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IMPLICATIONS OF AGRICULTURAL INNOVATION FOR
SOUTHEAST ASIA'S PATTERNS OF INTERNATIONAL RELATIONS

By Lester R. Brown

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Implications of Agricultural Innovation for Southeast...

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IMPLICATIONS OF AGRICULTURAL INNOVATION FOR
SOUTHEAST ASIA'S PATTERNS OF INTERNATIONAL RELATIONS ^{1/}

By Lester R. Brown

I. INTRODUCTION

The Vietnam war has caused most Americans to view Southeast Asia as a unit, a barrier to the expansion of Communism across the face of Asia. International relations tend to be seen as simple, and confined to mutual aid against insurgency. Reality is, of course, much more complex. The Region combines five great cultural traditions, the Islamic, the Hindu, the Buddhist, the Confucian and the Catholic. There are major linguistic and political divisions both within each country and between them. The interests of and outside influences on the individual nations have shown remarkable variety. What attempts there have been to create Regional organizations confined to Southeast Asia have generally been unsuccessful: examples include Maphilindo and the Association of Southeast Asian Nations. The overwhelming need for each country to establish itself as an independent unit has led to territorial disputes and a lack of positive efforts to build up trade patterns.

The leaders of Southeast Asia are aware of their diversity and of their difficulties. They are engaged in a search for new ways in which to develop mutually beneficial harmony. Within the last three years a new dimension has entered into the international relations of the area:

^{1/} Robert Shaw, my colleague at the Overseas Development Council, has been both deeply involved and exceedingly helpful in the preparation of this paper.

that is the new set of technological patterns which hold the promise of enormous increases in agricultural production, particularly for cereals. This Agricultural Revolution is spreading throughout the Region. It is creating new challenges in international relations. Opportunities for cooperation are at hand, and have the potential to change radically the lives of the peoples of Southeast Asia. At the same time, new problems are arising. In a sense these are the problems of success -- they derive from a potential abundance rather than from the horror of shortage. But, in order for the new knowledge to benefit the farmers as it is intended to, the governments of the Region must face up to these challenges and seek new solutions.

In the sections that follow I have attempted to outline the principal constituents of this new parameter in the relations between the nations of Southeast Asia.

II. IMPLICATIONS FOR THE GRAIN TRADE

A major component of international relations in Southeast Asia is trade. The Agricultural Revolution has already had a significant effect on trade in grains. This is likely to continue, though it is extremely hard to predict confidently the magnitude of the effect in the future. Rice dominates the Asian cereal trade. The prospects for trade in the other major food and feed grains are also likely to be altered by the recent technological changes and by the possibilities for substitution between cereals.

The World Rice Situation

The world rice situation during the sixties can be divided into three phases. Up through 1964, supplies and trade rose gradually, and prices were relatively stable. In 1965 and 1966, production failed to meet demand, and world prices rose sharply to 50 percent above their previous average. International trade leveled off at about 7 million tons, well above the 1964-65 peak, though still less than 3 percent of total world production.

Finally, in 1967, production picked up, as a result of a combination of good weather, new seeds, and improved technologies. Output for the non-Communist world increased by 8 percent to 184 million metric tons in 1967, followed by a further estimated increase of 3 million tons in 1968. Once stocks had been rebuilt, import demand eased, and international prices have fallen. The FAO world export price index for rice reached a high of 158 in March 1968, and had declined twenty points by January of this year. All indications are that it has continued to decline.

Southeast Asia produces about 20 percent of the world rice crop, and is involved in 30 percent of the international rice trade. Already the production increases deriving from the Agricultural Revolution are altering long-established patterns of trade within the area. The most spectacular change occurred in the Philippines. Imports of rice were halved from half a million tons in 1965-66 to less than 200,000 in 1966-67. In 1968 the country reached self-sufficiency and was even able to export 40,000 tons. The contribution of the high-yielding varieties to this success story has been most marked. In 1967, 11 percent of the area under

rice was planted with new seeds, which provided 27 percent of the total crop. This year, over one million acres, or about one-third of the total, are estimated to be growing the new varieties. South Vietnam, Burma, Indonesia, and Malaysia are increasing their output, though not with such rapid strides as the Philippines. As new and more acceptable varieties appear, this process is likely to accelerate. With the interaction of modern technologies and updated economic policies, projections of supply can be nothing more than tentative. In general, though, it can be said that the 1970s will be a period of ferment and change for the world rice trade. The specter of famine has receded and been replaced by a new dynamic which seems destined to alter radically existing production and trade patterns.

