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ASEAN-4: AGRICULTURAL DIVERSIFICATION IN THE 1990s¹

by

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ASEAN-4: AGRICULTURAL DIVERSIFICATION IN THE 1990s¹

Donald C. Taylor

INTRODUCTION

Agricultural "diversification" is a prominent theme in ASEAN-4 (Indonesia, Malaysia, Philippines, and Thailand) today.

Since formulation of Indonesia's First 5-Year Development Plan in 1969, the four primary concepts guiding the country's development have been intensification, extensification, rehabilitation, and diversification. In the Fifth Plan (1989-94), diversification was shifted up to top priority (Kasryno, et al., 1992, 1; Saroso, 1991, 184).

Malaysia's policies for export diversification have resulted in the value added from tin and rubber relative to the total value of primary exports decreasing from 63% in 1970 to 15% in 1990 (Yaacob, 1992, 4). Within agriculture, Malaysia has adopted policies to rely on its eight major large-scale irrigation schemes ("granary areas") for the vast majority of its rice production and to convert "non-granary" irrigated areas from rice to diversified crops. The country's paddy sector is being diversified through value-added production alternatives and vertical movement into processing and other forms of agroindustry (Mat and Chen, 1992, 167-169; Zulkifly, 1985, 105-110).

In the Philippines, the Department of Agriculture has adopted crop diversification as a strategy to increase agricultural production and farm income (Nilo, 1993, 19). The focus on diversification in the Philippines extends beyond crops to sustainable agroindustrial development in which possibilities for joint agricultural and industrial development are being actively pursued (Adriano, 1993, 14).

Since the mid-1980s, the Thai government has given a strong mandate to its Department of Agricultural Extension to promote agricultural diversification (Siamwalla, et al., 1992a, 211). Thailand's Sixth National Economic and Social Plan (1987-91) gives priority to agricultural diversification through farmers being encouraged to generate income from a greater variety of products and activities (Phattakun, 1991, 410; Siamwalla, et al., 1992b, 4).²

¹An extended version of this paper was initially prepared at the request of the Asia Productivity Organization, Tokyo, Japan.

²It is recognized that a host of government policies impact producer incentives to broaden the mix of enterprises they pursue. Certain macro-policies--e.g., those in regard to trade, foreign exchange rates, and interest rates--may more strongly affect economic incentives to produce particular commodities than micro-policies in the name of "diversification." A stated micro-policy means little unless it is understood within the perspective of a country's total set of policies. Further, the relative weight ultimately given to various policies stated in a 5-year plan depends on the particular configuration of political and economic factors when various decisions for plan implementation are made. The above-stated policies should be interpreted within this broader perspective.

In this article, brief attention is given to defining diversification and conveying a flavor of recent trends in agricultural diversification in ASEAN-4. The main focus of the article is on the rationale for and constraints to achieving diversification. In the concluding section, I indicate my judgment on future prospects for diversification in ASEAN-4.

ENTERPRISE/SECTORAL DIVERSIFICATION

From a micro-standpoint (i.e., from the standpoint of individual producers), the purpose of rural households pursuing strategies of diversification is to broaden and strengthen their sources of farm and non-farm income. Horizontal agricultural diversification involves diverse activities undertaken within farm production units, whereas vertical diversification involves income-earning activities undertaken off-farm. The latter may involve such activities as (1) establishment and operation of storing, processing, and handling facilities for domestic use and export of agricultural products and (2) the manufacture of non-agricultural products.

From a macro-standpoint, diversification involves the structural transformation of national economies away from agriculture to manufacturing and services (Barghouti, et al., 1990, 66; Timmer, 1992, 27). Such diversification can take place through the "push" of low farm income and/or the "pull" of higher wages and incomes in the manufacturing and services sectors. To the extent that "pull" factors are relatively great, the trauma of adjustment for workers moving out of farming can be kept to a minimum. Because of structural transformation considerations, an explicit macro-focus of diversification is toward creation of non-farm industry (Adriano, 1991).

Diversification can also have regional dimensions, in which regions individually may be (1) diversified in their respective enterprises or (2) specialized in a limited number of enterprises but where the regions collectively pursue a wide variety of enterprises. Individual farms/firms may specialize and yet be part of diversified regional and/or national economies. The broad underlying economic rationale for diversification is individual producers and regions pursuing those enterprises for which they enjoy greatest comparative advantage relative to other producers and regions.

Diversification provides a means to achieve the ends desired by individual producers and regional and national governments. Most fundamentally, it is a demand-driven process, not a series of efforts to achieve particular targeted enterprise mixes (Barghouti, 1990, 92; Timmer, 1992, 37). The basic objective in developing diversified agricultural systems is for individual producers and regional groups of producers to gain production flexibility so they can pursue any of a variety of activities/enterprises in response to changed market demand conditions. In sum, diversification is intended to confer to individual producers and regional and national economies the ability to adjust to changed economic and technological conditions with a minimum of adjustment costs and stresses (after Barghouti, et al., 1990; Petit and Barghouti, 1992; Timmer, 1988; World Bank, 1990).

RECENT TRENDS IN AGRICULTURAL DIVERSIFICATION IN ASEAN-4

A comprehensive determination of changes over time in the actual nature and extent of agricultural diversification in ASEAN-4 would require analysis of data on the extent of diversification (1) within individual farm production units in different agro-ecosystem regions of each country, (2) within each agro-ecosystem region and collectively for those regions nationally, and (3) collectively for the countries comprising ASEAN-4. Since data in such detail are not available, the following represents only a glimpse of changes over the past 2-3 decades in the region's agricultural diversification.

Major food and feed crops. Table 1 shows changes over time in average percentage growth rates in total physical production of selected food and feed crops in Indonesia, Philippines, Thailand, and Southeast Asia as-a-region. Over the entire 22-year period (1966-88) and for Southeast Asia, rates of growth in production for all crops/crop groups--except roots and tubers other than cassava--exceed that for paddy rice which represents Southeast Asia's traditional dominant food crop. Thus, in the aggregate, there is evidence of a growing diversity over the past 2-3 decades in the mix of food crops produced in Southeast Asia.

However, certain elements in Southeast Asia's diversification dynamic fail to be conveyed by this aggregate 1966-88 snap-shot picture for the region.

One factor not conveyed is variation among initial production levels for various crops. The initial production base for wheat in Southeast Asia, for example, is far less than that for most other food crops. Thus, although the relative percentage growth in wheat production in Southeast Asia is greater than that for any other crop shown in the table, the absolute tonnage growth in wheat production is, in fact, less than that for many other crops.

Further, rates of production growth for different crops differ much from one sub-period to another. For example, during 1966-74, growth rates in the production of (1) sorghum and (2) cereals other than wheat, sorghum, maize, and paddy rice were far greater than those for any other crop during that time period. In the 1980s, on the other hand, production of these commodities decreased. During 1974-82, the relative production dynamic was greatest for wheat and cassava, whereas during 1982-88 it was for maize. Thus, what one concludes about changes over time in the crop production mix at the level of Southeast Asia depends on (1) whether relative or absolute changes and (2) what time period are of central interest.

