

Dialogue

Trilateral Proposal Debated DOUBLING RICE PRODUCTION IN ASIA

To find a balance between population growth and food supply in the poor nations is one of the most serious challenges to mankind in the last decades of the twentieth century. If population grows faster than food production, the number of undernourished people in the world will far exceed the present estimate of 500 million by the end of the century. In order to feed a growing population and to ensure a per capita increase in food, as consumption rises with higher standards of living, food production will have to grow faster than the population. The demand could be met by increasing food production in the wealthy nations and sending the surplus to the hungry countries. But programs of this type, already in operation for the last two or three decades, cannot indefinitely provide a panacea.

Only two continents in the world are producing a net surplus in food which they can export: North America and Oceania. The other continents have so far been able to compensate for shortages by importing from the former two, but the volume of shortages has been on a steady increase over the years. Of all the supplier nations, the United States has provided the vast bulk of food exports. Until now, developments in American farm technology have played a leading role in filling the gaps in world food production, but it is unrealistic to expect the same level of progress to continue indefinitely.

If local food production can be increased annually, it will go a long way in providing employment
Saburo Okita (Continued on p. 2)



TRILATERAL NORTH-SOUTH FOOD TASK FORCE MEETS WITH ASIAN EXPERTS IN MANILA (JULY 1977). Clockwise from upper left (facing camera): Saleh Affif, Deputy Chairman, Bappenas, Indonesia; Benjamin U. Bagadion, Deputy Administrator, National Irrigation Administration, Philippines; J. D. Drilon, Director, Southeast Asia Regional Center for Graduate Study and Research in Agriculture, Los Baños, Philippines; S. C. Hsieh, Director, Projects Department I, Asian Development Bank; T. H. Lee, Governor of Taipei, Taiwan; Sneh Unakul, Governor, Bank of Thailand, Bangkok; David Sycip, Chairman, Council for Economic Development, Manila; M. S. Swaminathan, Director-General, India Council of Agricultural Research and Education; M. F. Taratdar, Chief, Flood Control and Water Resources, Planning Commission, Bangladesh; Tan Sri Thong Yaw Hong, Director-General, Economic Planning Unit, Prime Minister's Department, Malaysia; James E. Johnston, Deputy Director for Agricultural Sciences, Rockefeller Foundation; Max Langham, Associate for Philippines, Agricultural Development Council; Gerard Rixhon, Consultant, The Ford Foundation; Tadashi Yamamoto, Japanese Secretary, The Trilateral Commission; Yujiro Hayami, Professor of Economics, Tokyo Metropolitan University; D. Gale Johnson, Provost and Professor of Economics, University of Chicago; Toshio Shishido, President, Nikko Research Center, Tokyo; Umberto Colombo, Director-General, Research and Development Division, Montedison, Milano; Kenzo Henmi, Dean, Faculty of Agriculture, University of Tokyo; and Kunio Takase, Deputy Director, Projects Department I, Asian Development Bank.

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opportunities for people in the densely populated, less affluent nations of Asia. More jobs will mean more income. Even if the countries of North America and Oceania have a comparative advantage in terms of cost in producing rice for Asia, the poor nations of Asia do not have the foreign currencies with which to buy the grain. If they cannot increase domestic production, they can neither resolve their food shortages, nor increase employment and raise income.

Food production fluctuates widely according to the weather. India, for example, had poor harvests in 1972 and 1973, but since then, the monsoon rains have been good and production has risen, providing 20 million tons of grain for storage, with no need to import. But since weather conditions are never dependable, and since the majority of Indians are still not adequately nourished, the threat of shortage is ever-present. Indonesia has considerably increased its grain production and will soon be able to fulfill domestic demand, but it still had to import 2.5 million tons of grain last year.

