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FOOD AND AGRICULTURE IN ASIA TOWARDS THE YEAR 2000

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Abstract

On the basis of available food supply levels of Japan and the Asian NICs in the early 1980s, it is assumed that 2,600 calories represent available food levels needed for all Asian countries under full employment conditions. This level is substantially higher than estimates of Asian and WHO nutritionists (about 2,200). Their estimates are based on existing levels of unemployment and underemployment in South and Southeast Asian countries. The 2,600 calorie levels of available food supply corresponds to 2,300 to 2,400 of actual food intake levels, taking into account spoilage, wasters, and losses from meal preparations.

The food situation is most serious for South Asian countries, even though some of the countries (like India) are reported to be reaching self-sufficiency in rice. But this is achieved at low levels of per capita income and calorie intake of 1,800/1,900 with deficiencies in proteins, and other nutrients. In Southeast Asia and the insufficiencies and inadequacies in food intake are in the lower income families of peasants and laborers. For both regions, rice yields can be gradually improved with greater use of modern inputs, and it is in the non-rice food products (vegetables, fruits and animal products) that deficiencies are great. But eventually most of the rice needs can be met with rising yields during the rainy seasons of the monsoons through the use of modern inputs. Therefore, the need is for expanding production toward non-rice, diversified crops and animal products during the dry season.

Diversification of agriculture will lead to fuller utilization of rural manpower in monsoon agriculture; work will be available not only for the second and third crops, but also in the processing and marketing of the diversified crops (not to mention rural public works, noted above). This will enable rural families to raise their annual incomes and purchasing power for industrial products and services, thereby generating urban jobs, and reducing income inequalities. Japan, Taiwan and South Korea which succeeded in diversifying their agriculture in the past, should now stop protecting their agriculture and move toward reducing farm production. Their purchase of food from the other Asian countries will facilitate the shift to diversification in the other countries through export earnings, for mechanizing farming, processing, and public works. And as farm productivity rises, labor can be released to the other sectors, while improved nutrition will lower mortality with favorable impact on fertility and population growth.

FOOD AND AGRICULTURE IN ASIA TOWARD THE YEAR 2000

The Problem and its Significance

This paper deals with two issues: (1) what will be the food needs of Asians by the year 2000 and (2) what are the potentials, constraints, prospects, and policies of the agricultural sector in meeting the needs? The issue is important for most countries of Asia since food affects not only health but the vigor and intensity of work, while agricultural production involves the major use of inputs such as land, labor, capital, energy, raw materials and so on. The nature of the issue varies with countries and regions, less important for the rapidly industrializing countries and more important for the slowly industrializing countries. What is meant by food needs is difficult to specify precisely because food is consumed for various purposes, for health, for work energy, and for meeting a variety of tastes while the number of constraints found in monsoon agriculture complicate the outlook for supplying future needs.

Even for countries like Japan, Taiwan, and South Korea whose agricultural efficiency is high, the problems of agriculture, its relation to the nonagricultural sector and to the agriculture of other countries cannot be ignored and are dealt with at length in their Year 2000 plans. While for the city-states without an agricultural sector, the problem of earning foreign exchange to import food becomes vital to their existence.

For the ASEAN Four, which are approaching rice self-sufficiency, the problem is to find the crops to which to shift their agricultural production and/or to move faster into industrial sectors in order to

create jobs for their rapidly growing labor force. In both cases, there will be the need to find markets for increased output.

For most South Asian countries, food production is still too low for the vast majority of the population even though most of the labor force is working in agriculture. Thus, in three postwar decades of widely disparate growth of GDP per capita (6% in East Asia, 3.4% in the ASEAN Four, and 1.5% in South Asia), Asia finds itself divided into economies on three tiers of development in which the significance of agriculture and the levels of food consumption vary, even though there were no such wide differences at the opening of the postwar era. But the displacement of homogeneity with heterogeneity may open up prospects for a new scenario for regional cooperation in the rest of the century as will be discussed below, particularly with the rise of the yen to high levels.

Agriculture in monsoon Asia is a particularly troublesome sector because unlike most other regions of the world, the long dry spell of 4 to 6 months when the monsoon rains disappear makes the growing of crops, even feed for livestock, difficult without large investments in irrigation works. This, combined with the great labor-intensity of Asian paddy-rice cultivation, requiring large amounts of labor for transplantation and reaping with small knives and sickles, meant that a huge population of great densities needed for the rainy half of the year was largely redundant during the drier half of the year. The poverty of Asia, manifested by the fact that it has the lowest food consumption levels in the world (with caloric supply levels averaging below 2,000 in the beginning of the postwar era) was the outcome of the great labor intensity of paddy growing in small farms during the wet months and insufficient work during the dry months. Thus, the problem

of raising farm production and income was not simply that of raising yields per hectare but of constructing irrigation infrastructure which can accumulate water during the wet months and distribute it to the farms through rivers and canals after the rice was harvested. With low farm incomes, the domestic market for industrial products was small, and unable to support much industrialization, especially because during the dry months, peasant families had time to make their own clothing and housing needs.

In the postwar decades, Japan in the 1950s, Taiwan in the 1960s and South Korea in the 1970s were able to construct sufficient amount of irrigation infrastructure which enabled farming to be an all-year round activity, thus laying the basis for a rapid shift to industrialization. The additional crops per hectare (besides rising yields per hectare in the wet season) during the dry months enabled sufficient food to be produced during the year by a smaller labor force on the farm so that labor for the urban industries can move from the rural areas, and work throughout the year in the capital-intensive factories.[1/]

Historically, it was the insufficiency of labor to man the urban factories full-time throughout the year that retarded the industrialization

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[1/] Thus, the great rural to urban migration in Japan took place around the time when the absolute number of workers on the farm began to decline, Japan in the latter 1950s, Taiwan in the later 1960s and South Korea in the 1970s. This movement could not take place without the requisite urban demand but industrialization could have been retarded without the release of labor from the farms and without the increase in food production for the increasing population and higher per capita incomes. This problem is discussed in the latter portion of this paper.

of Asia in the 18th and 19th centuries. In the West, beginning with the rise of food production during the agricultural revolution which swept England from the 15th, 16th and 17th centuries, converting low-productivity manorial agriculture into large commercialized farming, labor was released for the industries and the share of the farm labor force decreased to 2/3 in England by the mid-18th century when the industrial revolution began. In Asia, agriculture continued to be combined with handicraft during the drier months while in the West agriculture increasingly became separated from industry, integrating crop growing with animal husbandry. Asia fell behind the West as the agricultural and industrial revolutions raised productivity and incomes both on the farm and in the factories while Asia continued to produce in small plots of land during the wet season and worked on handicrafts during the dry season. These were no match for the multiple-horse driven plows and mechanized spinning and weaving, so that the food and clothing produced per worker were much lower than in the West.

But even with irrigation and year-round farming, the problems of monsoon agriculture were not entirely solved in Japan, Taiwan and South Korea. The reason was that farm family incomes kept falling behind that of urban incomes once all-year round cropping reached saturation levels. Asian farms, typically one or two hectares in size, could only be a limited source of income increase even with multiple-crops, since yields per hectare rose very slowly, especially in the East Asian countries where yields were already very high (e.g., 4 to 5 tons of rice per hectare). Asia's civilization lasting over 1 to 2 millennia have lasted much longer than others and during the long period nearly all cultivable rice land has been taken up as

population rose so that there was not much room for expansion.[1/] Population grew as the traditional technology become more labor-intensive with the discovery of transplantation as a method of raising yields and of double-cropping which called for "back to back" reaping and harvesting and then putting in the next crop before the rains go away.

As a consequence, peasants demanded protection and subsidies to boost their incomes to keep up with the growth of urban-family incomes which rose rapidly with the rapid application of Western industrial technologies. The Western rice technologies were generally not applicable to Asia's tiny plots, due to differences in agronomical and climatic conditions, and where some of them were applicable, they required adaptations far more than for industrial technologies. The only solution for these countries is to consolidate the small plots into large-scale group farms using large machines and other technologies to raise productivity per worker which the small farmers are reluctant to do so. This is discussed in the latter portions of the paper.

Thus, it can be seen that the nature of monsoon agriculture raises a number of problems which may impede the expeditious march into the new century, and in the process posing issues which the other sectors cannot ignore. This paper will discuss in Part II the nature of the food needs and demand, and in Part III the potentials and constraints of the agricultural sector in supplying the food needs. Implications for

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[1/] See Chapter 1 of M. K. Bennett, The World's Food, Stanford University, 1954, where Chart B shows the enourmous rise in Asia's population share in the world population.

policies are found in Part IV. The general approach is to estimate food needs in calories, proteins and other nutrients per capita per day by the Year 2000, and then see how these targets can be met by the agricultural sector by the Year 2000.