Another element complicating interpretation of patterns of diversification arises from uniqueness in the diversification experience of individual ASEAN-4 countries. For example, in Indonesia over the entire 22-year period, the rate of growth in overall production has been greater for rice than for any other food crop, thereby suggesting that Indonesia's overall food crop mix has not become more diverse over time. However, during 1982-88, there has been some diversification in Indonesia away from rice and toward maize. Gonzales, et al. (1992, 30) also show significant diversification toward soybeans in Indonesia during the 1980s.

Table 1. Average annual percentage growth rates in total production of selected major food and feedcrops, Southeast Asia, selected time periods, 1966-74 to 1982-88.

Commodity	1966-74	1974-82	1982-88	1966-88
Southeast Asia*				
Wheat	-11.38	12.74	3.99	7.96
Sorghum	15.49	5.06	-6.29	7.25
Cereals other than wheat, sorghum, maize, and paddy rice	14.89	1.42	-1.53	6.67
Cassava	3.52	7.33	2.07	5.54
Maize	3.99	4.19	4.72	4.51
Pulses	3.04	5.36	2.73	3.60
Paddy rice	3.29	4.26	2.19	3.50
Roots and tubers other than cassava	0.75	1.54	0.44	0.45
Indonesia				
Sorghum	n/a	-5.90	-9.48	-11.32
Cereals, other than wheat, sorghum, maize, and paddy rice	37.10	-44.90	-11.59	-26.18
Cassava	0.45	1.00	2.91	1.46
Maize	0.86	4.98	5.68	3.81
Pulses	5.54	0.90	1.03	1.35
Paddy rice	6.11	5.62	3.40	5.03
Philippines				
Sorghum	24.68	1.33	-82.84	-18.74
Cereals other than wheat, sorghum, maize, and paddy rice	n/a	n/a	n/a	n/a
Cassava	-0.59	16.53	1.40	8.06
Maize	5.45	3.22	5.81	4.63
Pulses	1.81	5.23	-3.31	3.41
Paddy rice	3.78	3.45	2.63	3.53
Thailand				
Sorghum	12.51	4.46	-7.02	6.65
Cereals other than wheat, sorghum, maize, and paddy rice	56.43	12.85	2.74	18.44
Cassava	14.67	12.69	1.85	11.84
Maize	9.41	3.72	2.24	5.65
Pulses	5.80	8.33	3.50	5.31
Paddy rice	2.12	2.92	1.21	2.49

Source: Based on FAO data; excerpted from Agcaoili and Rosegrant (1992, 44-49) and Islam, et al. (1992, 114-120).

*Southeast Asia is defined to consist of Burma, Indonesia, Malaysia, Philippines, Thailand, Vietnam, Laos, and Cambodia.

In regard to sorghum and "other cereals," patterns of production growth differ greatly among the three countries. During 1966-88, for example, (1) Indonesia and the Philippines diversified away from sorghum and (2) Indonesia strongly diversified away from the "other cereals" group. Thailand, on the other hand, diversified strongly toward sorghum, "other cereals," and cassava at the expense of rice.

If comprehensive data were available for regions within each country and for individual farms within each region, the picture on trends in diversification would become even more complicated.

What can we conclude from this discussion? In the aggregate, it appears that ASEAN-4 is diversifying some away from its main traditional food crop rice. The way in which that diversification is taking place, however, is differing much from place-to-place and from time-to-time within the region.

Non-staple food commodities. Petit and Barghouti (1992, 2-4) show general upward trends in the production of fruits, vegetables, palm oil, sugar, poultry, and pork for ASEAN-4 between 1970 and 1988. Instances with the strongest positive production trends (a 50% or greater increase in physical output) are the following:³

- * Fruits in Philippines (2.5), Thailand (2.3), and Indonesia (1.8);
- * Vegetables in Indonesia (1.5);
- * Palm oil in Malaysia (11.7) and Indonesia (6.5);
- * Sugar in Thailand (6.6) and Indonesia (2.6);
- * Poultry in Thailand (6.2), Indonesia (5.9), Malaysia (3.3), and Philippines (2.5); and
- * Pork in Malaysia (4.0), Indonesia, (3.1), Thailand (1.6), and Philippines (1.5).

Thus, these non-staple food production data lend support to the notion of ASEAN-4 becoming more diversified in its agricultural production patterns over the past 2-3 decades.

³Data shown in parentheses are 1988 physical production levels expressed as multiples of 1970 production levels.

RATIONALE FOR DIVERSIFICATION

For at least six reasons, diversification is a prominent target of attention in ASEAN-4's overall national and agricultural economic development in the 1990s. Diversification is a possible means to (1) facilitate the process of structural transformation in national economies; (2) overcome low farm income resulting from depressed world prices for rice and other major export commodities; (3) maximize efficiency of resource use; (4) reduce production, price, and income risks; (5) respond to changes in the demand for various agricultural commodities; and (6) reduce ecosystem deterioration.⁴

Facilitate structural transformation

ASEAN-4 countries are pursuing intersectoral diversification as a concomitant to the major structural transformation taking place within each of their national economies. Among the ASEAN-4, the structural transformation between 1965 and 1988 has been more marked in Indonesia, Malaysia, and Thailand than in the Philippines (Table 2). For example, during this 23-year period, the share of agriculture in GDP in Indonesia dropped 32 percentage points and the share of labor in agriculture in Malaysia and Thailand dropped 24 and 23 percentage points, respectively. In the Philippines, the share of agriculture in GDP dropped 3 percentage points and the share of labor in agriculture dropped 8 percentage points.

These countries have need to diversify intersectorally so as to increase employment and income-earning opportunities for the increasing proportions of their people outside the agricultural sector. This rationale for diversification is fundamental to the long-term development of national economies (Timmer, 1992, 28).⁵

Table 2. Percentage share of agriculture in GDP and employment, ASEAN-4, 1965 and 1988.

Country	Percent share of agriculture in GDP		Percent share of labor in agriculture	
	1965	1988	1965	1988
Indonesia	56	24	71	55
Malaysia	28	21	60	36
Philippines	26	23	57	49
Thailand	32	17	82	59

Source: Based on World Bank data; excerpted from Petit and Barghouti (1992, 2).

⁴Three additional reasons that national planners are currently emphasizing diversification are to (1) overcome regional disparities in income distribution, through further developing and introducing new field crops and livestock enterprises suitable for marginal areas not naturally adapted to rice and wheat (Okabe, 1993, 3); (2) reduce the demand for irrigation water in regions experiencing increased water scarcity, by shifting from water-intensive rice to other crops (Petit and Barghouti, 1992, 2); and (3) improve foreign exchange earnings and balances-of-trade, by exploiting the export-earning potential represented by "high-value" commodities with high income elasticities of demand, e.g., fruits, vegetables, livestock (World Bank, 1990, 15-16).