At times when world production of food grains is steady and rising, observers become optimistic, but as soon as production slumps and shortages crop up, projections for the future tend to be pessimistic. During times of pessimism, investment in agricultural development is high; while ironically, investment receives less emphasis when people are optimistic. Problems in food supply for the future cannot be resolved by responding to the temporary fluctuations in the situation; investment must be made on the basis of accurate forecasts of long-term trends.

Most Asian nations are very densely populated and arable land for development is limited. The staple grain for virtually all Asians is rice, and most of their rice is produced in wet monsoon regions. Conditions in the Northeast Asian countries of Japan, Korea and Taiwan are different and allow intensive cultivation which yields an average of almost six tons of rice per hectare, but the monsoon belt countries of South and Southeast Asia produce only two tons per hectare. In order to use the new high-yield seed grains and fertilizer effectively, farmers must have access to good water control and irrigation. Although water control alone

is not sufficient for increasing production, it is one of the most important factors.

Few who have ever thought about the North-South disparity are likely to disagree that the industrialized nations must give as much assistance as possible to the people of the less affluent developing nations. And, although it is late, we are finally becoming aware that assuring the poor of sufficient nutrition, basic education, and health and sanitation facilities, while eradicating "mass poverty" from the world, should be the common goal of mankind. Nonetheless, politically and for other reasons, it is not desirable to depend on income transfer from the industrial nations to ensure basic human needs. One of the best solutions is to provide the minimum necessary assistance to establish a strong base on which production, particularly food production, can be increased by the needy countries themselves. Higher production, in turn, would lead to increases in income.

A Trilateral task force report has been devoted to the discussion of a plan for doubling rice production in Asia, formulated from the perspective outlined above.* On a few occasions, the report of the task force has been criticized for its narrow focus on a single product (rice), its exclusive attention to one particular region of the world (Asia), and for emphasizing only one method of increasing agricultural production (water control). Its critics claim that this approach is likely to constrain a whole range of alternative courses of action. We believe, however, that to achieve a larger goal it often helps to concentrate on one particular objective, and that a breakthrough in that area would help in efforts to improve the broader situation. Hence, our program for irrigation and rice production in Asia should be seen as an initial step toward a larger goal.

Kunio Takase and I drafted the initial plan, which later formed the basis for the Trilateral task force project, presented as a joint report for discussion at the Bonn meeting of the Commission in October 1977. Since the subject was rice production in Asia, we were somewhat concerned that it would lack appeal to the North American and European members. But, fortunately, most comments on the report

*Umberto Colombo, D. Gale Johnson and Toshio Shishido, *Reducing Malnutrition in Developing Countries: Increasing Rice Production in South and Southeast Asia*, A Report of the Trilateral North-South Food Task Force, The Triangle Papers: 16 (1978).

The Trilateral Stake: MORE FOOD in the Developing Countries OR MORE INFLATION in the Industrial Democracies

James P. Grant
President
Overseas Development Council

The Trilateral food task force's report, *Reducing Malnutrition in Developing Countries*, sets forth a proposal which, as an example of a major regional development project, represents the kind of undertaking which could dramatically increase the world's food production capacity. The proposal translates into action convictions at which more and more of the world's leaders are arriving: that increased North-South cooperation in a series of fields, of which foods is a notable example, is essential not only for meeting the basic needs of the developing world, but also for protecting the industrial democracies from crippling inflation and stagnation.

Just four years ago (1973-74), rising food prices added as much to U.S. and global inflation, according to a Federal Reserve study, as did rising oil costs. At the same time, the

skyrocketing costs of food, fuel, and fertilizer imports graphically illustrated the vulnerability of developing countries in general, and poor people in particular, to external disruptions of their food supplies.

These events served as a catalyst, forcing a major reassessment of over twenty years of development cooperation experience. The result of this reassessment is a growing recognition that only a rural development strategy, based on labor-intensive agriculture and aimed at involving the entire rural population in productive work—such as the objectives of the task force's proposal for increasing rice production in South and Southeast Asia—could hope to meet the food needs and development aspirations of most developing coun-

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were favorable; several members went so far as to say that the subject was sufficiently important for the Trilateral Commission to consider follow-up actions or projects.