The Self-Sufficiency Syndrome

The aim of all the deficit rice-producing countries in Southeast Asia is self-sufficiency. In view of the chronic shortages of foreign exchange experienced by these nations, and the wild price fluctuations to which the international market has proved susceptible, this aim is not to be wondered at. With the complexities and uncertainties on both the supply and demand side, it is difficult to state with precision exactly when each country will reach this goal. Malaysia expects self-sufficiency by 1972, Indonesia before the end of the decade, and South Vietnam shortly after the end of the war. In each case the principal force behind this drive will be new rice varieties combined with new inputs and cultural methods.

In most of Southeast Asia, population is growing at between 2-1/2 and 3 percent per year. If we assume that income is also rising but that

the income elasticity of rice is low, and if we predict some lowering of domestic prices in response to increasing supply, combined with a low negative price elasticity, it would seem reasonable to expect that rice demand within the Region will rise at a rate around 4 percent per year. With more research and extension, improved water control, and greater access to fertilizer, supply can rise at a considerably more rapid pace. The potentiality is certainly there: its realization will depend on appropriate government pricing and input supply policies, and on a calculation of the comparative advantages of rice production within each area.

Despite the vagaries of the weather, the outlook in the seventies is for a decreasing demand for rice imports, and a growing ability on the part of most countries in the Region to produce an exportable surplus. This trend obviously cannot continue for very long. We can predict, for much of Southeast Asia, a "self-sufficiency syndrome." As the pressures to attain self-sufficiency combine with the new technologies, production in most countries seems likely to exceed domestic demand. Attempts to export the surplus will follow. As prices fall, only those areas with a strong comparative advantage in rice production will be able to export economically. The other areas will be compelled to divert some of their acreage from rice to other commodities such as fruits and vegetables for which demand is growing. Expansion in this direction is likely to be limited. The real room for growth is in the production of feed grains for the livestock industry. The prospects for corn, sorghum and soybeans are discussed below.

The New Rice Crisis

In the world at large, the outlook for the rice trade is almost equally dampening. A new rice crisis is looming, one of world rice surpluses. A recent survey by the U.S. Department of Agriculture estimated that 1970 would show an excess of supply over demand. And this survey may have been conservative in its projections of supply: the Soviet Union for example is shown to require imports of 335,000 metric tons of milled rice in that year. However, the Russians themselves have set up a target of zero imports for 1970. While India, South Korea, West, and to a lesser extent East, Africa should continue to import large quantities for some years, the overall picture indicates a change from a sellers' market to a selective buyers' market this year and in the next decade. If this comes about, the price of rice in the world market is likely to continue to decline. Importers are likely to become much more discriminating about rice quality, detailed specifications and delivery dates. Lower prices and insistence on quality may lead to a rationalization of rice production favoring those areas which have a comparative advantage in growing this cereal. West Pakistan, with an abundance of solar energy and water control, seems destined to provide stiff competition for Southeast Asian exporters. Burma and Thailand will both feel the effects of increased competition. In order to retain or expand their positions as major rice exporters, both countries will have to undertake aggressive marketing campaigns, and reorganization of production along the most economic lines which would probably involve concentration on high-quality rices. In addition, both may have to be prepared to see the reduction of government

revenue from taxes on rice exports as they are forced to compete in a world of decreasing prices.

General concern about the future of the rice trade was evident at the Thirteenth Session of the FAO Study Group on Rice in March of this year. Several members of the group, notably the Philippines and Thailand, considered that some form of international action was necessary to control the rice trade. Proposals were made to prevent "undue" competition between the developed and the developing countries, to grant preferences to the rice exports of developing countries, to adjust rice production and prices in response to prospective demand, and to control the release of national rice stocks. Opposition to these proposals was voiced both from the rice producers in the developed countries, especially the United States, Japan and the EEC, and from those importers who stood to gain from declining prices and the maintenance of concessionary rice supplies.

