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Food Security, Agricultural Efficiency and Regional Integration

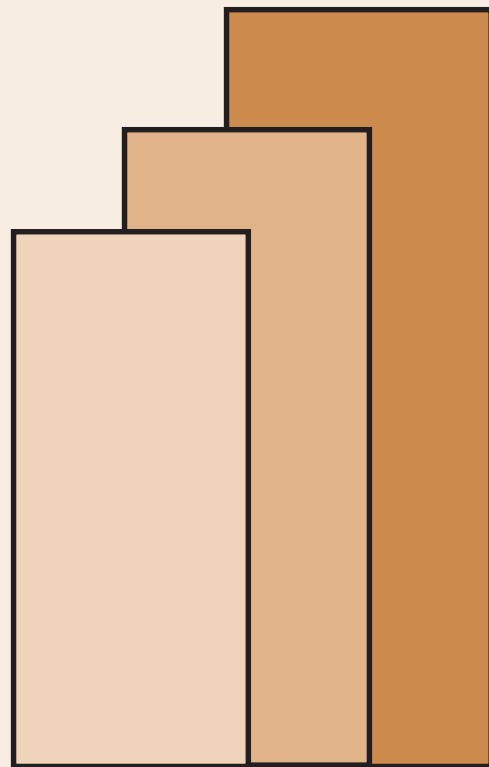
Amelia Bello

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**FOOD SECURITY, AGRICULTURAL EFFICIENCY
AND REGIONAL INTEGRATION**

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July 2004

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ABSTRACT

Food security remains a major concern among the APEC member economies. A simple and crude exercise shows that the region collectively could supply each member economy's demands for rice, maize and wheat. Thus, there is a potential role for enhanced intra-APEC agricultural trade to address food security issues. However, economies may be reluctant to abandon a policy of pursuing self-sufficiency because of "political sensitivities" and because of the uncertainties that trade is sometimes associated with. While tariffs and subsidies have been addressed, non-trade barriers such as sanitary and phyto-sanitary conditions are imposed on agricultural commodities. Hence, regional cooperation must also be pursued along other grounds such as institutional support and the dissemination of technological advancements. In addition, a collective definition of food security must be answered by the 21 member economies

Keywords: food security, agriculture, agricultural efficiency, regional integration, regional cooperation

EXECUTIVE SUMMARY

1. Achieving the goal of food security means making food available at prices that households can afford (Food and Agriculture Organization (FAO) definition of food security). Future demand for food will be driven by population growth and rising incomes; increasing the demand for meat, vegetables, fruits, and other staples.
2. The objectives of the paper are: to assess the food security situation for APEC member economies using a crude estimate of national food requirements for three types of grains and to compare and contrast their agricultural performances as a consequence of their domestic policies. It also seeks to analyze how regional cooperation can serve to fulfill the challenge of food security and recommend reform strategies to gain from the environment of liberalized trade on the basis of the experiences of the APEC member economies.
3. The paper employs Ohkawa's equation: $d = p + ng$, where p and g are the rates of growth of population and per capita income respectively and n is the income elasticity of demand for agricultural products as a very simple and crude measure of the annual rate of growth in national food requirements for rice, maize and wheat among the APEC member economies.
4. A brief examination of the raw data reveals that there are several commodities that are commonly being imported and exported by the APEC member economies. The most common imports, each with at least 10 economies importing the commodity are: dairy products and eggs, fish and fishery products, wheat, flour and wheat equivalents, maize, and bovine meat. Soybeans, rice, and wine are the next most common imported food items. Meanwhile, fish and fishery products were the most common export commodity, with 19 economies exporting it. The only exception to this was Brunei Darussalam, which solely exports poultry meat. The other most common exported food items are dairy products and eggs, coffee, wheat, flour and wheat equivalents, maize, oil of palm, and poultry meat.
5. If we consider the 21 member economies as one big group, the APEC member economies will be self-sufficient in the three commodities. In the case of maize, the region will post a surplus of 439 million metric tons on account of the huge surpluses to be posted by the United States and China. For wheat, the surplus economies will be the United States, Australia, Canada and the Russian Federation together with New Zealand and Chile. A surplus of 93 million metric tons for the 21 economies is projected. In the case of rice, a more modest surplus of 11 million metric tons will be posted due to the surplus production of China, Vietnam, and Thailand and to some extent by the United States and Australia. Korea will post a surplus of over half a million metric tons.
6. If we allow for enhanced intra-APEC member economy trade, the APEC member economies will be able to provide for the food needs of the group. The surplus producing economies can export their produce to the deficit nations. However, this point is easier said than done. The realities of the situation indicate that most economies are reluctant to abandon a policy of self-sufficiency, especially for some cereals like rice either because of a misguided definition of food security or

for other reasons that may be political in nature. Some economies despite not having a comparative advantage in the commodity persist in improving yields even at great costs to maintain an image of sufficiency in such politically sensitive crops. . Rice supply was strengthened by increasing domestic production with a host of input subsidies to keep prices low and output price controls to keep prices steady.

7. Among the ASEAN member economies, improving domestic production and beefing up of supplies through imports were used to ensure food supply. A definite move away from administrative or government intervention for targeting food supplies to the poor can also be noted, except in special circumstances. The stabilization of rice prices was also a priority for these economies. Since poverty is concentrated in the rural areas and agriculture is the main occupation of the rural workforce, agricultural development was given high priority in the effort to reduce poverty incidence. Self-sufficiency in food was an important objective of the development strategy.
8. Inasmuch as food security means making food available and affordable to citizens of a country, tackling the food security issue necessarily involves more than one strategy. An obvious strategy is increasing food production and improving yields. Another strategy is improving access to food, which means providing markets, investing in infrastructure and providing employment opportunities. A less obvious and perhaps least understood strategy involves improving food utilization which means reducing the waste in food preparation and reducing hunger and malnutrition not only at the household level but also at the regional levels. It also means proper biological use of food through adequate diet, water sanitation and health care. Finally, sound macroeconomic policies including a clearly defined food security policy are also essential.
9. Regional cooperative action in the following areas is important:
 - a. dissemination of technological advances,
 - b. institutional development, and
 - c. promotion of trade in food products.

The simple exercise involving Ohkawa's equation hint at a possible role for enhanced intra-APEC agricultural trade to enhance food security among the 21 member economies. However, trade in agricultural products, especially for certain commodities like rice and fresh fruits can be contentious. Rice is a highly sensitive commodity for economies like Japan and the Philippines and perhaps to some extent, Thailand, Vietnam and the United States. There are farmer and consumer groups 'to be protected.' In addition, international supplies are sometimes unreliable. Unreliability has two meanings. Food supplies may be available but world prices are unstable and second, supplies may be unavailable at any price. Rice and white maize are major cereal staples for certain economies in Asia but their international markets remain thin. Thus, interruptions in trade flows can be quite costly for those who solely depend on the world markets. Also, there are areas where people prefer white maize whereas much of the world trade is in yellow maize. Thus, many economies see the logical solution for these failures is a policy of self-sufficiency. They see the solution to the food insecurity problem as beginning at the national level (Siamwalla and Valdes). These remedies will

include large investments in food distribution systems, early warning systems that can be very costly and a mix of stock and trade policies. These economies must be made to see trade as a real possibility. However, barriers to trade, both quantitative and non-quantitative need to be addressed. An example is the issue of food safety and phyto-sanitary conditions. Institutional constraints should likewise be given attention so that the necessary structures will be in place for the enhanced trade that is projected.

10. Regional cooperation should be carried out simultaneously in all three fronts because they are intertwined with one another. Together with promoting trade, institutional development and the dissemination of technological advances should be pursued.
11. If regional integration and cooperation means moving towards a common goal using a common strategy, what becomes important is that the APEC member economies agree on what food security collectively means to them, what food items are important to each of them and the region in general so that regional integration and cooperation under the auspices of APEC can be promoted.

FOOD SECURITY, AGRICULTURAL EFFICIENCY, AND REGIONAL INTEGRATION¹

Amelia L. Bello

Just a few years from now, the world will have over 7 billion people to feed. About a third of these people live in the Asia-Pacific region making the task of assuring food security to these people both large and complex. Efforts thus have to be taken simultaneously at the household, national and regional levels to achieve the goal of making food available at prices that households can afford if the region wants to be food secure. (Food and Agriculture Organization (FAO) definition of food security).² Future demand for food will be driven by population growth and rising incomes; increasing the demand for meat, vegetables, fruits, and other staples. Exacerbating the food security problem is the issue of malnutrition. The FAO estimates that by year 2010, Asia will still account for about half of the world's malnourished population. This implies that it is not simply enough to be food secure, one must also be nutritionally secure. Food security suggests adequate availability and stability in the supply of and specifically, access to food particularly by the poor. The nutrition issue, however, adds a qualitative dimension to the food security problem. Aside from the simple measure of calorie intake, a qualitative dimension is imposed on the individual, in terms of consumption of essential micronutrients such as vitamin A and protein.

A. Objectives of the Paper

This paper aims to describe the food security situation for APEC member economies using a crude estimate of national food requirements for three types of grains and to compare and contrast their agricultural performances as a consequence of their domestic policies. It also seeks to analyze how regional cooperation can serve to fulfill the challenge of food security and recommend reform strategies to gain from the environment of liberalized trade on the basis of the experiences of the APEC member economies.

B. Significance of the Paper

Food security is a problem of both developing and developed countries. Although, in many cases, the growth in food production has outpaced population growth, complementary measures to ensure access to food and meet the conditions for adequate nutrition are still necessary. Thus, in the medium term, food security is not a problem of food production but one of access to food. In the long-term, however, there are

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²The World Bank similarly defines food security as the availability and affordability of food to all the citizens in a country, with the essential elements being the availability of food and the ability to acquire it (World Development Report 1986). The Rome Declaration on World Food Security and Plan of Action says 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 preferences for an active and healthy life. Efforts to achieve food security at the different levels will thus be different from each other, i.e., there are macro and micro dimensions to the food security problem.

uncertainties surrounding food production such as the extent and effect of climactic changes, the possible scarcity of fresh water, soil fertility and soil erosion, contributions and risks of biotechnology and genetic engineering, as well as changing lifestyles, which lead to shifts in food habits (Kracht and Schulz, 1999).

With the rise of a global economic order, the availability and affordability of food become common concerns. Thus, exploring ways and means to promote cooperation along these issues becomes a requisite. A declining terms of trade and the ensuing export pessimism on one hand, and increasing gains from specialization and trade on the other, can be addressed in a more comprehensive and rational fashion through regional cooperation. A study on how the twin problems of agricultural efficiency and food security can be addressed is therefore in order.

C. Methodology and Data Sources

Methodology

The Lewis (1950) of development assumes that the underdeveloped economy is composed of two sectors: a traditional overpopulated rural subsistence sector characterized by zero marginal productivity and a high productivity modern urban industrial sector into which labor from the subsistence sector is gradually transferred.

Following Lewis' (1950) dual-sector model of development, food supplies are contributed by the agriculture sector. The development process is seen as one of a structural transformation from an economy in which agricultural employment and output dominate to one in which industry takes the front seat. In Lewis' dual-sector model, if food supplies to the so-called modern sector are not able to keep up with its increasing demand for labor, the modern sector will have to consume a larger volume of its output in feeding its labor force, leaving a smaller amount for capital accumulation. Thus, if the labor force for manufacturing or another expanding sector is drawn from the agriculture sector, these new workers must "take their lunch" with them when they leave the rural sector. The expanding urban labor force thus must be supported by a growing supply of foodstuffs ((Meier, 1989).

The structural transformation that occurs also involves changes in the population picture. In Stage II of the demographic transition, better public-health methods and higher incomes lead to a marked reduction in mortality, which raise life expectancy. However, this decline in death rates is not immediately accompanied by a decline in fertility. Thus, the growing divergence between high birthrates and falling death rates lead to sharp increases in population growth. Thus, high rates of population growth or a growing population, a characteristic of most of the world's underdeveloped and developing nations, also contribute to the increase in demand for food. The rapid population growth and the transformation of the economy is accompanied by urbanization, increase of incomes, the spread of education and changes in attitudes and incentives (Todaro)

Johnston and Mellor (1961) claim that growth in food demand from population growth alone is substantial. They state "growth of demand for food is of major economic significance in an underdeveloped country for several reasons. High rates of population growth of 1.5 to 3 per cent now characterize most of the world's underdeveloped nations,

so that growth of demand from this factor alone is substantial.” A slow decline in birth rates plus a sharp decline in death rates have led to high rates of population growth. Population growth and industrialization are then the major factors affecting the demand for food. Johnston and Mellor specifically use Ohkawa’s equation in their paper (p572) and likewise mention that apart from autonomous changes in demand, which are presumably of limited importance, the annual rate of increase in food demand is given by Ohkawa’s equation: $d = p + ng$ where p and g are the rates of growth of population and per capita income and n is the income elasticity of demand for agricultural products. Johnston and Mellor (1961) also noted that not only are there higher rates of population growth in the developing countries but the income elasticity of demand for food is considerably higher than in the high-income countries. A given rate of increase in per capita income would therefore have a stronger impact on the demand for agricultural products in the low-income countries than in the economically advanced countries. The income elasticity of demand for food in the low-income countries is probably in the order of .6 or higher versus .2 or .3 in the United States and Canada.

