonzales, 1991). To address this problem, production of yellow maize in the country has been intensified in recent years in the Luzon area where most feed millers and livestock raisers are located.

About 30 to 40 percent of total cost of grains including maize from farm to the wholesale market is traced to inadequate infrastructure in marketing and distribution (Gonzales, 2003). One of the strategies under the Maize Commodity Road Map is construction of more post-harvest and storage facilities in major maize producing areas and bulk handling in ports engaged in maize transport. This is expected to reduce logistic costs from P1.81 to P1.14 per kilogram of maize. The reduction in logistic costs comes from savings in the cost of sacks, land transportation and shipment.

The marketing of sugar has been de-regularized in the Philippines. Sugar Regulatory Administration (SRA), a special agency for sugar industry, has been created by the government with the responsibility of both domestic and foreign marketing of sugar. During the period of preferential treatment, Philippine sugar entered the U.S. market duty free.

The PhilRice is the lead agency which undertakes agriculture research activities in rice. Besides, state colleges, universities and private organizations carry out research in agriculture. Budgetary support to R&D in general, however, remained low at less than 0.5 percent of the gross value added in agriculture.

A major breakthrough in research and development in yellow maize has been the development of open pollinated varieties (OPV).

### 3.2.4 Minimum Access Volume

Rice in the Philippines has been heavily protected for food security reasons. Under the WTO Agreement, a minimum access volume (MAV) of 59,730 MT in 1995 and 238,940 MT in 2004 rice has been allowed. The rice imports have always exceeded the MAV level which was necessitated to meet the gap between domestic demand and production. The NFA has the power to import rice at zero tariff rate even in excess of the MAVs. Further, the instrument of price policy for rice has been used primarily to protect the domestic market from extreme price fluctuations and protect rice (paddy) cultivators from low world prices. Nominal Protection Rate (NPR) for rice increased from (-)11 percent during 1975-1979 to 25 percent during 1990-1994. In spite of the structural reforms, trade liberalization and foreign exchange liberalization intensified during the decade of 1990s, paddy production and rice mills enjoy high tariff protection. The protection provided by the QRs affords domestic rice producers to operate inefficiently at a sub-optimal level.

Like rice (paddy) and rice (milled), maize and maize mills have also been highly protected by high tariffs. However, the quantitative restrictions for maize have been replaced with tariffs. Under the tariff quota system or MAV of the WTO agreement, the country has been allowed an MAV for maize that is equivalent to 3 percent of total maize consumption or imports subject to 35 percent tariff from 1995 to 2004. A minimum Access Plus Scheme was, however, established which allows maize imports above the MAV quota or out-quota volumes at an initial tariff rate of 100 percent in case of maize shortages in the country to prevent a sharp increase in domestic prices.[2] Unlike rice, the private sector is allowed to participate in maize imports, although the NFA holds the first right to import under the MAV.

For both raw and refined sugar, the Philippines had committed under the WTO the lowest in-quota tariff rate among its comparable sugar producing competitors and also the largest percentage reduction of out-quota tariff over time, an initial Bound Tariff Rate of 100 percent in 1995 to a Final Bound Rate of 50 percent by the year 2004. This discriminates the domestic producers because higher tariffs will be levied against the Philippine sugar. Foreign producers can export sugar to the country at lower tariffs making imported sugar more competitive especially when these countries have lower production costs of cane and raw sugar relative to those of the Philippines.

There are apprehensions amongst the sugar bloc that the current applied tariff is also the same for raw and refined sugar at 65 percent which may encourage industrial users to import refined sugar. Consequently, this poses a threat to local refineries due to lesser demand for raw sugar.

Tariff protection to coconut products varied across coconut products. Copra, CNO, desiccated coconut, copra cake and meal have been receiving negative tariff

[2] The out-quota tariff for maize has been reduced to 50 percent in July 2003.

protection rates from 1970s to mid-1980s. Beginning the 1990s, copra had zero protection rate on the ground that trade for the commodity was already focused on the domestic market.

The tariffs for competing oilseeds such as copra and palm kernel are equal at 10 percent under the Most Favored Nation (MFN) tariff but higher for copra at 5 percent against 3 percent for palm kernel under CEPT. For seed oils, crude coconut oil (CNO) has a lower MFN tariff of 10 percent but its competing crude palm oil has a tariff of 15 percent, apparently to protect the domestic CNO industry. CNO is exported while crude palm oil is imported.

## 4. PROSPECTS FOR FUTURE DEVELOPMENT OF THE SURVEYED COMMODITIES

The prospects for future development of the surveyed commodities depend on various internal and external factors, notable amongst them are as follows:

- Role of Government
- Competitiveness
- Technological Break Through and Modernization
- Self Sufficiency
- Infrastructure

### 4.1 Role of the Government

To achieve high growth rate in the surveyed commodities, investment in infrastructure including irrigation, availability of high quality of inputs such as fertilizers, certified seeds and its timely application, agricultural marketing, research and availability of credit is required. In addition, farmers need to be protected against the risk of loss of crops due to aberrant weather conditions, pest and diseases.

The local governments are in-charge of farm-to-market roads and the Philippine Ports Authority (PPA) provides and regulates port and shipping facilities. The development of the Roll-On-Roll-Over (RORO) shipping facilities has greatly enhanced commodity flow from one island to another in the country. The Land Bank and Quedancor are formal credit services while traders form part of the informal source of lending. The Philippine Crop Insurance Corporation (PCIC) provides insurance to farmers in cases of crop loss. The Agricultural Credit Policy Council (ACPC) sets priorities for credit allocation, assistance and delivery to agricultural crops and programs.

Various studies have found the existence of positive correlation between the size of farms and productivity and therefore it makes a sense to consolidate smaller farms. However, exactly opposite has been done by the government. Under the Comprehensive Agrarian Reforms Program (CARP), sugarcane plantations in excess of 25 hectares have been redistributed to workers and beneficiaries. This resulted in reduction in average size of farms from 14 hectares in the 1970s to 9 hectares in the early 1990s which led to a drop in yields and rendered most sugarcane farms uneconomic. Consequently, there was reduction in area harvested as small cane farmers shifted to more remunerative crops. This adversely affected the Philippine sugar production.

As consolidation enhances farm mechanization, leads to higher yields and higher level of efficiency, voluntary consolidation of farms will be encouraged.

There exists a potential to achieve a high sustainable growth rate in the domestic production of the surveyed commodities. To accomplish this, a holistic approach and a strong political will is required where public and private sector can participate and work together towards achievement of growth on higher trajectory.

## 4.2 Competitiveness

The price competitiveness of domestic maize *vis-à-vis* imported maize has been determined by the ratio of the import parity price to the domestic wholesale price, using import data from China in 2002. At 35 percent tariff, domestic maize is competitive with the calculated ratio of 1.05.[3] Sensitivity analysis using a higher tariff rate of 50 percent yield a ratio of 1.15 which indicates a higher degree of competitiveness. The results show the potential of domestic maize production for import substitution. Domestic maize for export is, however, uncompetitive as shown by the results of a study by Gonzales (2003).

Prospects for high export earnings from coconut products will continue by processing copra into higher value added products such as crude coconut oil (CNO). While the Philippine is still the largest source of CNO in the world market, the country is a price taker in the world market for vegetable oils since CNO comprise only about 5 percent of the world market for vegetable oils. The increasing supply of CNO substitutes such as soybeans oil, palm kernel oil and rapeseed oil have also affected CNO prices. The country's position in the world market for CNO is also being threatened by Indonesia, whose market share has grown ten folds over the last two decades (1980-2000) while the export share has been decreasing. This could be attributed to declining coconut productivity in the Philippines and shifting from CNO into oleo chemicals.

Coconut products continue to be the leading agriculture exports in the Philippines. Recent trade liberalization has offered opportunities for market expansion in major importing countries of coconut products due to lowering of their tariffs. To retain global competitiveness of coconut products, it is imperative to take the following measures:

i. To increase productivity at the farm sector by promoting replanting of age old trees with hybrids and timely application of recommended doses of fertilizer;
ii. To improve the quality of copra through improved drying facilities as this affects copra prices and CNO yields; and
iii. To assess the copra pricing scheme to encourage copra producers to invest in good drying facilities.

The pineapple industry, right from farm production to processing, in the Philippines is dominated by two multinational companies (MNCs). Due to investment in technology and large size of the orchards, they are able to reap the benefits of economy of scale and sustained productivity. Scientific farming practices adopted by the MNCs are replicated in nearby small private farms. For pineapple farms outside the domain of these large companies, production development is provided by the Department of Agriculture through its High Value Commercial Crops (HVCC) Program. There exists a potential for both commercial and small pineapple farms to improve productivity.

## 4.3 Technological Break Through and Modernization

In the Philippines, maize production is predominantly rainfed. The use of biotechnology (Bt) maize can extend the planting season that would result in improved supply distribution. Bt maize has been commercialized in 2003 in selected sites in the Philippines (Gonzales, 2003). A comparative study of the transcendental (socio-economic) effects of Bt and non-Bt maize in the field trials by Monsanto, one of the seed companies, by the SIKAP/STRIVE Foundation in 2002 showed a lower per unit cost of Bt maize by 25 percent during the wet season and 15 percent during the dry season; Bt maize is also cost competitive under export trade regime but marginally uncompetitive for non-Bt maize. Both Bt and non-Bt maize have been found to be competitive under import substitution trade regime.

[3] Competitiveness exists if the import parity/domestic wholesale price ratio is greater than one.

The use of high quality seeds and the conversion of areas planted to traditional and OPV varieties would double the national average yield of maize. About 320 thousand hectares with yield of 5 MT per hectare would make the country 80 percent self-sufficient of the requirements of the livestock industry and at 6 MT per hectare to be 96 percent self-sufficient (DA Maize Commodity Road Map).

The Sugar Program aims at improving the capacity utilization of mills, increasing recovery rate, efficiency and also labor productivity. Any increase in the capacity utilization of sugar mill depends upon cane production. Economic zoning enhances sufficient cane supply during the milling season.

Canes are harvested either by cane knife or "machete" or by machine. Training on improved cane cutting will be undertaken to reduce losses. This entails upgrading and/or installing new equipment and facilities for mills and refineries to enable them to meet international standards and to improve their performance. Mill efficiency can also be improved by reduction in costs of energy used, effective pollution management and control. Pollution management must not be viewed in terms of regulatory compliance alone.

Most mills continuously modernize their facilities at their own. Modernizing of sugar mills includes installation of new boilers, shredders, turbines, generators, evaporators, rehabilitation of conveying systems, phosphate control systems, tanks for treatment of hot water, core sampler and near infrared cane analyzer, automated cane milling and refinery, crystallizers and continuous vacuum pans, computerized sugar bag coding, saccharomat, geographic information system (GIS) in capturing and storing referenced data, monitoring of air, water and waste management through environmental management systems or EMS (Zabaleta, 2003).

### 4.4 Self Sufficiency

In the past, the government's rice programs aimed at export of rice in the event of surpluses. However, recent rice programs concentrate on import substitution. Maize Commodity Road Map aims at achieving at least 80 percent self-sufficiency in maize from the present 67 percent and reduces production and logistics costs. As a major feed ingredient, the potential of the yellow maize production to grow at sustainable rates to achieve feed self-sufficiency rests on increased productivity, backed up by infrastructure, flow of credit, favorable trade policy and good governance.

The primary concern of sugar industry is to attain self-sufficiency and become a net exporter of sugar. For improvement of the domestic sugar industry, a 10-year Sugar Action Plan has been launched in 2002. The Program focuses on the following four major areas:

i. Production, Harvesting and Transport;
ii. Milling and Refining;
iii. Marketing and Distribution; and
iv. Policies and Institutions.