The problems associated with attempts to reach worldwide agreement on such issues are amply illustrated by recent difficulties with the International Grains Arrangement. The system of minimum prices for wheat has broken down under the pressure of excess supply. In Southeast Asia, the importance of rice as a staple food and as a trade item makes it essential in the long term that the nations of the Region try to reach some solution to these issues. This requires diplomacy and dedication. In the absence of progress toward a worldwide agreement, the countries of Southeast Asia can work to improve existing arrangements for forecasting import requirements and export availabilities and for providing information on prices, contracts, stocks, and production programs and targets.

One further possibility might be for the nations of the Region to work toward their own limited and flexible agreement on rice. Such an agreement could be set up within the framework of the present Study Group on Rice, or through the Asian Development Bank. It could include agreements on quantities, prices and stocks. The former might be along the lines of the Wheat Trade Convention: participating importing countries would agree to purchase specified proportions of their requirements from the participating exporting countries, and vice versa. The proportions could be altered from year to year. This could be related to an agreed price range, which should be wide enough to permit some limited fluctuations in the market.

Trade in Other Food Commodities

While this section has concentrated on the basic food crop of Southeast Asia, namely rice, it is important to consider briefly the effects of agricultural innovation on the patterns of trade in other food commodities.

As rice supplies grow into surpluses, resources will be freed for other agricultural enterprises, including feed grains for livestock and poultry, and fruits and vegetables. This diversification will be spurred by the increases in incomes which seem likely to be generated by rapid gains in agricultural production. These two factors may combine to create significant changes in the historical patterns of trade. One outstanding example of this has occurred in Asia. As Japanese per capita income has risen, so has the demand for livestock and dairy products. In order to expand the livestock industry, massive new sources of feed

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grains have had to be developed. Japanese business interests, working closely with the Government of Japan, have introduced assistance programs in Thailand and Indonesia for promoting the production of feed grains for export to Japan. Thailand's exports of feed grains amounted to 1,574,000 metric tons in 1968, most of which consisted of corn, though an increasing proportion of sorghum and soybeans is also included. This trade can be expected to develop rapidly as the demands for livestock products in such areas as Japan, Taiwan, Hong Kong and Singapore soar upwards. Production of feed grains is itself being facilitated by new advances in agricultural technology. The introduction of new hybrid corn seeds and cultural practices is contributing to the rise in output.

As breakthroughs occur in the production of various cereals, and as incomes rise, shifting consumer preferences, there is likely to be some alteration in the patterns of grain consumption. Thus, in the Philippines, these two factors have coalesced to cause consumption of wheat and wheat flour to increase rapidly. Imports of wheat in fiscal 1968 totaled 446,429 tons, up 10 percent from the previous year, while flour imports increased 17 percent to 71,259 metric tons. Quantitative predictions of the future of the trends in cereal substitutions can only be very tentative. But it is reasonable to assume that the demand for wheat in Southeast Asia will continue to rise, and that this will increase the trade flow into the area in the near future.

The Role of Japan

Japan will play a very important role in determining the future of the Southeast Asian grain trade. Her hundred million people, her vigorous

economy, and her need to stimulate imports in order to foster export markets, all combine to make her potentially the biggest market for the agricultural surpluses of the Region. As recently as 1965 and 1966, Japan was importing nearly one million tons of rice annually. This year with increased yields and good weather, she is a net exporter. But this is at terrible cost. The support price for rice in Japan is \$412 per ton, or nearly three times the world price. Despite this, farm income is only about one-half of non-farm income. There are reports that Japan is trying to diversify some of her rice lands to other crops this year.

From the point of view of economic rationality, it would make sense for Japan to cut back significantly on her rice production and import from Southeast Asia. There are no indications that Japan proposes to do this. However, the potential mutual benefits mean that Japan might be susceptible to sustained pressure from the rice exporting nations of Southeast Asia to move in this direction.

Projections of import requirements show that Japan will require about 23 million tons of food and feed grains in 1977, assuming she remains self-sufficient in rice. This is an increase of more than 10 million tons in a decade. The bulk of these requirements consists of feed concentrates, wheat and soybeans. This fast market provides a future for the agricultural surpluses of Southeast Asia.