Taking this advice, we sent copies of the report to several international organizations, government bodies and individual experts to solicit an even broader range of opinions. We received a number of comments, one of which suggested making estimates of the necessary expenses for such a program, and making economic feasibility comparisons of irrigation improvement and other methods for increasing production. Another recommended a full investigation of the feasibility of expanding production of other agricultural items in addition to rice. Most who replied concurred with the basic strategy—a great encouragement to all of us who were involved in the research project and compilation of the report.

The proposal gives possible alternatives for a macro-approach to the food problem, one purpose being to arouse those involved in agricultural planning to put such a plan into action. The second step will be to determine how programs for improvement in irrigation and rice production will fit into the agricultural development plans of the South and Southeast Asian nations. Cost-benefit ratios will have to be calculated and further feasibility studies made. Appropriate plans should be adopted and carried out as soon as the preparations are final. We pointed out several times in the

report the necessity of a comprehensive policy for training people in rice cultivation procedures; expanding research; supplying fertilizer and insecticides; building roads, railroads, and warehouses; providing investment for all parts of the infrastructure; supplying farm credit; and devising a beneficial pricing policy for agricultural products.

Population is, of course, the other element; controls on population growth must be implemented in order to achieve a balance with food production. Birthrates in several developing nations have dropped sharply in the last couple of years. Usually, when improved nutrition through better food production becomes widespread, it quickly leads to a temporary decline in the deathrate and greater population growth. But over a longer time span, better nutrition and ample food seem to be accompanied by a gradual decline in birthrates. More and greater efforts must be made to slow population growth, using methods appropriate to the culture of the given country and stronger population-control policies, and providing adequate funding for population control from international and domestic sources.

The twenty-first century will be bright for our children and grandchildren if we can boost agricultural production and restrain population growth.

Saburo Okita
Chairman, Japan Economic Research Center

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tries and to hold down soaring food costs in the developed nations.

The importance of such a strategy was reinforced by the findings of a two-year study of the world food and nutrition situation commissioned by the U.S. National Academy of Sciences, of which I served as vice-chairman of the steering committee.

A principal conclusion of the study is that there must be far greater international cooperation on agricultural research, development, and investment to increase food production in developing countries if the future food needs of those countries are to be met and if food producers and consumers in the developed countries are to avoid sharply rising food production costs which would contribute significantly to inflationary pressures.

The One Consistent Trend Line: Inflation

The case for increasing production in developing countries for the benefit of *both* the industrial countries of the Northern Hemisphere and the developing countries to their South rests on the two following facts.

First, over the past quarter century, a growing world imbalance has emerged in food production and consumption. The developing countries, which were virtually self-sufficient in their food production and consumption in 1950, were importing between 15 and 20 million tons of grain in 1970, half of which was in the form of food aid. By 1975, the gross imports of these countries had reached 45 million tons. Projections by the International Food Policy Research Institute of the food situation for 1990, thirteen years from now, point to a tripling of cereal imports—rising to 120 to 145 million tons or more per year—unless there is a fundamental improvement in the capacity to produce more food in the chronic food deficit countries.

These projections have many adverse implications for the developing countries. Their rising imports will require increasing amounts of scarce foreign exchange, and will mean more unemployment and underemployment in the rural areas at a time when these are increasingly serious problems in most developing countries, and joblessness all too often means hunger in those countries without any social security.

The second important factor which the NAS study notes is that it will be increasingly difficult for the United States and other developed countries to play as dominant a role in world food supplies as has been the case in the last decade; in the very least, continuing that role will cause sharply rising grain prices. While no specific figures are cited, production cost increases could be in the 50-100 percent range or more within a decade if current production patterns continue, with a comparable cost increase being repeated in the 1990s. The inflationary potential of such increases could be substantial; the impact of rising food prices on global inflation in 1973-74 has already been noted.