### 4.5 Infrastructure

About 30 to 40 percent of total cost of production of grains from farm to the wholesale market is traced to inadequate infrastructure in marketing and distribution (Gonzales, 2003). One of the strategies under the Maize Commodity Road Map is construction of more post harvest and storage facilities in major maize producing areas and bulk handling in ports engaged in maize transport which would reduce logistic costs.

As the main cause of decline in sucrose content in sugarcane is delays in transporting the cane to the mills, it is envisaged to finance 2,244 trucks. This will help improve recovery rate of sugar from cane. Since 1993, the Philippine Sugar Millers Association (PSMA) has already proposed an improvement of roads linking the mills to

the farms.

## 5. PROPOSAL FOR THE SETTING UP OF A FORMAL MECHANISM FOR FUTURE PRODUCTIVITY SURVEYS

A formal mechanism for conduct of survey on agricultural productivity in the Asian region should be set up for purposes of in-country commitment and inter-country collaboration as well as in the improvement of methods. The mechanism for the purpose may be established in the following manner:

First, a specific nodal agency needs to be identified in each country through APO office in the member countries. This agency would serve as the nodal agency in agricultural productivity measurement.

Second, the in-country collaboration which the APO has spearheaded through the present survey should be continued and monitored. Standardization of concepts, continuous improvement in the methodology and other technical matters relating to agricultural productivity measurement should be regularly addressed. Other methods in measuring productivity should also be explored in future studies.

Third, a metadata base for agricultural productivity in the Asian region should be developed, using current technology in information and communication. Access to the database should be based on protocols which should be updated regularly. The effort initiated by APO should be sustained.

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# 6. THAILAND

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## 1. BACKGROUND: SURVEYED COMMODITIES AND THEIR PERFORMANCE

### 1.1 Rationale of the Survey and Criteria for Commodity Selection

The contribution of agriculture sector in Thailand's GDP has declined from 12.50 percent in 1990 to 10.39 percent in 2000. At the same time, importance of agriculture has increased and Thailand has been a leading net exporter of agriculture and food products in the world. Trade balance on account of agriculture and food products has been consistently positive and exhibited an upward trend in the decade of 1990s. It increased from Baht 98.65 billion in 1990 to Baht 351.45 billion in 2000 which is a major source of foreign exchange. Thailand has sought to promote her agriculture and food in the world by launching a campaign "The World Food Kitchen" which is an important mission statement that gives a signal that Thai's agriculture export is likely to move on a higher trajectory of growth in near future.

Competitiveness is a key to success of any business and agriculture is no exception. To provide policy makers and agricultural traders a tool for comparative analysis across industries and countries in Asia, APO conducted a survey on `Agricultural Productivity Index' in selected APO member countries to measure productivity of selected tradable commodities. In so far as Thailand is concerned, seven commodities namely rice, sugarcane, pineapple, rubber, maize, palm oil and soybeans have been selected under the survey. While rice, rubber and sugar have been selected because these are the country's major exportable commodities, pineapple, maize and palm oil are minor exportable commodities have also been covered from export oriented concern, inclusion of soybeans has been enabled by its high cost of production and also increasing volume of imports, necessitated to meet the gap between domestic demand and production.

### 1.2 Importance of the Surveyed Commodities

The importance of a commodity, particularly from trade perspective, can be viewed from its shares of exports/imports in the total agriculture and food trade of the country. Therefore, the relevant shares of various commodities selected under the Survey by the Thailand have been presented in Table1.

**Table 1. Shares of Exports and Imports of the Surveyed Commodities in Agriculture and Food Trade of Thailand during 1990-2000**

(Percent)

| Commodity | Exports | | | Imports | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| Rice (milled) | 12.39 | 11.95 | 10.46 | 0.00 | 0.00 | 0.00 |
| Sugar (raw) | 8.53 | 7.76 | 4.68 | 0.11 | 0.18 | 0.27 |
| Rubber (sheet) | 8.36 | 9.96 | 9.70 | 0.00 | 0.00 | 0.00 |
| Pineapple (canned) | 2.46 | 1.42 | 1.26 | 0.00 | 0.00 | 0.00 |
| Palm Oil | 0.00 | 0.07 | 0.19 | 0.05 | 0.12 | 0.18 |
| Maize | 1.85 | 0.13 | 0.05 | 0.01 | 0.00 | 0.06 |
| Soybeans | 0.00 | 0.00 | 0.08 | 0.00 | 0.71 | 4.17 |
| Total | 33.59 | 31.29 | 26.42 | 0.17 | 1.01 | 4.68 |

### 1.2.1 Rice

Rice, one of the most important crops of Thailand, contributes about 22 percent in the total value of output of agriculture. The export of the commodity increased from 4.02 million MT in 1990 to 6.14 million MT in 2000, though its share in the export of agriculture and food products declined from 12.39 percent in 1990 to 10.46 percent in 2000.

### 1.2.2 Sugarcane

Sugarcane and sugar industry contributes about 22 percent in the total value of output of agriculture in the country and provides approximately 0.60 million jobs. The share of sugar in the total export of agriculture and food products declined from 8.53 percent in 1990 to 4.68 percent in 2000. Nevertheless, Thailand continues to be a leading exporter in Asia.

Thailand also has locational advantage in low freight charges as it has major sugar markets in neighboring countries such as Japan, South Korea, Malaysia and Indonesia. However, the production cost of the Thai sugar has exhibited an increasing trend due to low efficiency, adversely affecting Thailand's advantageous position. Globally, Thailand is placed fourth after Brazil, EU and Australia in terms of export of sugar.

### 1.2.3 Rubber

Rubber and its products play an increasingly important role in the Thai's export earnings. The share of natural rubber in the total export of agriculture and food products increased from 8.36 percent in 1990 to 9.70 percent in 2000.

Of late, rubber in the form of rubber block has become more popular amongst users. Only 21 percent of Thai's rubber is produced in the form of rubber blocks. In contrast, Indonesia and Malaysia almost entirely produce this commodity in the form of rubber blocks. In the wake of increasing competition and pressure emerging from low-cost producing countries such as India and Vietnam who have already entered into the rubber smoked sheet sector, the Thai rubber production sector is being encouraged by the government to switch over to the rubber block production, referred to as Standard Thai Rubber or STR.

### 1.2.4 Pineapple

Thailand continues to be the leading exporter of the canned pineapple in Asia. The volume of export of canned pineapple increased from 0.40 million MT in 1990 to 0.47 million MT in 2000, though its share in the export of agriculture and food products decreased from 2.46 percent in 1990 to 1.26 percent in 2000. Thailand commands a

remarkable position in its share of total Asia's export and accounted for half of total Asia's export of this commodity in 2000.

There are 23 pineapple canneries, processing 1.7-1.8 million MT or 80 percent of the fresh pineapples for canned pineapple, pineapple juice, dehydrated pieces, paste, etc. These canneries operate at about 50 percent of the total manufacturing capacity.

### 1.2.5 Palm oil

Throughout Thailand's vegetable oil history, palm oil has been the most competitive amongst the vegetable oils group, both in its production and local marketing potentials. As it has relatively lower cost of production and price, palm oil offers a variety of its usages.

Thailand started export of palm oil in a modest manner. It exported only 100 MT of palm oil in 1990 which increased to 6 thousand MT in 1995 and further to 37 thousand MT in 2000. Though it accounted for only 0.3 percent in the total Asia's export, its contribution is noticeable as volume of the export expanded by six times during 1995-2000. As Thailand is strategically located and has congenial environment for plantation of palm oil, it is expected that it would make a significant contribution in the trade of this commodity in near future.

### 1.2.6 Maize

A large proportion of area covered under maize in Thailand is rainfed and a poor monsoon triggers low yield rate, exposing farmers to risk and uncertainty. This coupled with subdued prices of maize, area covered under the crop has shrunk and diversification of this crop to cassava has taken place during the decade of 1990s.

### 1.2.7 Soybeans

Soybeans crop is has been introduced in Thailand in early 1990s when prices of major Thai crops were subdued and farmers were looking for alternative crops to cover risk against low prices of agricultural crops. Its usefulness lies in the fact that it is a substitute of palm oil fishmeal and has demand by a large number of downstream oil mills, besides it can be cultivated as a rotational crop in tandem with maize, cassava and sugarcane.

## 1.3 Trends in Trade of the Selected Commodities

### 1.3.1 Rice

Thailand has been the most dominant exporter of rice and accounted for over 50 per cent of Asia's total rice export in 1990. It posted an annual growth rate of 9.1 percent during 1990-95. However, its share declined to 37-39 percent during the second half of 1990s due to significant export expansion by other countries and it recorded a negative annual growth rate at (-)0.2 percent during this period.

Thailand's rice for export has been categorized into three qualities, namely superior, medium and inferior. For the best quality rice, the US has been a major competitor while Vietnam, Pakistan, China and Myanmar compete with Thai's inferior quality rice. The major export markets are in Asia, the Middle East, Africa and Europe.

### 1.3.2 Sugar

The volume of export of sugar increased from 2.42 million MT in 1990 to 3.84 million MT in 1995 and further to 4.24 million MT in 2000. Thailand continues to be a leading exporter in Asia and accounted for two-third of Asia's total export of this commodity in 2000. As Thailand's export of sugar accounts for about 70 percent of its total production, farm prices heavily depend on the prices in the international markets.

### 1.3.3 Rubber

The volume of export of natural rubber from Thailand increased from 1.13 million MT in 1990 to 2.54 million MT in 2000. Thailand has achieved a remarkable growth in its share of Asia's total export from 30 percent in 1990 to 49 percent in 2000. About 90 percent of the domestic production is exported and some of its buyers are Japan, Malaysia, South Korea and the US.

### 1.3.4 Pineapple

The volume of export of canned pineapple from Thailand has exhibited an upward trend during the decade of 1990s, albeit with fluctuations. It increased from 0.40 million MT in 1990 to 0.47 million MT in 2000, though it dipped to 0.39 million in 1995. Thailand commands a remarkable position in its share of Asia's total export and accounted for half of Asia's total export of this commodity in 2000.

### 1.3.5 Palm oil

Thailand started export of palm oil in a modest manner. It exported only 100 MT of palm oil in 1990 which increased to 6 thousand MT in 1995 and further to 37 thousand MT in 2000. Though it accounted for only 0.3 percent in the Asia's total export, its contribution is noticeable as volume of the export expanded by six times during 1995-2000.As the domestic demand for palm oil grows at 10.75 percent per annum on an average, is less expensive compared to other vegetable oils, has variety of usages, it commands over 60 percent of relative share in the vegetable oil group in the domestic market.

### 1.3.6 Maize

The volume of export of maize decreased from 124 thousand MT in 1990 to 24 thousand MT in 2000 and its share in the export of agriculture and food products declined from 1.85 percent in 1990 to 0.05 percent in 2000 during the corresponding period. Increase in the domestic demand mainly due to the fast expansion of the animal feed industry has caused decline in export of maize. Thailand export maize to Malaysia, Singapore, Indonesia and at times to Taiwan.

### 1.3.7 Soybeans

Thailand imported 203 thousand MT of soybeans in 1995 which substantially increased to 1320 MT in 2000. Its share in Asia's total import increased from 1.8 percent to 5.4 percent during the corresponding period. Thailand mainly buys from Argentina, Brazil, Canada and the US. Import price of soybeans influence the domestic prices of the commodity.