⁵My own personal point of view, however, is that the rather extreme degree of structural transformation which has taken place in the U.S. and certain other industrialized countries may ultimately prove problematic to the long-term sustainability of these countries.

Overcome low farm income resulting from depressed commodity prices

Efforts over the past 2-3 decades to expand world rice production culminated in attainment of rice self-sufficiency in most major rice-consuming nations by the mid-1980s (Timmer, 1992, 27; World Bank, 1990, 8). Within Southeast Asia, becoming self-sufficient in rice production was most significant for Indonesia, since for many years it had been the world's major rice-importing country (Barghouti, et al., 1990, 14). While "achieving rice self-sufficiency" does not describe well Thailand, which for years has been a rice-surplus country, nor Malaysia, which continues to lose ground in attaining rice self-sufficiency (Fitzpatrick, 1991, 122), world-scale rice surpluses peaked in 1986, with a result that rice prices were driven to historic lows--just one-tenth of the real level of peak world rice prices in 1974 (Timmer, 1992, 27).⁶

Between the 1970s and 1985, prices of several other export crops (e.g., sugar, palm oil, coconut oil, copra, rubber) also dropped significantly, with little prospect of reversal (in "real" terms) in the future. Since ASEAN-4 produces over 75% of the world's exported rubber, palm oil, and coconut oil, these "adverse" price trends have especially important implications to the region (Barghouti, et al., 1990, 18).

Faced with these circumstances, governments must decide whether to (1) provide costly subsidies to their rice and export crop farmers to maintain production and farm income, (2) watch farm incomes plummet downward, and/or (3) develop policies to enhance alternative income sources for farmers. The strategy adopted by most major rice and export crop-producing and rice-consuming countries has been to emphasize policies which facilitate development of non-rice enterprises, both on- and off-farm, to augment the greatly reduced incomes of their farmers.

In the midst of the current active interest in exploiting diversification opportunities, however, we should remember that diverse agriculture is not new to Asia. Agriculture in most

⁶Pingali (1992, 111-112) indicates a declining long-term profitability of rice production in Asia, not only because of a secular decline in the world rice price, but also because of declining or stagnant rice yields and increasing input costs.

In spite of world trends toward rice surpluses, unusual weather, pest attacks, and other disturbances to production can cause rice self-sufficiency in individual countries to be elusive. In one year or a few years, a country may be in surplus, only to fall again into deficit in the wake of a production calamity. Indonesia's Minister of State for National Planning, Saleh Afif (1992, 10), documents these circumstances for recent years in Indonesia, "Rice surpluses in 1985 and 1986 stimulated policy attention on diversification away from rice production, but deficits in 1987 and 1988 renewed concerns over Indonesia's capacity to maintain self-sufficiency in rice. These concerns were partially alleviated by the excellent rice crop in 1989, but were renewed by the drought in 1991."

parts of Asia was traditionally characterized by diverse farm enterprises involving crop rotations, intercropping, relay cropping, and various types of livestock. The Green Revolution and other modern technological developments over the past 2-3 decades have, in some respects, represented a frontal assault to such diversity. In an effort to meet the world food production challenge, modern agricultural methods have been strongly oriented toward intensifying agricultural production through more highly specialized, larger-scale production.

Thus, in some ways, the current call for greater diversification in agricultural systems in ASEAN-4 might appear to be a call to return to the past. However, in other and more fundamental respects, the current call to diversification is quite different. It involves a fresh search for ways to interject flexibility into agricultural and rural economic systems, taking maximum advantage of modern technological, market, and rural industrial developments--within the long-term overall context of a diminished relative role of the agricultural sector in national economies.

Maximize efficiency of resource use

To achieve maximum efficiency of resource use, producers need to strike a balance between specializing in "too few" enterprises and diversifying in "too many" enterprises.

The primary argument for enterprise specialization is to achieve economies-of-scale, with resulting low per-unit costs of production. Per-unit costs of output often are less with larger-scale, specialized enterprises because total fixed costs of production are spread over larger amounts of output. Further, on specialized farms, capital inputs (e.g., farm machinery) need be acquired for producing only a few, rather than many, enterprises. Higher levels of managerial expertise can sometimes be achieved if producers are able to concentrate their time and mental energy on only a few, rather than many, enterprises. In countries with high population densities, the scale of individual food staple enterprises on particular farms may have increased even if the total size of farm operations has not.

However, if production units become too specialized, they may fail to capture potential benefits from synergism. At the core of a "synergistic" production system is a tight-knit integration among component parts of the system, such that the whole is equal to more than the sum of the system's individual parts. By carefully choosing combinations of enterprises/economic activities, producers can take advantage of production complementarities and complementarities, and thereby reap the benefits of synergism. Such complementarities and complementarities involve multidimensional use of space, multidimensional use of time, enterprise symbiosis, waste products from one enterprise becoming inputs to other enterprises, and intensified use of "fixed" labor.

Multidimensional use of space. An example of multidimensional use of space is a multistoried intercrop system which is designed so that (1) tall trees provide canopies of protection to lower plants and the soil (e.g., rubber) and (2) intermediate-sized trees or shrubs provide analogous canopies (e.g., coffee) to (3) lower growing annual field crops. Associated

with the multiple-layering of various plant species is an increased exposure to sunlight of the respective crops collectively and, as a result, the marshalling of added photosynthetic activity and hence added production (Cheng, et al., 1992, 1135).

Multidimensional use of time. Relay cropping involves planting of a crop in a field prior to the harvesting of a prior crop. In so doing, the second crop gains a head start on germination and growth, compared to its having been planted only after the first crop had been harvested.

Enterprise symbiosis. "Enterprise symbiosis" involves positive biological and economic interactions among various enterprises in a production system.

Consider possible interactions between crop rotations and livestock, for example. Livestock add value to forages and other crops and recycle nutrients back to the soil through manure. Forage legumes add nitrogen to the soil, break grain crop pest cycles, and provide feed for livestock. By including both crops and livestock on their farms, producers can minimize the very substantial costs of transporting bulky forages and livestock wastes that otherwise would be required on farms specialized in only crop or livestock production. Thus, while neither livestock without forage legumes in crop rotations nor forage legume rotations without livestock may be profitable on a particular farm, integrated livestock-forage legume crop rotation systems may be profitable. Further, farms with both crop and livestock crop enterprises can avoid market transaction costs otherwise involved in the exchange of ownership of (1) crops sold to intermediaries by specialized crop farmers and (2) crop feedstuffs purchased from intermediaries by specialized livestock farmers (after Ikerd, 1991).

Another example of enterprise symbiosis is the introduction of fish in flood-irrigated paddy-rice fields. Certain species of fish eat weeds and insects naturally found in paddy fields. Thus, introducing fish into paddy fields can be a means of decreasing the need for purchased agricultural chemicals for paddy pest control. In addition, fish produce manure that can substitute for some of the purchased fertilizer otherwise required in paddy production.