II. Asian Food Needs by the Year 2000

The concepts of nutrient requirements, intake, purchased amounts, and available supplies should be differentiated. The food balance sheet approaches the estimation of available supplies for consumption by starting with totals of various types of foodstuffs produced by the agricultural sector, adding the quantities imported to arrive at the concept of food supply available for the year.[1/] From the available supply, deduction is made for "quantities exported, fed to livestock, used for seed, put to industrial and other non-food uses, or lost during storage and transportation" to obtain food available for human consumption.[2/] Then, applying food composition tables which list the amount of energy calories, protein, fat, vitamins, and other nutrients contained in each type of food, the nutrient content of the foods available for human consumption are obtained, which divided by the number of days in the year and total population give the fats

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1/ See FAO manuals and handbooks on the food balance sheet approach. One query I would raise at this point is the need to adjust for the inventory of foods left over from the previous year which should be part of the available supply totals. It may be that this information is difficult to get.

2/ FAO Production Yearbook 1980, Rome, 1981, page 9. Food balance sheets are reported to be estimated for 164 countries or nearly the entire world population, and like national income accounts have become valuable data set for a number of purposes.

calories, proteins, vitamins and other nutrients available for purchase, per capita, per day. These differ from the actual purchases of consumers reported in food consumption surveys by the amounts which are purchased out of the previous year's carry over stock and the amounts remaining unsold at the end of the present year.

Nutritionists often conduct surveys to measure the actual amounts of foods taken into the stomach since these amounts will differ from purchases because of the spoilage during the transport of food from the stores to the home, the leaving out of parts of foods which are not edible during cooking, and the leftovers from meals. These intake estimates expressed in calories and other nutrient quantities differ from the amounts said to be required by human beings for good health, estimated by WHO and nutrition institutes in various countries.[1/]

The difference in these concepts must be kept in mind in order to arrive at food consumption targets for the year 2000 as they differ significantly. In the case of the Philippines, calorie requirements for adequate health were 2036 per capita per day, but the calories available for consumption computed from the food balance sheets were 2600, while the actual intake was found to be 1808. In proteins, requirements were 50.8 grams, intake 50.6, and available for consumption 70.6 grams.[2/] (It is

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[1/] See for the latest estimates Handbook on Human Nutritional Requirements, World Health Organization, Geneva 1974.

[2/] See Second Nationwide Nutrition Survey, Philippines, by Food and Nutrition Research Institute, December 1983. In 1978 in the First Nationwide Nutrition Survey, October 1979, five years earlier, calorie intake was found to be 1804 compared to the available supplies of 2,500, while protein intake was 53 grams compares to supplies of 63 grams. Available supply data from food balance sheets of the National Economic Development Authority.

misleading to compare the available totals with requirements to compute adequacy or sufficiency rates as is often done.[1/])

As in all macro data, there are problems in all of the figures from the different concepts. The intake surveys are extremely expensive as they involve a number of nutritionists to watch and weigh the amounts consumed at the table during each meal, so that the samples must be small and confined to a few days in a year, and the surveys cannot be taken frequently in a decade, (taken every 5 years in the Philippines). The food balance sheet estimates can be easily carried out as long as detailed food production data are available. But the estimated production data may not be very reliable especially for the diversified crops, for fishery and livestock products. The coefficients assumed for food fed to animals, wastage and spoilage, used for manufacturing, and so on may be off by a wide margin. Foodconsumption surveys are also expensive to conduct and like the food intake surveys must be based on a small sample. Conceptually, the intake figures are the most relevant for our purpose as they come closer to meeting physical needs than the others. But in a broad survey of many countries overtime there is no choice but to depend on the food balance sheet estimates as they are the only ones available for most countries and over long periods of time.

In Appendix Table 1 estimates of available supply of calorie and protein from the food balance sheets in the postwar decades. The figures underlined for some of the countries in the table are approximately the years when full employment was reached: Japan in the late 1950s, South

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[1/] E. G., Philippine Statistical Yearbook, 1985, page 442.

Korea in the latter 1970s, Taiwan, Singapore and Hong Kong in the late 1960s or early 1970s, and Malaysia in the early 1980s.[1/] Note that for all these countries the levels of calories available per capita are in the 2600's. For these countries caloric levels in the late 1940s were below 2000 and steadily rose as employment increased until they were beyond 2600 in the early 1980s.

Calories are measures of energy needed by the body for basal metabolic processes (the human body even at complete rest needs energy for conversion of new organic substances, for new cells and tissues, for the actions of the heart, for breathing, for digestion, and for the functioning of other organs of the body).[2/] Also the muscles need energy for work, play, and other daily physical activities. With basal metabolic energy taking up about 1,000 calories for the typical Asian population of children and adults, the rest of the calorie intake will go to daily activities, the most important for blue collar workers being work activities of about 40 to 50 hours per week.[3/]

[1/] See discussion in my volume, Postwar Asian Economic Growth: A General Survey, forthcoming, Tokyo University Press, September 1986.

[2/] On basal metabolism, see WHO Handbook, op.cit., page 6.

[3/] The 1000 figure was estimated by R. F. Florentino, "Energy Requirements of Filipinos," Philippine Journal of Nutrition, Jan.-June 1986, and relates to the entire population. A Korean study on adult males doing moderate work found that roughly 1 calorie per minute goes to basal metabolic functions, and together with the routine domestic activities and recreation about one-half of the 3000 calories went to non-work activities. See D. J. Kim, K. S. Ro and K. H. Choi, Studies of Basal Metabolism and Energy Expenditure of Koreans in Daily Life, paper presented to the 11th Pacific Science Congress, August 1966.

It is necessary to link calorie levels to full employment. If it can be said that by the year 2000, all countries of Asia should be reaching full employment, a level in the 2600's may be thought of as a minimum goal to strive for in consuming food for energy purpose. From the food consumption point of view, there is an important economics rationale for full employment. The basal metabolic amount (roughly one-half of total caloric intake) can be regarded as a fixed cost that is constant for a given population throughout the year whether the population works full time, part-time or none at all. The most variable part of food intake may be calories for work activities which can fluctuate a great deal in monsoon Asia with long dry seasons. If unemployment, underemployment and part-time work can be eliminated or minimized, the percentage in total calories consumed for basal metabolic functions will decrease, so that in this sense there is a saving in food expenditures relative to income growth with fuller employment. Moreover, except for calories, the other nutrients including proteins are not connected with work activity levels and do not vary much, if any. Their intake is nearly the same for a fully employed or fully unemployed person (of the same age, body size, and sex in a given locality).[1/] This may be one of the factors underlying the fall in the Engel coefficient before full employment since in the early stages of development it is the cost of energy foods that

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1/ In "Food Consumption, Nutrition, and Economic Development in Asia," Economic Development and Cultural Change, July 1967, I cite the example where if the basal metabolic rate plus leisurely activities take 1500 calories, the first crop of rice may require 500 calories or a total of 2000 calories and the second crop will also require 500 additional calories. Hence, in a one crop economy, the cost is 2000 calories but in a multiple-crop economy producing double the amount of the one-crop economy, the food cost goes up only one-fourth.

dominates food expenditures. With the fall in the Engel coefficient, more of the rising income can be spent on industrial goods, thereby creating a larger domestic market for industrialization.[1/]

A level of 2,600 calories supply may appear high in the light of calorie requirements of 2100 and 2200 recommended by nutritionists. But the latter do not correspond to full employment levels of work activity. In monsoon Asia, the slack activity during the dry seasons over time immemorial has probably brought down requirements. FAO reports that:

"Experience shows that human beings have a remarkable capacity for adjustment to restricted calorie intakes. This is to some extent the result of physiological adjustments, for example, in the form of low body weight and low basal metabolic rate. Social adjustments is however, perhaps even more important in such circumstances. The whole manner of life is adapted to an insufficient supply of calories, with results that are socially undesirable: lack of initiative, avoidance of physical and mental effort, excessive rest."[2/]

Thus, a peasantwho is used to little or light work during the drier season will be eating light meals instead of 3 or 4 big meals during the

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[1/] For further discussion of points in the above paragraph, see "Seasonality and Underemployment in Monsoon Asia," Philippine Economic Journal, First Semester, 1971.

[2/] FAO, Calorie Requirements, Report of the Second Committee on Calorie Requirements, Rome, 1957, page 7. The Eskino in Alaska and

(continued in the next page)

busy months of planting and harvesting. His low calories intake will not show up to the nutritionists in the surveys in the form of underweightness, nor will he look tired and exhausted. The consumption and nutrition surveys are often taken during the dry half of the year when work load and food stocks are low, since it is easier to get respondents to cooperate in answering the long interviews during the slack season.