## 2. MEASURED PRODUCTIVITY INDICES OF THE SURVEYED COMMODITIES

In this Section, land, labor, capital and total factor productivity of the national average farms in respect of the following crops (raw) have been investigated:

- **Rice (Paddy);**
- **Sugarcane;**
- **Rubber;**
- **Pineapples;**
- **Palm Oil;**
- **Maize; and**
- **Soybeans**

However, the analysis of tradable processed Commodities could not be undertaken due to non-availability of requisite data.

### 2.1 Productivity of Rice (Paddy)

### 2.1.1 Land and Labor Productivity of Rice (Paddy)

Productivity measures of national average rice (paddy) farms and corresponding growth rates have been presented in Table 2:

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during the entire reference period and the growth rate during 1994-2000 has been higher at 1.06 percent per annum compared to 0.54 percent per annum during 1991-94.

Value added per hectare of rice (paddy) farms decreased annually at (-)6.56 percent during 1991-94. However, declining trend showed down to (-) 0.81 percent during 1994-2000. Value added per MT declined faster compared to value added per hectare during the entire reference period.

**Table 2. Land and Labor Productivity of Rice (Paddy) in Thailand-1991-2000**

(1994=100, Percent)

| Measure of Productivity | 1991 | 1994 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1994 | 1994-2000 |
| Land Productivity (MT/hectare) | 1.98 | 2.01 | 2.14 | 0.54 | 1.06 |
| Labor /Land Ratio (Man-day/ hectare) | 34.38 | 33.46 | 32.05 | -0.90 | -0.72 |
| Labor Productivity (Kg./ man-day) | 57.62 | 60.16 | 66.91 | 1.45 | 1.79 |
| Value Added per hectare (at constant 1995 US $) | 309.51 | 252.46 | 240.50 | -6.56 | -0.81 |
| Value Added per hectare (Index) | 122.59 | 100.00 | 95.26 | -6.56 | -0.81 |
| Value Added per man-day (at constant 1995 US $) | 9.00 | 7.55 | 7.51 | -5.72 | -0.09 |
| Value Added per man-day (Index) | 119.32 | 100.00 | 99.47 | -5.72 | -0.09 |
| Value Added per MT (at constant 1995 US $) | 156.24 | 125.42 | 112.18 | -7.06 | -1.84 |
| Value Added per MT (Index) | 124.57 | 100.00 | 89.44 | -7.06 | -1.84 |

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, declined annually at (-) 0.90 percent during 1991-94 compared to (-)0.72 percent during 1994-2000. Lower the ratio, higher the intensity of labor which may be taking place due to farm mechanization. Lower value of this ratio during the latter period indicates higher investment in farm mechanization.

Value added per man day (at constant 1995 US $) declined at (-)5.72 percent annually from US$9.00 in 1991 to US$ 7.55 in 1994. It further declined to US$ 7.51 in 2000 at annual rate of (-) 0.09 percent.

### 2.1.2 Capital Productivity of Rice (Paddy)

Value added per depreciation posted an annual growth rate at (-)10.74 percent during 1990-1994 against (-) 8.12 percent during 1994-2000 (Table 3).

**Table 3. Capital Productivity of Rice (Paddy) in Thailand -1991-2000**

(1994=100, Percent)

| Measure of Productivity | 1991 | 1994 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1994 | 1994-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 0.94 | 0.67 | 0.40 | -10.74 | -8.12 |
| Value Added per capital (Index) | 140.60 | 100.00 | 60.16 | -10.74 | -8.12 |

This trend mirrors the farm mechanization.

### 2.1.3 Total Factor Productivity Rice (Paddy)

Total factor productivity (TFP) of rice (paddy) decreased at an annual rate at (-) 4.23 percent during 1991-94 but increased at 1.54 percent during 1994-2000 (Table 4).

**Table 4. Total Factor Productivity of Rice (Paddy) in Thailand – 1990-2000**

(1994=100, Percent)

| Measure of Productivity (Index) | 1991 | 1994 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1994 | 1994-2000 |
| Total Output | 120.78 | 100.00 | 116.34 | -6.10 | 2.55 |
| Total Input | 106.10 | 100.00 | 106.12 | -1.95 | 0.99 |
| Total Factor Productivity | 113.84 | 100.00 | 109.63 | -4.23 | 1.54 |

The positive growth in TFP during latter period has taken place due to the fact that total output has increased faster than total input during the corresponding period.

## 2.2 Productivity of Sugarcane

### 2.2.1 Land and Labor Productivity of Sugarcane

Land and labor productivity of national average sugarcane farms and corresponding compound annual growth rates have been presented in Table 5.

**Table 5. Land and Labor Productivity of Sugarcane in Thailand-1992-2000**

(1995=100, Percent)

| Measure of Productivity | 1992 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 51.94 | 57.71 | 59.23 | 3.57 | 0.52 |
| Labor /Land Ratio (Man-day/ hectare) | 227.27 | 69.04 | 63.44 | -32.78 | -1.67 |
| Labor Productivity (Kg./ man-day) | 228.53 | 835.89 | 933.59 | 54.08 | 2.24 |
| Value Added per hectare (at constant 1995 US $) | 529.52 | 705.14 | 682.19 | 10.02 | -0.66 |
| Value Added per hectare (Index) | 75.09 | 100.00 | 96.74 | 10.02 | -0.66 |
| Value Added per man-day (at constant 1995 US $) | 2.33 | 10.21 | 10.75 | 63.67 | 1.03 |
| Value Added per man-day (Index) | 22.81 | 100.00 | 105.27 | 63.67 | 1.03 |
| Value Added per MT (at constant 1995 US $) | 10.19 | 12.22 | 11.52 | 6.22 | -1.18 |
| Value Added per MT (Index) | 83.43 | 100.00 | 94.25 | 6.22 | -1.18 |

Land productivity of sugarcane in physical quantity terms has shown an upward trend. The growth rate during 1992-95 has been higher at 3.57 percent per annum compared to that of 0.52 percent during the second half of 1990s.

Value added per hectare increased at 10.02 percent per annum during 1992-95 but declined at (-) 0.66 percent per annum during the second half of 1990s. Value added per MT posted an annual growth at 6.22 percent per annum during 1992-95 but declined at (-)1.18 percent per annum during the second half of 1990s. Movements of value added per hectare and value added per MT of sugarcane have followed similar trends during the reference period.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, declined annually at (-)32.78 percent during 1992-95 compared to (-)1.67 percent during the second half of 1990s. Lower decline in this ratio during the second half of 1990s compared to that in the first period shows investment in farm mechanization has decelerated.

Value added per man day (at constant 1995 US $) increased at 63.67 percent annually from US$2.33 in 1992 to US$ 10.21 in 1995 and further increased to US$ 10.75 in 2000 at 1.03 percent per annum.

### 2.2.2 Capital Productivity of Sugarcane

Value added per depreciation posted an annual growth rate at 3.72 percent during 1992-1995 against 0.44 percent during1995-2000 (Table 6).

**Table 6. Capital Productivity of Sugarcane in Thailand-1992-2000**

(1995=100, Percent)

| Measure of Productivity | 1992 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 0.87 | 0.97 | 0.99 | 3.72 | 0.44 |
| Value Added per capital (Index) | 89.62 | 100.00 | 102.22 | 3.72 | 0.44 |

### 2.2.3 Total Factor Productivity of Sugarcane

Total factor productivity (TFP) increased at an annual growth of 7.57 percent per annum during 1992-95 but declined at (-)18.22 percent during the second half of 1990s (Table 7).

**Table 7. Total Factor Productivity of Sugarcane in Thailand -1992-2000**

(1995=100, Percent)

| Measure of Productivity(Index) | 1992 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-1995 | 1995-2000 |
| Total Output | 78.85 | 100.00 | 102.50 | 8.24 | 0.50 |
| Total Input | 98.14 | 100.00 | 280.27 | 0.63 | 22.89 |
| Total Factor Productivity | 80.34 | 100.00 | 36.57 | 7.57 | -18.22 |

This has happened due to the fact that total input increased faster at (-) 22.89 percent per annum compared to (-)0.50 percent in total output during the second half of 1990s.

## 2.3 Productivity of Natural Rubber

### 2.3.1 Land and Labor Productivity of Natural Rubber

Land and labor productivity of national average natural rubber farms and corresponding compound annual growth rates have been presented in Table 8.

**Table 8. Land and Labor Productivity of Rubber in Thailand-1995-2000**

(1995=100, Percent)

| Measure of Productivity | 1995 | 2000 | Annual Growth Rate During |
|---|---|---|---|
| | | | 1995-2000 |
| Land Productivity (MT/hectare) | 1.13 | 1.52 | 6.04 |
| Labor /Land Ratio (Man-day/ hectare) | 140.94 | 102.20 | -6.23 |
| Labor Productivity (Kg./ man-day) | 8.03 | 14.85 | 13.08 |
| Value Added per hectare (at constant 1995 US $) | 1280.84 | 838.86 | -8.12 |
| Value Added per hectare (Index) | 100.00 | 65.49 | -8.12 |
| Value Added per man-day (at constant 1995 US $) | 9.09 | 8.21 | -2.02 |
| Value Added per man-day (Index) | 100.00 | 90.32 | -2.02 |
| Value Added per MT (at constant 1995 US $) | 1131.49 | 552.61 | -13.35 |
| Value Added per MT (Index) | 100.00 | 48.84 | -13.35 |

Land productivity of rubber in physical quantity terms has shown an upward trend during 1995-2000 and posted a growth rate of 6.04 percent per annum during this period.

Both value added per hectare and value added per MT of rubber farms declined during the second half of 1990s and the rates of decline have been (-)8.12 percent per annum and (-)13.35 percent per annum respectively.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, declined at (-)6.23 percent per annum during the second half of 1990s. This indicates farm mechanization has been taking place.

Value added per man day (at constant 1995 US $) decreased at (-)2.02 percent per annum from US$9.09 in1995 to US$8.21 in 2000.

### 2.3.2 Capital Productivity of Rubber

Value added per depreciation declined at (-)8.74 percent per annum during 1995-2000 (Table 9).

**Table 9. Capital Productivity of Rubber in Thailand-1995-2000**

(1995=100, Percent)

| Measure of Productivity | 1995 | 2000 | Annual Growth Rate During 1995-2000 |
|---|---|---|---|
| Value Added per depreciation (at constant 1995 domestic prices) | 4.57 | 2.89 | -8.74 |
| Value Added per capital (Index) | 100.00 | 63.31 | -8.74 |

This trend indicates that the farm mechanization is taking place.

### 2.3.3 Total Factor Productivity of Rubber

Total factor productivity (TFP) of rubber declined at (-)0.25 percent during the second half of 1990s (Table 10).

**Table 10. Total Factor Productivity of Rubber in Thailand-1995-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1995 | 2000 | Annual Growth Rate During 1995-2000 |
|---|---|---|---|
| Total Output | 100.00 | 79.38 | -4.51 |
| Total Input | 100.00 | 80.36 | -4.28 |
| Total Factor Productivity | 100.00 | 98.78 | -0.25 |

This has happened due to the fact that total output decreased slightly faster at (-) 4.51 percent per annum compared to (-)4.28 percent decline in total input during the second half of 1990s.

## 2.4 Productivity of Pineapple

### 2.4.1 Land and Labor Productivity of Pineapple

Land and labor productivity of national average pineapple orchards and corresponding annual growth rates have been presented in Table 11.