This paper similarly employs Ohkawa's³ equation:

$$d = p + ng$$

where p and g are the rates of growth of population and per capita income respectively and n is the income elasticity of demand for agricultural products as a very simple and crude measure of the annual rate of growth in national food requirements for selected commodities among the APEC member economies.

Admittedly, Ohkawa's equation is a very crude estimate of the needed rate of growth in national food requirements. More sophisticated models have been developed. For instance, Rosegrant, Paisner, Meijer and Witcover (2001) using the IFPRI’s International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT) Model have projected world food supply and demand, trade and prices to the year 2020. The model is specified as a set of country-level demand and supply equations linked to the rest of the world through trade. Food demand is a function of commodity prices, per capita income and population growth. Crop production is determined by the area and yield response functions. Area is projected as a function of crop price, investment in irrigation and estimated rates of loss of land due to urbanization and land degradation. Crop yield is a function of crop price, input prices, and investments in irrigation and yield growth due to technological change. Growth in productivity due to technological change in turn is estimated by advances in management research and plant-breeding research. Other sources of growth considered include private-sector investments in agricultural research and development, agricultural extension and education, markets, infrastructure and irrigation.

Ohkawa’s equation is also crude because Engel's Law has been verified in a number of studies among countries showing that over time, the proportion of total expenditures allocated to food declines as income rises. While food is a necessity, its consumption rises less rapidly than does income. Thus beyond marginal changes in income, the income elasticity coefficient estimates become invalid. Most low-income consumers, however,

³ The original equation was $d = p + gn + pgn$. Ohkawa dropped the last term in the final version of his paper because he argued that the last term was of small importance.

devote a larger share of their budgets to food and also buy significantly more food when income increases.

Mellor and Johnston (1984) have come up with a "food equation" which views in dynamic balance the relationship between food supply and food demand. The food equation is much more than a race between food and population. Equilibrium in the food equation can range from a low equilibrium, i.e., a small increase in food supplies and little purchasing power in the hands of the people to high levels of each variable. The level at which the food supply -food demand equation is balanced is largely dependent on the design and implementation of a country's development strategy. This view is consistent with Sen's (1981) claim that ascribes the occurrence of famines not in terms of there not being enough food but in terms of entitlement or the failure of groups of people to establish their right to a certain amount of food, operations of rights, and the availability of political opportunities.

Alex F. McCalla (1994), former chair of the Technical Advisory Committee, Consultative Group on International Agricultural Research (CGIAR) agrees that in addition to population growth, income growth will also increase the demand for food. Urbanization will cause the diets to shift from roots and tubers and lower quality staple grains to higher quality cereals. While most everyone agrees that food demand will grow, there is less agreement on the capacity of the world to provide the supply that will meet the projected demand. There are four different but accepted views with regards to the projected trends in production. The conventional view argues the increase in food production must come primarily from increased productivity. Production must increase on the same land base while maintaining or improving the natural resource base. It implicitly views the food supply problem as a nationalistic one where countries are responsible for their own food security. Increased research and development efforts are necessary and economies face the twin challenges of creating environmentally sustainable production systems. Trade has a limited role.

The second view is basically that of Ohkawa's where rates of population growth are added to rates of income growth modified by the income elasticity of demand for food. This rate is then compared to the rates of growth in productivity. The model is therefore a projection of two compounding growth rates where any deviation from these rates either leads to food gaps or food surpluses. In the more complex models, prices may be made endogenous so as to equilibrate quantity supplied to quantity demanded; real prices either rise or fall. A prime example of this view is Mitchell and Ingo's (1993) "The World Food Outlook." The result of their simulations is that global food production increases will more than keep pace with increases in demand. Despite regional problems, the outlook for the world food situation is good. Other studies in the same vein include Rosegrant and Agcaoili (1994). Like the previous paper, they project that growth in global production will keep pace with global demand.

A third view is more pessimistic. Future supply trends will be subject to declining fertilizer use, declining investments in agricultural research and increased environmental pressures. The book *Full House: Reassessing the Earth's Population Carrying Capacity* by Brown and Kane (1994) exemplifies this view. The declining response of crops to additional fertilizer application and the losses of cropland to industrialization and urbanization as well as the demands for water that are pressing against hydrologic limits

will be among the constraints facing supply trends. The growing imbalance between food and people can only be redressed by attacking the population problem.

A fourth view, put forth by Ian Carruthers (1993) argues that our traditional model of developed countries supplying the world with manufactured goods and financial services and developing countries providing primary products is not sustainable. He argues that in the long run, developing countries will produce manufactured goods and trade them for food from developed countries. The fragile tropical and subtropical environments are incapable of producing enough basic foodstuffs while production increase potentials are greater in the temperate zone because of better technology. Carruthers says that this trend has already started with the United States, Canada, and Australia exporting food to developing countries while increasingly importing labor-intensive manufactured goods. A more pronounced role for trade is espoused by this view. Carruthers' paper however contains no numbers so that the impact on food prices if trade does not expand as needed is not clear.

This paper adopts the methodology used by the second view. While more complex models, e.g., IFPRI's IMPACT model, have been developed analyzing alternative scenarios for global food demand, supply and trade, Ohkawa's equation provides a quick and quite reliable base figure to project changes in food demand. Its data requirements are more modest. Food demand is a function basically of prices, income, and population growth while growth in crop production is affected by crop prices and the rate of productivity growth. In addition to the papers by Mitchell and Ingco, Rosegrant and Agcaoili (1994), Stevens (no date), Quisumbing (1986) and Widjajanti and Li (1996) used income elasticities to predict food and expenditure patterns.

Data Sources

The selected commodities are rice, wheat and maize. These three are among the top seven food exports and imports for the period 1996-1998. The main reference used to track the top traded commodities among the APEC member economies was the 1998 FAO Trade Yearbook and the FAOSTAT Database 1990-1998. Flowers and other horticulture products are not included in the FAO Trade Yearbook, hence their absence in the list. Data for China include those for Taiwan Province and in some cases Hong Kong. Thus while Taiwan is a member economy of APEC, in many cases, data from Taiwan is subsumed under that of China. The most traded commodities are shown in Tables 1 and 2.

Ohkawa's equation was estimated for the APEC member economies using published data. Projected rates of growth of population were taken from the World Bank's 2000 World Development Indicators; projected gross domestic product (GDP) growth rates from the 2001 APEC Economic Outlook/website and the PECC website and Rosegrant, et. al. (2001). The APEC and PECC websites contain a compilation of projected gross domestic product growth rates as submitted by the member economies economic planning bodies. GDP growth rates disparities are noticeable with growth rates highest in Southeast and North East Asia.

Income elasticity tells us the percentage change in quantity demanded for a certain commodity as a result of a one percentage change in income. A positive sign for income elasticity tells us that the commodity is normal good while a negative sign implies that the

commodity is an inferior good. For instance, ground meat in some countries may be considered an inferior good because consumers switch to better cuts of meat as their incomes go up. Consumer theory tells us that income elasticities are derived from the income-expansion path with each income expansion path drawn for a particular set of relative prices that is assumed (Timmer, et. al.)

To estimate income elasticities, the food balance sheet and disaggregated household food consumption data are needed. National aggregate data are not suitable sources for estimating micro consumption parameters because information about which individual household consumes which commodities are lost in the aggregation. Only household data are adequate for such estimation. Ideally, for macro consumption parameters, fifteen to twenty years of data are needed to allow for changes in tastes, expectations, structure of the economy, and even statistical reporting procedures.

Income demand elasticities were from Rosegrant, et. al. (2001) and Hossain and Sombilla (1999). The classification of economies used by Rosegrant, et. al. (2001) in their IFPRI/IMPACT model was followed where the former Soviet Union was included with the Developed Countries because of their same income demand elasticities. The income elasticities of demand assumed that there would be a gradual shift in the demand structure from the main staples to high-value products. The factors responsible for this include expected increases in per capita incomes arising from economic growth, rapid urbanization and the continued commercialization of agricultural production. The income elasticity demand parameters are the average of the aggregate income elasticities for each country, given the income level and distribution of population between urban and rural areas. Previous studies have shown that urbanization hastens the change in diets away from basic staples such as maize to cereals requiring less preparation such as wheat, fruits and processed foods. Maize as a food commodity has a negative income elasticity, implying that it is an inferior commodity. The demand for maize depends on the demand for livestock products, which in turn depends on the growth of population and per capita income. Developed economies dominate the market for maize since their per capita consumption of livestock products is many times higher than the developing economies. The latter economies draw their energy and protein requirements largely from cereal grains and not from meat.

Rosegrant, et. al. (2001) used the Almost Ideal Demand System (AIDS) model to estimate income elasticities. The AIDS uses a two-stage budgeting framework to model household behavior. In the first stage, the household decides how much of the available income is to be allocated among food and other household needs while in the second stage, the household decides on the allocation of the predetermined expenditure on food among the various commodities depending on prices, the level of incomes and the relevant demographic and locational variables that may influence tastes and preferences. Income elasticity of demand for rice is positive for some economies but negative for some especially the developed economies reflecting the ongoing increase in the share of meat as food habits change and as eating away from home becomes more prevalent. The other economies that have negative income elasticities for rice have basic diets, which revolve on other starchy foods such as roots and tubers.

Assumptions on GDP projections vary for the APEC member economies. For the case of Australia, assumptions include a little change in interest rates, a steady cyclical decline in

housing investment, improvement in the terms of trade of around 2% and a strong pick-up in Australian mining exports. For Canada, its growth is conditioned on growth in the United States. Net exports will be flat, domestic demand will underpin the growth and business investment will pick up. In the case of Chile, the acceleration in demand for copper and the depletion of world stocks will guarantee a relatively high copper price. Less traditional export sectors will resume growth but inflation will accelerate close to the lower bound of 2%.

There is some concern that the Chinese economy might overheat. Fixed assets investment is expected to remain a major driving force and export growth is expected to stay strong, growing 18% in 2004. Money supply will grow by 17% in 2004, some 3% lower than the previous year. Meanwhile, a combination of many factors, such as the inflow of funds, low interest rates and improving sentiment will push Hong Kong's growth. Exports of goods and services will grow by some 11% and private consumption by some 5%. Growth will pick up for Indonesia, due to an expected positive impact of the 2004 elections. Consumption will drive the growth as investment is still lagging and exports remain modest. The exchange rate assumption is Rp 8,500. Oil exports are expected to increase due to the high price of oil.

A strong growth of fixed capital investment is projected for Japan while the digital consumer electronics boom has just begun. Personal consumption expenditures will maintain a 1% growth rate but there will be a downsizing in public work as central and local government spending will decline (10% drop). The assumptions for Korea include a strong export growth of 18-19%, a gradual decline in the unemployment rate and a core inflation rate in the upper 2% range. For Malaysia, economic growth will come from increased activities in the manufacturing and services sectors. Export and import growth are projected to be at 11% and 15% respectively due to improvements in the trade environment. Domestic demand will be driven by pro-business fiscal and monetary measures.

Mexico's growth will be due to modest auto exports and private consumption growth of about 3%. No major changes in macroeconomic conditions are seen although oil prices above the original budget will provide more room for maneuvering. Inflation is likely to be above the Central Bank's target of 4.1%. New Zealand's growth will be affected by the slow population growth as net inflows of migrants decline. The effect will be most felt in residential investment. Growth in export volumes is expected but the effects of a high NZ dollar will continue to impact on exports. Tourism is expected to experience growth in the coming years due to recent high international exposure. The Peruvian economy will remain solid unless the political situation worsens. Achieving an FTA with large economies is important for Peru since external demand will probably be the most important engine for growth.

The Philippine economy suffers when oil prices rise and a consistently weakening peso will push up domestic fuel costs. Confidence in the country's ability to manage its large public and external debt rests on the ability of the government to address the budget deficit problem. Singapore faces competition in attracting more foreign investments. Fostering a more vibrant SME sector will still be a major objective since SMEs comprise 90% of all businesses providing employment for half the workforce and contribute almost 30% to output. The outlook for the Singaporean economy is based on the assumption that the

Chinese economy will not overheat, that the major economies' synchronized recovery will continue and terrorism will not happen again.

Taiwan's exports are strong when the US market is expanding. Thus, the biggest risk to Taiwan's growth lies in the US economy. China will also have a major influence on Taiwan's economic performance. China and Hong Kong are Taiwan's largest trading partners. In the case of Thailand, private consumption is expected to grow and increasing corporate profits and capacity utilization will be positive factors in the investment side. Export volumes may not be as strong due to reduced chicken imports by Japan and the EU, the slowdown of the Chinese economy and the reduction in shrimp exports.