In a fully empbyed economy, time becomes more precious and there is an increase in the "hustle and bustle" of the population, which acts with greater vigor and vitality, enhancing productivity. More food is needed, offsetting some of the savings in fixed consumption for basal metabolism, as noted above.

We now go on to ask: what levels of actual food intake do available supplies of 2,600's imply? A comparison of several food intake surveys and available supplies from food balance sheets shows that the former are usually about 200 to 300 calories lower than the latter, depending on how good the intake surveys are, the agricultural production estimates and the coefficients used in the food balance sheets in various countries.[1/] The Philippine figures

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the Masai in the dry lands of Africa have adjusted to a meat diet with practically no fruits and vegetables, i.e., to a diet of very low levels of vitamin A and C. More recently, Japan which has been annually surveying working youths' body size has found that the weight of 29 years old working males has risen from 55.5 kilograms in 1950 to 62.8 in 1980 (by 13%) and the height from 164 centimeters to 170 (or by 4%). See Statistical Yearbook of Japan, 1983.

[1/] See the nutrition surveys sponsored by the U. S. National Institute of Health on eight Asian countries: Malaya, Vietnam, Burma, Thailand, Philippines, South Korea and Taiwan in the early 1960s cited in my Economic Development and Cultural Change, paper op.cit.

cited above for 1982 showing 2,600 taken from the food balance sheets and 1808 from the nutrition survey (for 1978, 2500 and 1804) are exceptional. The wide differences are due probably to the overstatement of annual agricultural production figures, especially for non-rice crops of the Ministry of Agriculture and Food, and understatement in the nutrition surveys. The overstatement in the former is shown by the fact that nearly all of the crop results of the 1980 Census of Agriculture were found to be lower than the Ministry's 1980 reports. In the 1960s there were several regional nutrition surveys conducted besides the United States sponsored one, all of them, showing intake levels of 1,800, and it is hard to believe that there was no rise in caloric intake between 1960 and 1980[1/]. The 1982 survey was taken from February to May which are slack months for the peasantry hence a low food intake was reported.

If we assume 200 to 300 calories as the difference, the actual intake target for the Year 2000 will be about 2,300 to 2,400 per capita per day or higher by about 200 or so than the intake requirements recommended by nutritionists for Asian countries. But there are reasons to think that intake levels of 2,300 to 2,400 may not be too high by the Year 2000.

First of all, our main interest is the peasants, laborers and others of the blue collar class whose lower incomes imply lower levels of food consumption, even though their work load is the heaviest; and under full employment their annual food consumption must rise from present levels if their employment and productivity are to increase. Various surveys indicate that even for countries where food consumption levels are not low, the lowest income groups doing heavy work are not consuming as much

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[1/] For references to the result of these studies, see The Statistical Reporter, January-March 1966, National Economic Council.

as the upper groups. It is ideal if we can target and strive for the elimination of all family income differences by the year 2000. But this is not feasible, and probably not desirable. Even under socialism like that of China under Mao, the attempt to pay equally to blue and white collar workers in the urban sector brought about an urban Gini as low as 0.2 but this equalization reduced work incentives and slowed down growth. And attempts are now being made to pay more to the educated class in order to get them to do more to modernize the economy. Off hand, a Gini lower than 0.3 and higher than 0.6 is not conducive to good work incentives and, therefore, counter-productive of growth. This does not mean that most countries in Asia should not strive for a strategy of development by the year 2000 that is consonant with lower income disparities but trying to equalize below a Gini of 0.3 may not be desirable. The strategy suggested in this paper of reaching full employment by multiple-diversified cropping will make a substantial reduction in income inequality, as noted below.

For most countries with the available surveys, food expenditures rise from the lower income groups to the higher income group, absolutely though not relatively to income (due to the Engel effect). And in most countries for which data are available, the absolute physical amounts of food consumed (in grams per capita) rise from the lower income to the higher income groups. In the more affluent NICs, the rise in food expenditures is mainly in the higher income elasticity foods (meat, fish, poultry products, and some types of fruits and vegetables). But in the ASEAN Four all categories of foods tend to be purchased more by the higher income families (on a per capita expenditure basis). In South Asian countries where per capita incomes are lowest, and calorie and protein

supplies (from food balance sheets, as shown in the Appendix table) are lowest, the cross section Engel coefficient from family income and expenditure surveys is rising or remains high and not falling in the lower income groups of India, Nepal, and Bangladesh (but probably not in Sri Lanka).[1/]

In the South Asian cases where the Engel coefficient is not falling, it is an indication that families are consuming insufficient quantities of food so that as incomes rise, more or the same share of income must be spent on food, especially when the rise in income is due to increased days and hours of work. And even in cases where the Engel coefficient is falling from high levels yet the absolute quantities of food (in grams) bought are rising rapidly, this is still an indication that most of the blue collar workers' families are not consuming sufficient amounts of foods. This characterizes the situation in most families in the ASEAN Four countries. In the case of most families in Japan and the NICs where both the Engel coefficient from low levels and absolute quantities (in weight) consumed are falling, expenditures on food are rising, as food consumption patterns are shifting from low elasticity foods (such as cereals and root crops) to high elasticity foods (such as meat, poultry, fish, more expensive fruits and vegetables, alcoholic beverages, and so on).[2/]

[1/] See A Survey of Employment, Income Distribution and Consumption Patterns in Nepal, 1976/77, National Planning Commission Secretariat, Kathmandu, Nepal, 1983; for India, Consumer Expenditure, National Sample Survey, 28th Round, 1973-1974.

[2/] Food consumption by family incomes are found in the following publications: Household Expenditure Survey, 1973, Malaysia. In Thailand no absolute amounts available but food expenditures except for grains and cereals rise positively with the size of incomes; Socio-Economic Survey

(continued in the next page).

There are other reasons for targetting higher food intake by the year 2000. In all countries of Asia the percentage share of population consuming less food will be falling. The year 2000 target of food intake corresponding to 2300-2400 calories (and proteins about 70 grams) is an average of different age and sex groups with different food needs. Children up to 9 years old need only about one-half the calories and proteins of adult males who are moderately active. Teenagers (10-19 years old) and adult women's need average about 85% of adult male needs.[1/] Although females of all ages consume less than males of corresponding ages the share of the population of the sexes are not expected to change over the years to 2000, although the increased share of adult females in the labor force may raise calorie needs. What is projected to occur is the aging of the population as birth rates decrease and life expectancies rise. The share of children (up to 10 years old) which comprise the lowest consuming group will decline from 23% of the total Asian population in 1985 to 20% in 2000. The teenage group is expected to decline from 23% in 1985 to 18% in 2000. These changes 43% of children and teenagers in 1985 to 38% in 2000 should raise the demand for per capita calorie and protein intake, only slightly offset by the

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1975-1976 Whole Kingdom, Thailand, Bangkok. In the Philippines: Food consumed per capita in grams rises positively with the size of income; Income and Food Consumption (Summary of 19 Economic Surveys), 1978 Ministry of Agriculture and Food; food consumed in grams per capita rises positively with income size except for cereals and vegetables; Second Nationwide Nutrition Survey, Philippines 1982, Food and Nutrition Research Institute, NSTA, 1983. For additional references, see my paper in EDCC, op.cit., July 1977.

[1/] See WHO Handbook, op.cit. The adult males and females are assumed to be moderately active and consuming 3,000 and 2,400 calories respectively. For very active adults the calories are 3,500 and 2,600, and for exceptionally active ones 4,000 and 3,000.

increase in the share of the aged group (60 years old and above) which is expected to rise from 7% to 9% from 1985 to 2000. The decline in the population share of children and teenagers will be greater in South and Southeast Asia than in East Asia.[1/]

But off-setting the age effect is the change in occupational composition of the labor force in the year 2000. The shift upwards from blue collar (especially farmers and laborers) to skilled work, and to white collar jobs, together with the greater mechanization of work operations in the farms, factories, offices, and homes using thermal energy in place of muscle power, should reduce calorie needs. The major impact of the shift to white collar work and more use of thermal energy may be on the demand for inferior grains such as maize, barley, low-grade rice and root crops such as potatoes and cassava which will fall absolutely as they did in Japan, Taiwan and South Korea.

Another impact is that of increasing urbanization. A study by Professor Ernesto Pernia shows that between 1980 and 2000, the share of urban population will be doubling in Bangladesh and Nepal, rising by about 50% in India, Sri Lanka, Southeast Asia, (except for Singapore), and China, and by 5 to 10% in Japan and the NICs. Using data on income elasticities for different foods, he shows that food consumption rises with urbanization.[2/]

[1/] Calculated from UN, World Population Prospects, New York, 1985.

[2/] See his paper, Implications of Urbanization for Food Policy Analysis in Asia- Countries, Population Research Institute, Nihon University, Tokyo, 1986.