**Table 11. Land and Labor Productivity of Pineapple in Thailand-1991-2000**

(1998=100, Percent)

| Measure of Productivity | 1991 | 1998 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1998 | 1998-2000 |
| Land Productivity (MT/hectare) | 22.60 | 22.60 | 22.49 | 0.00 | -0.24 |
| Labor /Land Ratio (Man-day/ hectare) | 144.46 | 146.01 | 153.02 | 0.15 | 2.37 |
| Labor Productivity (Kg./ man-day) | 156.44 | 154.79 | 146.97 | -0.15 | -2.56 |
| Value Added per hectare (at constant 1995 US $) | 892.89 | 3840.30 | 612.89 | 23.17 | -60.05 |
| Value Added per hectare (Index) | 23.25 | 100.00 | 15.96 | 23.17 | -60.05 |
| Value Added per man-day (at constant 1995 US $) | 6.18 | 26.30 | 4.01 | 22.98 | -60.98 |
| Value Added per man-day (Index) | 23.50 | 100.00 | 15.23 | 22.98 | -60.98 |
| Value Added per MT (at constant 1995 US $) | 39.51 | 169.92 | 27.25 | 23.17 | -59.95 |
| Value Added per MT (Index) | 23.25 | 100.00 | 16.04 | 23.17 | -59.95 |

Land productivity of pineapple orchards in physical quantity terms has marginally declined during 1991-2000. It declined from 22.60 MT per hectare in 1991 to 22.49 MT per hectare in 2000.

Value added per hectare increased at 23.17 percent during 1991-98 but declined at (-) 60.05 percent during 1998-2000. Value added per MT also exhibited similar trends.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, increased marginally at 0.15 percent per annum during 1991-98 which accelerated to 2.37 percent per annum during 1998-2000.

Value added per man day (at constant 1995 US $) increased at 22.98 percent annually from US$6.18 in 1991 to US$26.30 in 1998 before declining to US$4.01 in 2000 at (-)60.98 percent per annum.

### 2.4.2 Capital Productivity of Pineapple

Value added per depreciation posted an annual growth rate at 19.39 percent per annum during 1991-1998 but sharply declined at (-)53.22 percent per annum during 1998-2000 (Table 12).

**Table 12. Capital Productivity of Pineapple in Thailand-1991-2000**

(1998=100, Percent)

| Measure of Productivity | 1991 | 1998 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1998 | 1998-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 11.72 | 40.53 | 8.87 | 19.39 | -53.22 |
| Value Added per capital (Index) | 28.92 | 100.00 | 21.89 | 19.39 | -53.22 |

### 2.4.3 Total Factor Productivity of Pineapple

Total factor productivity (TFP) of pineapple increased at 23.28 percent per annum during 1991-98 but declined at (-) 49.69 percent per annum during 1998-2000 (Table 13).

**Table 13. Total Factor Productivity of Pineapple in Thailand-1991-2000**

(1998=100, Percent)

| Measure of Productivity (Index) | 1991 | 1998 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1991-1998 | 1998-2000 |
| Total Output | 28.22 | 100.00 | 26.22 | 19.81 | -48.79 |
| Total Input | 122.15 | 100.00 | 103.60 | -2.82 | 1.78 |
| Total Factor Productivity | 23.10 | 100.00 | 25.31 | 23.28 | -49.69 |

The decline in TFP during 1998-2000 has been due to free fall in total output as a result of steep fall in prices of this commodity.

## 2.5 Productivity of Palm Oil

### 2.5.1 Land and Labor Productivity of Palm Oil

Land and labor productivity of national average Palm Oil and corresponding compound annual growth rates have been presented in Table 14.

Land productivity of palm oil farms in physical quantity terms has shown an upward trend. It posted a growth rate of 27.48 percent per annum during 1992-94 which decelerated to 2.08 percent per annum during 1994-2000.

**Table 14. Land and Labor Productivity of Palm Oil in Thailand-1992-2000**

(1994=100)

| Measure of Productivity | 1992 | 1994 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-1994 | 1994-2000 |
| Land Productivity (MT/hectare) | 8.50 | 13.81 | 15.63 | 27.48 | 2.08 |
| Labor /Land Ratio (Man-day/ hectare) | 23.19 | 35.32 | 41.75 | 23.43 | 2.82 |
| Labor Productivity (Kg./ man-day) | 366.60 | 391.05 | 374.29 | 3.28 | -0.73 |
| Value Added per hectare (at constant 1995 US $) | 463.10 | 665.08 | 349.64 | 19.84 | -10.16 |
| Value Added per hectare (Index) | 69.63 | 100.00 | 52.57 | 19.84 | -10.16 |
| Value Added per man-day (at constant 1995 US $) | 19.97 | 18.83 | 8.38 | -2.91 | -12.63 |
| Value Added per man-day (Index) | 106.08 | 100.00 | 44.48 | -2.91 | -12.63 |
| Value Added per MT (at constant 1995 US $) | 54.48 | 48.15 | 22.38 | -5.99 | -11.99 |
| Value Added per MT (Index) | 113.15 | 100.00 | 46.47 | -5.99 | -11.99 |

Value added per hectare increased at 19.84 percent per annum during 1992-94 but declined at (-) 10.16 percent per annum during 1994-2000 (Table 14). Value added per MT declined at (-) 5.99 percent per annum during 1992-94 and further declined at (-) 11.99 percent per annum during 1994-2000.

Labor to land ratio (man-day/hectare) increased at 8.78 percent per annum during 1992-94 which decelerated to 3.40 percent per annum during 1994-2000.

Value added per man day (at constant 1995 US $) decreased at (-) 2.91 percent annually from US$20 in 1992 to US$19 in 1994 and further declined to US$8 in 2000 at (-) 12.63 percent per annum.

### 2.5.2 Capital Productivity of Palm Oil

Value added per depreciation posted an annual growth rate at 9.11 percent per annum during 1992-94 against (-) 8.74 percent during1994-2000 (Table 15).

**Table 15. Capital Productivity of Palm Oil in Thailand-1992-2000**

(1994=100, Percent)

| Measure of Productivity | 1992 | 1994 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-95 | 1994-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 0.21 | 0.25 | 0.15 | 9.11 | -8.74 |
| Value Added per capital (Index) | 84.00 | 100.00 | 57.76 | 9.11 | -8.74 |

### 2.5.3 Total Factor Productivity of Palm Oil

Total factor productivity (TFP) of palm oil increased substantially at 79.85 percent per annum during 1992-94. The growth decelerated to 2.71 percent per annum during 1994-2000 (Table 16).

**Table 16. Total Factor Productivity of Palm Oil in Thailand-1992-2000**

(1994=100, Percent)

| Measure of Productivity (Index) | 1992 | 1994 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-94 | 1994-2000 |
| Total Output | 50.19 | 100.00 | 86.44 | 41.15 | -2.40 |
| Total Input | 162.34 | 100.00 | 73.61 | -21.51 | -4.98 |
| Total Factor Productivity | 30.92 | 100.00 | 117.43 | 79.85 | 2.71 |

## 2.6 Productivity of Maize

### 2.6.1 Land and Labor Productivity of Maize

Land and labor productivity of national average maize and corresponding compound annual growth rates have been presented in Table 17.

**Table 17. Land and Labor Productivity of Maize in Thailand-1992-2000**

(1996=100, Percent)

| Measure of Productivity | 1992 | 1996 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-1996 | 1996-2000 |
| Land Productivity (MT/hectare) | 2.72 | 3.27 | 3.58 | 4.71 | 2.29 |
| Labor /Land Ratio (Man-day/ hectare) | 46.28 | 60.51 | 68.35 | 6.93 | 3.09 |
| Labor Productivity (Kg./ man-day) | 58.77 | 54.04 | 52.38 | -2.08 | -0.78 |
| Value Added per hectare (at constant 1995 US $) | 88.51 | 100.44 | 145.17 | 3.21 | 9.65 |
| Value Added per hectare (Index) | 88.12 | 100.00 | 144.53 | 3.21 | 9.65 |
| Value Added per man-day (at constant 1995 US $) | 1.91 | 1.66 | 2.12 | -3.48 | 6.36 |
| Value Added per man-day (Index) | 115.22 | 100.00 | 127.96 | -3.48 | 6.36 |
| Value Added per MT (at constant 1995 US $) | 32.54 | 30.72 | 40.55 | -1.43 | 7.19 |
| Value Added per MT (Index) | 105.94 | 100.00 | 132.01 | -1.43 | 7.19 |

Land productivity of maize in physical quantity terms has shown an upward trend. It posted a growth rate at 4.71 percent per annum during 1992-96 which decelerated to 2.29 percent per annum during 1996-2000.

Value added per hectare increased at 3.21 percent per annum during 1992-96 which accelerated to 9.65 percent per annum during 1996-2000. Value added per MT first declined at (-) 1.43 percent per annum during 1992-96 before posting a growth rate at 7.19 percent per annum during 1996-2000.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, increased annually at 6.93 percent per annum during 1992-96 compared to 3.09 percent during 1996-2000.

Value added per man day (at constant 1995 US $) marginally ebbed from US$1.91 in1992 to US$1.66 in 1996 before increasing to US$ 2.12. The growth rate at 6.36 percent per annum during 1996-2000 has been higher than (-) 3.48 percent per annum attained during 1992-96.

### 2.6.2 Capital Productivity of Maize

Value added per depreciation posted an annual growth rate at 0.51 percent during 1992-1996 against (-) 6.44 percent during1996-2000 (Table 18).

**Table 18. Capital Productivity of Maize in Thailand-1992-2000**

(1996=100, Percent)

| Measure of Productivity | 1992 | 1996 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-1996 | 1996-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 0.06 | 0.06 | 0.05 | 0.51 | -6.44 |
| Value Added per capital (Index) | 98.00 | 100.00 | 76.62 | 0.51 | -6.44 |

### 2.6.3 Total Factor Productivity of Maize

Total factor productivity (TFP) of maize increased at 8.82 percent per annum during 1992-96. However, it decelerated at 2.85 percent per annum during 1996-2000 (Table 19).

**Table 19. Total Factor Productivity of Maize in Thailand-1992-2000**

(1996=100, Percent)

| Measure of Productivity (Index) | 1992 | 1996 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1992-1996 | 1996-2000 |
| Total Output | 72.79 | 100.00 | 84.99 | 8.26 | -3.98 |
| Total Input | 102.07 | 100.00 | 75.95 | -0.51 | -6.65 |
| Total Factor Productivity | 71.31 | 100.00 | 111.90 | 8.82 | 2.85 |

## 2.7 Productivity of Soybeans

### 2.7.1 Land and Labor Productivity of Soybeans

Land and labor productivity of national average Soybeans farms and corresponding compound annual growth rates have been presented in Table 20.

**Table 20. Land and Labor Productivity of Soybeans in Thailand-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 1.24 | 1.28 | 1.45 | 0.60 | 2.51 |
| Labor /Land Ratio (Man-day/ hectare) | 51.47 | 58.31 | 67.29 | 2.53 | 2.90 |
| Labor Productivity (Kg./ man-day) | 24.15 | 21.97 | 21.55 | -1.88 | -0.38 |
| Value Added per hectare (at constant 1995 US $) | 326.00 | 347.52 | 290.33 | 1.29 | -3.53 |
| Value Added per hectare (Index) | 93.81 | 100.00 | 83.54 | 1.29 | -3.53 |
| Value Added per man-day (at constant 1995 US $) | 6.33 | 5.96 | 4.31 | -1.21 | -6.25 |
| Value Added per man-day (Index) | 106.29 | 100.00 | 72.40 | -1.21 | -6.25 |
| Value Added per MT (at constant 1995 US $) | 262.27 | 271.29 | 200.23 | 0.68 | -5.89 |

| | | | | | |
|---|---|---|---|---|---|
| Value Added per MT (Index) | 96.68 | 100.00 | 73.81 | 0.68 | -5.89 |

Land productivity of soybeans in physical quantity terms has shown an upward trend during the decade of 1900s and the growth rate during the second half of 1990s was higher at 2.51 percent per annum compared to that of 0.60 during the first half of 1990s.