The near term outlook for the United States depends on a steady consumer demand and business fixed investments. Net exports will begin to make a small positive contribution to GDP growth in 2005. Unemployment will hover in the 5% range but inflation will pick up in 2005. The Vietnamese economy will continue to grow; investment, especially private investment is expected to increase and export promotion activities will bring about increased exports. Inflation is expected to be about 6.5% in 2004 and 5% in 2005. Exports will increase because of increased exports to the expanding European market, a new focus on the Japanese market and the continuing exploitation of the American market.

Meanwhile, the projected growth rates in production were from the FAOSTAT Agriculture Data 2003. The base year data is a three-year average centered on 1997. The basic data used in the paper are presented in Table 3.

D. Results

The top seven most common traded food commodities of the APEC member economies in terms of number of trading economies and in terms of value are presented in Tables 1 and 2 respectively.

A brief examination of the data reveals that there are several commodities that are commonly being imported and exported by the APEC member economies. The most common imports, each with at least 10 economies importing the commodity are: dairy products and eggs, fish and fishery products, wheat, flour and wheat equivalents, maize, and bovine meat. Soybeans, rice, and wine are the next most common imported food items. Meanwhile, fish and fishery products were the most common export commodity, with 19 economies exporting it. The only exception to this was Brunei Darussalam, which solely exports poultry meat. The other most common exported food items are dairy products and eggs, coffee, wheat, flour and wheat equivalents, maize, oil of palm, and poultry meat.

Based on value alone; i.e., without considering the number of trading economies, the top seven food imports and exports again include fish and fishery products, soybeans, bovine meat, maize and wheat, flour and wheat equivalents for imports and wheat, flour and wheat equivalents, maize, fish and fishery products, oil of palm, rice and poultry meat for exports.

Table 1. Top 7 Most Common Traded Food Commodities of the APEC Member Economies

Imports	Ave Value (in US \$000)	Exports	Ave Value (in US \$000)
Dairy Products (17)	290,807	Fish + Fishery Pro (19)	1,249,092
Fish + Fishery Prod (15)	2,146,306	Dairy Products (8)	500,795
Wheat + Flour (14)	434,241	Coffee (7)	358,796
Maize (11)	569,656	Wheat + Flour (5)	2,231,730
Bovine Meat (11)	624,538	Maize (5)	1,363,789
Soybeans (8)	626,111	Oil of Palm (5)	1,085,715
Rice (7)	220,768	Poultry Meat (5)	821,127
Wine + Vermouth (7)	422,253		

Note: Numbers in parenthesis indicate the number of economies trading the commodity.

Source: FAOSTAT Database, 1990-1998 and FAO Trade Yearbook, Vol. 52. 1998.

Table 2. Top 7 Food Commodities of the APEC Member Economies Ranked by Value

Imports	Ave Value (in US \$000)	Exports	Ave Value (in US \$000)
Fish + Fishery Prod	2,146,306	Wheat + Flour	2,231,730
Pig Meat	740,255	Maize	1,363,789
Soybeans	626,111	Fish + Fishery Pro	1,249,092
Bovine Meat	624,538	Bovine Meat	1,118,255
Maize	569,656	Oil of Palm	1,085,715
Poultry Meat	543,244	Rice	900,643
Wheat + Flour	434,241	Poultry Meat	821,127

Source: FAOSTAT Database, 1990-1998 and FAO Trade Yearbook, Vol. 52. 1998.

Change in Food Requirements

Ohkawa's equation was estimated for the APEC member economies using published secondary data presented in Table 3.

Table 3. Basic Data Used for Estimating Ohkawa's Equation

APEC Member Economies	Population Growth	Income Demand Elasticities			GDP Growth Rate	Period	GDP per Capita Growth Rate
	(1998-2015)	Maize	Rice	Wheat			
Australia	0.8	-0.15	0.22	0.11	2.5	1997-2020	1.7
Canada	0.6	-0.15	0.22	0.11	3.2	2002-07	2.6
Japan	-0.1	-0.15	0.22	0.11	1.5	2004-06	1.6
New Zealand	0.5	-0.15	0.22	0.11	1.6	2003-07	1.1
Russian Federation	-0.4	-0.15	0.22	0.11	4.3	2003-04	4.7
United States	0.7	-0.15	0.22	0.11	3.1	2002-12	2.4

Chile	1.1	-0.02	0.19	0.03	4.5	2002-03	3.4
Mexico	1.4	-0.02	0.19	0.03	3.6	1997-2020	2.2
Peru	1.5	-0.02	0.19	0.03	4.8	2003-05	3.3
Brunei	2.06	0.04	0.01	0.28	4.1	2002-06	2.0
Indonesia	1.2	-0.3	0.14	0.2	5.9	2002-05	4.7
Malaysia	1.6	-0.4	-0.2	0.3	7.5	2001-05	5.9
Philippines	2.3	-0.25	0.1	0.2	6.6	2003-06	4.3
Thailand	0.9	-0.3	0.0	0.2	3.5	2003-04	2.6
Vietnam	1.2	0.04	0.01	0.28	7.5	2003-05	6.3
China	0.7	-0.35	0.04	0.2	7.0	2002-05	6.3
Hong Kong	1.0	-0.26	-0.2	0.13	3.0	2002-06	2.0
Korea	0.6	-0.26	-0.2	0.13	5.0	2003-04	4.4
Papua New Guinea	1.8	-0.26	-0.2	0.13	2.3	2003-07	0.5
Singapore	1.0	-0.26	-0.2	0.13	6.0	up to-2010	5.0
Taiwan	0.5	-0.26	-0.2	0.13	5.4	2003-04	4.9

To compute Ohkawa's equation, the relevant columns in Table 3 are the columns on population growth, the three columns on income demand elasticities and the column on GDP per capita growth rate. Growth in food requirements is estimated by adding population growth to the product of GDP growth per capita and the corresponding income demand elasticity, i.e., $d = p + ng$. Bearing in mind the qualifications mentioned in the methodology and data sources sections, Table 4 presents the results of Ohkawa's equation. Specifically, the third column of Table 4 tells us the projected growth rate in food demand for rice, wheat and maize given the various assumptions about population growth rates, income demand elasticities and per capita growth rates for each of the APEC member economies. The zeros indicate no production while n.a. stands for no available data. Figures for China include those for Hong Kong and Taiwan.

Table 4. Projected Annual Rates of Growth in Food Requirements, Production Growth Rates and Demand-Supply Gaps, 2010

A. Rice

APEC Member Economies	PRODUCTION	CONSUMPTION	Supply-Demand Gap
	Growth Rate 98-2010 (percent/year)	Growth Rate 98-2010 (percent/year)	
Australia	3.1	1.17	1.93
Canada	0.0	1.17	-1.17
Japan	-0.7	0.25	-0.95
New Zealand	0.0	0.74	-0.74
Russian Federation	1.6	0.63	0.97
United States	0.3	1.23	-0.93
Chile	2.5	1.75	0.75
Mexico	2.6	1.82	0.78

Peru	0.9	2.13	-1.23
Brunei	0.0	2.08	-2.08
Indonesia	1.3	1.86	-0.56
Malaysia	0.4	0.42	-0.02
Philippines	2.8	2.73	0.07
Thailand	0.8	0.90	-0.10
Vietnam	1.2	1.26	-0.06
China	0.1	0.95	-0.85
Hong Kong	0.0	0.60	-0.60
Korea	-0.1	-0.28	0.18
Papua New Guinea	0.95	1.70	-0.75
Singapore	0.0	n.a.	n.a.
Taiwan	n.a.	-0.48	n.a.

B. Wheat

APEC Member Economies	PRODUCTION	CONSUMPTION	Supply-Demand Gap
	Growth Rate 98-2010 (percent/year)	Growth Rate 98-2010 (percent/year)	
Australia	1.1	0.99	0.11
Canada	0.3	0.89	-0.59
Japan	-0.6	0.08	-0.68
New Zealand	0.76	0.62	0.14
Russian Federation	1.1	0.12	0.98
United States	1.0	0.96	0.04
Chile	2.92	1.20	1.72
Mexico	0.5	1.47	-0.97
Peru	2.92	1.60	1.32
Brunei	0.0	2.63	-2.63
Indonesia	0.0	2.14	-2.14
Malaysia	0.0	3.37	-3.37
Philippines	0.0	3.16	-3.16
Thailand	0.94	1.42	-0.48
Vietnam	0.0	2.96	-2.96
China	0.3	1.96	-1.66
Hong Kong	0.0	1.26	-1.26
Korea	-2.3	1.17	-3.47
Papua New Guinea	0.0	1.87	-1.87
Singapore	0.0	1.65	-1.65
Taiwan	n.a.	1.14	-1.14

C. Maize

APEC Member Economies	PRODUCTION	CONSUMPTION	Supply-Demand Gap
	Growth Rate 98-2010 (percent/year)	Growth Rate 98-2010 (percent/year)	
Australia	2.41	0.55	1.87
Canada	0.8	0.21	0.59
Japan	-2.19	-0.34	-1.85
New Zealand	1.03	0.34	0.70
Russian Federation	0.68	-1.11	1.79
United States	1.06	0.34	0.72
Chile	2.76	1.03	1.73
Mexico	1.25	1.36	-0.11
Peru	2.76	1.43	1.33
Brunei	0.0	2.14	-2.14
Indonesia	0.61	-0.21	0.82
Malaysia	4.59	-0.76	5.35
Philippines	2.81	1.23	1.59
Thailand	2.81	0.12	2.69
Vietnam	2.81	1.45	1.36
China	1.02	-1.51	2.53
Hong Kong	0.0	0.48	-0.48
Korea	0.33	-0.54	0.87
Papua New Guinea	2.81	1.67	1.14
Singapore	0.0	-0.30	0.30
Taiwan	n.a.	-0.77	0.77

In order to assess whether these required rates of growth in national food requirements can be satisfied by the member economies, it is compulsory to look at the trends in production. The production figures shown in the second column of Table 4 are from the FAOSTAT Agriculture Data 2003, and Development Trends in Agriculture: International Comparisons 7th Edition of the Bureau of Agricultural Statistics, Department of Agriculture. In the case of rice, projected production increases can range as high as 3.1% in Australia to a decrease by 0.7% in Japan. Wheat production can decline by as much as 2.3% for Korea or increase by 2.92% in the case of Chile and Peru. Maize production can again grow by 4.59% in Malaysia or show a decline of 2.19% for Japan. The last column in Table 4 is simply the difference in the projected rates of growth in production and consumption demand. A positive figure implies production increases are greater than the projected change in demand while a negative figure implies the opposite.

Table 5 translates the projected rates into levels, i.e., '000 metric tons. In most cases, the 1998 production and consumption figures were published data from the FAOSTAT Agriculture Data 2003. The results of Ohkawa's equation and the projected production growth rates were then applied to these base figures to arrive at the estimates for the 2010

levels. At the end of each of the three commodity tables is a total figure indicating whether the APEC member economies as a group has a surplus or deficit in the commodity. Again, the zeros indicate no production while n.a. stands for no available data and figures for China include those for Hong Kong and Taiwan.