All these effects, fewer children and teenagers, shifts to higher occupations, urbanization, higher female labor force participation, full employment, and more mechanization imply rising per capita incomes. Higher incomes, considered separately from the other effects, will have a major impact on the demand for food, both in quantity and quality, the former in South Asia, and latter in East Asia, and both in Southeast Asia. The Engel coefficient (the share of food expenditures in personal income) is high in South and Southeast Asia averaging during the first half of the 1980s in the range of 40 to 50% compared to the NICs 20 to 30%. In most South and Southeast Asian countries, the ration has fallen very slowly in the 1960s and 1970s in contrast to the NICs, perhaps reflecting the slow development of mechanization which involves the substitution of thermal energy for energy from foods.[1/] By the year 2000, the mechanization pace may quicken for countries in Southeast Asia, so that increases in per capita income may produce faster declines in the Engel coefficient than in South Asia. But for the majority of the blue collar workers in both regions the Engel coefficient is likely to remain high under conditions of full employment, so that the quantity of calories needed as incomes rise will remain high.

For Japan and the NICs and the white collar class in South and Southeast Asia, the increase in food demanded will not be for carbohydrates but for fruits, vegetables, legumes, and meat products. Fruits and vegetables

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[1/] Kilowatt per hour (KWH) of electricity per worker used in manufacturing more than tripled in Japan, Taiwan and South Korea in the postwar decades. See graphs in my paper "The Industrial and Demographic Transitions in East Asia," Population and Development Review, December 1983.

supply most of the protective nutrients such as vitamins; white corn, soybeans, cassava, etc. are feed crops for livestock, whose products meet the changing tastes for higher income-elastic foods. Thus, a major characteristic of agriculture by the year 2000 is a shift to diversification, i.e., away from rice production.

In planning for the year 2000, Japan targets per capita calorie and protein intake of 2,500 to 2,600 and 88 to 90 grams, respectively, slightly higher than the intake in 1980. Consumption of grains is expected to fall from 114 kilograms in 1980 to 88-94 kilograms, and for milk and dairy products to rise from 62 kilograms to 84-89 kilograms. Similar declines and increases are projected for Taiwan and South Korea in their outlook for 2000, although the absolute amounts targetted are not the same. The larger size Taiwanese will be consuming 2,800 calories with a much higher consumption of meat, 57 kilograms. The Koreans about the size of the Japanese but with lower per capita incomes by 2000 will be consuming twice as much grain as the Japanese and only about one-half as much of meat products as the Taiwanese but much more vegetables. These differences also reflect different dietary patterns with the Korean diet emphasizing vegetables much more than the Taiwanese diet, and the latter much more meat.[1/] Since these countries and the city-states will be highly industrialized and agriculture will become insignificant, the potential markets for diversified agricultural products will be considerable for Southeast and South

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[1/] See Japan in the Year 2000, Economic Planning Agency, Tokyo: 1983; Taiwan Economic Long-Term Outlook, 1985 to 2000, Council for Economic Planning and Development, Taipei, 1985; National Long-Term Development Outlook in the Year 2000, Agriculture Volume, Korean Rural Economics Research Institute, Seoul, 1986.

Asian countries.

III. Agriculture's Prospects: Potentials and Constraints

Shifting now from the demand side to the supply side, we look at what the prospects are as to the ability of agriculture to meet the needs of Asians for food levels of about 2,400 caloric intake or 2,600 available supply. This entails an examination of both the potentials and constraints, with emphasis on the latter in order to learn about the implications for policies toward the year 2000, particularly as they affect regional cooperation and trade relations.

The year 2000 studies of Japan, Taiwan, and South Korea, contain agricultural production projections.[1/] Japan expects to be importing half the rice requirements and most of the other foods by the year 2000. South Korea and Taiwan expect to be producing most of their foods but it will be argued in Part IV that the recent strengthening of the yen to 160-170 to the dollar may enable these countries to industrialize much faster than shown in their Year 2000 plans, so that their agricultural sectors will shrink faster than assumed at the time their year 2000 plans were formulated.

For Southeast Asia generally, the rise in rice production will be smaller than for diversified produce, as rice self-sufficiency is reached and only increases for a larger population and fuller employment need to

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[1/] Japan in the Year 2000, Economic Planning Agency, Tokyo: 1981; Republic of China, Long Range Plans for 1986-2000 by Economic Planning Council, Taipei: 1986, and Korea in the Year 2000, volumes by different agencies, Seoul: 1985 the former in Chinese and the latter in Korean.

be met. But for South Asia with the possible exception of Sri Lanka, rice production must be accelerated to meet present low consumption levels and future needs. For both regions, non-rice production will have to increase substantially as higher per capita incomes will induce shifts in food demand patterns to higher income-elastic foods and away from the grains and root crops. At a minimum, per capita incomes in ASEAN are expected to be rising at 3% and in South Asia at 2%.

To see how rapidly food production in relation to population has been growing, food production indexes are summarized in Appendix Table 2. In the 1960s, most of the countries in East and Southeast Asia have been producing food as fast or faster than population although the rapid food production of Japan, Taiwan and South Korea started in the 1950s. In South Asia, population grew faster than food supplies in the 1960s. In the 1970s, the situation changed, with food production growing slower than people in East and Southeast Asia while South Asia performed somewhat better in food production relative to population. But if both periods are considered, food supplies have lagged behind population in Southeast Asia, 4% for the former and 5.3% and even more for South Asia, 2.8% as against 4.3%. For both regions food has grown at 6.8% while population grew at 9.6%. Besides the unfavorable implications on the balance of payments, the impact on employment may become a problem as the labor force continues to increase and with uncertainties with respect to industrialization in the future.

If we look at diversification indexes, i.e., the extent to which countries are producing non-rice foods in the last decade and a half, the data available for Philippines and Thailand show that diversification

has been growing slowly in the 1970s and early 1980s as countries worked on the expansion of rice production. But with the approach of rice self-sufficiency in most countries, the shift to non-rice crops, fruits, vegetables, beans and animal-feed crops by the year 2000 should be faster.[1/] This implies that increasing rice yields per hectare in the wet season can be relied on to supply the rice needs of greater population, more employment and rising purchasing power by the year 2000, while the non-rice crops can be grown in the drier half of the year, through multiple-cropping which was the strategy pursued by Taiwan in the 1960s and 1970s.[2/]

Further diversification in South and Southeast Asia will depend mainly on irrigation, since new lands are limited in nearly all countries. As shown in Appendix Table 3, data on irrigated land as a percentage of total cultivated land indicate it is substantially lower in South and Southeast Asia compared to Japan, Taiwan and South Korea -- only about one-third on the average in 1982. (But note that in South Korea it is lower than in Japan and Taiwan but higher than in other countries.) This higher share in East Asia in part was the outcome of pre-war efforts by the Japanese colonialists who promoted more irrigation construction in order to enable

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[1/] See data from my paper "Agricultural Diversification and Employment in the Philippine Recovery Program," IBRD paper, 1986. The index was computed as a reciprocal of the sum of the square of each value added of 9 leading agricultural products including livestock, forestry and fishery products as a percentage of the total value of the selected agricultural products.

[2/] See Special Issue of the Philippine Economic Journal, Nos. 1 and 2, 1975, "Multiple-Cropping in Asian Development" which contains papers of a conference sponsored by the Council for Asian Manpower Studies and Joint Commission on Rural Reconstruction in Taipei; also the unpublished papers of a rural development conference in Manila, 1976, sponsored by the Council for Asian Manpower Studies.

these countries to produce rice to export for Japan's industrialization and militarization drive. Unfortunately, the Western colonialists were not rice-eaters and were mainly interested in plantation crops which did not require irrigation. Also in the early postwar decades, East Asia made a greater effort in building irrigation. Moreover, the quality of irrigation, particularly with respect to its suitability for use during the dry months, were not as good in other countries.[1/]

Water appears to be available for expansion of irrigation for the crops in the dry season in nearly all countries, with the possible exeptions of Thailand and Nepal where the average rainfall throughout the year and in the dry season is the lowest. But in Central Thailand, the Chao Phraya River brings water from the northern mountain ranges. But it is in the Northeastern region that intensified cropping is needed to reduce agricultural extensification to cut down dry season unemployment which is extensive in the Northeast.

Annual rainfall as shown in Appendix Table 3, is highest in Bangladesh, Burma, and West Malaysia but the most fortunate is West Malaysia with a good rainfall in the first half of the year. This is exceptional for monsoon Asia and makes Malaysia ideal for plantation tree crops which require rain throughout the year. (Also the sandy soil of most parts of Malaya favors tree crops over paddies.) This is also true with Sri Lanka with 30 inches of rain in the dry season.