Value added per hectare increased annually at 1.29 percent during the first half of 1990s but declined at (-) 3.53 percent during the second half of 1990s. Value added per MT posted a marginal growth rate at 0.68 percent per annum during the first half of 1990s but declined during the second half of 1990s at (-)5.89 percent per annum.

Labor to land ratio (man-day/hectare) increased at 2.53 percent per annum during the first half of 1990s compared to (-)2.90 percent during the second half of 1990s. Higher growth in this ratio during the second half of 1990s compared to that in the first half of 1990s indicates that investment in farm mechanization may be declining.

Value added per man day (at constant 1995 US $) decreased at (-) 1.21 percent during the first half of 1990s compared to (-)6.25 percent per annum during the second half of 1990s.

### 2.7.2 Capital Productivity of Soybeans

Value added per depreciation declined at (-) 5.35 percent per annum during 1990-1995 against (-) 3.95 percent per annum during1995-2000 (Table 21).

**Table 21. Capital Productivity of Soybeans in Thailand-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Value Added per depreciation (at constant 1995 domestic prices) | 2.41 | 1.83 | 1.50 | -5.35 | -3.95 |
| Value Added per capital (Index) | 131.67 | 100.00 | 81.75 | -5.35 | -3.95 |

### 2.7.3 Total Factor Productivity of Soybeans

Total factor productivity (TFP) of Soybeans declined during the decade of 1990s. The rate of decline in TFP during the second half of 1990s has been almost of the same order as during the first half of 1990s (Table 22).

**Table 22. Total Factor Productivity of Soybeans in Thailand-1990-2000**

(1995=100, Percent)

| Measure of Productivity (Index) | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Total Output | 154.54 | 100.00 | 75.77 | -8.34 | -5.40 |
| Total Input | 86.71 | 100.00 | 132.95 | 2.89 | 5.86 |
| Total Factor Productivity | 178.23 | 100.00 | 56.99 | -10.91 | -10.64 |

## 3. ANALYSIS ON THE TRADE PERFORMANCE AND PRODUCTIVITY INDICES

### 3.1 Correlation between Productivity Indices and Trade Performance

Thailand has been the most dominant exporter of rice and achieved a growth rate of 9.1 percent in its export of rice during 1990-95. However, due to significant export expansion by other countries, its growth rate turned negative at (-) 0.2 percent during the second half of 1990s. Against this, the country posted a growth at (-) 4.23 percent per

annum in TFP during the first half of 1990s compared with 1.54 during the second half of 1990s.

Thailand has also been forerunner in export of sugar in Asia. Its export expanded at an annual growth rate of 9.6 percent during the first half of 1990s which decelerated to 2 percent during the second half of 1990s. In terms of TFP of sugarcane, the country posted a growth rate at 7.57 percent per annum during 1992-95 against negative growth rate at (-) 18.22 percent per annum during the second half of 1990s.

The country realized a drastic expansion of rubber export from 1.1 million MT in 1990 to 2.5 million MT in 2000 and its share increased from 30 percent to 49 percent in Asia during the corresponding period. The TFP, however, marginally declined at (-) 0.25 percent per annum during the second half of 1990s.

In case of export of pineapple, Thailand accounted for about 50 percent share in Asia. Although volume of export from Thailand has not changed significantly during 1990-1995, it posted a modest growth at 2.8 percent annually during second half of 1990s. The performance in terms of TFP fluctuated violently from 23.28 percent per annum during 1991-98 against (-) 49.69 percent per annum during 1998-2000.

Thailand started export of palm oil in a modest manner, its contribution is noticeable when it expanded its volume of export by six times during 1995-2000.TFP recorded a growth rate at 2.71 percent per annum during 1994-2000.

The country has been exporting significant volume of maize until 1995 but it decreased to one-fifth during 1995-2000. TFP posted a growth rate during 1992-96 which decelerated to 2.85 percent per annum during 1996-2000.

As regards soybeans, Thailand could export only a negligible quantity of this commodity. However, a discernible increasing trend in imports of soybeans from nil to 1.3 million MT has been observed during the decade of 1990s.However, TFP has exhibited downward trend during the corresponding period.

Thus, Thailand's trade performance of various agricultural commodities is not fully explained by relative movements in the productivity of the corresponding commodities. This is so because other factors such as national agriculture and trade policy, prices, exchange rates, productivity of other competing countries, macro economic performance etc. also influence trade performance. Therefore, it is not expected that productivity alone would fully explain the movements in the trade.

## 3.2 Effect of Agriculture and Food Policy

### 3.2.1 Production Promotion

To promote production of various commodities, the Government of Thailand has launched various programs which include farm restructuring and production system, investment for farm group and adoption of area specific approach such as feed stockpiling, farm processing, water resource development and management, acidic soil remedy, provision of improved seeds, farm registration and farmer identity card program. Besides, the farm input support program focuses on enhancement of the farm production efficiency and the quality of the produce.

The public policy on fertilizers in the country is primarily concerned with acquisition and distribution of fertilizer at fair prices through the network of the Bank of Agriculture and Agricultural Cooperatives (BAAC), the Marketing Organization of Farmers (MOF). In addition, the Office of the Rubber Replanting Aid Fund (ORRAF) is in charge fertilizers for rubber planters.

To monitor prices of fertilizer and ensure its smooth delivery, the MOAC often acquire fertilizers and deliver them to farmers through BAAC and the Agricultural Cooperative Federation.

There is a constraint on the supply side of seeds in Thailand. MOAC is able to provide about 3 percent of the HYV paddy seeds of total requirement which adversely

affects the production levels. To enhance production and thus its supply, the government had started the program of production of seeds with multiplication activities in 1993. This program imparts training to the agent farmers who participate in the multiplication program. At the same time, the private participation in production of seeds is also encouraged.

The pace of farm mechanization has been increasing, particularly in the advance irrigated zones, to enhance crop production and transform the agriculture sector. The domestic machinery manufacturing has not been protected. Nor the related import policy is restricted.

### 3.2.2 Price Support/Control

To ensure remunerative prices to rice (paddy) cultivators and also to stabilize prices in the interests of consumers, the government support both farm and the rice mills through measures such as price support program, market intervention, setting up of targets of export. Under Paddy Mortgage Program, repayment of loan is rescheduled to enable farmers to stagger sale of their produce so that they get a better price. This prevents distress sale of paddy at the time of harvest when prices are usually subdued due to bumper supply in the market. The cultivators deliver their produce to the designated rice mills or warehouses in the course of mortgaging. During the period of mortgage, the rate of interest charged is low and farmers are entitled to 90 percent of the expected price at the time of mortgage.

### 3.2.3 Credit

Agriculture credit is crucial for the growth of the sector. The share of institutional sources of credit has increased form 70.5 percent in 1986-87 to 81 percent in 1991-92 because institutions such as Agriculture and Agricultural Cooperatives, agricultural cooperatives and commercial banks have played more important roles in supporting agricultural development. The commercial banks had increased the farm credit from Baht 219,952 million in 1990 to Baht 289,648 million in 1991, while the BAAC released Baht 340,628 million in 1991 against Baht 259,992 million in 1990.

Although the farm credit services has been expanding significantly over the years, small holders and those without land title deeds for use as loan collaterals still face the problem of limited access to the capital.

### 3.2.4 Infrastructure, Research and Extension

The Thai government assign high priority to infrastructure development as it may be seen from allocation of approximately 50 percent of its annual budget in the Plan VII (1992-1996) for economic services in the transportation and communication sector. The program comprises water transportation, railways, air transportation and services of storage, highways, telecommunications and waterways. Emphasis is laid on development of land and water transportation.

#### 3.2.4.1 Agricultural Markets

Development of agricultural market in Thailand had begun during the Plan V (1982-1986) period in the form of central markets. During Plan VI (1987-1991), production and marketing diversification program was lunched to promote the export of agriculture commodities. During Plan VII (1992-1996), the government started developing regional central markets to improve the quality of the products and facilitate flow of investment by the private sector.

#### 3.2.4.2 Infrastructure of the Export Promotion Facility

The Department of Export Promotion (DEP) is in charge of promotion and enhancement of export activities with the following programs:

**i. Information Services / DEP Information System**

The system consists of several subsystems which relate to exporters, foreign importers, product profiles. The procedures on information relating to planning a business in Thailand, industrial and DEP brochures etc. are published.

**ii. Thai Trade Mission**

Thai Trade Mission often undertakes overseas visits and invite the foreign missions to meet Thai exporters and manufacturers.

**iii. Overseas Commerce Centers**

There are more than 17 Overseas Commerce Centers and a number of commerce counselors to act as focal points for the importers and the Thai businessmen.

**iv. Trade Exhibitions**

Trade exhibitions are organized as trade shows to promote the Thai trade.

**v. Training in Export**

Training is regularly imparted to better equip the business interest groups to handle and respond effectively to the needs of the export.

**vi. Export Credit**

The Export-Import Bank of Thailand aims at providing financial services to support export, import and related investment. The export credit is classified as pre-export or post-export finance. An exporter has the option to take credit from the commercial banks or the Bank of Thailand.

### 3.2.5 National Research and Development Potentials in the Fields of Science and Technology

Agriculture research and development in the areas of tissue culture of crops, upgrading of crop varieties and livestock strains, organic fertilizer production, disease and insect control with organism and the genetic engineering, both for quantitative and qualitative improvement in the farm productivity have been and continue to be undertaken in Thailand. Furthermore, there are technological research initiatives in evaluating the chemical and biological laboratories, testing technologies for standards of raw materials and farm commodities that are able to promote and develop agricultural production and commodity production processes for better quality, advantage of cost competitiveness. In addition, introduction of information technology to the agriculture helps develop the production and marketing database.

### 3.2.6 Trade Policy

Thai agriculture policy aims at enhancing farm income. As a major food exporting nation, policy emphasizes competitiveness in the world market, particularly for export commodities. It also stresses improvement in productivity to reduce the cost of production, processing of farm products to raise domestic value-added and the provision of marketing facilities to enable farmers to get fair prices for their produce.

In the context of trade liberalization under the WTO and AFTA, production of export commodities has been stimulated to enhance export earnings. The government support central agricultural markets, rice-upland crop markets and rubber markets in the

major production areas. Under WTO, Thailand allowed market access to 23 importable farm products, which was impermissible earlier. Imports of soybeans, maize and palm oil, among others, have been allowed in excess of the minimum access under the WTO.

In the wake of globalization, free trade farm policies are favored by the world communities. Under AoA (Agreement on Agriculture), WTO members have committed to reduce the tariffs, extend internal support and export subsidies. Thailand has prepared and adjusted itself to a more liberalized trade system. Thailand has started tariff reduction on a number of export commodities in 1995.

### 3.3 Effect of Business Performance on the Processing Sector

#### 3.3.1 Quality Control

The National Bureau of Agricultural Commodity and Food Standard has been set up in 2002 with the mandate to standardize the agricultural and processed products including food from the point of production to the consumers. This will go a long way in improving the quality of the Thai farm products and food to meet international standards and compete in the international markets.

#### 3.3.2 Effect of the Product Diversification And Automatic Market Diversification

Of late, emphasis has been laid on increasing exports of processed agricultural products such as processed fruits and seafood. With research and technological developments, consumers are offered a variety of processed food in the form of ready-to-eat foods.

The value of Thai food industries has been estimated at 1.2 million baht or 28 percent of the GDP. The food export account for 3.5 percent of the market share of the total world trade in food. The value of export of total Thai food increased from Baht 190 billion in 1991 to Baht 444 billion in 2001 which account for 10 percent of the national export. The food industries absorb about 80 percent of the raw materials in the country. Major export commodities include rice, sugar, shrimps, canned tuna, chicken, cassava products and canned pine apple.