Waste products from one enterprise becoming inputs to another enterprise on the same farm. A special case of enterprise interdependence involves the recycling of waste products. In countries like China, organic wastes are an integral feature of tightly integrated crop-livestock-aquaculture-microbial production systems. Material recycling is accomplished through waste products from one enterprise becoming inputs for other enterprises. Biogas methane digesters are at the center of such material recycling. The principal inputs into the digesters are animal and human wastes and crop residues. Through anaerobic fermentation, the raw materials are more efficiently converted into energy/fertilizer/feed resources (namely, biogas methane and slurry-sludge) than if the raw manure and other organic waste products had been used directly (Cheng, et al., 1992, 1135).

Intensified use of "fixed" labor. By diversifying a farm's enterprises, producers can often expand the overall demand for rural labor and make fuller use of "fixed" labor in periods of the year when that labor would otherwise be unused.⁷ This point has particular validity in respect to fruits, vegetables, flowers, fish, and livestock whose production is especially labor intensive.

Similarly, by becoming involved in part- or full-time off-farm rural-based economic activities, rural households can augment the income earned from their farm enterprises. In this connection, the People's Republic of China has an enviable record over the 1980s in developing rural-based business enterprises (Byrd and Lin, 1990). The labor absorbed in and the income generated from such enterprises has done much to facilitate China's structural transformation and stem pressures for "premature" rural-to-urban migration. Since populations that remain geographically dispersed are likely to be more sustainable in the long-run, the development of industrial and service sectors in rural areas has an inherent advantage over such sectoral development in major urban centers.

Reduce production, price, and income risks

Micro dimensions. Other things the same, the more enterprises maintained by a producer, the less are his production, price, and income risks. The **production risk** is less because of differing susceptibility of different enterprises to particular adverse growing conditions (e.g., drought, particular disease or insect outbreaks). The **price risk** is less because the chances of the prices of all enterprises on a farm simultaneously falling is less than the chances of the price(s) of only one or two of the farm's enterprises falling. Since production and price risks on diversified farms are less, the **risks** of farmers experiencing years with unusually low farm **income** are also less. This point is reinforced by the fact that crops which do not fully mature because of adverse growing conditions can often be used as feeds for livestock on diversified crop-livestock farms, thereby avoiding the wasting or near zero-return disposal of only partially matured crops on specialized crop farms.

"Other things" are not always the same, however. A manager with "too many" enterprises may have inadequate time and expertise to properly manage each enterprise. Through managerial shortcomings, production and/or marketing set-backs may be experienced. In addition, if a new enterprise is brought into a farming operation for which (1) the production, marketing, and processing technology is not well developed; (2) the farmer has no production experience and little technical information; (3) markets are only "thin" or not yet developed; (4) susceptibility to adverse production conditions is unusually great; and/or (5) the product is highly perishable (in contrast with traditional grain crops), the risk of low income to the overall farm operation may actually increase from introduction of such an enterprise.

⁷To the extent that countries are "labor-short," this point may fail to be fully applicable.

Macro dimensions. The same reasons why diversification can protect against potential micro production, price, and income risks also apply at a macro regional or national level. A region which produces and markets only a few enterprises is vulnerable to economic down-swings whenever the price of one of those enterprises plummets down or a natural disaster strikes production of the enterprise. Such regional economic down-swings translate into reduced incomes for individual producer families, with potential for exacerbating the poverty of any families living at or only slightly above a subsistence level.

A region with a variety of enterprises and flexible production systems, on the other hand, is likely to find some "informal insurance" from diversification. When prices or production circumstances for some of its enterprises become unfavorable, it is likely that prices and production circumstances for some of its other enterprises will be at least partially offsetting and that its producers can shift from the "hurting" enterprise(s) to one or more other enterprises that are in a stronger economic condition.

Thus, the need for government budgetary expenditures to stabilize prices and incomes tends to be less for regions and nations with highly diversified enterprises and flexible production systems. This fact represents perhaps the single strongest current motivation for government policy makers in ASEAN-4 to support development of diversified, flexible production systems (Petit and Barghouti, 1992, 5; Timmer, 1992, 27).

Regions can become more at risk from diversification efforts, however, if a new enterprise(s) is introduced on a large-scale and becomes vulnerable to the types of uncertainties indicated in the micro section above. A tender balance needs to be maintained in selecting enterprises for introduction in diversification programs between those which are unique and potentially very profitable versus those which are more familiar even if not potentially as profitable. This point highlights the importance of diversification programs and policies which place emphasis on development of flexible production systems rather than on the production of particular new commodities.

Response to changes in the demand for various agricultural commodities

Changes over time in a country's per capita demand for various agricultural commodities are determined by (1) changes in the per capita personal disposable income of its people and (2) income elasticities of demand for the various agricultural commodities. By also taking into account changes in a country's population, changes over time in the country's aggregate demand for various agricultural commodities can be determined.

Table 3 shows annual rates of change in per capita GNP of 3.0-4.0% for 1965-1988 in ASEAN-4 and projected annual rates of population growth ranging among ASEAN-4 countries from 1.3% for Thailand to 2.3% for the Philippines. Because increases in per capita income in ASEAN-4 have been substantial and sustained, the magnitudes of the income elasticities of demand for particular commodities in these countries have a critical impact on changes over time in the demands for various agricultural commodities.

Table 3. Population and GNP levels and growth rates, ASEAN-4, selected years and time periods.

Country	Population		GNP	
	Millions (1989)	Projected annual percent growth rate (1989-2005)	US dollars per capita (1989)	Annual percent growth rate (1965-88)
Indonesia	178	1.60	500	4.0
Philippines	61	2.30	710	3.0
Thailand	55	1.30	1,220	4.0
Malaysia	17	2.20	2,160	4.0

Source: Based on World Bank, United Nations, and IFPRI data; excerpted from Agcaoili and Rosegrant (1992, 70).

Income elasticities of demand for meat are highly dependent on a country's stage of economic development. Unnevehr (1991, 184) reports estimated elasticities of 0.91 in 37 middle-income countries with annual per capita incomes ranging from US\$600 to US\$5,000, 0.83 in 33 low-income countries, and only 0.12 in 27 high-income countries. The relatively high and rapidly increasing per capita incomes in ASEAN-4 place these countries in the "take-off stage" relative to consumer demand for meats and related products. Since the conversion of grains into meat and related products is inherently inefficient,⁸ demand increases are likely great for commodities serving as both "food" and "feed" grains in countries experiencing rapidly increased demand for meat and related products.

Table 4 shows separate estimated elasticities of demand for selected commodities used as both human food and livestock feed for ASEAN-4. With the exception of wheat in Indonesia and the Philippines and the pulses in all four countries, estimated income elasticities of demand for food are positive and less than 0.20, or they are negative. This outcome implies that, as per capita disposal incomes rise, the impact on the demand for food for the vast majority of these commodities in the different ASEAN-4 countries is very limited and, in some cases, even negative.