[1/] ADB has underway irrigation projects in a couple of villages in Indonesia and Philippines, experimenting with methods which are most suitable for diversified crops on a small farms.

It is, of course, true that over the decades costs of extending irrigation have risen, something like twice the costs compared to a decade ago, as the irrigation of more readily irrigable areas have been completed.[1/]

Only a few countries appear to have made land suitability surveys evaluating soil texture, topography, climate and other conditions, testing their suitability for various diversified crops, and estimating the domestic resource costs for each crop. If one goes by the surveys for the Philippines, one can conclude that ample land are suitable for a variety of crops.

L. A. Gonzales has found that in the Philippines 10.6 million hectares out of 30 million were suitable for a variety of cropping patterns, of which the three major diversified crops for import-substitution, corn, soybeans, and cotton were suited to 3.7 million hectares.[2/] He found private profitability (private net profit as percent of gross revenues) high for the import-substitution crops (corn, cotton, and soybeans), and high for the potentially exportable crops (rice, garlic, peanuts, sorghum). For other exportable crops, the private profit rate was lower but positive, (mungbeans, cassava). For livestock, it was high for goats, carabaos and cattle and lower for hogs, broilers, and layers.

From a social point of view, based on domestic resource cost analysis and social profitability measures, Gonzales found that under conditions of

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[1/] Agriculture in Asia: Its Performance and Prospects, ADB Staff Paper, September 1984.

[2/] See his paper, "An Economic Perspective of Crop Diversification in Rainfed Areas: Implications to National and Regional Planning," The Philippine Journal of Crop Science, Vol. 9, No. 2, 1984. The most important, corn, was found to be suited to 1.5 million hectares.

foreign exchange constraints, "a strong economic argument of efficiency exists in the domestic production of current imported commodities (cotton, corn and soybeans), and potential export crops (rice, white potato, cassava, sorghum, garlic and peanuts)".[1/] Gonzales also found that except for broilers there was comparative advantage in livestock production. Even for broilers, the improvement in domestic corn production could change the situation. These results were obtained even though only a small part of diversified crop were grown with irrigation (only 1%) despite ample irrigable areas (58%). With self-sufficiency, investment funding for large-scale irrigation construction can be shifted to drainage, furrow and sprinkle systems for diversified crops.

FAO studies indicate that between 1980 and 2000 at least 43 million hectares can be added to irrigated areas in Asia as a whole. The largest part of this potential, 36 million hectares, is found in South Asia and the rest in Southeast Asia. The total cost in 1975 prices will be about 7 billion dollars, only 350 million per year.[2/]

Diversification entails greater commercialization and will require more facilities for transport, storage, electrification, communication and selling if prices of crops are to be brought down. In Taiwan in the 1960s

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[1/] Ibid., page 9. These measures, as in other quantitative indices, do not take into account qualitative aspects. But in the long run the quality of Philippine products can be improved, particularly under conditions of better institutional mechanisms, so that foreign exchange saved from import-substitution and earned from exports can rise.

[2/] See paper by V. S. Viyas and W. E. James, Agricultural Development in Asia: Performance, Issues, Policy Issues, paper presented at Asian Productivity Organization meetings on Development Strategies and Productivity Issues in Asia, January 1986.

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when diversification started rural roads paved had to be tripled, the number of trucks and railroad wagons increased 8 times, and cold storage capacity doubled.[1/] Data available for the paved roads for the early 1980s indicate that compared to West Malaysia's 10 kilometer per 1000 agricultural workers, the other countries in South and Southeast Asia have less than one-third with Bangladesh only 0.3 kilometers. Similarly, KWH of electricity per agricultural worker is far less than that of Malaysia.[2/]

Most important, institutional constraints must be removed. Viyas and James pointed out that in the past only two-thirds of the potentials of large-scale irrigation schemes have been effectively used because of the failure of organizational and institutional arrangements for distribution and maintenance of the existing systems, taking exception to the views expressed in models such as induced innovation that technological and institutional changes respond to factor endowments and prices.[3/]

The government plays a key role in agricultural development. But agricultural administration is difficult because it must deal with innumerable peasants widely scattered over the country, going through provinces, cities

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[1/] See paper by H. Y. Chen, "Farm Diversification and Product Marketing in Taiwan," Philippine Economic Journal, Nos. 1 and 2, 1975.

[2/] Data from official statistical yearbook; and the Statistical Yearbook for Asia and the Pacific, 1983, ESCAP.

[3/] Viyas and James, op.cit. Also my "Introduction, Summary, Prospects: A Report on the Rural Development Conference," sponsored by the Council for Asian Manpower Studies, Manila 1976.

and towns to the farms in the villages, some of which are not easily accessible. Branches of the agencies must be located in these places to transmit the messages and services which come from or up to the national ministry. Often the administration is either too centralized or decentralized, and without good cooperatives and other organizations, the messages and services such as extension must be delivered separately to each farmer, which is costly and perhaps less effective.

Hence, it is understandable that often there is much waste, confusion, discrimination against and unfairness to small peasants in the actions taken by governments. This is compounded in some countries by unefficient and corrupt officials on the one hand and by the passivity, ignorance, and fear of small peasants, resulting in unequal delivery of government services and benefits to different groups in the villages.[1/] If the national agencies are too decentralized, many lines of communication from the central government will be confusing for the peasants on the receiving side; and if too centralized the tendencies are to snuff our or suppress initiatives and self-reliance in the local governments and in the grass roots.

Governments have tended to discriminate against agriculture in their efforts to promote industrialization. Farm prices have been held down to

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[1/] See papers presented to the Rural Development Conference of the Council for Asian Manpower Studies, op.cit.

keep food prices low for urban workers and wage costs low for industries. The structure of protection and subsidies have discriminated against agriculture in favor of industries, while budgetary allocations have been insufficient for research, extension, and credit for agriculture.[1/]

Cooperatives and other farmers' organizations are essential to agricultural development. But unlike in Japan, Taiwan, South Korea and perhaps Malaysia, where nearly all farmers are members of associations, in most of the other countries only a small portion of the peasantry are members. And the existing associations are largely controlled by the big farmers and land owners. In countries like the Philippines where the government took the initiative to organize farmers' associations, the latter exist only on paper. In many countries, the marketing of diversified crops are monopolized by groups of traders, who through credit extensions and transport such as trucks, exercise extensive control in the purchase of inputs and the marketing of outputs.

Agrarian reform is needed in various countries or parts of a country where tenancy is prevalent. It was comprehensive land reform in Japan, Taiwan and South Korea early in the postwar era which got these countries started on the road to high growth. Limited reforms were carried out in some of the countries like the Philippines, India, and Sri Lanka. In Burma it was comprehensive but was not followed up with supportive measures such as credit, extension, and so on. Land reform laws have been enacted

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[1/] See papers in Food Trade and Food Security in ASEAN and Australia, by A. Booth, David, C. C., et al. Canberra: 1986.

in some countries but not implemented. The size of the landless workers group is rising to alarming levels in the Philippines, Bangladesh, India and Indonesia, such that land should be distributed to many of them if the stability of the countryside is to be maintained.

Although the main aim of land reform is to redistribute power in the village through more equal ownership of land, it will also be conducive to increased productivity, especially if supportive measures follow, as was clearly the case in East Asia. The more egalitarian the power structure in the villages, the better is the access to services such as credit, water, extension, transport, markets and so on of the lower-income farmers, and therefore more inputs to improve yields. The reduction of power of larger landowners will mean more democratic control and operation of cooperatives and other organizations which will respond better to the needs of the majority of small peasants. All this may, in the long run, promote self-reliance, improve skills of farm management, raise savings propensities, increase the purchase of farm equipment, and get the central government to improve its treatment of the agricultural sector, hence reduce its bias for the industrial sector.

Institutions work better if members are educated, trained, and well-informed. This raises the issue of manpower development for agricultural diversification. More than in rice-growing, diversified agriculture is commercialized and requires farmers to take care of the transporting and marketing of their products. Besides the marketing literature, they must be able to read about future prices and prospects for different crops and make the shift to various crops with the best future. And the market works best with such participants.

In the 1960s when Taiwan and Korea started diversification programs, literacy levels of the adult population were already around 60%, but in India, Nepal and Bangladesh they were below 30% in 1960 and below 40% in 1975. In 1970, years of school completed among Taiwanese and Korean farmers averaged 4.4 years, enough to assure that most peasants were literate. (Japanese farmers averaged 8.5 years in 1960.) Indonesian farmers averaged only 2.2 years in 1971, in the Philippines it was 3.9 years and 5.1 years in Thailand.[1/] The literacy figures suggest that large numbers of peasants in South Asia, Philippines and Indonesia may not be able to read the literature on diversified crops and their marketing.