The export markets for the Thai foods have been the United States, with 26-29 percent of the total food exports including pineapple products having an annual value of more than US$1.7 billion, followed by Japan with 20-30 percent share and the Economic Union with 15 percent share and the ASEAN market with 8 percent share. The major exports commodities include seafood, livestock products, processed fruits and vegetables.

#### 3.3.3 Sales Promotion

Campaigns for sanitary and environmental concerns, spread of public information services, marketing advertisements, safety awareness in consumption add to enhancement of the demand for increasingly diversified tastes and preferences for food products by different segments of consumers, both domestic and overseas. Consequently, demand for processed health foods supplemented with Thai herbs, contamination-free farm products, fresh and fermented fruit drinks and traditional handicrafts made from farm produce in local communities has increased.

#### 3.3.4 Market Integration

To increase market management potentials, the integration aims at developing and facilitating distribution system for farm commodities, both in international and domestic markets. For international markets, the efforts have been made for expansion of low cost products to potential markets, seek and build trading allies by international networking among those who export the same commodities, build the Thai brand name

products and support setting up of distribution centers for Thai commodities abroad in cooperation with private businesses.

The arrangement of trading allies among producers and the distributors, together with the development of IT system for public relations on the products and trading with e-commerce are aimed to support the inducement in domestic markets.

### 3.4 Effect of International Factors

#### 3.4.1 Changes in National Trade Patterns

The traditional Thai export commodities have been rice, maize, cassava slices and rubber. Of late, there has been a paradigm shift in composition of exports commodities to include processed products such as seafood and fruits. Technological innovations have created a wide spectrum of varieties in the form of ready-to eat food.

Thailand, Malaysia and Indonesia have entered into an agreement on organizing the International Tripartite Rubber Corporation with the main objective of mutual stockpiling and trading. Indonesia and Thailand have already put the investment for the transnational firm.

#### 3.4.2 Changes in Exchange Rates

Thailand began its first baht devaluation in 1984. As the trading system was somewhat opened, a stable rate of exchange was fixed in 1996.The economic crisis in 1997 drove the national economy to the recession. The depreciated baht value caused higher prices for imported production input, particularly for the oil and agricultural chemicals. General loss of liquidity in the initial phase of the recession of the economic system negatively affected investment.

#### 3.4.3 Changes in International Prices

The domestic prices of rice, feed corn, sugar, rubber and soybeans showed downward trend during 1997-2000 while those of pineapple and palm oil improved during the corresponding period. The downward trend in the first five commodities were in consonance with the general decline in the world food prices. The increase in prices of pineapple and palm oil was probably due to lack of effective competition from other countries.

#### 3.4.5 Gaps in Technology among Trading Countries

The productivity of Thai rice is quite low compared to HYV rice(paddy) sown in the US and some other countries. Yield rate of Thai rice (paddy) is 2.14 MT per hectare compared to 4.24 MT per hectare in Vietnam in 2000. Likewise, yield rates of other commodities are also low compared to those of other major producing countries of the relevant commodities. Malaysia's palm oil crushing was 120 MT per hour with the cost of crushing in the range of Baht 0.8 – 1.0 per kilogram whereas it was 45 MT per hour with the crushing cost at Baht 2.0 per kilogram in Thailand.

It is, however, noted that the competitiveness in the current farm trading systems does not depend on the cost of production and wages alone. It also depends on adoption of appropriate technology and achieving high standards of the quality.

Most of the sugar mills in Thailand have adopted advanced technology with the result that their production performance has improved compared to that of several other countries. Thailand's efficiency in the production of sugar is comparable to that of Australia, one of the leading exporters of sugar in the world. Although Thailand face comparative disadvantage in the matter of supply of raw material due to lower yields and quality compared to its competitors, Thai sugar industry is capable to compete in the international market due to its superior technology in the processing.

### 3.5 Effect of Other Factors

#### 3.5.1 Macroeconomic Performance

The agriculture sector compete with the rapidly growing non-agriculture sector for land, labor, capital and other inputs. Despite land and water constraints and long-term decline in farm prices in the face of rising factor cost, Thailand agricultural GDP grew at an annual rate of 2.5 percent during Plan VI (1987-1991), 3.4 percent in Plan VII (1992-1996) and 1.05 percent in Plan VIII (1997-2001). Thai farmers have adjusted cropping patterns and enterprise mixes in response to market signals within the given constraints of physical, agronomic and financial factors. They have shifted to intensive, land saving technology and to crops and enterprises that yield higher income per unit of land. Thai farmers are price responsive as is evident from considerable expansion of upland crops of sugarcane, rubber and soybeans, to some extent.

#### 3.5.2 Effect of Changes in Socio-Economic Conditions

To assess the effect of economic crisis that began in 1997 on the farm sector, a socio-economic survey was conducted in 1998-99 in collaboration with the Department of Agricultural Economics, Kasetsart University. Major findings are summarized as follow:

i. Growth in the national average farm household cash income at 11.07 percent was much surpassed. The economic crisis pushed down both the value of cash asset and the operating capital.
ii. Agriculture credit from non-institutional sources increased form 9 percent to 17 percent of total farm credit after the economic crisis. This situation signaled adverse effect on farm productivity due to unfavorable terms of credit by non-institutional sources.
iii. The influx of seasonal migration of farm labor force increased considerably.

## 4. PROSPECT FOR FUTURE DEVELOPMENT/POTENTIAL OF THE SURVEY COMMODITIES

### 4.1 The Role of Government in Exploiting Future Potential

Thai agricultural policy emphasizes improvement in productivity to reduce the cost of production, enhance the domestic value added of food processing sector, improve access of farmers to marketing facilities to enable them to get remunerative prices and ultimately raise small-holder's income. As a major food exporter, Thailand's policy also stresses competitiveness in the world market, particularly of the exportable.

The Board of Investment offers special incentives to agro-industries established outside Bangkok. Further, the government supports farmer organizations through low interest loans to store farm produce for marketing when prices are favorable.

Since Plan VII (1992-1996), the government categorized farm commodities into domestic consumption goods, exportable and importable and adopted category-specific policy. Under AoA, Thailand allowed the market access to those 23 importables which were not given any import permits earlier. Imports of soybeans, maize and palm oil have been permitted in excess of the quantities fixed under the Minimum Access Volume.

### 4.2 International Cooperation among APO Members

As most APO member countries have committed themselves to the WTO, cooperation among them has in any case followed at its own.

## 5. PROPOSAL FOR SETTING UP A FORMAL MECHANISM FOR FUTURE SURVEYS

To the extent possible, relational formulae should be developed to make computation of various parameters of interest easy and accurate in future surveys. For example, the GDP deflator, land productivity, labor productivity and the exchange rate calculated in the Tables 3.1 series may be linked to tables 7.1 series.

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# 7. VIETNAM

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## 1. BACKGROUND: SURVEYED COMMODITIES AND THEIR TRADE PERFORMANCE

### 1.1 Rationale of Survey And Criteria For Commodity Selection

The share of agriculture sector in Vietnamese GDP has declined from 49.26 percent in 1990 to 29.24 percent in 2000. The population dependent on this sector constitutes 78 percent. The climate of the country has both positive and negative influence on agriculture development. On one hand hot and wet climate is conducive for crops and on the other, natural disasters such as typhoon, tropical low atmosphere, cyclone, whirlwind, torrential rain, flood and drought damage the crops.

Vietnam has been net importer of rice until the mid of 1980s. During the decade of 1990s, the Vietnam made a turnaround and transformed herself from a net importer of rice to a leading exporter of rice. It is second only to Thailand in Asia in terms of share of volume of export of rice. Another commodity that is important from the country's economic perspective is natural rubber. Historically, rubber had been cultivated mainly to meet the demand of French rulers. At present, rubber plays a significant role both in domestic and international trade.

To provide policy makers and agricultural traders a tool for comparative analysis across industries and countries in Asia, APO conducted a survey on `Agricultural Productivity Index' in selected APO member countries to measure productivity of selected tradable commodities. In so far as Vietnam is concerned, two commodities namely rice and rubber has been selected under the survey. The choice of these commodities has been enabled by their significant shares in the total export on agriculture and food. Thus, the selection of these commodities is based on their being export oriented.

### 1.2 Importance of the Surveyed Commodities

The importance of a commodity, particularly from trade perspective, can be viewed from its shares of exports/imports in the total agriculture and food trade of the country. Therefore, the relevant shares of the two commodities selected under the Survey by Vietnam have been presented in Table1.

**Table 1. Shares of Exports and Imports of the Surveyed Commodities in Trade of Vietnam in Agriculture and Food during 1990-2000**

(Percent)

| Commodity | Exports | | | Imports | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| Rice (Milled) | 37.16 | 30.18 | 25.05 | 0.00 | 0.00 | 0.00 |
| Rubber (sheet) | 6.77 | 10.71 | 9.99 | 0.00 | 0.00 | 0.00 |
| Total | 43.93 | 40.89 | 35.04 | 0.00 | 0.00 | 0.00 |

#### 1.2.1 Rice

Production of rice in Vietnam is important from the perspective of food security and contributes significantly in the agriculture GDP. To achieve food security and also maintain buffer stock, the Government targets to cover 4 million hectares of area under

rice (paddy), build an irrigation system during the next decade. While the production of rice in north Vietnam fluctuates as it is dependent more on climatic conditions, it is steadier in the southern part. South Vietnam also contributes more to export of rice. With favorable Government policy, aid from Food and Agriculture Organization and application of high-tech manufacturing programs, yield rate of rice has increased significantly during the decade of 1990s. During this period, export increased from 1.48 million MT to 3.48 million MT.

### 1.2.2 Rubber

Rubber has been and continues to be considered as a strategic commodity in agriculture of Vietnam. Historically, a preponderate proportion of tapped natural rubber used to be transferred to France and very little was left for domestic industry. With mechanization, modernization and industrialization campaign, both acreage and production have progressively increased. The harvested area increased from 81 thousand hectares in 1990 to 216 thousand hectares in 2000 and production increased from 58 thousand MT to 291 MT during the corresponding period. The country exports rubber products mainly to Laos and Cambodia.

## 1.3 Trend Of Export/Import of The Surveyed Commodities

### 1.3.1 Rice

The trade of rice (milled) by Vietnam during the decade of 1990s has been presented in the Table 2.

**Table 2. Trade of Rice (Milled) by Vietnam-1990-2000**

| **Trade** | 1990 | 1995 | 2000 |
|---|---|---|---|
| **Export** | | | |
| Quantity ('000 MT) | 1624.0 | 1988.0 | 3477.0 |
| Share in Asia (percent) | 20.8 | 12.4 | 21.1 |
| **Import** | | | |
| Quantity ('000 MT) | 2.0 | 11.0 | 5.0 |
| Share in Asia (percent) | 0.0 | 0.1 | 0.0 |

Vietnam has been one of the most important rice exporters in Asia during the decade of 1990s.The volume of rice (milled) exported by Vietnam posted an annual growth rate of 4.1 percent during the first half of 1990s which substantially increased to 11.8 percent during the second half of 1990s. The share of import has been negligible during the entire reference period.

### 1.3.2 Rubber

The trade of rubber by Vietnam during the decade of 1990s is presented in the Table 3.