⁸Rask (1991, 171) reports the following kg of cereal equivalents required to produce 1 kg of each of the following commodities: 11.7 for beef, 6.0 for pork, 3.6 for eggs, 3.0 for chicken, and 1.2 for milk. These "liveweight conversion factors" include feed for breeding stock.

Table 4. Income elasticities of demand for selected commodities as human food and livestock feed, ASEAN-4 countries.

Commodity	Indonesia	Malaysia	Philippines	Thailand
Wheat as food	0.50	0.04	0.60	0.05
Paddy rice as food	0.18	0.04	0.10	0.00
Maize				
Food	-0.20	0.04	-0.20	0.05
Feed	1.20	0.64	1.10	0.90
Sorghum				
Food	-0.20	0.04	-0.45	0.05
Feed	1.27	0.64	0.84	0.87
Cassava				
Food	0.20	-0.11	0.10	-0.22
Feed	1.20	0.64	-0.20	0.87
Other cereals				
Food	-0.17	0.04	-0.45	0.05
Feed	1.27	0.64	0.84	0.87
Other roots & tubers				
Food	-0.15	-0.11	0.10	-0.22
Feed	1.27	0.64	-0.20	0.87
Pulses				
Food	0.24	0.60	0.56	0.40
Feed	1.25	1.23	0.84	0.40

Source: Based on FAO and IFPRI data; excerpted from Agcaoili and Rosegrant (1992, 69).

The income elasticities of **demand for feed** are larger than the corresponding elasticities of **demand for food** in all commodity and country situations except for cassava and "other roots and tubers" in the Philippines. Apart from these two rather unexpected exceptions, the estimated income elasticities of demand for feed are 0.40 or larger. This outcome, of course, implies that as per capita disposable incomes rise, substantial proportions of the increased incomes are translated into demand for feed grains. This pattern is shown by Yotopoulos (1985, 468) in the proportions of total cereals consumed as feed grains for groups of countries at various stages of development in 1980: 66% for market developed countries, 27% for middle-income countries, and 2% for low-income countries.

Illustrative data on changes over time in patterns of food consumption in selected ASEAN-4 countries from three sources follow. Islam, et al. (1992, 110) report increases between 1961 and 1989 in total plant-based food caloric intake per capita of 17% in Thailand, 34% in the Philippines, and 59% in Indonesia. The types of food represented in these increased food intakes differ greatly from country to country:

- * Indonesia, rice alone accounts for 80% of the increased intake;
- * Philippines, maize and rice account for 23% and 18% of the increased intake, respectively; and
- * Thailand, food sources other than cereals, starchy roots, and pulses account for all the increased intake.

Rosegrant and Gonzales (1992, 33) report that, in the Philippines between 1978 and 1982, the consumption of cereals and cereal products decreased, whereas the consumption of several other foods/food categories increased, e.g., (1) meat products by 35%; (2) dried beans, nuts, and seeds by 24%; (3) sugars and syrups by 16%; and (4) eggs, fish and fish products, and starchy roots and tubers by 13-14% each. Phattakun (1992, 409) reports that, in Thailand between 1970 and 1982, per capita consumption of fruits, pork, and bean oil increased by 1.4-1.9 times. Chicken and vegetable consumption also increased by 27% and 19%, respectively.

What can be concluded from these illustrative sets of data? It appears that (1) total food intake is increasing in ASEAN-4; (2) diets are changing rather rapidly, with a movement away from the relative dominance of the traditional food staple, rice; and (3) nutrition intake is becoming more diverse and nutritious for those who are able to afford larger quantities of food and to substitute fruits, vegetables, meats, fish, and other higher valued foods for traditional starchy staples in their diets.⁹ While there is a general trend away from rice toward higher valued foods, the particular configuration of diet changes differs much from country to country.

⁹Another possible "side to this coin," however, is the possibility of poor people having reduced access to food as their more affluent counterparts consume ever richer and more nutritious diets (Barkin, Batt, and DeWalt, 1990).

To limit growing food imports in response to these changing patterns of food demand, individual countries are exploring their domestic potential for producing as many and much of the newly demanded foods and feed grains as possible. Thus, changing patterns of food demand by increasingly affluent people in the rapidly developing ASEAN-4 represents one of the strong pushes for agricultural diversification in the region. Changes in world demand for certain commodities are reinforcing these within-country incentives for domestic agricultural diversification.

Reduce ecosystem deterioration

A growing minority of political leaders, professional people, and the general public in Southeast Asia is becoming concerned with one or more of the following ecosystem stresses and strains: (1) deterioration in the quality and quantity of ground and surface water and farmland (Dixon, 1990), (2) depletion of non-renewable energy resources (Clark, 1990), and (3) loss of biodiversity.¹⁰

Flinn and De Datta (1984) and Pingali, et al. (1990) indicate that the technological frontier for rice in Asia has stagnated and shows signs of long-term decline. Pingali (1992, 109) writes:

The long-term decline in the irrigated yield frontier under intensive rice monoculture can be attributed to increased pest pressure, rapid soil micronutrient depletion, changes in soil chemistry brought about by intensive cropping, and increased reliance on low-quality water. Although the rice research system has been generating varieties with increasingly high genetic yield potential, the rate of degradation of the paddy environment has been even greater.

Dillon and Suprpto (1992, 2) state that one of the reasons behind Indonesia's focus on diversification is increasingly "adverse environmental effects from overuse of fertilizer and pesticides in rice production."

In this section, I explain something of the basis for ecological and environmental concerns with "modern agriculture," reasons why farm enterprise diversification can help to

¹⁰Other ecosystem and institutional stresses and strains not directly related to enterprise diversification are (a) deterioration in forest and coastal resources; (b) intensified urban and industrial air, noise, and solid waste pollution; (c) acid rain build-up, ozone layer depletion, global warming, and rising sea level; (d) threats to human health through (i) workers handling toxic synthetic chemicals and/or working under unsafe conditions and (ii) diet-sensitive consumers eating foods containing harmful chemical residues; (e) inequitable distribution of wealth among various groups of people and limited access of poor people to sources of new income-earning streams; (f) rapid population growth; (g) loss of cultural-diversity; and (h) weakened family structures and rural communities (Taylor, 1992, 2-3).

overcome underlying causes of ecosystem deterioration, and revisions in public policies that could be made to overcome current disincentives for diversification and positive long-term natural resource use.

Modern agriculture's contribution to ecosystem deterioration. The "modernization" of agriculture the world over during the past 3-4 decades has involved development and adoption of intensive production systems in which yields per unit of land have increased greatly. Producers adopting modern production methods have tended to specialize in a limited number of enterprises and to apply heavy dosages of (1) synthetic fertilizers to maximize yields and (2) agricultural chemicals to control weeds, insects, and diseases. Specialization has been exacerbated in public irrigation schemes developed in Asia's humid tropics over the past 3-4 decades which were commonly designed exclusively for flooded monoculture rice.