The manpower problem goes beyond literacy and schooling and involves the acquisition of various skills. It was found by the Institute of International Rural Reconstruction in its rural development movement in the Philippines and Thailand during the 1950s and 1960s that the peasants were not only interested in literacy but even more in learning skills such as sewing, machine-repairing, mushroom culture, and other vocational skills. In addition to literacy and skills, manpower development must content with improving social values, attitudes, and habits. The Saemaul movement in South Korea started out with a strong emphasis on "spiritual uplift", i.e., changing attitudes toward work, thrift, consumption, learning, cooperation and self-reliance.

[1/] The data on years of school completed are from tables in my "Human Resources in Macro-Comparative Productivity Trends in Asia," forthcoming in the volume Development Strategies and Productivity Issues in Asia, Asian Productivity Organization, Tokyo: 1986. Literacy figures from World Development Report, 1980.

In monsoon Asia, it is the underemployment of agriculturists during the dry half of the year which must be solved to achieve full employment. It is this part of the year where the potentials for increased production and higher income for the peasants are the greatest. The experience of Japan and Taiwan (and now South Korea and China) points to the use of this idle labor in the growing of diversified crops, and in the processing of these crops in agro-industries through off-farm employment, as the best way to absorb the underemployed farm labor, once rice self-sufficiency is approached, because these crops tend to be labor-intensive.

In Thailand, for example, even without irrigation, crops such as kenaf, cotton, soybeans, cassava, peanuts, tobacco and leucaena tend to require as many mandays of labor per hectare as irrigated (136 mandays) and rain fed rice crops (120 mandays) while maize, castor bean, sorghum, and cotton require as many mandays as deep water rice (73 mandays).[1/]

In Indonesia, which has one of the highest labor requirements in paddy growing in Asia (360 days), in large part because work animals are scarce and human labor must be used for plowing. Maize and cassava require nearly one-third of paddy manpower (or approximately 100 days) while sweet potato,peanuts and soyabeans require about one-half (or 180 days). In Peninsular Malaysia, food crops other than cassava and sugar cane require on the average more mandays per hectare.[2/] In the

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[1/] Credit for Rotation with Alternative Crops, Bank for Agriculture and Agricultural Cooperatives, Bangkok 1982.

[2/] Input-Output Table of Thailand and Input-Output Table of Indonesia, Institute of Developing Economies, Tokyo: 1975.

Philippines, paddy requires an average of 66 mandays per hectare but all other crops average 132 days. The major commercial crops (banana, sugarcane, coconut and pineapple) is of the same labor-intensity as rice but the various vegetables require more than double the paddy labor.[1/]

In the Philippines, Thailand, and elsewhere outside of East Asia, labor requirements for diversified crops tend to be lower because they are not irrigated except in Java where much of the crops are grown in irrigated farms (and the use of animals is restricted). In Taiwan where crops are grown with even more irrigation, mandays per hectare in diversified crops are substantially higher than in rice-growing, averaging 319 mandays.[2/]

Despite the labor-intensity of monsoon paddy, labor absorbed comprises only a small proportion of the aggregate mandays expended in agriculture. For the Philippines where the requisite data are available for the computation, the estimated share of aggregate mandays (of 1920 million mandays) is only 11% (or 212 million mandays) for rice and 89% for all the other crops in 1985. The reason for this rather surprising result is that in rice, labor required is minimal after the transplanting is over and until harvesting begins since weeding is minimal when the crop is growing in the paddy, the other crops require attention throughout the entire season for weeding, watering, fertilizing, and so on.

[1/] Data from tables on labor utilization for 1982-1984 from the Bureau of Agricultural Economics, Ministry of Agriculture and Food, Quezon City: 1986.

[2/] Agricultural Statistics of the Republic of China, Directorate-General of Budget, Accounting and Statistics, Executive Yuan, Taipei: 1982.

Diversified food production includes livestock and fishery products. It is difficult to obtain data on mandays required per hectare for such activities. For the Philippines, we simply take from the national accounts the proportion of the wage bill in total value added in each of the two sectors to obtain 481 million mandays in livestock and 406 million in fishery.[1/] These estimates appear to be on the high side but even if we reduce them by one-half, it is surprising that so much labor is absorbed in producing livestock and fishery products. (Part of the mandays may include activities around the farm for processing, transporting, and selling the output.) Thus, in the Philippines three-fourths of aggregate agricultural mandays are spent on diversified food production.

The development of diversified agriculture entails the expansion of the agro-processing manufactures and the ancillary activities such as transporting, storage, financing, and marketing. Also to be included is the construction or irrigation, drainage, roads, piers needed for the agricultural activities. All these activities may be thought of as activities linked backward and forward as in input-output tables, and their expansion may be regarded as the acceleration effect, and the incomes generated set up multiplier effects. To arrive at a notion of their importance, the following

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[1/] Computed from aggregate mandays in Philippine agriculture, cited above, of 1920 million, less 212 million of rice and 686 million for other crops, leaving 1020 million mandays. From this, 135 million mandays were estimated for forestry activities and deducted out, leaving 887 million mandays for livestock and fishery. Mandays are used because employment statistics include many in farming who are not fully employed.

estimating procedures are presented, based on Philippine data sets.[1/]

The latest publication of the Annual Survey of Establishments, 1979, reports food, beverage, tobacco, wood and paper manufactures to employ 380,000 workers and generate ₱10 billion added value, both amounting to about one-third of total manufacturing employment. From the 1974 Inter-Industry Accounts of the Philippines, the main industries selling to agriculture are the chemical, petroleum, cement, metal product and machinery industries, accounting for ₱2 billion sales, or 12% of income originating in manufacturing in 1974. Non-manufacturing industries selling to agriculture are the public utilities, construction, financial institutions, transport, communication, storage, government and retail and wholesale trade, totalling ₱1 billion, or 3% of income originating in these sectors.

Mandays and income are roughly approximated for the Philippines by applying the above percentage shares to the 1984 income and employment originating in the respective industries. Net value added in manufacturing in 1984 was ₱128 billion and in other industries and services ₱143 billion (from national currents minus 10% for depreciation), a total of ₱171 billion. If we add one-third for manufacturing firms buying from and 15% for industries selling to agriculture, 48% or roughly one-half of ₱171 (₱85 billion) is obtained. From the labor force survey using the tables on average days worked, we estimate that a total of 4070 million mandays was worked by the entire work

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[1/] We go through these exercises in estimation in the hope that they will be helpful to other countries in drawing up their year 2000 plans in the future. Most countries have the data sets used in the above.

force. Since we have found that 1920 million mandays were used in agriculture, 2150 million mandays are left for nonagriculture. Multiplying by 48%, a total of 1032 million mandays is obtained for industries.

For public works (roads, ports, irrigation, flood control), the data available do not lend themselves for estimation of public works installed for agriculture. On the basis of infrastructure projects programmed for 1986 by the Ministry of Public Works, the Philippine planners have estimated that around 20 million mandays will be required. This includes public works for urban needs besides schools, national buildings and the like. We arbitrary take one-half of 26 million or 10 million mandays for our purpose, and one-eight of ₱5 billion total cost of the infrastructure program as income originating. Thus, total mandays in nonagriculture or the acceleration effect is 1042 million and income originating or value added ₱90 billion. From the national accounts, something like 260 billion pesos is estimated to originate in agriculture and related industries.

Incomes and employment generated by increased activities in diversified agriculture comprise multiplicands in the multiplier mechanism. The average propensity to consume in 1984 is about 92% of national income, if we use Philippine national accounts data. It is lower in the other countries but higher in Nepal and Bangladesh. We use a multiplier of 5, taking into account leakages from the multiplicand of about 30%.[1/] If 10% of the 260

[1/] For details of the multiplier estimation, see my paper in the Developing Economies, October 1986, entitled "Construction Boom in the 1970s." The multiplier of 5 may be on the low side because the marginal propensity to spend of peasant and construction workers families is higher than the others in the economy. The 1971 Family Income and Expenditure Survey of the Philippines shows that their marginal propensity to save is close to zero.

billion is the incremental income, a multiplicand of 20 billion pesos multiplied by 5 will give 100 billion pesos.

Thus, the required mandays in millions are: 212 for rice growing; 686 for other crops, 481 for livestock, 406 for fishery, 135 for forestry, 1032 for agriculture related industries and services, 10 million for public works construction, or a total mandays of 2750 million (leaving out rice). If there is an increase of 10% in diversified agricultural production, jobs created in the dry months will amount to 275 million mandays. In the 1985 labor force survey, those working less than 280 days (assumed to be annual full-time employment) needed 228 million days of work to be fully employed. Hence, a 10% increase in diversified agricultural production is probably sufficient to absorb those wanting more work. Additionally, a multiplicand of 20 billion pesos and a multiplier of 5 will imply a generation of incomes more than sufficient to absorb the surplus labor in the urban areas, including the new workers entering the labor force in the ensuing years as far as the Philippines is concerned.