The adverse consequences of rising food production costs are particularly serious at a time when the weight of the evidence increasingly indicates that inflationary pressures

will serve as the principal "hobble" to OECD growth policies in the 1980s and beyond.

The reasons for rising costs are primarily two. First, since 1973-74, per hectare yields of major crops have dropped in the United States at a time when most observers had comfortably assumed that the yield trend line would continue to increase on the ever-increasing yield patterns that have prevailed since World War II. Until there is another generation of basic research to draw on—which is at least a decade or more off—rising yields per hectare in the United States and most other developed countries will only be possible through rising costs.

The explanation for this is fairly simple—use of increasingly marginal land, scarcer water supplies, decreasing yield increments from increased applications of fertilizers and increased costs of fertilizers and other energy-intensive inputs. The NAS study indicated the costs of fertilizer will increase sharply in the years ahead due to at least three factors: the rising costs of raw materials from which to make fertilizer as natural gas and oil become scarcer and the difficulty of mining phosphate rock increases, sharp rises in the cost of facilities for nitrogen and phosphate fertilizer production, and rapidly rising costs for transporting and distributing fertilizer. The cost of producing urea fertilizer in the industrial countries, for example, has been projected to rise from \$176 in 1977 to \$331 in 1990 (in constant 1977 dollars). Thus, it is clear that if the United States, the world's major grain supplier, is to greatly increase its production over the next 12-15 years, considerably higher prices will be required.

This change in yield and cost trends for grain in the developed countries is occurring at the same time that the yield trends for food production from the seas and fresh water sources have flattened. No major relief in food prices can be expected from this front.

Current trend lines indicate, unfortunately, that tremendous increases in grain production will be required just for developed countries' consumption. By 1990 in the developed countries alone demand for grains will have increased from 617 million tons in 1970 to 846 million tons; this increase of over 200 million tons is nearly equivalent to all the current grain production in the United States. During this same period of approximately twenty years demand in the developing market economy countries will increase by 350 million tons—nearly one and a half times that of current United States production—and, as indicated earlier, 100 million tons or more of this increase will need to come from the developed countries, principally the United States, if past trend lines prevail. Thus, rapidly rising demand is the second factor pushing costs of production upward in the developed countries.

The current under-production in the developing areas is therefore serious not only for them, but also for those in the developed countries too, for reasons that most developed country consumers do not yet realize, i.e., that developed country production is already running into trouble on the cost front.

The Changing Pattern of World Grain Trade¹

Region	1934-38	1948-52	1960	1970	1976 ²
	(MILLION TONS)				
North America	+ 5	+23	+39	+56	+94
Latin America	+ 9	+ 1	0	+ 4	- 3
Western Europe	-24	-22	-25	-30	-17
E. Europe and USSR	+ 5	—	0	0	-27
Africa	+ 1	0	- 2	- 5	-10
Asia	+ 2	- 6	-17	-37	-47
Australia and N.Z.	+ 3	+ 3	+ 6	+12	+ 8

¹Plus sign indicates net exports; minus sign, net imports.

²Preliminary estimates of fiscal year data.

Source: Derived from FAO and USDA data and author's estimates.

Worldwatch Institute

Developing Country Food Potential

By now it is generally agreed that the answer to the need for increased food production must lie primarily in increasing production within the food-deficit developing countries if substantially higher world food prices are to be avoided in the late 1980s. South Asia in particular could double or even treble its food production at current international price levels if only the financial and organizational and some applied research obstacles to greater use of their grossly underutilized water, labor, and other potentials would be overcome. In this, the task force's proposal for improved and expanded irrigation of rice-producing areas may well be a well-justified investment.