Table 5. Projected Production and Consumption Levels, 2010

A. Rice

APEC Member Economies	PRODUCTION	CONSUMPTION	Supply-Demand Gap
	Projected 2010 ('000 metric tons)	Projected 2010 ('000 metric tons)	Projected 2010 ('000 metric tons)
Australia	1,306	185.96	1,120
Canada	0	378.32	-378
Japan	7,775	11,716.03	-3,941
New Zealand	0	8,763.50	-8,764
Russian Federation	319	757.56	-439
United States	6,309	3,240.14	3,069
Chile	135.69	177.74	-42
Mexico	400	727.24	-327
Peru	1,251	1,471.14	-220
Brunei	0	43.11	-43
Indonesia	36,341	39,434.35	-3,093
Malaysia	1,377	2,003.11	-626
Philippines	9,500	9,643.69	-144
Thailand	16,940	9,609.68	7,330
Vietnam	22,902	14,867.79	8,034
China	138,613	129,551.57	9,061
Hong Kong	0	n.a.	n.a.
Korea	5,170	4,488.93	681
Papua New Guinea	0.67	291.12	-290
Singapore	0	n.a.	n.a.
Taiwan	n.a.	n.a.	n.a.
Total			10,988

B. Wheat

APEC Member Economies	PRODUCTION	CONSUMPTION	Supply-Demand Gap
	Projected 2010 ('000 metric tons)	Projected 2010 ('000 metric tons)	Projected 2010 ('000 metric tons)
Australia	24,899	1,514.27	23,385
Canada	26,028	3,096.83	22,931
Japan	535	5,518.10	-4,983
New Zealand	329.65	282.75	47
Russian Federation	41,093	19,591.54	21,501
United States	74,816	27,220.53	47,595
Chile	2,271.43	1,908.50	363

Mexico	3,507	4,151.79	-645
Peru	197.55	1,698.06	-1,501
Brunei	0	16.75	-17
Indonesia	0	4,266.08	-4,266
Malaysia	0	948.71	-949
Philippines	0	3,724.53	-3,725
Thailand	0.83	688.41	-688
Vietnam	0	728.35	-728
China	119,216	122,176.09	-2,960
Hong Kong	0	n.a.	n.a.
Korea	4	2,601.61	-2,598
Papua New Guinea	0	144.70	-145
Singapore	0	n.a.	n.a.
Taiwan	n.a.	n.a.	n.a.
Total			92,620

C. Maize

APEC Member Economies	PRODUCTION	CONSUMPTION	Supply-Demand Gap
	Projected 2010 ('000 metric tons)	Projected 2010 ('000 metric tons)	Projected 2010 ('000 metric tons)
Australia	349.37	90.47	258.90
Canada	9,811.83	99.11	9,712.72
Japan	0.17	1,337.89	-1,337.72
New Zealand	197.75	2.49	195.27
Russian Federation	887.54	35.85	851.69
United States	279,412.59	3,986.72	275,425.87
Chile	1,255.69	243.94	1,011.75
Mexico	21,222.92	14,390.23	6,832.69
Peru	1,241.92	386.88	855.04
Brunei	0	7.13	-7.13
Indonesia	10,913.90	6,924.55	3,989.35
Malaysia	77.54	86.44	-8.90
Philippines	5,112.36	545.26	4,567.10
Thailand	6,174.47	426.25	5,748.22
Vietnam	2,155.57	638.41	1,517.16
China	149,500.99	19,042.90	130,458.09
Hong Kong	0	n.a.	n.a.
Korea	83.38	708.59	-625.22
Papua New Guinea	8.02	11.60	-3.57
Singapore	0	n.a.	n.a.
Taiwan	n.a.	n.a.	n.a.
Total			439,441.29

As expected, there will be economies exhibiting either surpluses or deficits in 2010. Note however, that consumption figures are unavailable for Singapore while the figures for China include that for Hong Kong and Taiwan. If we consider the 21 member economies as one big group, however, the APEC member economies will be self-sufficient in the three commodities. In the case of maize, the region will post a surplus of 439 million metric tons on account of the huge surpluses to be posted by the United States and China. There will be five deficit economies. Only Japan and Korea, among the developed economies will post deficits. Brunei, Malaysia and Papua New Guinea round up the deficit economies; Brunei basically because of zero production.

For wheat, the surplus economies will be the United States, Australia, Canada and the Russian Federation together with New Zealand and Chile. A surplus of 93 million metric tons for the 21 economies is projected. All the other economies will register deficits, notably the Southeast Asian economies that depend on wheat imports due to zero production of wheat.

In the case of rice, a more modest surplus of 11 million metric tons will be posted due to the surplus production of China, Vietnam, and Thailand and to some extent by the United States and Australia. Korea will post a surplus of over half a million metric tons. All the other economies will need to import rice inasmuch as their demand requirements exceed their projected production volumes.

The above surpluses point to a potential role for trade to promote food security in the APEC member economies. If we allow for enhanced intra-APEC member economy trade, the APEC member economies will be able to provide for the food needs of the group. The surplus producing economies can export their produce to the deficit nations. However, this point is easier said than done. The realities of the situation indicate that most economies are reluctant to abandon a policy of self-sufficiency, especially for some cereals like rice either because of a misguided definition of food security or for other reasons that may be political in nature. Some economies despite not having a comparative advantage in the commodity persist in improving yields even at great costs to maintain an image of sufficiency in such politically sensitive crops. Policies to boost production, price policies and market intervention policies to stabilize prices and ensure a stable food supply were implemented by the ASEAN member economies surveyed. Rice supply was strengthened by increasing domestic production with a host of input subsidies to keep prices low and output price controls to keep prices steady. This point will be elaborated further in Section E – Country Policies, Section F – Patterns in Trade Specialization and Section G- Solving the Food Security Problem and Areas for Cooperation.

Historical Agricultural Output and Productivity, 1980-1992

In addition to the above data, Table 6 provides a breakdown of the historical growth rates of agricultural food production, for various periods and for a number of agricultural produce for selected ASEAN member economies. Improved agricultural production has directly contributed in creating an environment for ensuring food security among these five economies (FAO, 1998). An increase in calorie intake has likewise been noted, bulk of which came from improved domestic production. Indonesia achieved sufficiency levels in rice and increased its non-rice agricultural exports as well. Rice production grew 3.29% annually for the period 1980-1992 and non-cereal foods, which still occupy an important

place in the Indonesian diet, substantially increased. Sugar output improved by 4.82% while vegetable oils grew 7.34%. Growth in animal products, milk, meat and eggs was satisfactory given the fact that they started from a low base.

Malaysia more than compensated for the increase in its food and animal products imports by an improved export performance of non-food agricultural products. Maize production improved by 12.14% while meat output grew 8.94%. Although rice exports slackened, Thailand registered an increase in the exports of other agricultural commodities. Cow milk production grew 19.58% and hen eggs by 9.85%. Vietnam became a rice exporter and was able to create an exportable surplus in fish and fish products, cocoa, vegetable oils, fruits, and vegetables. Sadly, food imports of the Philippines increased at the same time that its exportable surplus in agricultural products declined. For Indonesia, the Philippines, Thailand and Vietnam, the significant growth in domestic agricultural production was also accompanied with a drop in population growth. Accordingly, per capita agricultural production increased. Changes in cropping patterns have also been noted. Soybean production in Thailand increased in response to increased demand for cattle feed. In all five countries, demand for wheat increased with growing urbanization. However, the production of pulses, which is an important source of protein for the poor, has declined.

Aside from the improvement in calorie intake, there have also been remarkable changes in the composition of the sources of calorie. A progressively larger share of calories is now being accounted for by animal sources compared to vegetable sources. Within the vegetable sources, a shift from cereal to non-cereal sources and within the food grains from starchy roots and tubers to superior cereals, i.e., rice and wheat is also evident. The shift in this direction was or more less common to all five economies, but at varying paces (FAO, 1998).

Accompanying improved domestic production; the economies also achieved inter-temporal stability in food availability, with the extent of stability being measured in terms of inter-year variations in food availability. Initial evidence seems to imply that in most of these economies, food availability declines during the period before the harvest of the food grain and improves after the harvest. This is important because from the viewpoint of poor families, inter-seasonal stability is more important than inter-year stability. Bi-monthly trends in the prevalence of underweight children support the strong seasonality effect (FAO, 1998).

Table 6. Growth Rates of Agricultural Production, 1980-92 (in per cent)

Commodity	Indonesia	Malaysia	Philippines	Thailand	Vietnam
Cereal, total	3.45	0.83	2.58	0.66	4.67
Maize	4.70	12.14	3.55	0.89	5.66
Rice	3.29	0.72	2.17	0.65	4.63
Pulses	-0.58	n.a.	0.56	1.23	3.52
Roots /Tubers	2.00	0.89	0.35	1.20	-0.94
Cassava	2.13	1.62	n.a.	1.28	-1.67
Oilcrops, total	7.34	7.74	0.55	7.54	8.74
Vegetables	6.21	2.69	n.a.	n.a.	n.a.
Sugar	4.82	5.14	-2.08	8.69	4.46
Meat, total	8.05	8.94	3.57	4.80	5.59

Cow Milk	12.82	2.44	0.69	19.58	3.26
Hen eggs	6.11	8.31	2.23	9.85	5.68

n.a. – not available Source: FAO, 1998.

Asian Population and Food Requirements: The Case of Rice⁴

Rice remains to be the most important food crop with human consumption accounting for 85% of total rice production (Hossain and Sombilla). International trade in the commodity has grown to more than 16 million tons in 1993 from about seven million tons three decades earlier. However, rice trade remains limited; only about four percent of world rice production is transacted in the international market. This is due to the fact that rice in Asia is grown in small family farms and is grown primarily for family consumption. Thailand, the USA and Vietnam are the major rice exporters. However, Thailand is losing its comparative advantage in rice production and rice exports due to the increase in farm wages. A decade ago, Thailand taxed its rice exports but started to provide export subsidies to raise prices in the domestic markets in order to sustain farmers' incentives in rice cultivation. In Vietnam, the economic liberalization has led to the rapid rise in production but its potential for realizing further increases in rice yields is almost fully exploited.

Rice is said to be a normal commodity. When income increases, demand shifts from low-cost energy sources to rice. But with further increases in income, rice becomes an inferior commodity (Ito, et. al.) as consumers shift to a more diversified diet with vegetables, bread, fish and meat as sources of protein and vitamins. Changing food habits and the practice of eating away from the home have led to a reduction in per capita rice consumption. Japan, South Korea and Taiwan, and the more industrialized economies have passed through this demand shift. Malaysia and Thailand are undergoing the same experience. However, these five economies account for less than 10% of total grain consumption in the region. Indonesia, Vietnam and the Philippines account for the bulk of total consumption and dominate consumption growth as well.

What are the rice supply trends in Asia? Recent figures in rice production growth raise concern about the region's ability to meet the demand for rice (Table 7). In 1985-1994, rice production growth was 1.6% per annum, half of what was recorded in the period 1975-1985. A decade earlier, rice production growth was 2.9%. Population growth hovers at 1.8-1.9% per annum. Increases in rice production have failed to match the population growth in several countries in Asia. The reasons for this are: (a) yield growth rates have approached yield ceilings, particularly for the irrigated areas which have been the major source of growth in rice production and (b) natural resource constraints, i.e., closing of the frontier in cultivable land, exacerbated by the pressure to release land planted to rice in favor of vegetables, fruits and other crops, as their market becomes stronger and bigger with economic growth. In the case of China, the rice-harvested area fell from 37 million hectares in 1976 to 32 million hectares in 1992. For the Philippines, it declined from 3.7 million hectares to 3.2 million hectares for the same period. A third cause is the problem of sustaining farmers' interest in rice cultivation as the economy progresses. The growth of the non-farming sector has pushed non-farm wage rates promoting migration of labor from rural areas to cities and increased agricultural wages. Since traditional rice farming is

⁴ This and the next section are from Hossain and Sombilla. Their methodologies and assumptions are different from this paper because of the more detailed nature of the data that theory employed. For instance, they distinguish between irrigated and rain-fed areas in computing for yield.

highly labor-intensive, the increase in wage rates has pushed up the cost of rice production, reduced profits and farmers' incomes. Japan, Taiwan and South Korea have experienced a continuous decline in their farming populations with the aging of workers and depopulation in remote areas.

Table 7. Growth Rates of Population and Rice Production, Major Rice Growing APEC Economies

Country	Rice harvested area, 1994 (mil ha)	Population growth (in % pa)		Growth in rice production (in % pa)	
		1975-85	1985-94	1975-85	1985-94
China	30.4	1.4	1.4	3.2	0.4
Indonesia	10.7	2.1	1.7	5.5	1.9
Vietnam	6.5	2.2	2.2	3.6	4.0
Thailand	8.5	2.1	1.4	3.0	-1.0
Japan	2.2	0.8	0.4	-1.0	-1.6
Philippines	3.4	2.4	2.1	3.5	1.3
Korea	1.2	1.5	1.0	1.8	-1.7
Asia	1.2	1.9	1.8	3.2	1.6

Source: Hossain and Sombilla, 1999.

The Philippine Case- Rice

The Philippines in the three decades of the 1960s-1990s made notable progress in rice production. From 4.1 million tons in 1965, the level of production increased to 10.5 million tons in 1994 or 1.3 tons per hectare to 2.9 tons per hectare. This growth was attributable to the gradual replacement of traditional low-yielding cultivars with high-yielding ones, supported by an expansion of irrigation and increased consumption of chemical fertilizers. However, since the mid-1980s, growth has slowed down following the decline in public investment for the expansion and maintenance of irrigation infrastructure and the limited scope of further expansion of areas under modern varieties. Since 1982, rice yield increased by only 1.7% per year, eroding the gains posted earlier. (Hossain and Sombilla)

Hossain and Sombilla projected the quantity of rice, which the Philippines must produce to be self-sufficient until 2020. An upward pressure on per capita rice consumption is expected due to a number of reasons: population increase, improvement of living conditions which will enable more people to meet their grain needs and the substitution of rice for corn as human food. The income elasticity of demand for corn is -0.25; if per capita income increases, corn consumption may decline, as corn is likely to be substituted by rice. Table 8 shows that the Philippines may need to produce about 16.3 million tons of unmilled rice by 2010 in order to remain self-sufficient. If the current area under rice cultivation is maintained, rice yield has to increase to 5.1 tons per hectare. If population will grow by 1.3% per annum till 2020, rice production must grow at the same rate to at least maintain per capita consumption at the present level.