III. INPUTS

If the new high-yielding varieties that are fueling the Agricultural Revolution are grown using traditional methods, the results, in general,

are unspectacular. The new seeds require new technologies. In turn, the technological changes require massive inputs in the forms of research, water control, fertilizer, pesticides, and so on. The production and coordination of these inputs offers numerous possibilities for cooperation among the nations of Southeast Asia. Some of the possibilities are already being exploited. Many more opportunities exist, however, for worthwhile regional cooperation in the area of agricultural development. I shall try to outline some of the more important of these opportunities.

Research

The Agricultural Revolution was triggered by the major advances in breeding new cereal varieties. In Southeast Asia the principal catalyst was the work done by the IRRI at Los Banos in the Philippines, where IR-8, the "miracle" rice, and IR-5 were developed. The diffusion of this research, as well as its organization, are remarkable tributes to international cooperation. All the non-Communist countries of Southeast Asia have direct access to the seeds and to the accumulated knowledge of associated technologies. IR-8 is planted extensively in the Philippines, Indonesia, and South Vietnam, and being tried experimentally elsewhere. Scientists from 25 nations, including most of Asia, are working at Los Banos. Seminars and conferences have been conducted, and visiting agriculturists are welcomed. Through this medium many Southeast Asian scientists are getting to know one another and working together.

But much more needs to be done. While the new varieties produced to date are widely adaptable, they have certain characteristics which make

them less acceptable in some areas. The milling quality of IR-8 is poor, for example, and the grains tend to be chalky, thus not fitting the preferences of many rice eaters. Similarly IR-8 is susceptible to some diseases prevalent in Southeast Asia, especially bacterial leaf blight and some strains of rice blast fungus.

These problems can be attacked on two levels. At the international level, centers such as IRRI can work to produce further new varieties that are highly productive, disease resistant and acceptable over wide areas. On the more local level, national systems of research must work to adapt the new varieties to particular ecological conditions within the country. IRRI is well qualified to do the type of research involving the assembling, testing and manipulation of large banks of germ plasma. Work on this scale involves sophisticated equipment and a large team of highly skilled experts. Given the scarcity of these resources, concentration of this type of work in one center of excellence makes good sense, provided the results can be rapidly disseminated throughout the region, and provided further local research is done to realize the full potential of these varieties.

National research systems, in order to coordinate properly with IRRI, should concentrate on agronomic aspects and on the adaptation of new varieties to local conditions. It is also important that national research institutions cooperate very closely with extension systems so that the new varieties may be spread as rapidly and widely as possible. The national research institutions of Southeast Asia have performed very creditably. But there is still room for improvement in training and

organization. More can be done to learn from the experiences of other countries within the Region. The two-way flows of information between the international center and national institutions can be emphasized and rationalized. The recent establishment of a regional agricultural center at Los Banos will contribute to this process.

Now that research in high-yielding varieties of rice is well under way, much work must be done on the problems of other tropical crops, corn and sorghum, the pulses, oilseeds and fruits and vegetables. This is necessary in order to restore the traditional balance among tropical crops that has been radically upset by research on rice, and also to make diversification from rice production profitable. Many opportunities exist for the Regional pooling of experience and knowledge in these areas. They must be utilized to the full.

Irrigation

Water control is a prerequisite for significant increases in agricultural production, and especially for rice. In the Philippines rice yields are 40 to 50 percent higher in irrigated fields than in those fed by rain. Yet the majority of rice-growing land in Southeast Asia is still rainfed: in Thailand, for example, no more than 20 percent is irrigated. Two shifts are occurring in irrigation thinking, both leading to more effective utilization of water. On the one hand the intensive approach is being emphasized. On the other hand several countries are moving away from a focus on large irrigation projects in the form of dams and major canals which generally have a low long-term payoff toward small early-return

Considering the crucial role played by water control, remarkably little research has been done in such areas as specific water requirements, and the optimum timing of water application. The Asian Development Bank has recommended that an Asian Institute for Irrigated Agriculture be set up to concentrate on these issues. The nations of Southeast Asia, which stand to see very high returns from such an investment, should encourage the rapid establishment of this project. The functions of the Institute would include training for water management as well as research.