For example, yields per acre in India are approximately 1000 pounds compared to 3000-4000 pounds in the more advanced production countries. India has about the same overall quality of natural environment—land, water availability, temperature, etc.—as the United States; it also has roughly the same cultivatable acreage. It already has 20 percent of its land under irrigation, as compared to 10 percent in the United States, and this could easily be doubled in the 1980s at a time when worldwide additions to irrigated acreage are expected to slow sharply as compared to the past twenty-five years.

India, therefore, *could* be producing at least three times the output per acre that it is now, at present cost levels, if it could just overcome problems of organization, finance, and applied research. This would increase its total output from the current level of 110-120 million tons annually to more than 300 million tons, well above the 250-260 million tons of grain now being produced in the United States. Such an increased level of output at current cost levels would have a profound effect on world prices—and fertilizer demand—ten to twenty years hence.

Some Asian developing countries have already made breakthroughs. Taiwan and South Korea are both producing at the U.S. level of output per acre. In short, the comparative advantage in terms of dollars and cents for increasing

agricultural production in the 1980s and 1990s lies in the developing countries.

Expressed differently, it would be to the advantage of the developed as well as the developing countries if by the year 2000 the developing countries were growing 120 to 140 million tons more grain each year than is likely on present trend lines. To do so, however, will require major institutional and structural changes as well as major capital investments.

* * *

We can thus conclude that projects like the task force's rice production program will be critically important endeavors for the *mutual* benefit and protection of developing and developed countries alike. In judging specific projects, however, such as a \$54 billion investment in the expansion and improvement of irrigation in South and Southeast Asia, certain criteria should be applied.

A project's strategy should focus on increasing rural employment by use of labor-intensive agricultural techniques. Ways must be found to see to it that increased food supplies are actually consumed by those people who need the additional food most—and increased consumption requires income, and income comes primarily from more jobs. Unless emphasis is placed on the employment-creating potential of food production, poverty and hunger will continue unabated.

Fortunately, recent experience has demonstrated that in land-short, people-plentiful countries, labor-intensive small farms can be more efficient than large farms if effectively supported with low-cost education, health, and credit systems. For example, the two highest developing-country producers in Asia—Taiwan and South Korea—follow the labor-intensive Japanese model. [In the 1960s in Japan, 87 workers were used to cultivate each 100 acres; in the United States only one person was used.] Japan and Taiwan (and Egypt, which also follows the labor-intensive model) each have higher yields per acre than the United States (with South Korea close behind), while putting a great many people to work from what would otherwise be an underemployed labor force.

Closely related to any major capital investment project must be efforts to more effectively support developing country farmers by credit and other means to buy inputs such as fertilizer. During the last two decades, food production in the developing countries has become increasingly dependent on fertilizer use. Although only a small proportion of *total* food production in most of these countries can be attributed to fertilizer, a considerable proportion of the production increase is brought about by fertilizer use along with the introduction of new fertilizer-responsive crop varieties and other improved technology. Fertilizer use in the developing countries has accounted for approximately thirty percent of the total increase and more than fifty percent of the yield increases in cereal production over the past two decades.

But fertilizer use in the developing countries is still at minimal levels, and thus the real potential of fertilizer use is yet to be realized. Since they currently use very little or no fertilizer, most farmers in the developing countries are still near the low end of the fertilizer-response curve—which demonstrates that the increase in yields from initial applications of fertilizer is substantial, but drops sharply after greater levels. Farmers in the agriculturally advanced tri-lateral nations, in contrast, are far up on the curve, with crop yields relatively unresponsive to additional chemical fertilizer. As an illustration of the relative potential of increased fertilizer application, Professor Raymond Ewell, a leading fertilizer expert, has calculated that in the more developed nations, raising grain production by 100 million tons would require an additional 24 million tons of chemical nutrients, while in the less developed countries, the same production increase would require only 10 million additional tons of fertilizer.