Similar estimation should be made for other countries. For countries in South Asia with larger amounts of unemployment and underemployment, more than 10% increases in agricultural production (including rice) may have to be assumed and longer than 2 or 3 years must be taken. But this is appropriate since their food consumption levels are substantially lower than in Southeast Asia.

As we are concerned mainly with diversification in small farms similar to the experience of Japan and Taiwan, the distribution of farm family incomes should improve substantially. The lowest incomes in Asia

are found among the small peasants and the landless and they should rise not only with more crops per hectare but with off-farm jobs in the agro-industries and the labor-intensive industries of nearby towns. It is the small peasant and landless workers families with more surplus labor per family during the dry period. The experience of Japan, Taiwan and South Korea clearly demonstrates that income disparities fall substantially with multiple-cropping and off-farm employment, as discussed elsewhere.[1/]

[1/] Details are found in "Levels and Trends of Farm Families' Nonagricultural Incomes at Different Stages of Monsoon Development," Philippine Review of Economics and Business, September/December 1985, and also in a volume just published, edited by R. Shand, Australian National University, Canberra, August 1986, chapter entitled "The Significance of Off-Farm Employment in East Asia's High Growth."

IV. Summary and Policy Implications

The potentials are there but there is much to be done if the agricultural sector is to grow at rates of 3 to 4% in order to cope with population growth, and the rising demand for more food as per capita incomes increase and fuller employment is achieved, entailing food consumption levels corresponding to available calorie supplies of 2,600 per capita per day by the end of this century. These are the kind of problems that require ample time and funding to deal with and cannot be solved overnight. This is true not only of physical infrastructure construction such as irrigation, rural transport, rural electrification, agro-industrial enterprises and marketing centers, but also establishing new institutions and improving the old, problems of manpower development and human capital formation.

Agrarian reform is more than land reform, as it requires follow-up, supportive steps such as credit programs, wider extension systems, upgrading government's national and local administration and institutions such as research. Education needs to be extended to all the villages reaching especially the illiterate poor peasants, the landless, and women. To reduce birth rates, family planning, health and nutrition programs must be extended to all. These and other policies must be formulated now and implemented if the food and agricultural needs are to be met toward the end of the country. Hence, they must be central elements to be included in any plan for the year 2000, as they are in the year 2000 plans for Japan, Taiwan and South Korea where agriculture is no longer the dominant sector.

This implies that, in the plans to be drawn up for the year 2000 in South and Southeast Asian countries, adequate attention should be paid not

only to the agricultural sector per se but to the implications of its future needs and problems impinging on the other sectors. Thus, in employment and poverty policies, rural underemployment which lies at the core of monsoon Asia's idle manpower should be tackled while steps to raise low incomes and reduce poverty must contend with the rural sector where the lowest income families and the largest group of the poor reside. In population problems, the highest birth rates and death rates and the largest families are in the agricultural sector. Most critical in the conservation of natural resources is the problem of deforestation, as population pressures and food needs push cultivation into forested areas. Technological transfer planning should not be confined to industrial technology since the technology of diversified agriculture lags far behind that of Japan, Taiwan and South Korea.

There are two other areas which call for discussion. The development of agriculture will require adequate financing provided by the government. In countries like Burma, 4% of GDP is allocated to agricultural development but in the Philippines, Thailand, Malaysia, Bangladesh and Sri Lanka less than 2% is spent while in India only 1%. More should be allocated but this means that less would be spent on industrialization.[1/] But with such a sector as agriculture with one-half or more of the labor force, much more should be spent.

[1/] Data (circa 1982) from IMF, Government Finance Statistics Yearbook 1984, Washington, D. C.: 1985.

The most difficult problem in agricultural planning faced by countries outside of Japan and the NICs in trying to think ahead to the year 2000 relates to the plans drawn up by Japan, Taiwan and South Korea in their year 2000 volumes. In the targets for their agricultural sector, these countries are taking for granted that the structure of agricultural protection will be retained into the future. In all three countries, the plans for the year 2000 aim at increases in agricultural production for all diversified crops including livestock products, and only the production of low-income elastic crops such as rice, other grains and root crops are to be reduced from the early 1980s as domestic demand for these have reached satiation levels.[1/] In short, the assumption of these plans is that these countries are going to produce food in line with the present domestic demand and this means that the structure of protection will be maintained.

Tariff and nontariff bariers to the importation of food have been rising rapidly in the three countries especially from the early 1970s as may be seen in the table from S. Y. Shei and K. Anderson reproduced Appendix Table 4. Moreover, the Western industrialized countries have also erected barriers against several agricultural products as pointed out in the World Development Report, 1986, of IBRD. In addition, Japan, Taiwan and South Korea together with the Western countries have been holding on to some of their lower-value labor-intensive industrial production, making it difficult for the developing countries to make much headway in exporting to them. Countries like Australia, while leaving unprotected their agriculture, have protected their labor-intensive industries.

[1/] See Tables on page 78 of Japan in the Year 2000, p. 16 in the agricultural volume of Korea in the Year 2000, and p. 154 in Taiwan Long Range Economic Outlook, op.cit.

Under these circumstances, a major dilemma is posed for working out the year 2000 plans in the other countries, especially in ASEAN. How much diversified agriculture growth should they target if the barriers are to remain? If they are to plan just for their internal markets, the planned expansion is not likely to be large enough to reduce underemployment in the dry season to attain rural full employment. And with barriers against their labor-intensive industrial products, what else can they do but to turn to a second round of import-substitution with emphasis on capital-intensive industrialization. The latter will require extreme protective measures which would bar the industrial products of East Asia.

As noted elsewhere, full employment growth is necessary if the other countries in Asia are to attain high growth and expeditiously make their way through the agro-industrial transition by the year 2000, in the same way that Japan and the NICs attained full employment at various times in the postwar decades and then were able to accelerate growth with rising real wages and faster capital-labor substitution.[1/]

The year 2000 plans must be worked out with two scenarios: one assuming little change in the protective structure of the East Asian countries, as noted above, and the other assuming drastic changes. In the first scenario, detailed plans for the second-round of import substitution

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[1/] See data on wages, etc. in my note, "Towards a Model of Monsoon Asian Economic Growth," Singapore Economic Review, October 1984. On the relation of rapid growth and the demographic transition, see graphs in my paper, "The Demographic and Industrial Transition in Asia," Population and Development Review, December 1983.

should be made, including the structure of protection and subsidies needed for the new industries, the capital required, employment generated, and the growth rates implied. The other scenario should also be similarly detailed, but with estimates of how much each of the tariffs in each of the East Asian countries must be reduced in order for the other countries to be able to fulfill their agricultural targets with local consumption and exports. The plans must do the same for industrial products, particularly in the labor-intensive ones in which other countries want to export. When the first draft of these year 2000 plans are completed, a conference should be called to discuss the regional implications, with the participation of East Asian countries, Australia, New Zealand, United States and other countries interested in Asian trade.[1/]

What the two scenarios will portend for growth of the region as a whole towards the year 2000 may be drastically different. The first will mean slow growth with high capital costs, increasing unemployment and poverty, lower regional trade and the decline of regional cooperation, and more regional disharmony. The second scenario will just be the opposite but will be difficult to realize as the issues of trade and protection in all the countries are extremely complex and have ramifications for every sector of the economy and all classes of society. But the contrast in the two scenarios may be too disturbing to all concerned that they may provoke countries to take some action for a better future of the region.

1/ Countries like Australia seeking to sell more of their agricultural products are realizing that this will be difficult if their industrial protection is not lowered. See Economic Development in East and South-East Asia: Implications for Australian Agriculture in the 1980s, Bureau of Agricultural Economics, Canberra, Australia: 1984.

And some changes may be forthcoming. A major factor has emerged which in the long-run may be favorable to regional cooperation. And this is the appreciation of the yen to high levels in the recent month. One can assume that the yen will stay high for sometime since it is the product of enourmous increases in the productivity of the Japanese economy (especially industry) during the postwar era, perhaps unprecedented in the annals of history. Appendix Table 5 shows that Japanese industrial productivity has risen twice as fast as industries in the major European countries and four times as fast as United States industry.

If so, the strong yen is likely to hasten the industrialization of Taiwan and South Korea which has already begun to benefit from the high yen with accelerated exports in the two quarters of 1986. This implies that Taiwan and South Korea will soon face labor shortages in the cities and the exodus from the rural sector will speed up, leaving the agricultural sector with insufficient workers, as was the experience of Japan in the 1960s. The outlook for these countries has changed substantially from the years of slowdown in the early 1980s when the year 2000 plans were drawn up, and a faster phase out of agriculture may be feasible.