At the same time, there is a strong need for attacking the problems of rain-fed agriculture, in order to prevent a growth in the disparities between areas. Again, in order to make the most effective use of resources, a Regional approach is indicated. Perhaps Southeast Asia should consider setting up a separate institution to grapple with the problems of diffusing improved water management practices such as contouring, terracing, fallowing, and water-spreading.

Finally, while it is not primarily an irrigation scheme, the massive and unique Mekong River Project has made and will continue to make a major contribution to international relations between the four participating countries, Laos, Cambodia, South Vietnam, and Thailand.

Whereas relations between these countries have been frequently strained in other fields, the work of the Committee overseeing the Project has continued apace and seems destined to make a manifest contribution to peace, improved welfare, and stability within the area.

Fertilizer

The most important single characteristic of the new rice varieties is their high rate of response to fertilizer. The new rices, which are short and sturdy, can absorb heavy dosages of fertilizer and are more efficient in its use. This is especially true of nitrogen fertilizer. Yields of traditional varieties of rice in Southeast Asia increase with the application of nitrogen fertilizer until application rates reach about 40 pounds per acre. IR-8 yields rise until the application of nitrogen reaches 100 - 120 pounds per acre. It is not surprising, then, that fertilizer consumption throughout the Region has soared as the high-yielding varieties have been introduced.

Technological breakthroughs in fertilizer production are presenting the nations of Southeast Asia with difficult choices. At present the region produces only about half of the nitrogen it consumes. The rest is imported and costs precious foreign exchange. At the same time, new technology has greatly reduced the capital and operating costs of ammonia plants. Capital costs of large plants producing 1,000 tons per day are nearly 50 percent less than they would be for plants using the old pre-1963 technology. Many companies have invested in these large plants, causing an excess supply of ammonia, and very low prices. It is unlikely, therefore, that many new fertilizer projects will be started by these companies in the Region in the first few years of the next decade. This applies even to Brunei and Indonesia, both favorable locations for fertilizer plants in view of their large supplies of natural gas. But this does not solve the foreign exchange difficulties of the Region.

Delicate negotiations will have to be carried out to resolve this contradiction.

The small countries of the Region will find that a large plant, with its economies of scale, is too large for national needs, but that appropriate-sized plants result in high-cost output. Low-cost fertilizer could be made available from one or more large plants established to serve the region as a whole. The problems of size, location and distribution are all considerable. Nevertheless, the possible advantages of efficient use of regional reserves, increased intra-regional trade, and lower nutrient prices for farmers would seem to make this plan a worthwhile exercise in cooperation.

Nutrition

Agricultural scientists are making strenuous efforts to improve not only the quantity of the food supply in the Region, but also its quality. The breeding of high-protein wheat varieties in the United States and India has been quite successful, and has led to India offering to share her knowledge with interested parties. In order to improve the diets of Southeast Asians, a similar attack must be launched to increase the nutritional value of rice and other basic foods. Some work has been started. But in view of the importance and magnitude of the task, the nations of the Region might give consideration to the establishment of a specialized institution along the lines of the Institute of Nutrition of Central America and Panama, situated in Guatemala.

Other Possibilities

The list of possible areas of fruitful cooperation is long. Pest control, a regional resource survey, coordination of statistics, exchange of extension methods, and so on, all provide possibilities. The challenge is set: the goals of increased agricultural productivity and regional contact are worthwhile. The response requires organization and dedication.

IV. COOPERATION OUTSIDE THE REGION

Aside from the problems of trade and marketing, the Agricultural Revolution has created new relationships between Southeast Asia and several outside countries. Principal among these is the United States, which has given important help in the form of technical assistance, capital loans, and food aid. Increasingly, other countries will be involved in these fields. Japan, in particular, appears willing to provide assistance, in the hope that it might stimulate diversification of Japan's sources of supply, and facilitate increased entry into the Southeast Asian market for Japanese industrial goods.