However, serious institutional constraints exist on increasing fertilizer use in the developing countries, particularly at the small farm level. Unfavorable price relationships between fertilizers and farm prices too often have not been conducive to persuading farmers, particularly small farmers, to use large quantities of fertilizer. There is an additional set of constraints limiting fertilizer use which particularly affects the small farmer. These can be classified under the broad category of risk. The small farmer who uses recommended quantities of fertilizer takes high risks if water availability is unpredictable and beyond control, if crop response to fertilizer is questionable or unknown, if credit is expensive and/or unavailable, or if the price the farmer receives for farm products is uncertain. Furthermore, most of the fertilizer materials used today were designed for use in temperate climates in a well-managed and sophisticated agriculture. Such conditions frequently do not exist yet in much of the developing world. As a result, modern fertilizers have not performed as well where the basic credit and distribution system needed to move fertilizers is undeveloped, where water regimes are poorly developed or uncontrollable, and where the basic field research needed to predict plant response to fertilizer is lacking or where the educational system needed to transmit this information is not functioning properly. For these reasons, major structural and institutional improvements need to be introduced by governmental and private sector institutions before the comparative physical advantage of more fertilizer use can be put to the fullest global economic and humanitarian advantage in most developing countries.

Finally, *it is very important that the next generation of basic research be focused on ways of increasing the ability of plants to make better use of resources in their immediate natural environment rather than depending on external inputs such as fertilizer, water, and pesticides.* The last generation of research increased the ability of plants to use external inputs which are either in increasingly short supply, as with water, or for which there are now resource limits, as with energy-intensive fertilizers, or are creating environmen-

tal problems, as with pesticides and in some cases chemical fertilizers. Applied research and the more effective use of existing knowledge will remain of primary importance to the developing countries for the next decade and more, but a whole new generation of basic scientific knowledge is required to (1) enable the developing countries to maximize production increases at low cost and without the complexities of outside inputs; and (2) enable the developed countries to sharply increase production without sharply increasing costs—with the added benefits of reducing dependence on limited resources and reducing environmental damage. This next generation of knowledge is a decade away, and its broad application another decade . . . but the research must begin in earnest now.

The NAS study concluded that over the long term the most promising new technologies for both the developed and the developing countries are to be found in making plants more responsive to the nutrients available in their immediate natural environments. Examples include biological nitrogen fixation, photosynthesis and genetic engineering to improve plant resistance to pests and to make better use of water in the soil. This generation of research would not only help meet the need for less resource and environmentally demanding production, but would help meet the great need for current technologies to be adapted to make them "scale neutral," at a minimum, in order that they benefit small farmers as readily as the large farmers who have tended to benefit from prior capital-intensive research breakthroughs.

Research in the natural environment areas can have a major impact on fertilizer demand by the mid to late 1990s. It should not be so much by reducing the total demand for fertilizer but by greatly reducing the increase in demand for fertilizer required for increasing grain production.

* * *

The post-World War II era has witnessed a trebling of world output and a doubling of per capita income, but in absolute numbers there are more poor and malnourished people now than there were in the late 1940s.

The worst aspects of absolute poverty continue to cause millions to die prematurely each year; jeopardize the survival over the decades ahead of tens of nations as we now know them; and threaten the continued well-being and further progress of the growing proportion of the world's people who are more advantaged, including those in Europe, Japan, and the United States.

If existing world systems continue to work as well to the end of the century as in the 1960s, there will be another trebling of global output, but, while the *proportion* of poor will decline somewhat, there will again be an increase in the absolute *number* of poor and malnourished. The seemingly intractable problems of the world's poorest billion are not only a tragedy in human terms, but also increasingly jeopardize the well-being of all on a myriad of fronts and are contributing to the discernible slowing of global progress that is now apparent.

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Agricultural Development at the World Bank

A Conversation with Dr. Montague Yudelman

Director of Agriculture and Rural Development,
The World Bank

Q. *What is your general assessment of the problem of food production in developing countries?*

A. The food problem consists of three interrelated elements. The first concern is whether the world will be able to feed its burgeoning population, expected to rise from 4 billion in 1978 to close to 6 billion by the end of the century. All the available evidence indicates that the world does have the resources and technical capacity to more than double production so that, in the aggregate, there should be enough for all. What is needed is the will and commitment to ensure that this will indeed happen.