But more is involved in the high yen. One survey indicated that four-fifths of 73 presidents of large firms in Japan expect their companies to transfer parts of production abroad to where wage levels are lower.[1/] And the Ministry of International Trade and Industry has completed plans to

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[1/] See Japan Economic Journal, June 7, 1986.

assist a large number of small and medium firms to move out to Thailand, Indonesia and Malaysia in the coming years. With the high yen, the opportunity for better regional cooperation may have come but much remains to be done before other countries in Asia can draw up year 2000 plans which can look forward to a bright future toward the end of this century. This may be the time to bring matters to a head through the year 2000 studies of the APDC.

Appendix Table 1

Food Supply: Calories and Proteins, 1964-1982

	Calories per Caput per Day				Protein per Caput per Day (gram)			
	1964 1966	1969 1971	1974 1976	1980 1982	1964 1966	1969 1971	1974 1976	1980 1982
East Asia (simple ave.)	2374	2534	2642	2823	67.5	72.9	77.4	81.3
Japan	2636	2758	2789	2869	76.1	82.5	84.9	90.8
Taiwan	2270	2660	2720	2765	61.0	72.0	75.0	77.5
South Korea	2209	2456	2610	2938	56.1	64.5	73.4	82.1
North Korea	2318	2501	2769	3065	72.1	73.6	81.7	85.8
Singapore	2462	2682	2801	2937	59.6	68.9	75.3	76.0
Mongolia	2576	2434	2549	2753	105.6	95.3	97.6	97.3
Hong Kong	2534	2690	2685	2768	66.4	76.7	78.6	82.0
China	1991	2092	2216	2490	43.4	50.0	52.5	58.8
Southeast Asia	1989	2156	2268	2455	43.7	47.9	50.9	55.3
Malaysia	2274	2417	2500	2636	48.0	49.9	54.5	61.5
Philippines	1862	2026	2116	2405	43.5	48.1	50.4	54.3
Thailand	2067	2160	2211	2312	42.7	46.8	45.8	46.4
Indonesia	1705	1872	2048	2363	34.5	38.5	42.1	50.5
Brunei	2035	2305	2464	2558	49.9	56.1	61.5	63.7
South Asia	1901	2077	1979	2119	46.4	48.2	46.3	48.9
Sri Lanka	2222	2308	2040	2331	46.7	46.0	41.2	44.5
India	1966	1992	1921	2030	47.4	49.5	47.7	49.2
Burma	1374	2031	2082	2360	47.6	52.6	53.9	62.2
Bangladesh	2000	2033	1842	1869	43.5	44.2	40.2	40.4
Nepal	1943	2020	2010	2005	47.0	48.9	48.7	48.2

Note: For Taiwan figures are for 1965, 1970, 1975 and average of 1980 and 1982

Sources: FAO Production Yearbook 1984, Vol. 38, FAO, UN. Figures for Taiwan from ADB Key Indicators of Developing Member Countries of ADB Vol. XVI, April 1985.

In the early 1950s, when most countries reached pre-war peak levels of per capita incomes, food supply available for consumers was 1930 for Japan, 2100 for Taiwan, below 2000 for South Korea and Sri Lanka, and around 1700 for the Philippines and India.

Appendix Table 2

Growth Rates of Food Production, 1961 to 1983

	Food Prod. 1961-1972	Pop. growth rate in 1960s	1971-1983	Pop. growth rate in 1970s
East Asia(sim. ave.)	2.9	2.4	(0.2)	1.8
Japan	1.6	1.0	(0.7)	1.1
South Korea	3.1	2.6	0.6	1.7
Singapore	8.0	2.3	(2.4)	1.5
Mongolia	(0.1)	3.0	0.9	2.9
Hong Kong	1.8	2.5	(3.1)	2.4
China	2.4	2.3	1.3	1.4
Taiwan	3.6	3.0	1.7	1.9
Southeast Asia	3.1	2.8	0.9	2.5
Malaysia	4.4	2.8	0.1	2.5
Philippines	2.6	3.0	1.1	2.7
Thailand	2.9	3.1	0.8	2.4
Indonesia	2.5	2.1	1.5	2.3
South Asia	1.2	2.3	1.6	2.3
India	1.6	2.3	0.9	2.3
Burma	1.1	2.2	2.7	2.2
Sri Lanka	1.5	2.4	2.4	1.7
Bangladesh	1.2	2.5	1.4	2.6
Nepal	0.5	1.9	0.6	2.6

Notes and Sources:

1) Number in parentheses denote negative rates
2) The growth rate for Taiwan was computed using the 3 year moving averages data which used index nos. of agricultural production. All the rest used index nos. of food production.
3) Food production figures from various issues of FAO Production Yearbook and population data from various issues of IBRD World Development Report.

Appendix Table 3 Miscellaneous Data on Agriculture and Off-Farm Employment

	Farm land per worker (1000 ha) 1982	Average Rainfall in (in.)			% of irrigation to arable land			% of permanent land to arable land (1982)
		12 months	Wet	Dry	1969-71	1974-76	1982	
East Asia								
Taiwan		77.6	59.2	18.2	50.9	54.2	75.7*	
Japan	0.8	67.0	43.9	23.1	68.1	73.5	75.9	13
South Korea	0.4	78.2	57.9	20.3	46.2	51.4	57.1	6
China	0.4	36.6	25.3	11.2	41.4	43.5	45.9	3
Southeast Asia								
Malaysia	1.9	88.8	48.8	40.0	26.4	32.8	38.2	325
Thailand	1.2	47.3	41.3	6.0	16.0	16.2	19.5	11
Philippines	1.5	84.1	62.3	21.8	11.6	15.3	17.6	51
Indonesia	0.7	94.0	78.8	15.2	33.7	34.0	38.2	37
South Asia								
India	1.0	78.4	69.9	8.5	18 8	20.5	24.5	2
Sri Lanka	0.8	67.3	37.3	30.0	48.7	50.2	49.3	107
Burma	1.4	88.8	80.8	8.0	8 5	10.3	10.8	5
Bangladesh	0.3	96.0	83.4	12.6	11 9	15.2	20.2	2
Nepal	0.4	50.6	47.4	3.2	6.0	7.9	9.9	1

Sources: Farm land per worker and percent of irrigation and permanent land to arable land are from FAO Production Yearbook 1980 and 1983, pp. 50-52, 57, 65-66. Average rainfall are from Statistical yearbook for each country. Irrigation per arable land for Taiwan from Agricultura Yearbook of Taiwan 1974 & 1982 and Agriculture Census 1980, *1980.

Appendix Table 4

NOMINAL RATES OF AGRICULTURAL PROTECTION,[a] JAPAN, SOUTH KOREA AND TAIWAN, 1955 TO 1982
(per cent)

	1955-59	1960-64	1965-69	1970-74	1975-79	1980-82
Japan						
Rice	50	72	99	160	263	249
Wheat	37	62	97	127	276	278
Barley	39	66	101	129	312	399
Soybean	37	43	53	124	170	287
Beef[b]	113	142	165	146	284	181
Pork[b]	-22	27	33	36	16	3
Chicken[b]	-12	27	21	23	20	6
Weighted Average[c]	44	68	87	110	147	151
South Korea						
Rice	-14	-9	6	55	138	154
Wheat	-22	-8	18	16	47	128
Barley	-14	7	-6	36	71	107
Corn	na	31	17	43	67	101
Soybean	-23	5	51	53	109	226
Beef	3	5	55	86	281	326
Pork	-11	-5	82	111	113	208
Chicken	-27	7	132	103	153	140
Weighted Average[c]	-15	-5	9	55	139	166
Taiwan						
Rice	-31	-8	-13	4	58	144
Wheat	48	25	39	32	57	92
Barley	15	73	67	33	49	99
Corn	2	21	37	29	41	91
Soybean	69	47	37	11	16	56
Beet	-4	8	20	37	162	153
Pork	15	32	40	38	13	3
Chicken	-30	-2	21	27	29	36
Weighted Average[c]	-21	2	2	17	36	55

Appendix Table 5
Growth of GDP per Employee by Sector
1950-1981

	Agriculture	Industry	Services
France	5.1	4.7	2.6
Germany	5.7	4.8	2.6
Japan a/	5.8	8.4	3.2
Netherlands a/	5.4	5.0	2.1
United Kingdom	4.2	2.6	1.4
United States a/	4.6	1.8	1.4
Average exclude Japan	5.0	3.8	2.0
Growth of Japan over ave.	1.2	2.2	1.6

Note: a/ figure is only up to 1980

editor.

Source: Kendrick, John, "International Comparisons of Productivity and Causes of the Slowdown," Table 2-9, pages 73. article by Angus Madison.