Table 8. Projected Population and Philippine Demand for Rice, 2000-2020

Year	Projected Population (millions)	Per capita Rice Consumption Annual Rate of Growth (in %)	Required Production to Meet Demand (million tons)
2000	77.3	2.2	12.82
2005	85.6	2.1	14.59
2010	93.8	1.8	16.31
2015	101.4	1.6	17.28
2020	108.4	1.3	17.86

Source: Hossain and Sombilla, 1999.

The Philippines need not attain self-sufficiency to attain food security. Singapore and Hong Kong have very little rice but can boast of better records of food security. Malaysia meets some 40% of its rice requirements through imports. This suggests a need for favorable growth that permits the import of food from countries, which have surpluses and produce the commodity at lower costs. In addition, low-income households must have enough income opportunities to obtain productive employment and earn income to procure food from the market.

Distribution of Income/Consumption

The second element in food security is access to food. Aside from improved food production and a stable food supply, household access to the required quantity and quality of food is also needed. In the absence of data on the food intake for the 21 member economies of APEC, we use poverty data as proxy for food security. Using data on poverty in the context of food security means that we have to make certain assumptions: (i) all poor are food insecure, an assumption which may be reasonable to make and (ii) all non-poor are food secure, an assumption what may be infeasible especially when quality dimensions are added to the picture. The poverty profile for Indonesia, Malaysia, the Philippines, Thailand and Vietnam suggest that the proportion of poor households has declined. For Indonesia and Malaysia, the decline was rapid, moderate for Thailand and slow for the Philippines and Vietnam. Table 9 profiles the poverty situation for these economies.

Table 9. Percentage of the Population Below the Poverty Line

Country/Year	Rural	Urban	Total
Indonesia			
1976	40.4	38.8	40.1
1990	14.1	16.8	15.2
Malaysia			
1973	n.a.	n.a.	37.0
1987	n.a.	n.a.	15.0
1995	n.a.	n.a.	10.0
Philippines			
1971	57.7	40.6	52.2
1991	50.7	36.7	44.6

Thailand			
1975/76	35.6	17.6	31.7
1990	21.4	10.1	18.2
1995 est.	n.a.	n.a.	13.0
Vietnam			
1992/93	57.0	25.0	51.0

n.a. – not available

Source: FAO, 1999.

The poverty figures depict headcount ratios only. It does not reflect the intensity of poverty. Headcount ratios across economies are not strictly comparable since the poverty norms may be different. However, in spite of these limitations, certain trends are reflected in the data. For instance, the proportion of the poor households in the rural areas is higher compared to those in the urban areas. There is also a concentration of the poor in the backward regions. Farmers in low-value subsistence agriculture and low educated rural youth are particularly poverty prone. Intra-household inequity in food consumption is also high, manifesting a bias against women.

The 2000 World Development Indicators contain data on the distribution of income or consumption expenditures, albeit for different periods depending on the survey year. Japan has the least inequitable income distribution picture with a Gini index of 24.9 in 1993. Chile, on the other hand, registered the worst income distribution picture with a Gini index of 56.5 for 1994. In terms of consumption expenditure, South Korea posted a Gini index of 31.6 for 1993 while Papua New Guinea had the worst index of 50.9 registered in 1996.

E. Country Policies⁵

From the late 70s to the early 80s, the Southeast Asian nations, with the exception of Thailand had been dependent on food imports. But in the mid 80s, most of the countries became self-sufficient and some even exported food surpluses. In addition to policies designed to boost production, price policy and market intervention policies were implemented to stabilize prices and ensure a stable food supply, particularly rice.

To ensure food security, measures were instituted to strengthen supply (both by increasing domestic production and beefing up import stocks). A host of input subsidies to keep costs low and output price controls to keep prices steady were likewise implemented. The countries also favored economic policies and market mechanisms instead of administrative interventions, for targeting food supplies to the poor. The stabilization of rice prices was also a major objective.

Indonesia

Until the 1970s, the Indonesian economy was dominated by petroleum and rubber. The economy faced boom and bust situations mainly due to fluctuations in petroleum prices and partly due to macroeconomic policies. The results were an increased current account deficit, curtailed expenditures on infrastructure, and high inflation rate. The situation

⁵The focus of this discussion of country policies is the five Southeast Asian economies of Indonesia, Thailand, Malaysia, the Philippines and China.

changed in the mid-80s with greater attention to agriculture, diversification of industrial and foreign trade patterns, greater monetary discipline and more market friendly policies.

Indonesia protected agriculture, by instituting input subsidies (fertilizers, seeds, insecticides and pesticides). BULOG (a National Logistics Agency) was set up to provide a market for paddy and to set a floor price for farmers. Through the village level cooperatives or KUDs, stocks were acquired and stored to be used as buffer stock to meet shortages as well as for open market operations to regulate prices. The difference between domestic and border prices for rice in the 80s was 19% and 9% in the 90s, mainly due to price support. The decline in the rate of protection of rice prices in the 90s, however, indicates a shift in focus to international competitiveness. Thus, the positive relationship between cost reduction measures and the fall in the relative prices of paddy helped ensure a better access to food (Anderson and Pangestu, 1995).

Malaysia

Malaysia sustained high rates of growth in the 70s with a brief period of stagnation in the mid-80s. The growth can be traced to a favorable terms of trade for its principal exports, i.e., petroleum, palm oil and rubber but also improved productivity, particularly in rubber. Malaysia has been an open economy since the mid-70s. Exports account for a very large share of gross domestic product. Malaysia's pattern of growth is similar to other developing countries in the region, but its pace was more rapid. For example, agriculture's share to output fell from 22% to 14% in less than a decade. This was accompanied by a corresponding rise in the share of manufacturing and services, and a marked shift in exports from traditional primary products to industrial products.

Malaysia, unlike Indonesia, did not favor a cheap food policy to help the poor. Instead it aimed at improving yields. However, the government also arranged to buy rice from small growers not only to provide a steady market but also to provide a support price. Jenkins and Kwok-kong Lai, 1991, estimated that the effective protection rate for paddy in the late 80s, was 26%. The rate was much higher in the early 80s. The buffer stocks were initially held to provide support against shortages, but in the recent years, the main function has been to stabilize prices for the producers.

Thailand

Thailand had the fastest growth among the Southeast economies in the 90s, with output growing at over 8% per year. Industry had a major share in the rapid economic growth, with its contributions to national income and exports outstripping that of the primary sector, especially rice. Its economic development is characterized by low government interference except in the rice and sugar sectors. Rapid growth in the economy has not resulted in significant occupational diversification.

Although Thailand has traditionally been a rice exporter, the Government's concern has also been to protect the urban consumers against excessive increases in rice prices due to rice exports. A Rice Reserve Commission was set up in 1960, to establish buffer stocks through open market purchases. A consumption subsidy in the range of 10% was also offered in the 1960s. This rose to 25-30% in the 70s with the rise in the international prices of rice. The reserve requirements for exporters were also raised. In the late 70s, the

Government even distributed rice at a controlled price. The scheme was later abandoned as the rich cornered and resold the bulk of the cheap rice in the open market. Operations of the Rice Reserve Commission ceased in 1990 as the world price of rice fell and the number of competing rice exporters rose (Siamwalla and Setboonsarng, 1991).

Previously Thailand imposed a tax on rice exports. This was done partly to raise government revenues but more so to lower the domestic price of rice. In the process, the tax lowered the producer price and the real incomes of rice farmers who had a surplus to sell. Recent studies have shown however, that Thailand's rice export tax worsened the incomes of the urban poor. The tax lowered the income earning prospects of unskilled workers and to a sufficient extent as to more than offset the benefit they receive directly in terms of lower food prices (Anderson).

At present, the Thai government is guaranteeing high prices for paddy pledged under a state rice price intervention program. In the 2001-2002 seasons, the government plans to spend up to 10 billion baht in buying 8.7 million tons of various types of paddy. The maximum price for fragrant paddy is 7,000 baht a ton compared to the 5,000 baht farmers have received recently. 2001 was a record setting year for Thai rice exports, with shipments amounting to 7.4 million tons. The Thai government faces two challenges in this year: shoring up rice prices and whittling down its own rice stocks. A trade co-operating group with Vietnam, Indonesia, China, Pakistan and Burma was announced, but exact details are still unknown. The Thai government insists the group will work to benefit the farmers and not distort world rice trade (Bangkok Post, December 31, 2001).

China

Food security is a vital issue for the Chinese Government. It feeds one-fifth of the world's population with a scant one-fifteenth of the world's arable land. In its shift from a socialist to a market-oriented economy, price and market reforms have been key components. In the late 70s, the price and market reforms were aimed at raising farm level prices and gradually liberalizing the market. Some of the reforms include the negotiated procurement of surplus production of grains, oils and most other commodities, introduction of above quota bonuses for cotton, tobacco and other cash crops, and flexibility in marketing of the surplus production of all agricultural products privately.

A second stage of price and market reforms was announced in 1985 aimed at limiting the scope of government price and market interventions and enlarging the role of market allocation. For instance, farmers and state commercial departments were to "negotiate" purchase contracts before the planting season at some weighted price. The intent was to gradually eliminate planned procurement of agricultural products; the government departments may only buy and sell at the market. The contract system however had a negative impact on agricultural production as the marginal price of producers declined (Sicular). A sharp drop in agricultural production and severe food price inflation stalled the implementation of the new policy. Mandatory procurement of grains, oil crops, and cotton continued at the "contract price." Contract prices were raised over time to act as an incentive to farmers. However, the increase in the nominal agricultural procurement price was lower than the inflation rate.

In early 1993, another attempt to abolish the compulsory quota system and the sale at ration prices was made. Both state distribution and procurement systems were successfully liberalized but the state compulsory quota system was reimposed in most parts of the country in 1994 and in all China in 1995 following higher food price inflation and the fear of food supply shortages. An important agricultural marketing policy was instituted in 1994-1995. The provincial governor's "Rice Bag" responsibility system was designed to strengthen food security and grain markets by making the local officials and governments responsible for balancing grain supply and demand. The policy contributed to increased output, more stable grain production and a reduction in short-run price fluctuations. However, it also affected the efficiency of resource allocation, farmer's incomes and the diversification of agricultural production.

China is once again initiating a new grain marketing and reserve system. The overall goals of the reform are to improve the efficiency of grain marketing system and to reduce the central government's burden in financing grain circulation and reserve system. It has liberalized most agricultural input prices and markets but the fertilizer market retrenchment policy of 1994 was weaker than the grain quota procurement policies. In 1995 and early 1996, all imports fertilizer imports were licensed and managed by government appointed trade agents.

Philippines

In the beginning of the 70s, the Philippines was one of the richest economies in Southeast Asia. The economy started to slide after that and in 1980-85; it registered a negative growth rate of 1.88% a year. The major reasons for the economic decline were faulty economic policies; current account imbalances rose, inflation could not be curbed, and external debts reached 90% of gross national product. There was a clear urban bias in the development expenditure patterns and land reform was implemented only halfheartedly. External factors, in terms of an adverse terms of trade for its exports and political instability were additional handicaps.

The agriculture sector accounts for some 20% of GDP and over 40% of employment. However, Philippine agriculture has been posting slower growth through the years, indicating that the country is losing its competitive advantage in the sector. Table 10 shows that the ratio of agriculture imports to agricultural exports has increased from 30% in 1960 to 160% in 1996 (David). The sector has thus been a net importer of foreign exchange. Measures of comparative advantage for the sector as a whole and for all major agricultural exports have also declined. For instance, in 1960, the agriculture sector had a comparative advantage indicator of 3.0. The similar figure for 1995 was 1.1. Sugar registered 22.0 in 1975; this was down to 2.0 two decades later (David). The indicator is measured as the ratio of the share of a commodity group in a country's exports to the commodity group's share of world exports. (Table 11)

Table 10. Agriculture's Share in Total Imports and Exports and Ratio of Agricultural Imports to Exports, 1990-96 (in per cent)

Year	% share to total imports	% share to total exports	Imports/Exports
1960	19	64	31
1965	21	63	36
1970	14	44	34
1975	10	54	26
1980	8	35	31
1985	9	26	46
1990	10	15	96
1995	8	11	126
1996	7	9	160

Note: Agricultural imports include nonagricultural inputs such as agricultural chemicals, fertilizers and machineries.

Source: David, 1999.

Table 11. Trends in Revealed Comparative Advantage in Agriculture and Selected Major Agricultural Exports, 1960-95

Year	Agriculture	Coconut	Sugar	Banana	Canned Pineapple
1960	3.0	131.8	15.3		
1965	2.7	145.0	21.4		
1970	2.6	211.2	22.0	29.3	
1975	3.8	224.1	12.1	30.4	82.2
1980	2.9	212.3	7.6	31.2	91.6
1985	2.4	212.3	3.8	23.4	70.2
1990	1.6	153.5	2.0	14.1	41.5
1995	1.1	131.8	15.3		

Source: David, 1999.