**Table 3. Trade of Rubber by Vietnam-1990-2000**

| **Export** | 1990 | 1995 | 2000 |
|---|---|---|---|
| Quantity ('000 MT) | 76.0 | 138.0 | 273.0 |
| Share in Asia (percent) | 2.0 | 3.2 | 5.3 |

Vietnam has exported moderate quantity of rubber during the decade of 1990s and posted at an annual growth rate at 12.7 percent during the first half of 1990s which

accelerated to 14.6 percent during the second half of 1990s. The country did not import any quantity of rubber during the corresponding period.

## 2. MEASURED PRODUCTIVITY INDICES OF THE SURVEYED COMMODITIES

This section has been divided in the following two sub-sections:

- **Productivity of Raw Crops**
- **Productivity of Tradable Processed Commodities**

### 2.1 Productivity of Raw Commodities

The discussions in this section focus on productivity of the national average farms in respect of two commodities selected under the survey namely rice (paddy) and rubber**.**

#### 2.1.1 Productivity of Rice (Paddy)

Productivity measures of national average rice (paddy) farms and corresponding annual compound growth rates have been presented in Table 4.

**Table 4. Land and Labor Productivity of Rice (Paddy) in Vietnam-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 3.10 | 3.60 | 4.20 | 3.04 | 3.13 |
| Labour /Land Ratio (Man-day/ hectare) | 110.00 | 98.00 | 115.00 | -2.28 | 3.25 |
| Labour Productivity (Kg./ man-day) | 28.18 | 36.73 | 36.52 | 5.44 | -0.12 |
| Value Added per hectare (at constant 1995 US $) | 643.27 | 483.27 | 458.53 | -5.56 | -1.05 |
| Value Added per hectare (Index) | 133.11 | 100.00 | 94.88 | -5.56 | -1.05 |
| Value Added per man-day (at constant 1995 US $) | 93.04 | 44.71 | 21.96 | -13.63 | -13.25 |
| Value Added per man-day (Index) | 208.09 | 100.00 | 49.12 | -13.63 | -13.25 |
| Value Added per MT (at constant 1995 US $) | 207.51 | 134.24 | 109.17 | -8.34 | -4.05 |
| Value Added per MT (Index) | 154.58 | 100.00 | 81.33 | -8.34 | -4.05 |

Land productivity of rice (paddy) in physical quantity terms has shown an upward trend during the decade of 1990s. It recorded a growth rate at 3.04 percent per annum during the first half of 1990s which marginally accelerated to 3.13 percent per annum during the second half of 1990s.

Value added per hectare of rice (paddy) farms (at constant 1995 US $) declined at (-)5.56 percent during the first half of 1990s and the rate of decline slowed down to (-)1.05 percent per annum during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s.

Labor to land ratio (man-day/hectare), an important indicator of labor intensity, exhibited an upward trend during 1995-2000. It posted growth at 3.25 percent per annum during 1995-2000 compared to (-) 2.28 percent annual growth during 1990-1995. Low intensity of labor during the second half of 1990s indicates that farm mechanization may not be taking place.

Value added per man day (at constant 1995 US $) has been declining sharply which may be seen in the light of devaluation of local currency vis-à-vis US Dollar.

### 2.1.2 Productivity of Rubber (Natural)

Productivity measures of national average rubber (natural) farms and corresponding annual compound growth rates have been presented in Table 5.

**Table 5. Land and Labor Productivity of Natural Rubber In Vietnam-1990-2000**

(1995=100, Percent)

| Measure of Productivity | 1990 | 1995 | 2000 | Annual Growth Rate During | |
|---|---|---|---|---|---|
| | | | | 1990-1995 | 1995-2000 |
| Land Productivity (MT/hectare) | 0.72 | 0.85 | 1.34 | 3.38 | 9.53 |
| Labour Productivity (Kg./ man-day) | 0.12 | 0.14 | 0.22 | 3.36 | 9.84 |
| Value Added per hectare (Index) | 73.03 | 100.00 | 65.27 | 6.49 | -8.18 |
| Value Added per man-day (at constant 1995 US $) | 3.58 | 4.89 | 3.24 | 6.47 | -7.92 |
| Value Added per man-day (Index) | 73.09 | 100.00 | 66.18 | 6.47 | -7.92 |
| Value Added per MT (Index) | 86.22 | 100.00 | 41.40 | 3.01 | -16.17 |

Land productivity of rubber (natural) in physical quantity terms has shown an upward trend during the decade of 1990s. It recorded a growth rate at 3.38 percent per annum during the first half of 1990s which accelerated to 9.53 percent per annum during the second half of 1990s.

Value added per hectare (at constant 1995 US increased at 6.49 percent per annum during the first half of 1990s. However, it declined at (-) 8.18 percent per annum during the second half of 1990s. Value added per MT declined faster compared to value added per hectare during the second half of 1990s. The movements in value added per man day (at constant 1995 US $) have been to those of value added per hectare and value added per MT.

## 2.2 Productivity of the Tradable Processed Commodities

### 2.2.1 Rice (Milled)

Productivity of rice (milled) has been exhibited in Table-6.

**Table 6. Productivity of Rice (Milled) in Vietnam-1990-2000**

| Measure of Productivity | 1990 | 1995 | 2000 |
|---|---|---|---|
| Value Added per worker (Absolute at constant 1995 US $) | 2643 | 1297 | 1334 |
| Value Added per worker (Index) | 204 | 100 | 103 |

Vietnam had experienced a declining trend in productivity of rice (milled) and value added per worker attained a low level at US $1297 in 1995, half of 1990. The situation improved marginally during the second half of 1990s when the growth rate turned positive at 0.60 percent compared to (-) 13.3 percent during the first half of 1990s.

### 2.2.2 Rubber (Processed).

Productivity of rubber (processed) is shown in Table-7.

**Table 7. Productivity of Rubber (Processed) in Vietnam-1990-2000**

| Measure of Productivity | 1990 | 1995 | 2000 |
|---|---|---|---|
| Value Added per worker (Absolute at constant 1995 US $) | 2323.3 | 1078 | 1221.7 |
| Value Added per hectare (Index) | 215.5 | 100 | 113.3 |

The country has experienced a declining trend in the productivity of rubber (processed) and value added per worker attained a low level at US $1078 in 1995, less than half of 1990. During 1995-2000, the situation improved when the growth rate turned positive at 2.5 percent compared to (-)14.2 percent during 1990-95.

## 3. NALYSIS ON THE TRADE PERFORMANCE AND PRODUCTIVITY OF THE SURVEYED COMMODITIES

### 3.1 Correlation Between Trade Performance And Productivity

Due to constraint of non-availability of data on capital productivity and total factor productivity, it has not been possible to undertake full analysis of movements of productivity and their relationship with trade performance. However, export of rice (in volume terms) by Vietnam has shown an increasing trend during the decade of 1990s whereas value added per worker declined significantly during the first half of 1990s and then marginally increased during the second half of 1990s. Similar movements have been observed in export of natural rubber and its productivity. Therefore, it can be said that there exists no conclusive evidence between productivity and trade performance in Vietnam.

### 3.2 Effect of Agricultural/Food Policies Relating To The Surveyed Commodities

Communist Party and the State have made a number of important decisions which would have far reaching impact on agriculture sector of Vietnam, notable amongst them are as follows:

i. Household has been made a basic unit in agriculture. Law on land (1993) allows owners to have five major rights of usage, heritage, collateral, transfer and joint venture. These rights induce farmers to invest in the land.
ii. Most of old co-operatives had closed operations which lacked transparency. New laws on co-operatives movement (1993) have paved the way for launch of new type of co-operatives based on participatory and democratic styles of management to help support private enterprises in rural areas.
iii. Given low domestic investment, congenial environment has been created to boost investment in agriculture sector. This includes reduction in tax on land, making agriculture credit available at appropriate rate of interest without collateral.
iv. Appropriate opportunities have been created for rural people by encouraging farmhouses, state-run farms to expand their sizes to optimize use of resources.

### 3.3 Effect of Business Performance On The Processing/Trading Sectors

#### 3.3.1 Processing Sector

During the decade of 1990s, agricultural processing sector in Vietnam has made significant progress. Investment in agriculture equipments and machinery has been made to modernize rice mills. With this, the conversion rate of rice (paddy) into rice (milled) has increased considerably from 0.48 in 1990 up 0.63 in 2000 and consequently milling cost has been reduced from 504,500 VND/MT in 1990 to 408,500 VND/MT in

2000. Vietnamese rice mills aim at further improving conversion rate to 0.7-0.8 and also improve the quality of milled rice. With improvement in conversion rate and quality, Vietnamese rice would become more competitive in international market.

Shelf life of natural rubber is very low and therefore it is required to be processed very quickly. However, long distances between farms and factories has been a constraint in Vietnam. It would be strategically suitable if rubber processing factories are built close to farms. Besides logistic problem, this increases cost of transportation which ultimately affects total cost of production of this commodity and its competitiveness.

The conversion rates of Vietnamese rubber increased from 0.42 in 1990 to 0.56 in 2000. Even the rate that prevailed in 2000 is considered to be low. The potential exists to increase it to 0.7 by investing in modernization of factories.

### 3.3.2 Trading sector

Average export price of Vietnamese rice increased from US$ 188/MT in 1990 to US$197/ MT in 1995 but decreased to US$ 192/ MT in 2000. Similarly, average export price of Vietnamese rubber increased from US$ 868/MT in 1990 to US$964/ MT in 1995 but ebbed to US$ 608/ MT in 2000 in response to excessive supply. The domestic prices of both commodities, however, exhibited upward trend during the decade of 1990s due to conscious policy of the government to give remunerative prices to farmers which is guided by the concern for food security and production promotion.

## 3.4 Effects of International Factors

### 3.4.1 Changes in National Trade Pattern

Vietnam had strong economic and friendly relations with the then Union of Soviet Socialist Republics (USSR). Crashing of USSR has adversely affected trade performance of Vietnam as it lost its market in USSR. However, Vietnam turned towards its traditional trading partners, especially Cuba and Iraq and managed to recover the lost ground.

Globalization has made a paradigm shift from closed economy to open one and paved the way for bilateral and/or Multilateral Trade Agreements. With this, Vietnam's economy has transformed from central planning to market-oriented regime and invited foreign investors to invest in agriculture.

### 3.4.2 Changes in Exchange Rate

Vietnamese currency (VND) has been devalued from 5,374VND in 1990 to 15,050VND in 2000. With this, Vietnamese exports became cheaper and more competitive in international market. This also explains downward trend in productivity measured in US$.

### 3.4.3 Effect of Other Factors

#### 3.4.3.1 Macro-Economic Performance

The decade of 1990s has witnessed many changes. Some important developments that impinge on macro-economic performance are given hereunder:

i. Establishment and development of markets such as output market, input markets including real-estate market, capital market and labor market have been a key role in growth of agriculture since 1986.
ii. Paradigm shift from monopoly to market led policy and competition has boosted domestic production market. Market economy has made availability of agricultural inputs such as seeds, fertilizer in rural areas and high land easier. Similarly, market oriented regime has helped farmers to sell their products at factories and 'specialized' regions.

iii. State-owned banks have eased lending standards, interest rate, tenor, collateral conditions for farmers and others in rural areas to boost agriculture credit.
iv. The development of labor market in rural areas has added remarkable efficiency to agriculture.

#### 3.4.3.2 Effects of Changes on Socio-Economic Conditions

i. Transparent policies and market oriented regime has led to significant increase in per capita income.
ii. US Government lifted the economic sanctions on Vietnam and entered into trade agreement with US (2000). This implies improved trade relations and higher foreign investment. Vietnam has been a member of ASEAN, AFTA (1995), became part of APEC and has sought to become a member of WTO. "Open the door and integrate" policy of Government has truly created good conditions for both consumers and producers.