While such modern production methods have permitted much needed increases in food production, negative longer-term side-effects have arisen in certain places. Illustrative side-effects are the leaching of excess synthetic chemicals into soil and the ground water below and the run-off of excess chemicals into surface water. When this happens, the quality of (1) drinking water for people, livestock, and fish and (2) irrigation water for crops can deteriorate to the point at which the health and productive efficiency of water-users is impaired. Similarly, the presence of alien chemicals in the soil can kill some of the soil's micro-plant and animal life essential to the continued health and fertility of the soil (after Dixon, 1990).

Farms specialized in only one or a few food/feed and cash crops can also experience added pest problems and soil erosion. By moving away from traditional agricultural habitats with multiple plant and animal species, more specialized farmers have lost many natural ecosystem check and balance mechanisms for controlling pests. Further, by moving away from crop rotations involved small grains, row crops, and forage legumes interspersed over time, processes involving (1) the longer-term natural build-up of elemental nutrients, organic matter, and tilth in the soil and (2) natural protection of soil against wind and water erosion have sometimes been hampered.

A common intensification strategy, leading to the Green Revolution in wheat and rice and more recently with other crops as well, has been development of high yielding varieties with widespread adaptability. The multiplication and distribution to producers of a few wide-spectrum varieties is more efficient than the multiplication and distribution of a larger number of varieties, each with a narrow range of adaptation. Thus, "modern" production methods have contributed to a loss of natural biodiversity.

Role of enterprise diversification in overcoming ecosystem deterioration. Enterprise diversification represents a potential means of overcoming some of the negative side-effects of monoculture rice and other farming systems involving only a few enterprises. Through legume-based crop rotations, intercropping, and relay cropping, soil fertility can be enhanced as nitrogen is collected from the air and recycled through nitrogen-fixing legumes and minerals are released from soil reserves and recycled. Thus, the need for purchasing fertilizer, whose manufacture

requires much non-renewable fossil fuel energy, is reduced. Some components of crop rotation, intercropping, and relay cropping farming systems may generate relatively low short-term profits. Only if considered jointly with the benefits they bring to other crops in the system and from a long-term point of view might they be economically justified.

Crop rotations can also bring natural defenses against weeds, insects, and diseases. By varying the plant species from season-to-season, farmers can often interrupt the growth cycles of individual pests that, with monoculture cropping, are self-repeating season-after-season. Intercropping and relay cropping can also bring natural defenses against weeds, insects, and diseases as the presence of one species can militate against pests that otherwise would attack other species. Further, intercropping and relay cropping enable farmers to make fuller use of field space and growing season time.

Forage legumes can be effective in combating weeds because of their natural competitive nature and their multiple harvests (weeds are cut at the same time as forages are harvested). The "allelopathic" effects (through chemicals released by plants that suppress growth of other plants), heavy tillering (through space competition), and wide leaf canopy (shading) features of crops such as rye, millet, and buckwheat can also contribute to weed control.

Through diversifying into livestock, farmers can often make rather efficient use of forages, crop residues, and other potential low-value components of crop rotations. At the same time, the livestock produce manure, which if applied to fields in reasonable quantities, can build up soil nutrients, organic matter, tilth, and other dimensions of overall soil fertility. Including green manures (non-harvested forages plowed back to the soil) in crop rotations and turning back crop residues can also naturally build up soil fertility over the long-term and reduce farmers' needs to purchase synthetic fertilizers.

Policies for promoting diversification and positive long-term natural resource use. In selecting projects to promote economic and social development, project analysts have traditionally used discounting methods to convert future benefit and cost streams to present values. In effect, it has been assumed that current generations (1) hold all rights over decisions on resource use and (2) should exploit use of the resources for their own benefit (Norgaard, 1992, 1). A premium is given to achieving short-term technical and economic efficiencies. Market prices are assumed to send appropriate and necessary signals for the allocation of resources.

Such approaches to decision-making can result in decisions that fail to take into account the longer-term benefits of diversification and other aspects of long-term natural resource development and use. Further, such approaches often overlook the strengths in current location-specific institutional situations, including unique factor scarcities, indigenous knowledge, indigenous technologies and institutions, and indigenous cultural and artistic values (Clarkson, et al., 1992; Hecht, 1990; Warren, 1991). To counteract this limitation, a new framework for policy and project decision-making needs to be developed.

Policy and project decisions that are sound for future as well as current generations should be based, not only on short-term economic efficiency, but also on meeting certain physical resource limits and standards that will help to ensure adequate formation, maintenance, and transfer of resources to future generations. Within this context, traditional project analysis should be used to complement, rather than dominate, other types of considerations. Such other considerations involve attention to quantity and quality dimensions of the intergenerational transfer of assets, participation of local people to be impacted by projects in development and implementation of the projects, and appropriate attention to unique indigenous resources and cultural and artistic values.

CONSTRAINTS TO DIVERSIFICATION

Possible lack of economic incentives to producers to diversify

Decisions to diversify farm enterprises and seek off-farm employment in ASEAN-4 are usually made by private individuals, not by government civil servants, public policy-makers, or public decision-making authorities. Unless the prospective private economics from decisions to diversify are at least reasonably favorable, producers will not choose to expand the scope of their production activities. Thus, a necessary condition for realization of expanded diversification is producers having prospect of gaining enough economically from a proposed added enterprise/job to offset the extra effort to learn about, undertake, and assume possible added risks from adopting the new economic activity.

The private economics of production can differ rather substantially from the social economics of production. This circumstance arises when there are significant benefits and/or costs to society external to the private market place. In such cases, government has to decide if it is willing to subsidize producers so that the producers will have economic incentive to achieve goals in the best interest of society, but which otherwise would not be in their best private interest.

Table 5 shows illustrative private and social returns data for soybean and corn production in three Indonesian provinces. If no subsidies are provided, producers in all three provinces would strongly prefer to produce soybeans to corn. From society's standpoint, however, soybeans in East Java are only slightly more preferred and in Lampung are strongly dispreferred relative to corn. If the social advantage of corn in Lampung results in government desiring for its farmers to diversify into corn rather than soybeans, it would have to be willing to provide a subsidy of at least Rp 44,763/ha (Rp 46,990-2,227) for farmers to reasonably be expected to produce corn rather than soybeans.

This illustration is provided, not to imply the advisability of governments subsidizing diversification, but rather to make obvious the lack of realism in policy-makers expecting farmers to adopt diversification patterns for which the private economics are not favorable.

Table 5. Private and social returns to soybeans and corn production under "import regimes," selected provinces, Indonesia (Rp/ha).

Province/return	Soybeans	Corn
East Java		
Private return	224,664	42,546
Social return	197,634	160,039
Lampung		
Private return	46,990	2,227
Social return	-58,221	79,985
Aceh		
Private return	64,768	-33,573
Social return	69,166	12,574

Source: Excerpted from Manwan, et al. (1992, 156).