The Aquino administration corrected the policy and institutional distortions introduced during the Marcos regime. Export taxes, government monopoly over international trade in coconut oil, corn, soybeans and the marketing of sugar were removed. The agricultural bureaucracy was streamlined with the transfer to the Department of Agriculture of most agriculture-related agencies. However, these reforms proved difficult to fully implement. Price distortions were exacerbated by efforts to circumvent the agricultural trade policy reforms stipulated by the GATT-UR agreement. The Estrada administration declared the attainment of food security as the central program of his government. But food security is often confused with self-sufficiency in rice and corn production, two commodities highly political in nature.

Up to the 1980s, price intervention policies, both economy-wide and commodity specific created an incentive structure biased against agriculture. The bias has been primarily through the overvaluation of the peso due to the industrial protection system and other policies to support the deficit in the balance of payments. The various structural adjustment measures to correct the distortions in the economic sectors included trade policy reforms to remove quantitative trade restrictions and reduce the level and

dispersion of tariffs and liberalization of the foreign exchange market. Thus, the 20-30% overvaluation of the exchange rate dropped to 20% by 1992 (David). The real effective exchange rate appreciated strongly between 1991 and 1996, lowering the relative prices of tradable agricultural products. This was partly caused by the short-term foreign capital inflows attracted by the high interest rates due to the tight monetary policy. Until 1995, nontariff barriers such as quantitative trade restrictions, import prohibitions, price controls and government monopoly control in international trade were the dominant commodity specific policy interventions in the agriculture output market. Tariffs were more commonly applied to inputs and agricultural products not locally produced in significant quantity.

David estimated nominal protection rates for major agricultural commodities and found that exportable goods received no price protection at all. The changing rates of nominal protection over time reflect the government's attempts to stabilize domestic prices from the 70s till early 80s. However, after this period, there has been an upward trend in nominal protection rates, especially among the major import-competing agricultural goods. Sugar historically has been the most highly protected. Nominal protection rates for rice was over 50% in 1995 and 1996, a drastic reversal of rice price policy from pro-urban to pro-farm (Table 12). The 1997 peso devaluation reversed the rising trend as the government tried to protect domestic consumers from sharp increases in food prices. The government also authorized more rice imports to prevent domestic prices from rising, 1998 being an election year.

Table 12. Trends in Nominal Protection Rates of Major Agricultural Commodities, 1970-98 (in per cent)

Commodity	1970-79	1980-84	1985-89	1990-94	1995	1996	1997	1998
Rice	-4	-13	16	19	63	91	82	34
Corn	24	26	67	76	104	54	96	72
Sugar	5	42	154	81	91	93	66	99
Copra	-17	-28	-6	0	0	0	0	0
Coconut Oil	-4	-4	7	18	10	5	0	0
Des Coconut	-4	-4	0	0	0	0	0	0
Bananas, Pineapple, Tobacco, Abaca	-4	-4	0	0	0	0	0	0
Pork	6	-9	43	31	44	n.a.	n.a.	n.a.
Chicken	34	46	39	74	84	n.a.	n.a.	n.a.

Source: David, 1999.

The policy-induced biases against agriculture mentioned above gave rise to an effective resource transfer out of the agricultural sector. Offsetting this was the amount transferred directly into agriculture through government spending via input price subsidies and public investment. Bautista cites that calculations by Intal and Power of the net annual resource transfer out of agriculture from 1970 to 1982 point to an average of more than 20% of agricultural value added in real terms. The corresponding estimate is less than 5 % for Malaysia, where trade and macroeconomic policies were much less discriminatory.

The Philippines is a signatory of the World Trade Organization. Ideally, membership in the WTO can set the path towards a price intervention framework for Philippine agriculture, improved market access and better world prices for the country's agricultural exports. However, the agreement itself and the manner of implementation suggest that none of the benefits may be realized (David). The rice sector, a heavily regulated commodity is exempted from tariffication for the next 10 years because as a food staple, rice is a politically sensitive commodity. Furthermore, while the quantitative restrictions were lifted in April 1996, applied tariffs that are equal to the high binding tariffs (mostly 100%) were applied. These binding tariffs are higher than the nominal protection rates under a regime of quantitative trade restrictions. These binding tariffs are also higher than the book tariff rates under EO 470, which programmed the tariff reduction for a wide range of goods. Although the applied tariffs are scheduled to decrease in the next decade, they will only be about equal to or even higher than the tariff rates in 1995 under EO 470. In summary, the country's drift towards increasing protection for agriculture has not been prevented by the WTO agreement. This is due to the high binding tariffs and the exception of rice in the coverage.

Thus, the Philippine Government from time to time intervened in the agricultural markets and fixed prices, primarily to soften the impact of price shocks on both consumers and producers. The domestic price of rice in the 70s and 80s were generally below border prices as a result of input subsidies (on fertilizers, credit and other inputs) and "stock and release" strategies of the Government. However, in the 90s, price protection was reduced following the progressive removal of trade barriers. In the 70s, the Marcos administration had the exclusive rights to import wheat, soybean and other edible items. A Food Terminal Inc. was set up to process, store and market food items. It also had the responsibility of selling low priced basic food in urban outlets through the Kadiwa outlets. This set-up together with measures to increase food production (as result of superior rice technologies and subsidized inputs) aimed at providing cheap food. The program was formally ended in the late 80s, because of budgetary constraints, inefficient implementation and poor harvests over prolonged periods. Export taxes on such commercial crops as sugarcane and soybean were also abolished. Meanwhile, the National Food Authority has the monopoly of all rice imports with the government setting the total limit or QRs on the amount that may be imported. The Philippines was granted exemption in 1995 for the removal of QRs on rice. Said exemption from the tariffication of rice QRs will expire December 31, 2004.

The ASEAN Member Economies

The experiences of the five economies briefly discussed above point to common themes but sometimes-different economic policies. As earlier mentioned, improving domestic production and beefing up of supplies through imports were used to ensure food supply. Input subsidies to keep cost low and output price controls to keep food prices at reasonable levels especially for urban consumers were implemented. A definite move away from administrative or government intervention for targeting food supplies to the poor can also be noted, except in special circumstances. The stabilization of rice prices was also a priority for these economies. The world price of rice fluctuated widely during the 70s and 80s, with the coefficient of variation reaching 39%. In contrast, the coefficient of variation was 19% in Indonesia, 25% in the Philippines, and 13% in Thailand for the same period.

Since poverty is concentrated in the rural areas and agriculture is the main occupation of the rural workforce, agricultural development was given high priority in the effort to reduce poverty incidence. Self-sufficiency in food was an important objective of the development strategy. In recent years, though, the urgency attached to agricultural growth has diminished. Malaysia directs its poverty alleviation in the rural areas to high value added agriculture. Since paddy production does not mean this criterion, the small farmers were encouraged to plant rubber, with infrastructure support from the state. In more recent years, small farmers were encouraged to grow palm oil. By not targeting self-sufficiency, resources were freed up for high value crops. In Thailand, a more concerted approach was made to encourage non-farm activities in the rural areas. In Indonesia and the Philippines, the emphasis continued to be on improving productivity in cereals production. The Philippines was the first country to start with a paddy-based Green Revolution. Indonesia also took the route of intensification of its cereal economy with its Bimas program and later with its Inmas program.

In one form or another, the selected economies have organized public distribution of food grains. Thailand made arrangements for subsidizing food grains for those who wished to take advantage of the offer. In Malaysia, an administered price regime was introduced with highly subsidized rice distribution, the subsidy element amounting to some 40%. The Philippines has targeted subsidized food in selected areas through special development assistance programs. Chinese policy kept food price artificially low by replacing free market operation with state compulsory agricultural procurement, planned production and food rationing.

<u>Indonesia</u>	<u>Malaysia</u>	<u>Thailand</u>	<u>China</u>	<u>Philippines</u>
protected agriculture by: input subsidies, set up a agency to provide a market for rice, set floor price, stocks were acquired to serve as buffer stock and for use in open market sales	aimed at improving yields; but also arranged to buy rice to provide a steady market and to provide a support price; did not target self-sufficiency in rice in the process freeing up resources for other high value crops like palm oil	set up a Rice Reserve Commission to establish buffer stocks through open market sales/purchases; to protect urban consumers, a consumption subsidy of 10% was offered; at present, has a state price intervention scheme to provide support price for rice farmers	shifted to market economy with price and market reforms; in the 70s, reforms aimed to raise farm level prices; in mid-80s, reforms aimed at limiting government price and market interventions; in 1993 attempted to abolish compulsory quota system; Rice Bag program made local governments responsible for balancing supply and demand	government intervened from time to time and fixed prices; input subsidies resulted in lower domestic prices of rice; in the 1990s, removal of trade barriers were implemented, export taxes were abolished and government monopoly over certain commodities was removed; agriculture bureaucracy was streamlined

F. Patterns in Trade Specialization

Yanagida and Tian (1995) examined trade specialization and trends in selected trade indices (revealed comparative advantage –RCA and revealed competitive advantage- RC) for 42 economies in the Pacific Basin and Asia, covering such principal crops as wheat, rice, coffee, cocoa, tea, spices, vegetable oils and natural rubber. A RCA index with value greater than 1 would imply comparative advantage or specialization of trade in that commodity by the economy while a positive RC measure demonstrates that an economy has a competitive edge in producing and trading the commodity. Their results show that economies having RCA values larger than one and having positive RC values are similar. Economies that specialize in export trade for a particular commodity has a competitive advantage in that commodity (Table 13). In the case of wheat trade, Australia has a clear competitive advantage. China and Vietnam both have competitive advantage in tea and spices while China is competitive in rice and Vietnam in coffee and natural rubber.

Table 13. RCA and RC Indices for APEC Member Economies

Commodity	Countries with RCA > 1	Countries with RC > 1
Wheat	Australia	Australia
Rice	China, Thailand, Vietnam	China, Thailand, Japan, Australia
Coffee	Indonesia, Philippines, Singapore, Papua New Guinea	Indonesia, Philippines, Singapore, Thailand, Vietnam, Papua New Guinea
Cocoa	Indonesia, Malaysia, Singapore, Papua New Guinea	Indonesia, Malaysia, Papua New Guinea
Tea	China, Indonesia, Singapore, Papua New Guinea, Brunei	China, Korea, Indonesia, Singapore, Vietnam, Papua New Guinea, Brunei
Spices	China, Indonesia, Malaysia, Singapore, Vietnam, Brunei	China, Indonesia, Malaysia, Singapore, Vietnam, Brunei
Vegetable Oils	Indonesia, Malaysia, Philippines, Singapore, Papua New Guinea	Indonesia, Malaysia, Philippines, Singapore, Vietnam, Papua New Guinea, Japan
Natural Rubber	Indonesia, Malaysia, Singapore, Thailand, Vietnam, Papua New Guinea	Indonesia, Malaysia, Philippines, Singapore, Thailand, Vietnam, Papua New Guinea, Brunei

Source: Yanagida and Tian, 1995.

A more recent and updated study of a similar nature for the APEC member economies was done by Anderson in 2000, albeit the food and agricultural sector was treated as a whole. Table 14 computes for the food and agricultural trade specialization index and grain self-sufficiency for various APEC economies. The index is defined as exports minus imports of food and agricultural products as a ratio of export plus imports of those goods. The index spans the range of +1 to -1; an economy has a stronger agricultural comparative advantage (or disadvantage) the closer its index is to +1 (or -1). Topping the list are New Zealand, Australia, and Chile. Those at the bottom on the other hand, include Japan, Russia, Taiwan and Singapore. Grain self-sufficiency varies widely among the APEC economies. Most East Asian economies have chosen policies to ensure that they are close

to being self-sufficient in rice but with the increasing demand for flour and livestock products as incomes and urbanization grow, their wheat and feed grain imports have expanded considerably, leading to a decline in self-sufficiency.

Table 14. Food and Agricultural Trade Specialization Index and Grain Self-Sufficiency, Various APEC Economies, 1995

APEC Member Economies	Specialization Index	Grain Self-Sufficiency (in %, 1995)
New Zealand	0.75	85
Australia	0.73	401
Chile	0.52	71
Thailand	0.37	65
Peru	0.28	48
Malaysia	0.22	36
United States	0.21	151
Canada	0.19	170
Indonesia	0.1	n.a.
Vietnam	0.08	100
Philippines	0.04	95
China + Hong Kong	-0.01	100
Mexico	-0.09	n.a.
Singapore	-0.24	n.a.
Chinese Taipei	-0.37	22
Korea	-0.67	25
Russia	-0.73	n.a.
Japan	-0.92	30

Source: Anderson, 2000.