#### 3.4.3.3 Others

Asia-pacific region is vibrant and dynamic. With globalization, which gives an impetus for cooperation and competitiveness, Vietnam commits herself to the process of international integration and aims at scaling high standards in competitiveness and efficiency in agriculture sector.

## 4. PROSPECT OF FUTURE DEVELOPMENT/POTENTIAL OF THE SURVEY COMMODITIES

### 4.1 Likely Changes in Internal and External Conditions

The implementation of Vietnam-US Bilateral Trade Agreement, bilateral trade agreements / negotiations with other countries, economic stability and the Government's commitment to reforms would expand markets and would attract foreign investment. As a member of APEC, ASEM and ASEAN, Vietnam is expected to expand its international trade of agricultural commodities.

### 4.1 The role of Government in exploiting a future potential of the survey commodities.

i. The Government has committed itself to carry on the process of industrialization and modernization in agriculture and rural area, set international standards for quality of her domestic products and improve its productivity. This would go a long way in enhancing its competitiveness and consequently improve its share in the international trade.
ii. The Government envisage investing in building infrastructure, mechanization and electrification to boost processing industry, besides implementing suitable land programs to optimize the efficiency of cultivable land and water resources.
iii. Emphasis is laid on agriculture research to find new varieties of rice, rubber with high productivity, besides putting in place necessary arrangements for disasters management.
iv. The Government contemplates to shift a part of labor force from agriculture sector to industry and progressively increase cultivated area per labor, expand scale of operations and increase income of farmers.

## 5. PROPOSAL FOR SETTING UP OF A FORMAL MECHNISM SURVEYS

The present survey is basically a fact finding survey. It neither aims at identifying bottlenecks prevailing in the agriculture sector of various countries nor does it outline a

roadmap to remove those bottlenecks. Vietnam takes this opportunity to suggest APO to include diagnostic and policy prescription aspects on improving productivity and competitiveness in future surveys.

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# V. APPENDICES

## 1. LIST OF PARTICIPANTS, CONSULTANTS, RESOURCE SPEAKERS AND SECRETARIAT

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### A. PARTICIPANTS

| *Country* | *Name/Official Address* |
|---|---|
| Republic of China | Ms. Tsai-feng Hsiao<br>Senior Specialist<br>Council of Agriculture<br>37 Nanhai Road<br>Taipei, 100, Taiwan |
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| Japan | Ms. Yuko Watanabe<br>Assistant Director in charge of Analysis<br>Information Analysis Office<br>Ministry of Agriculture, Forestry and Fisheries<br>1-2-1 Kasumigaseki<br>Chiyoda-ku, Tokyo 100-8950<br>Japan |
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## 2. PROGRAM OF ACTIVITIES
(15-17 December 2003)

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| Date/Time | | Activity |
|---|---|---|
| *Mon., 15 December 2003* | | |
| | Forenoon | Opening Session<br>Presentation on Discussion on Regional Report<br>By Dr. Saburo Yamada<br>Special Presentation on "Benchmarking in Agriculture""<br>By Mr. Glenn Ronan |
| | Afternoon | Presentation of Country Reports by Participants |
| *Tues.,16 December* | | |
| | Forenoon | Presentation of Country Reports by Participants |
| | Afternoon | Presentation of Country Reports by Participants<br>Workshop Discussions: *Development of Competitiveness Indicators and Future Program* |
| *Wed., 17 December* | | |
| | Forenoon | Continuation of Workshop Discussions<br>Recapitulation and Concluding Session |

## 3. CONCEPTS, DEFINITIONS AND LIMITATIONS

The following symbols are used in the report:
.. means that data are not available.
- none or negligible.
0 or 0.0 or 0.00 means zero or less than half of the unit shown.
$ means current US dollars unless otherwise noted.

**Growth Rate**

Growth rate between two points in time for certain indicator is calculated from the following equation

$$r = \{(p_t / p_0)^{\wedge} (1/n)\} *100,$$

where $p_t$ and $p_0$ are the last and first observations respectively in the period and n is the number of years in the period. It does not take into account the intermediate values of the series. Nor does it correspond to the annul rate of change measured at one year interval, which is give by $(p_t - p_{t-1})/ p_{t-1} *100$.

**Land Productivity : Crop yield per hectare**

Land productivity is defined as the physical quantity (metric ton or MT) of crop yield per unit of planted area (hectare), which is the simplest indicator of technical efficiency in the use of land resource. This measure does not take cognizance of differences in varieties, quality, production conditions (irrigated /unirrigated fields), seasons (wet / dry), size of operation, duration of the crop and host of other relevant factors. Nor quality differences in labor such as sex, age, education, experience etc. have been taken into consideration.

**Land Productivity: Value added per hectare**

Value added (of crop production) per hectare is a useful indicator of land productivity to compare relative economic efficiency of land use across different crops. The term “value added” is defined as the value of total agricultural production less the value of intermediate inputs (such as seeds, organic fertilizers produced on farm, feed grain, etc.) and current inputs from the non-agricultural sector (such as chemical fertilizer, pesticides, fuels, etc.).

**Value Productivity in the Domestic Market**

Production of a commodity is essentially an economic matter. Thus, the product price and cost of production should be considered in measuring productivity. Therefore, value productivity in terms of value added per MT and value added per hectare have been measured for analyzing competitiveness. Higher the value productivity of a farm/factory, higher the competitiveness of the farm/factory in the domestic market of the country.

**Value Productivity in International Market**

In the international market, the price structure varies a great deal across countries and also price is affected by exchange rate of related countries. To enable meaningful international comparison, value added in terms of current domestic currencies have been converted into 1995 US$ by applying the exchange rate for the relevant years. These value added data then have been adjusted to 1995 constant prices by using MUV G-5 index (manufactures unit value index for G-5 countries are France, Germany, Japan, UK and USA). Similarly, value productivity of labor has also been measured and compared in terms of 1995 US$ per man-day.

**Labor Productivity: Value added per man-day**

Value added per man-day is defined as the total value added divided by the number of

man-days. It is useful in undertaking comparative analysis of labor productivity across economic activities of sectors (between agriculture and non-agriculture, or among different sub-sectors of agriculture) within the same country as well as across countries to compare the efficiency of labor input. However, for the purpose of international comparison, the value added is measured in terms of international currency.

**Capital Productivity**

For measuring capital productivity, it is common to express it as the inverse ratio of the other productivity indices, that is in terms of the capita-output ratio. This ratio is defined as the ratio of the total capital stock value to the total output value. This index shows the requirement of total capital necessary to realize a unit amount of agricultural output, disregarding the intensity of its use in production. To calculate this index, value of total capital stock for the specific crop being grown is estimated.

**Total Factor Productivity (TFP)**

The productivity concepts defined above measure “partial productivity” which is a productivity indicator of a single factor resource, without taking into account the effects of all the other factor inputs. The partial productivity is a biased measure of technical progress as labor productivity, for instance, is affected by the extent of mechanization. To avoid such possible biases, the “total factor productivity” (TFP) is applied. TFP is defined as the overall productivity of the aggregate of all factor resources, or the ratio of output (value added) index to the aggregate input index. The problem of measuring TFP is how to aggregate all different types of inputs into a single value. A major method for carrying out this aggregation is the linear aggregation of all factor inputs with factor shares as weights, or, based on the conceptual assumption of a linear form of an aggregate production function.

Total factor productivity (TFP) indices of raw commodities have been computed as the ratio of total output index to total input index which is an aggregated index of different input resources such as land, labor and capital. TFP, which encompasses all resources, represents changes in overall productivity of a commodity and is an objective indicator of productivity. TFP indices have been compiled at constant 1995 local prices (1995=100). Since TFP have been measured in terms of index, the level of productivity cannot be compared across countries nor across commodities in a country.

Likewise, TFP indices for processed commodities have been measured at constant 1995 local prices (1995=100) against total input index composed of labor and capital (depreciation) on value added basis.

**Two Concepts of Value Added**

Two concepts of value added viz. ‘narrow’ and ‘broad’ have been used in this report. Narrow concept of value added means the value of outputs less all cash costs while the broad concept denotes costs of hired labor and capital as part of value added as well. The distinction between the two concepts is whether the value added is seen from the viewpoint of individual farms or the agriculture sector as a whole. If viewed from the latter, costs spent for hired labor or capital can be regarded as part of value added reallocated to the production elements in its own sector as in the case of family labor and farmland.

**Margin Rate**

The margin rate is the ratio of margin (output value less the total cost) to output value.

**Benchmarking**

Benchmarking has been employed as a tool to assess competitiveness of the surveyed commodities. Ratios of cross-sectional key budget indicators such as cost of production /value of output of benchmark (BM) farms/ factories have been compared with the

corresponding budgets of National average (NA) farms/factories. The criterion for classifying a farm or a factory as benchmark ('best') varied a great deal across countries as indicated hereunder:

(a) a farm with scale of 20 hectare, highly mechanized for ROC;
(b) farms over 10 hectare for India;
(c) farms over 5 hectare in Kinki area for Japan;
(d) irrigated leading farms for the Philippines; and
(e) export farms for Thailand and for Vietnam.

Due to lack of standardization in the norm of benchmarking, usefulness of comparison of the ratios across countries is rather limited.

**Net Protection Coefficient**

Net Protection Coefficient (NPC) measures the divergence of domestic price from international prices. It is a measure of comparative advantage and determines the level of competitiveness in export and import of the relevant commodities. It is defined as

$$NPC_k = p_k^d / p_k^b$$

where $NPC_k$ = Net Protection Coefficient of $K^{th}$ commodity ;
$p_k^d$ = Domestic wholesale price of $K^{th}$ commodity; and
$p_k^b$ = Border price (cif or fob) of $K^{th}$ commodity.

**Limitations**

The report has the following limitations:

**Data Consistency and Reliability**

i. Statistical methods, coverage, practices and definitions differ widely across APO member countries. Cross country and intertemporal comparisons involve complex technical and conceptual problems. Although the country correspondents draw data from reliable sources, they should be construed only as indicating trends and characterizing major differences among member countries rather than offering precise quantitative measures of those differences. For these reasons, full comparability can not be assured.
ii. In certain cases, data have been taken from FAO Yearbook(s), which are at variance with the corresponding figures in the concerned country reports.
iii. While estimating the cost of production and margin, imputed value of unpaid cost for family labor and owned resources is required to be imputed, besides assessing the value of output or total production. It is a moot point whether these have been precisely imputed/valued.
iv. In certain cases, analyses are based on primary data collected by the correspondents themselves. These primary data are based more on "enquiry" method rather than following any standard sampling technique. In the ultimate analysis, this affects the reliability of the results.
v. To make an assessment of quality of estimates generated, it is imperative to estimate coefficient of variation (CV) and standard error (SE). However, this has not been done as the size of the sample is small.

**Differentials in Variety/Quality**

Land productivity or yield of a commodity does not take into account varieties, their quality differences or different production conditions such as irrigated and non-irrigated fields, wet and dry seasons, sizes of operation.

**Narrow Approach to Benchmarking**

The benchmark analysis undertaken in this Survey is essentially based on the budget data of the respective countries. It has not taken into account the concerns about strategy

and processes adopted in farms/ factories.

**Maturity Period of Crops**

The short duration crops, *ceteris paribus*, are more competitive compared to long duration crops. The land productivity of various regions/countries may not be comparable if maturity periods of crops in different regions/ countries vary significantly. This is all the more important when the opportunity costs of land and labor are high.

**Variations in Reference Year**

Some data in the report pertain to agriculture year (July to June) while others are based on financial year (April to March) and calendar year (January to December). In the analysis, it has been assumed that these data pertain to the same reference period namely calendar year and accordingly all data have been presented as if these pertain to calendar year.

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