Possible infrastructural shortcomings

Research and development. Carefully allocated expenditures on research and development (R & D) represent one of the most fundamental investments that a country can make in its economy. One of the greatest payoffs from such investments is reduced per-unit costs of commodity production and marketing. Since the world today is characterized by extreme economic competition, any country (region) which does not continuously search for ways to reduce its per-unit costs of production and marketing will inevitably lose out in its battle for economic survival.

Within the context of diversification, R & D on newly introduced commodities and newly developed farming systems is essential if newly diversified producers are to become competitive in production and remain so over time. At the same time, unless research on basic food staples is also maintained, commodities once in surplus are likely to return to being in deficit, with product price implications that will likely undermine the process of diversification (Hayami, 1991, 36).

Deriving adequate R & D funds to support diversification is particularly challenging because agricultural research allocations in many countries have been traditionally weighted heavily toward rice and limited numbers of export crops (Barghouti, et al., 1990, 94; Okabe,

1993, 2). A particular challenge in designing agricultural research programs is to determine ways to maintain rice productivity and at the same time to seek out and exploit potentials for improved productivity with secondary crops, fruits, vegetables, flowers, livestock, fisheries, and agro-forestry.

Research to support diversification and desired long-term resource use needs to go beyond issues in agricultural production and marketing. In the sections that follow, several critical and perhaps even more fundamental other areas for research are identified.

Market development for newly introduced commodities. The International Rice Research Institute and members of the Asian Farming Systems Research Network have concluded that the absence of product markets has most constrained diversification in Asia (Zandstra, 1992, 16). High valued commodities with high income elasticities of demand are often the target of diversification programs. Because such commodities often are rather perishable compared to traditionally grown grains, the challenges of marketing with diversification are unusually great. Among other things, the link between production and marketing needs to be tight.

One of the dilemmas inherent in producers or regions diversifying into production of new commodities is whether markets should be developed by the private sector or by government. Experience seems to generally show that the private sector should have at least some involvement in market development (Hayami, 1991, 3). Supporting roles by government may be in development of newly required infrastructure, communications, and information systems--including establishment of grades and standards controlling the marketing of new commodities (Petit and Barghouti, 1992, 10).

A central strategic question in new product market development is whether capacities to (1) produce new commodities or (2) market new commodities should be given initial attention. While this issue is rather like a "chicken-and-egg" proposition, experience seems to indicate that initiatives need to be taken to develop markets for commodities before producers enter into production of the commodities (Timmer, 1988, 132-134). During initial stages of marketing and production, marketers may find it helpful to establish contractual arrangements with producers.

Because the domestic demand for newly introduced commodities tends to be limited, there often is an advantage in diversifying production toward commodities in world markets rather than toward commodities demanded only domestically. Such a strategy can help insure against price volatility that often characterizes commodities in "thin markets" and provide sounder long-term economic prospects for newly introduced commodities which ultimately prove to be highly profitable.

Design and management of irrigation and drainage systems. Most public irrigation systems in Asia's humid tropics were designed primarily for rice production (Miranda, 1992, 126; Petit and Barghouti, 1992, 7). Introduction of non-rice crops into such systems can be problematic because (1) the irrigation requirements for non-rice crops differ much from those

for wetland rice and (2) the soil properties conducive to the growing of non-rice crops are different and generally more limited than for growing rice.

To meet land preparation requirements, rice-based irrigation systems are usually designed to deliver at least 1.5 liters per second per hectare (lps/ha) at the tertiary level. To deliver this flow of water, canals are usually designed with a capacity of nearly 2.0 lps/ha and with operating structures that function properly only when running at 70% or more of design capacity. For diversified cropping, however, the irrigation water demand is much less, often as little as 0.2-0.3 lps/ha. To deliver such amounts in systems, designed to handle much larger flows, requires a greater density of control structures and a more frequent operation of gates (Pasandaran, et al., 1989, 52-53).

With diversified cropping, the pattern of irrigation water demand is more complex than that with rice monoculture. Demand varies spatially, depending on the location of rice and non-rice crops within a system, and in time, depending on the duration of each crop. Variations in spatial and temporal demands for irrigation water with diversified cropping systems can be met only with a maximum of managerial effort--by system personnel who operate and maintain main systems and irrigation-users who operate and maintain on-farm systems. Meeting the more exacting requirement for non-rice crops can be particularly challenging with run-of-the-river systems whose rates of flow over time are often rather irregular.

Since the supply of water during the wet season significantly exceeds the water requirements of non-rice crops, diversification into secondary crops during the wet season is feasible only in the limited number of irrigation systems with light soils and well-functioning drainage systems. Possibilities for irrigated crop diversification during the dry season are greater but, even then, they depend much on soil type. Under rainfed conditions, possibilities for non-rice crops depend jointly on whether lowlands or uplands are involved and the season of year (Pingali, 1992, 112-116).

Since 1985, the International Irrigation Management Institute (IIMI) has been undertaking research on irrigation management for crop diversification in Indonesia, the Philippines, and Sri Lanka. This research--aimed at identifying physical, managerial, and institutional changes needed to permit cultivation of non-rice crops in irrigation systems developed primarily for rice production shows the following constraints (Miranda, 1992, 128-132):

- * Controlling the supply and removal of water for non-rice crops is more demanding because of these crops' stricter soil moisture requirements;

- * The presence of canal regulation and measuring facilities is essential to provide functional water control and enable effective monitoring of the water supply; and

- * Since the cash and labor inputs required for non-rice crops can be 3-4 times greater than for rice and many rice farmers are unfamiliar with non-rice crop irrigation and production technologies, many farmers prefer to grow rice if water supplies permit.

To overcome constraints such as these, it appears that irrigation systems selected first for the introduction of non-rice crops should be those having (1) substantial areas of well-drained and coarse-textured soils; (2) physical structures and management to enable necessary controls over water delivery and removal, especially at the turnout level; and (3) dry-season water supplies insufficient for rice to cover the entire command area. From the beginning, constructive working relationships between irrigation staff and water-users for managing the irrigation systems need to be nurtured. Farmer participation in management is particularly critical because of the more complex irrigation water demands for non-rice crops. If groundwater supplies are available, particularly at the tail-end of irrigation command areas, the possibilities of installing tubewells should be considered.

Finding "middle of the road" government policies

ASEAN-4 nations are searching for public policies to appropriately facilitate expansion of diversification within the overall context of desiring to (1) maintain over time a reasonable level of rice food self-sufficiency, (2) minimize economic trauma for farmers arising from reduced profits from producing rice and other export crops, (3) keep government budgetary costs under control, and (4) ensure that movement toward needed long-term structural adjustments is not impeded by adoption of policies to meet short-term needs. The search involves finding a balance among these contradictory objectives that will ensure adequate and appropriate incentives for farmers to meet domestic rice consumption needs, diversify into other farm enterprises, and seek employment and income outside of agriculture.