Anderson also notes the strong complementarities between trade patterns among the APEC economies; therefore, a bias toward intra-APEC trade because of relative proximity and cultural affinities would ensure that most of the benefits from opening up markets would go to other economies in the region. Moreover, about 70% of APEC food trade is intra-APEC. Thus, regional cooperation would promote the welfare of these economies.

G. Solving the Food Security Problem and Areas for Cooperation

Inasmuch as food security means making food available and affordable to citizens of a country, tackling the food security issue necessarily involves more than one strategy. An obvious strategy is increasing food production and improving yields. Another strategy is improving access to food, which means providing markets, investing in infrastructure and providing employment opportunities. A less obvious and perhaps least understood strategy involves improving food utilization which means reducing the waste in food preparation and reducing hunger and malnutrition not only at the household level but also at the regional levels. It also means proper biological use of food through adequate diet, water sanitation and health care. Finally, sound macroeconomic policies including a clearly defined food security policy are also essential.

The following strategies follow from the definition of food security and its key elements of availability, stability and access. They may be interpreted as policies that purely promote domestic food security but there is room for cooperative action in some like in the areas of promoting technological change and expanding markets.

Enhancing Food Supplies

Enhancing food supplies can be done via encouraging technological change, increasing the efficiency of irrigation, and improving natural resource management.

1. Encouraging Technological Change

The *Agricultural Biotechnology in the Developing World*, an FAO publication lists the national biotechnology programs as well as the bilateral and multilateral assistance involved in these programs. Majority of the external assistance is country-specific and is generally concerned with the provision of infrastructure and equipment and postgraduate training. A few of the regional/international biotechnology activities are the following: UNIDO's International Center for Genetic Engineering and Biotechnology, FAO/UNDP project - Biotechnology Development for Animal Production and Health, Asian Program for Small-Scale Agricultural Biotechnology, and the Cassava Biotechnology Network. It is vital that future increases in agricultural production be achieved through yield increases. This can be done by preventing or minimizing pre-and post-harvest losses, raising actual yields closer to production potential and raising the production potential.

Among the major crops in the region, rice appears to have the biggest chance of gaining from advances in biotechnology. Current technologies being used on rice include DNA fingerprinting for identification of genetic variation in pests, pathogens and rice populations, molecular marker-aided selection, and genetically engineered tungro-resistant rice lines by the International Rice Research Institute. There are other transgenic crops such as virus-resistant potatoes and soybeans and the hybrids of sunflower. Biotechnologically derived biopesticides, biocontrol agents, and biofertilizers will be developed in the future.

With regards to animal production, a cooperative regional network on nucleus herd breeding system can be started. Several economies in the Asia Pacific region have a standardized multiple ovulation and embryo transfer technology, which could produce, desired sizes of breeding populations. A cooperative program on buffalo biotechnology, including improved efficiency of embryo transfer and initiation of a buffalo genome project is encouraged.

To promote a cost-effective and widespread use of fish hormones and vaccines, the regional capability for production and sharing of these products should be improved. Biotechnology can be applied in the production of fish feed using local resources to boost and sustain the aquaculture industry in the region.

Unfortunately, much of the biotechnology programs being undertaken are unfocused. Work must be diverted to the crops and animals of importance to the country or region and to the biotic and abiotic stresses these commodities face. The commodities with high food and non-food values in local settings, but of little significance to the capital-intensive

markets of the industrialized countries (often referred to as "orphan" commodities) should receive due attention from local biotechnologists. Commodities such as coconut, oil of palm and buffaloes are almost monopoly commodities of the region and responsibility for their biotechnological improvement falls primarily to the countries of this region.

In this regard, each country could establish a national biotechnology committee comprising of government agencies, universities and scientific academies, mass media, industry, and financial institutions (Swaminathan). A reasonable budget must be allocated for basic biotechnology research and policies should promote public-private sector involvement.

2. Increasing the Efficiency of Irrigation

Irrigation has contributed much to the production hikes seen in the last decades. However, urban and industrial users have been increasingly competing with agriculture in the use of water. Therefore, there is a need for all sectors to improve the efficiency of their water use. Improving incentives in water uses, such as establishing water markets, clarifying water rights, and pricing water to reflect its true value are possible policy measures (Ayres and McCalla)

3. Improving Natural Resource Management

Better natural resources management together with projects that aim to intensify agricultural production is another avenue to enhance food supplies. A community-based approach to resource allocation, enforcement, and maintenance can be incorporated in the new agricultural development projects. Ayres and McCalla cite the social forestry projects underway in Asia as an example as well as the major watershed rehabilitation project in the Loess plains in China which include the terracing of slope lands, the planting of orchards and grasslands, and the building of sediment control dams. As a result, farmers have doubled their crop yield and at the same time reduced soil erosion.

Improving Access to Food

Providing education and health services, strengthening and expanding markets and agribusinesses, investing in infrastructure, and fostering broad participation are some of the ways to improve the people's access to food.

1. Education and Health Services

Even though it has long been accepted that education and health services are linked with poverty reduction, it still bears mentioning that better educated and healthier people make for a more productive population. Providing education and health services to women is especially vital since women have a major role to play in growing crops and in reducing hunger in their families.

2. Strengthening and Expanding Markets

Growth triangles, a uniquely Asian strategy, aim to increase economic cooperation among participating economies in an economic sub-region. They are the result of multilateral

incentives to stimulate economic growth by intensifying trade, investments and tourism in and around common border areas. The past years have seen the creation of a number of such growth triangles: (a) Singapore-Johore, Malaysia-Riau and Indonesia (SIJORI) Triangle; (b) Hong Kong, Guangdong and Taiwan or the South China Triangle (also called the Pearl River Delta Triangle); (c) Northern Sumatra, Northern Peninsular Malaysia, and the southern provinces of Thailand called the Indonesia-Malaysia-Thailand Triangle and (d) the Brunei Darussalam-Indonesia-Malaysia-Philippines-East ASEAN Growth Area (BIMP-EAGA).

The BIMP-EAGA Growth Area is the youngest of these growth triangles, covering a population of about 45 million people and with a central goal of increasing trade, investment, and tourism through cross-border cooperation. Growth in the sub-region is envisioned to be fueled by local as well as overseas investment sources. The four participating governments are coordinating their efforts to enhance the implementation of economic policies and the development of needed infrastructure. The BIMP-EAGA is likewise envisioned as a loosely organized association so as to create broad avenues for private sector participation. Efforts to promote economic cooperation in the BIMP-EAGA can be characterized as market-driven and anchored on the private sector as the principal player in economic cooperation. Under the original agreement creating the BIMP-EAGA, 13 areas of cooperation were identified including expanding air linkages, sea transpiration and shipping services, fisheries, agro-industry, human resource development, and environmental protection and management.

As an offshoot, new airline routes have been opened linking such areas as Kota Kinabalu and Davao, Brunei to Sarawak, to name two. In the shipping sector, regular shipping services linking Zamboanga with Bitung in North Sulawesi are operational. Expanding transportation linkages

under the BIMP-EAGA is not only limited to connecting destinations within the area. Since its creation, there has been increasing interest in flights that would connect EAGA with other cities in the Asia-Pacific area such as Darwin in Australia.

3. Infrastructure Investments

Adequate communication, storage facilities not to mention roads and power supply are needed to help farmers obtain the information they need, store crops, and move them to market. Some 15% of production is lost between the farm gates and consumers due to poor roads and storage facilities, reducing farmers' incomes and raising urban consumers' food costs (Ayres and McCalla).

4. Encouraging Broad Participation

The broad participation of local stakeholders is a necessary input in development projects. e.g., income generating projects, sanitation projects. These projects are more likely to reflect the affected communities' priorities and are therefore more likely to be sustainable.

Improving Food Utilization

Integrating household food security and nutrition policy into rural development operations will assist in reducing hunger and malnutrition. Plans are underway to establish an Asia-

Pacific Food Insecurity and Vulnerability Information and Mapping System (FIVIMS), which can act as a food information and early warning system and provide directions for undertaking preventive and control measures especially when wide disparities in food availability occur. The focus of the FIVIMS will be people who are at risk or food insecure. By linking relevant databases being maintained by international agencies and other institutions, the international community will be able to better monitor food security trends at a global level and facilitate the mobilization of resources for all countries, paying particular attention to countries facing an inadequate and deteriorating food security and nutrition situation (Regional Office for Asia and the Pacific, FAO, Thailand).

The ASEAN Framework for Regional Cooperation

The Declaration of ASEAN Concord established the basic framework for regional cooperation including cooperation in the field of basic commodities particularly food and energy. Aside from increasing their cooperation in production, member countries will provide mutual assistance by giving priority to:

1. supplying the needs of member countries in times of emergency and
2. purchasing the exportable surpluses from member countries.

To implement the Declaration, the ASEAN economic ministers in 1976 adopted the principle of the first refusal in times of special circumstances (i.e., in times of shortage or glut) for food especially rice. A Committee on Food, Agriculture and Forestry was asked to study the feasibility of establishing buffer stocks and buffer stock arrangements which resulted in the establishment of a regionally coordinated system of food security reserve. An ASEAN Food Security Reserve Board was established whose duties included managing a regional emergency rice reserve, the periodic evaluation of the ASEAN food situation and providing information of food security policy development in the member countries. A regional emergency rice reserve of 50,000 tons was initially set. This was later increased to 53,000 tons when Brunei became a member. At present, the earmarked quantity of ASEAN emergency rice reserve stock is 87,000 tons broken down as follows:

Table 15. Earmarked Quantity of ASEAN Emergency Rice Reserve Stock

Country	Reserved Stock (m tons)
Brunei Darussalam	3,000
Cambodia	3,000
Indonesia	12,000
Laos	3,000
Malaysia	6,000
Myanmar	14,000
Philippines	12,000
Singapore	5,000
Thailand	15,000
Vietnam	14,000
Total	87,000

An emergency refers to states or conditions in which an ASEAN member country, after suffering extreme and unexpected natural or man-made calamity, is unable to cope with such state through its national reserve and is unable to procure the needed supply through

normal trade. Procedures for releasing rice from the Emergency Reserve were likewise formulated and include the member country directly notifying other ASEAN member countries of the emergency and the amount of rice required. The prices, terms and conditions of payment shall be subject to direct negotiations between the countries concerned. The office of the reserve board secretariat is in Thailand.

In addition to the above rice emergency reserve stock, the ASEAN in 1997 agreed to pursue further cooperation by promoting ASEAN food, agricultural and forestry products in the international markets. A common quality standard on specific commodities was agreed upon especially for products that would be recognized internationally. A strategic plan to consolidate existing and new initiatives in order to enhance the competitiveness of agricultural and forestry products is being drafted with 2003 as the intermediate target date and 2020 as the long-term target date. In 1998, in Thailand, it was decided that the Strategic Plan on ASEAN Cooperation in Food, Agriculture and Forestry should cover the overall cooperation in the three major sectors but with greater emphasis on strengthening food security arrangements in the region, enhancing the international competitiveness of food, agriculture and forest products and strengthening ASEAN position in international fora.

Last August 2003, East Asian agriculture ministers agreed to carry out a pilot project- the East Asian Emergency Rice Reserve. A steady supply of rice is key to regional food security, according to the joint press statement. Each member economy will keep a surplus stock while more economically advanced members such as Singapore could provide financial assistance to those in need. The management team to carry out the pilot project would be established early 2004.

Areas for Possible Cooperative Action Among the APEC Member Economies

The need for regional cooperation arises if a country's actions have benefits and costs that may spill over to other countries. The potential for collaboration increases if the total gains from doing so are greater than the sum of the gains of countries acting independently. Lessons may be learned by the late starters from the development experiences of the early starters. Regional programs will provide an opportunity for a transfer of experience between countries in tackling food security issues. Since political constraints and high transaction costs may hinder the promotion of a regional collection action, multilateral institutions like the FAO may help reduce the participation cost for individual countries through information exchange and policy dialogue as well as provide basic public goods such as upstream research in biotechnology. In addition, these institutions may have the comparative advantage in developing basic methodologies and guidelines at the regional level that may be later fine-tuned to the specific requirements at the national level. Cooperation may be on a country-to-country level but there will be more gains if countries as a group collectively work towards a common goal.

The APEC is home to one third of the world's poor. The APEC has put food security in its agenda but there has yet to be a set of comprehensive policies or programs regarding joint or cooperative actions to ensure food security. The APEC Business Advisory Council has proposed an APEC Food System, which would efficiently link together food producers, processors and consumers. The system will harness the resources of the region wherever these agents are located, in order to meet the food requirements of its peoples and

maximize the contribution of the food sector to the welfare and prosperity of all economies, whether food exporting, or food importing, developing or developed. The primary objectives of the APEC Food System are to ensure the long-term availability of food, at affordable prices, to all consumers and that the food sector contribute to sustainable growth and development in the region. Bearing the above in mind, cooperative action in the following areas is important:

- a. dissemination of technological advances,
- b. institutional development, and
- c. promotion of trade in food products.