Outside involvement in the Agricultural Revolution may be divided into two parts, direct and indirect. Direct involvement shows concern for immediate results in boosting agricultural production. It includes making supplies and credit available for the inputs required for production, and then assisting with transport, storage, processing and marketing. Indirect involvement includes teaching, research and extension, activities designed to provide the skills and techniques to achieve greater output. The United States has executed direct programs aimed at fulfilling needs

in both types of involvement. Fifty-six Thai technicians have been trained in the United States. South Vietnamese purchases of seeds and pesticides have been financed: the United States provided technical and capital assistance for the expansion of irrigation and rural credit systems in the Philippines, and so on. Other agencies have provided similar support though on a smaller scale; the World Bank, for example, loaned Indonesia \$5 million to rehabilitate rundown irrigation facilities. Such programs are not substitutes for effective action by the local government, but, hopefully, they may act as complements and speed the rise of the Asian farmer into the mainstream of national life.

What are the needs for the future? In the short term, the requirements for outside assistance of the direct type are likely to mushroom. Farmers throughout Asia are rapidly adopting the new seeds and technologies. This accelerates demands for seeds, irrigation, fertilizer, and credit. In turn, the increased production places heavy burdens upon existing systems of storage, transport, processing and marketing. Despite valiant efforts, most national systems in Southeast Asia have been swamped by the unexpected rush to higher production. These difficulties must be solved, and solved quickly, if the promises of the Agricultural Revolution are to be fulfilled. International resources must be mobilized through both bilateral and multilateral agencies. If the necessary help is forthcoming, experience indicates that local systems will rapidly grow to the stage at which they can handle the supply of farm inputs and the distributions of the fruits of revolution.

In the areas of teaching, extension and research, longer term cooperation between the Region and the outside is predictable. In these activities the exchange of ideas, accumulated knowledge, and personnel over an extended period of time should be of benefit to both parties. The successes that have been achieved with the worldwide diffusion of some of the new cereal varieties lend particular emphasis to this proposition. As the new agricultural technologies are developed and spread, the importance of close contact between researchers, teachers and disseminators will grow.

Careful coordination between the nations of Southeast Asia and the United States is necessary with respect to food aid. While PL 480 is intended to be tied in with self-help programs in the recipient country, it is conceivable that the release of PL 480 cereals could lower the price on the local market. This, in turn, could decrease the incentive to farmers to produce more. This danger must be faced squarely, while, at the same time, ensuring against the possibility of hunger.

Another similar form of difficulty can arise in international trade. Those countries in Southeast Asia who have or are in the process of developing exportable surpluses may find that demand for their cereals is restricted by concessional deliveries by certain developed countries to rice-deficit areas. South Korea poses such a problem. She receives rice on deferred payment and barter arrangements on very soft terms from both the United States and Japan. She is understandably reluctant to buy rice from Southeast Asia on commercial terms. Yet Thailand and the Philippines are losing a valuable external market because of these arrangements.

Such problems need to be submitted to international negotiation. Though somewhat toothless, the FAO Study Group on Rice does at least provide a forum where these issues may be discussed.

V. POLITICAL IMPLICATIONS

I now reach the realm of pure speculation. The question I want to pose is "To what extent and in what directions is the Agricultural Revolution likely to affect the political relationships between the nations of Southeast Asia?" No clear answer will emerge, but I shall try to suggest some parameters which should be taken into account when considering these issues.

In the flush of independence from colonialism, Southeast Asia entered a brief honeymoon of optimism. This evaporated as the problems of modernization and economic development, of the creation of meaningful nations and viable regional relationships shattered the earlier euphoria. The countries have followed diverse paths which have, on occasion, led to collisions.

One common element may be distinguished, however; that is the renewal throughout Southeast Asia of the search for identity in the face of an unprecedented process of change. The search has two main, though closely related, components. Within each country

there exists a search of identity in the sense of nationalism. This involves the accommodation of cultural and linguistic traditions, and an attempt to establish institutions and philosophies of government which are appropriate to the individual nation. On a broader level, each country appears to be searching for a role in the Region, and ultimately in the world at large. These are related to the extent that permanent and productive relationships can only exist between countries which have achieved a certain level of internal unity and stability. The renewal of the search contains a growing awareness of the need for the Region to depend less on the major powers and to look to their own resources. The trauma of Vietnam and the possibility of lessened American interest in the area have contributed to this feeling. There is general recognition that economic assistance will be needed for many years, but the relationship between the poor countries of Southeast Asia, the beggars, and the rich countries of the West, is undergoing radical changes in both psychological and political terms. Thus politicians throughout the area are talking about "the second phase of the Asian revolution."