Degree of government intervention. Southeast Asia's path to expanded agricultural diversification could be constrained by governments pursuing policies that are either too interventionist toward or too remote from diversification. Governments can be judged to be too interventionist if they excessively regulate the diversification process or develop policies and programs with unsustainable budgetary consequences. Governments can be judged to be too remote in their promotion of diversification if they fail to anticipate and develop policies and programs to overcome strategic constraints to diversification that the private sector is unable to address.

One of the major thrusts in recent government policies is toward "privatization." Kikeri, et al. (1992) report that more than 8,500 state-owned enterprises in over 80 countries have been privatized in the past 12 years. The basic rationale for privatization is to provide incentives for improved managerial, employee, and overall business performance and reduce the number of government employees and the magnitude of government budget expenditure. Their research on privatization shows certain key lessons, e.g., privatization works best when it is part of a larger program of reforms promoting efficiency, regulation is critical to the successful privatization of monopolies, and countries can benefit from privatizing management without privatizing the ownership of assets.

In considering policies most suitable for supporting intensified diversification in Southeast Asia, it is important to look to the private sector to undertake a maximum of economic activity.

Incorporating lessons from experiences with recent "privatization" policies and developing means for furthering effective coordination between the private and public sectors are special challenges at this stage in the development of ASEAN-4's national economies (Barghouti, et al., 1990; 99-100; Okabe, 1993, 3-9; Saleh Afif, 1992, 21; Timmer, 1988, 123-125; World Bank, 1990, 46)

Nature of government intervention. Agricultural development policies in many Third World countries have traditionally been rather strongly oriented toward development of particular commodities. Planning and implementing such policies is relatively straight-forward.

Diversification involves a process intended to create production flexibility, however, rather than to achieve particular commodity production targets. Thus, policies likely to effectively support diversification have to be weaned of their commodity orientation (Petit and Barghouti, 1992, 9; World Bank, 1990, 15). With an aim to generate added flexibilities in agricultural systems, policies to support diversification require an integrated holistic sectoral orientation with supplementary provision for the intersectoral transfer of resources. With an aim to achieve long-term sustainability, policies need to be aimed at insuring the formation, maintenance, and transfer of adequate amounts of resources for future generations.

Achieving these joint aims requires a fundamental reorientation in the traditional criteria for project appraisal and evaluation. The relative importance of short-term economic efficiency via time discounting needs to be downgraded in project appraisal and evaluation. The notions of "flexibility" in production and marketing systems and the meeting of certain physical quantity and quality resource limits and standards that will help to ensure adequate formation, maintenance, and transfer of resources to future generations also need to be given creative and significant consideration.

Developing policies and projects to support long-term sectoral development and intersectoral transfer of resources, rather than simple commodity production targets, is a foreboding task. Substantial investments in (1) research on public policy formulation and project appraisal/evaluation and (2) human resource development will be required to produce the "new generation" of public policies and project instruments required to support diversification and other strategic features underlying needed long-term sectoral and intersectoral development in ASEAN-4 (after Petit and Barghouti, 1992).

Meeting short-term food security versus long-term structural needs. In principle, a country's short-term food security needs can be met if the price of its major food staple, rice, is "fixed" high enough above the world price. By removing short-term price instability at price levels remunerative to farmers, a country can ensure that its food security needs are met. To do so, however, may require costly government expenditures and delay intersectoral adjustments that ultimately have to be faced by all countries.

On the other hand, a country can take a free market price policy position in which domestic rice and other commodity prices are free to move up and down in line with world prices and, as income-earning opportunities in agriculture diminish, people leave farming for

other more remunerative sources of livelihood. This approach minimizes government expenditures but creates the possibility for social and political unrest--if, during the transition period, countries lose too much in their battle with staple food self-sufficiency, the poverty of rural people becomes too exaggerated, and/or the consequences of premature rural-to-urban migration become unbearable.

In a nutshell, the dilemma is determining a compromise between providing economic safety nets for a country's rice and other export crop farmers and promoting diversification. In searching for a compromise resolution, the principle is to pursue policies that will stabilize commodity prices against extreme short-run world price fluctuations but, at the same time, will allow the long-run trend of world commodity prices to pass through to domestic commodity markets.

Emphasis on income distribution or economic efficiency. Recall the percentage shares of GDP earned in agriculture versus the percentage of laborers employed in agriculture from Table 2. For each ASEAN-4 nation, the former percentages are lower than the latter, indicating that on average per capita farm incomes are lower than urban incomes. One of the dilemmas facing national policy makers is whether to artificially support the incomes of people in agriculture in the interest of alleviating sectoral disparities in per capita income or to pursue policies to maximize efficiency of resource use (Timmer, 1992, 28). Efforts to maximize resource-use efficiency inevitably involve painful transition periods as people and associated resources shift from current to more productive uses.

FUTURE PROSPECTS FOR DIVERSIFICATION

Future prospects for diversification in ASEAN-4 depend on the degree to which the constraints to diversification are overcome. The four principal actors for overcoming those constraints are government, agribusinesses, community leaders, and farmers/farmer groups.

In this concluding section, I indicate (1) eight critical areas for facilitating intensified diversification and achievement of related long-term resource and structural objectives in ASEAN-4 and (2) a framework for decision-making on who should undertake the various tasks represented by each of these critical areas.

* Research and development focused on public policy formulation, project appraisal and evaluation, public-private sector development coordination, rice productivity improvement, converting irrigation systems designed for monoculture rice into systems for irrigating non-rice crops, searching out of potentials for non-rice crop and non-farming rural economic activities, and farming system adoption;

* Input supply and delivery systems and production information dissemination services to support the new array of commodities comprising the diversified enterprise mix;

* Physical infrastructure required for producing and marketing new diversified commodities;

* Appropriate grades and standards and dissemination of information on prices for new diversified commodities;

* Institutions and organizational structures to facilitate production and marketing support activities for new diversified commodities;

* Development of domestic and export markets for new diversified commodities;

* Human resource development opportunities involving the education and training of a new generation of public policy makers, project appraisers/evaluators, agricultural researchers and extension agents, agribusiness managers, community leaders, and farmers;¹¹ and

* Devising public policies and programs to provide incentives to the private sector to pursue strategic activities required for long-term diversification and related natural resource development and use for which private costs exceed private benefits.

Depending on current circumstances, either government or the private sector needs to take leadership in developing creative and effective partner relationships among government, agribusinesses, farmer organizations, community leaders, and individual farmers to address these strategic issues. The objectives of dialogue among these various groups will be to determine how to most appropriately address each strategic issue and the most satisfactory division of responsibilities among various government and private sector bodies to accomplish these strategic tasks. Fundamental in such discussion will be allowing (1) maximum scope for local participation in policy-program formulation and implementation, (2) maximum freedom to the private sector to pursue those tasks for which private benefits are expected to exceed private costs, and (3) reserving for governmental bodies only the residual activities.

¹¹Education and training programs to prepare rural people for non-agricultural jobs are also required.

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