The simple exercise involving Ohkawa's equation hint at a possible role for enhanced intra-APEC agricultural trade to enhance food security among the 21 member economies. The APEC member economies collectively can provide for its consumption needs in the three cereals, albeit the surplus figures differ. The greatest surplus will be posted for maize, followed by wheat. The least surplus will be posted for rice. The surplus figures point to a possible role for trade. However, trade in agricultural products, especially for certain commodities like rice and fresh fruits can be contentious. Rice is a highly sensitive commodity for economies like Japan and the Philippines and perhaps to some extent, Thailand, Vietnam and the United States. There are farmer and consumer groups 'to be protected.' In addition, international supplies are sometimes unreliable. The reliability of concessional and commercial supplies differs considerably. Worse, food aid sometimes has been used to get political concessions from the recipient economies. Unreliability has two meanings. Food supplies may be available but world prices are unstable and second, supplies may be unavailable at any price. Rice and white maize are major cereal staples for certain economies in Asia but their international markets remain thin. Thus, interruptions in trade flows can be quite costly for those who solely depend on the world markets. Also, there are areas where people prefer white maize whereas much of the world trade is in yellow maize. Thus, many economies see the logical solution for these failures is a policy of self-sufficiency. They see the solution to the food insecurity problem as beginning at the national level (Siamwalla and Valdes). These remedies will include large investments in food distribution systems, early warning systems that can be very costly and a mix of stock and trade policies. These economies must be made to see trade as a real possibility. However, barriers to trade, both quantitative and non-quantitative need to be addressed. An example is the issue of food safety and phyto-sanitary conditions. Institutional constraints should likewise be given attention so that the necessary structures will be in place for the enhanced trade that is projected.

Thus, the order of the above three areas where cooperative action may be pursued in no way reflects their rank of importance. Regional cooperation should be carried out simultaneously in all three fronts because they are intertwined with one another. Together with promoting trade, institutional development and the dissemination of technological advances should be pursued.

Regional Cooperation in Biotechnology

There is great potential for regional cooperation among the APEC member economies in the area of biotechnology. At present, the benefits of food related technology are confined to a small number of economies, resulting in uneven benefits throughout the region.

However, it must be stressed that work in the area must be diverted to the crops and animals of importance to the member economies and to the biotic and abiotic stresses these commodities face. The so-called "orphan" commodities should receive due attention from local biotechnologists. These would include coconut, oil of palm and buffaloes that are almost monopoly commodities of the region. Advances in biotechnology and technology-based methods of farm/crop management and food processing will improve food sector productivity, product quality and safety and minimize the harmful effects of food production on the environment. Regional cooperation in the area of harmonizing food-related regulations (as they relate to technology), the dissemination of these technologies in a manner consistent with market principles and intellectual property rights and the distribution of information on the most environmentally sound food production and processing techniques is greatly needed.

The ABAC is also suggesting the creation of alliances between "domestic champions" (i.e., entities capable of understanding and articulating technological advances) in each economy and "intellectual property (IP) owners" in other economies, with the aim of identifying and applying best practices in technology transfer. Private sector organizations and research organizations in each economy can be used to identify domestic agents and other suitable participants.

New technologies are not evenly spread across the APEC region. The new technologies are confined to the few and often richer economies. This is so because the poorer economies spend a much smaller portion of their agricultural value added on public agricultural research and hence end up importing and adapting technologies developed abroad. The other reason is because the private sector depends on sound property rights law being enacted and enforced before it is willing to invest in producing or transferring many of the new technologies (Anderson).

Scope for regional cooperation exists in: distributing information on more efficient and environmentally sound farm and food practices; disseminating ways to enact and enforce legislation to better protect intellectual property rights, the environment, and consumers so as to attract more private investment in technology transfer; and aiding governments in their support of those investments in farm technologies that are under-supplied by the private sector.

Regional Cooperation in Trade

Regional cooperation among the APEC member economies in the matter with respect to markets is another area to look into. The food sector of many APEC economies is much less integrated with international markets because of major obstacles to international food trade and investment. This has led to lower product prices for farmers and higher food prices for consumers than are necessary; and when prices are subsidized, there is a burden imposed on taxpayers.

An unmistakable trend in agricultural trade in the area is the shift away from bulk commodities to processed and consumer-ready products, a trend that has made agricultural trade more difficult to analyze. Many of the products are more perishable and require higher transportation costs per unit. This change has increased interest and shifted focus to concerns about food safety and sanitary/phytosanitary issues as well as the trade-off

between trade in processed products and direct foreign investment in the food processing sector (Coyle).

Promoting trade facilitation measures will reduce the cost of trade in food products such as a program of technical assistance to upgrade SPS procedures and the harmonization/equivalency of food regulation and control systems will enable the agriculture sector to play multifunctional roles in each economy and to achieve food security. Already, Thailand and Indonesia as well as Vietnam and China have formed a trade co-operating group in rice but the exact objectives of the group are still not clear.

The growth and composition of agricultural trade among the APEC member economies is the result of rapid economic growth and evolving policy reforms. Economic vigor comes from trade-oriented policies and not protectionist policies that close off a country from the global economy. Thus, harmonizing a broad range of policies, including macroeconomic policies as markets become more integrated through freer trade becomes more essential (Coyle). These include policies regarding quality standards, phytosanitary regulations as well as policies designed to stabilize prices. For instance, Canada is the third ranking market for US agricultural goods while the US is the most important market for Canadian agricultural products. The removal of Canadian rail subsidies made nearby US markets more attractive to Canadian wheat producers. Facilitating trade via harmonizing customs procedures and exchanging regulatory information on food safety standards will lower the cost of trading food products.

Thus, we see that as we promote trade we need to also make sure that the non-tariff barriers to trade are not erected. For some countries, issues concerning food safety are non-negotiable; help in harmonizing SPS procedures and food regulation and control systems will be necessary. Similarly, support in building the institutional framework to support the liberalized trade must be forthcoming.

The Formulation of A Food Security Policy Framework- An Integral Element

Before trade in agriculture can be promoted as a strategy to achieve regional food security among the APEC member economies, a food security framework must first be crafted. A key ingredient to achieving food security is the formulation of a food security policy framework that is collaborative and multi-disciplinary in character. Food security assessments could be made part of the region's policy framework. Thus, there is a need for a **clearer definition of food security for APEC member economies as a whole**. For instance, does food security mean self-sufficiency in rice? Or should Malaysia's policy of not targeting self-sufficiency be the example? A food policy of de-emphasizing self-sufficiency in rice must take into consideration the establishment of an appropriate and efficient price and supply stabilization strategy. One possible approach is a multilateral buffer stock arrangement in rice in the region, together with the US, which is the only major rice exporter outside monsoon Asia. Without such mechanisms, economies would be reluctant in abandoning rice self-sufficiency policies despite the great inefficiency costs. Thus, the multilateral approach to pursuing food security in rice must find its way into the discussion agenda of regional economic groupings like APEC (Habito, et. al). A closer study of trade-offs in resource allocation and prioritization within agriculture, e.g., rice vs. corn, coconut and horticultural products is also needed.

Thus while the empirical results show that the region collectively can achieve food security via trade, and while the specialization and RCA/RC indices point to strong complementarities between trade patterns among the APEC economies, unless the member economies agree on what food security means, there will still be some economies insisting on producing rice to achieve self-sufficiency. In addition, there will be economies hesitant on relying on trade because of two reasons: reliability of access to these imports and the economies' capacity to maintain food imports at their desired levels. Food import capacity is affected by prices and the other terms on which food may be imported as well as the foreign exchange situation. Countries who depend on food imports to a great extent are more vulnerable to shocks arising in the global food market. So unless these fears are addressed, there will still be economies that will strive for food self-sufficiency.

Let us take the case of rice. Rice remains an important food crop for the APEC member economies. Of the three major food crops, rice is mainly used as food; human consumption accounts for over three-fourths of total rice production and total caloric intake. Thus, further improvement of food security and nutrition will depend primarily on the greater availability of rice and whether it is affordable to more people. Rice moreover has become a "political" commodity. The question of self-sufficiency or self-reliance thus has become muddled. Political pronouncements have not helped either. Political leaders continue to send mixed signals that fail to provide clear policy directions. (Cabanilla) He cites the case of the government-sponsored Food Security Summit in 1996 where officials vowed to support self-sufficiency in rice and corn production. The Anti-Poverty Summit, which followed likewise, urged self-sufficiency in these two food crops. In the Philippines, Republic Act 8435, otherwise known as the Agricultural and Fishery Modernization Plan (AFMP) focuses on five major concerns including food security. The Department of Agriculture in coordination with other concerned departments or agencies shall formulate medium-and long-term plans addressing food security, poverty alleviation, social equity and income enhancement concerns based on, but not limited to, the following goals and indicators of development:

- a. increased income and profit of small farmers and fisher folk;
- b. availability of rice and other staple foods at affordable prices;
- c. reduction of rural poverty and income inequality;
- d. reduction of the incidence of malnutrition;
- e. reduction of rural unemployment and underemployment; and improvement in land tenure of small farmers.

Food security as defined in the AFMP refers to "the policy objective, plan and strategy of meeting the food requirements of the present and future generations of Filipinos in substantial quantity, ensuring the **availability and affordability of food to all, either through local production, or importation, or both** based on the country's existing and potential resources endowment and related production advantages and consistent with the overall national development objectives and policies. However, **sufficiency in rice and white corn should be pursued.**

The above pronouncement has led to certain groups and organizations that have vested interests to argue that genuine self-sufficiency in rice, not importation is the only way to secure the food security of the country. Problems with regards to the competitiveness of local production vis-à-vis other countries, they point out can be resolved through the

promotion and adoption of more efficient production and post harvest processes as well as the rationalization of the rice marketing channels.

As earlier mentioned, Hossain and Sombilla point out that the Philippines need not attain self-sufficiency in rice production to achieve and sustain food security, citing the cases of Singapore and Hong Kong and Malaysia. But can the Philippines and the other APEC member economies depend on the world rice market to meet its needs through imports? If regional integration and cooperation means moving towards a common goal using a common strategy, what becomes important is that the **APEC member economies agree on what food security collectively means to them, what food items are important to each of them and the region in general so that regional integration and cooperation under the auspices of APEC can be promoted.**

Food supply security will be improved through cooperation and interdependence among the APEC member economies. This interdependent approach would be characterized by APEC economies producing and trading food in such a manner that trade complements domestic production and reserves as a means of assuring supply. APEC member economies should agree not to restrict food trade through embargoes, export taxes and other restraints except in exceptional cases. Thus, at the level of each national economy, the development of an extensive rural infrastructure as well as institutions is an integral component of building an efficient regional food system. The physical infrastructure will link food producers with processors and consumers and will mean more diverse sources of supply and more stable/secure food markets. At the regional level, therefore, the development of funding mechanisms to facilitate, reduce the cost of private sector investment in infrastructure is proposed. The FIVIMS, which will link several databases to allow us to monitor food security trends at both regional and global levels, can also be expanded to become a network system for immediate access to trade-related information.

In addition to the above concerns, Naya and Iboshi of the East-West Center (1994) have noted that the member economies of APEC are divided on how to achieve the goal of more liberalized trade. A group of member economies wants to concentrate on legalistic agreements and timetables while another group favors a more evolutionary approach. The split arises from differences in views regarding an Asia-Pacific “community.” The first group’s approach to Asia-Pacific cooperation is evident in the reports of the APEC Eminent Persons Group. The first report called for a clear endorsement of free trade and the setting of a target date for reaching that goal. In contrast, the “evolutionary” Asian view of economic cooperation calls for gradual development of regional ties. The ASEAN style can be characterized as “cautious, consensus-driven, low-key and proceeding at the pace dictated by the slowest member.” ASEAN however has its limits as a model for APEC.

The paper probably raises a few more questions and issues than it can answer at the moment. The simple exercise with the three commodities, namely rice, wheat and maize already identify economies likely to incur production shortages in the basic staples. The three are among the top commodities being imported in the region. Likewise, the list of top seven most common traded food commodities among the APEC member economies point to the possibility of food production specialization within the APEC once integration targets are defined and achieved. For instance, dairy products and eggs, which are imported by 17 of the member economies and exported by 8 member economies, is one

possibility. Wine and vermouth and alcohol products are another. Both Australia and Chile produce the product, which is among the list of top 7 imported commodities. Collaboration on expanding the harvest of fish and other fish products is another venture worth looking since inasmuch as 19 member economies import the product while 15 member economies import it. Wheat, flour and wheat equivalents also remains an important commodity; it is the number one ranked export in terms of average value. However, a more definitive statement on this matter has to wait until a closer examination of trade patterns and direction can be done. Likewise while the figures point to a potential role for trade to address regional food security concerns, it is important that the APEC member economies first collectively agree on a food security policy framework and tackle issues such as self-sufficiency and import vulnerability.

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