How does the Agricultural Revolution fit into this pattern? The production of food may be seen as the key to recovery and future growth for the nations of the Region. The growing of food, and in particular rice, is not only important because of the pivotal position of cereal production in the economies of Southeast Asia; it also has a tremendous psychological and symbolic significance. Since rice is the staple crop of the whole region, it is hardly surprising that national independence should be closely linked with self-sufficiency in rice. The Agricultural

Revolution offers the prospect of self-sufficiency and more. It offers the possibility of increased rural participation in national life. If agricultural production can be accelerated, then this can provide a base for developing the other sectors of the economy, through increased saving and investment. And a growing economy reinforces the needs and incentives for orderly and progressive government. Thus the new seeds could be the catalyst for establishing self-confidence and strength among the nations of the Region.

If the Agricultural Revolution does help towards the creation of effective national units, we can anticipate that political relationships within Southeast Asia will enter a new era. The country which stands to gain most is Indonesia. With almost half of the Region's population, and with great potential wealth and strength, Indonesia is in a position to provide economic and political leadership, assuming she recovers from the economic disasters inherited from Sukarno. To accomplish this, rice production remains one of the keys. Inflation, goaded by supply shortages, caused prices to rise 635 percent in 1966. As the supply situation began to ease, the rise in prices amounted to only 112 percent in 1967, and inflation had dropped to 2 percent a month by mid-1968. A large part of this cut was due to the large increase in rice production. With increased use

*1. total supply
2. foreign aid
3. well used
4. rice*

of new seeds, irrigation and fertilizer, Indonesia could set herself on the road to becoming the principal force for stabilization in Southeast Asia.

Elsewhere in the Region, the national governments that manage to achieve agricultural breakthroughs can expect to receive the confidence of their people. The position of the progressives, the economic planners and political moderates who can sustain the necessary changes, should grow in strength. If appropriate policies are taken to diffuse the benefits of the new technologies as widely as possible, the peoples of Southeast Asia can take new hope. It is conceivable that there would be less opportunity for successful insurgency. In addition, internal achievement might remove the necessity for the type of border squabbles that seem to be used as national rallying points by so many Regional leaders. All of this depends upon the intelligent and coordinated prosecution of the Agricultural Revolution, and upon an effective attack on the problems that are likely to arise from successful increases in agricultural production, such as the overburdening of marketing and storage systems.

One problem that should be mentioned in an interregional context is that of the traditional middlemen in Southeast Asia, the Indian and especially the Chinese merchants and small businessmen. As agricultural production rises, so will the role that these groups usually play, in marketing and distribution, and in the supply of credit and farm inputs. In several countries this growth in importance may cause a racial backlash, and an increasing polarization of the society. Since such unrest has

become a major issue in much of the Region, national governments should take great care to integrate majority groups into these highly visible activities.

VI. CONCLUSION

IR-8, the miracle rice, its successors, and the whole range of high-yielding grains hold out the opportunity for a transformation of international relations in Southeast Asia. Increased international cooperation is essential to the fulfillment of the promise of the Agricultural Revolution. Trade problems must be overcome. The scarce resources of the Region, and in particular the skilled manpower, must be coordinated and focused on the problems of raising agricultural productivity. Assistance from outside the Region can make a considerable contribution to this process.

At the same time the success of the Agricultural Revolution is likely to have implications for the patterns developing both within Southeast Asia and between those nations and the rest of the world. If the economic, social, political and psychological effects of the new technologies are such as to strengthen the existing national units and the ties between them, then the Region can look forward to a new era of stability and prosperity. In particular, agricultural innovations have the power to revolutionize the lives of the hundreds of millions of peasant farmers in the Region. There are many problems at the local, at the national, and at the international levels. These problems must be seen as challenges.

They require clear definition, the careful weighing of alternative solutions, and the determined implementation of the plan of action decided upon. Only in this way can the revolution become a lasting reality for the people of Southeast Asia.