The second element arises because many food deficit countries are poor countries. At present the only substantial food surplus area in the world is North America, primarily the U.S.A. The major food deficit countries that are of concern, though, are the poor populous countries in Asia and the poor sparsely populated countries of Sahelian Africa. If present trends in population and food production continue, these countries, especially those in Asia, will have to import substantial amounts of food; unfortunately, though, these countries are too poor to divert scarce foreign exchange for importing food. The problem in these countries has to be resolved by them, by increasing their own production. They cannot look to food from North America to resolve their problems.

The third element links poverty and undernourishment. There are hundreds of millions of poor people who are malnourished because they cannot afford to buy food. These poor people live in all the developing countries, but mostly in the poorest countries. This problem can only be resolved by raising incomes and/or by having special programs to distribute food for direct consumption by these groups. This latter point can be highlighted by Indian experience: In recent years, India has had record harvests and now has some 20 million tons of grain in storage. Despite this, though, very few would claim that there has been a substantial fall in undernourishment and malnutrition. Indeed, a central problem confronting the government is how to convert its current surplus into food for the undernourished.

At present, the world is in a fairly comfortable position vis-à-vis food supplies, having a grain reserve of about 20% its annual consumption level. Substantial investments in increasing food production together with good weather have resulted in considerable improvement from the situation two or three years ago. Nonetheless, the

world should not be lulled into a false sense of security. There is the everpresent problem of rapidly growing population, growing food deficits in poor countries, and hundreds of millions of people who are too poor to buy enough to eat. These problems can only be overcome by sustained and substantial efforts.

Q. *What global strategy does the World Bank draw from this assessment?*

A. What is important to emphasize, I think, is the evolving nature of the Bank's approach to agriculture. At first, we made no loans for agriculture, for the simple reason that agriculture was not seen to be a major problem. The thinking about development and development patterns did not stress agriculture; it concentrated on industrialization, transport, power, and so forth. Food wasn't seen to be a problem. It was assumed that there was plenty of land and plenty of local labor who could produce the subsistence needed by local populations. The first involvement of the Bank in agriculture was in irrigation. This was primarily a part of the process of transferring resources and was favored because irrigation was a relatively simple mean of transferring foreign exchange as well as technology. Building a large dam may only require a contract with a major engineering firm, operating under the guidance of highly qualified consultants. Thus, a tested technology was transferred to country X, where the dam was built, and consultants made sure that the technology was both appropriate and proper.

However, we in the Bank soon realized that building a dam did not necessarily result in an increase in agricultural production. At the same time, we came to recognize that agricultural growth and increased production were necessary for development. We moved, therefore, to extend our efforts—and we became aware of the fact that agricultural development required involvement in a wide range of rural investments. The Bank embarked on a very wide spectrum of activities—irrigation, credit mechanisms, agricultural research, extension services, the whole panoply needed to make farmers more productive.

By widening our lending, we were increasing production, but the benefits of this increase were not necessarily widespread. A classic illustration of this is

our lending for livestock in Latin America: Our first efforts were made largely through commercial banks. We made funds available to governments which then passed these through commercial banks to large livestock producers. The large cattle ranchers increased production, and both exports and growth went up. Our analysis showed, however, that these loans had little direct impact on the creation of jobs, and that the income that was generated from these investments was not being widely distributed. It appeared to us that very large numbers of small farmers were getting no benefit whatsoever from loans of this kind. We moved, therefore, to the next phase of lending, that of *rural development*. This is the phase in which we are at the moment; it involves trying to raise the productivity and incomes of many who seldom benefit from traditional investments. Rural development, in our terminology, means addressing poverty head-on. To do so, we have shifted our emphasis from financing large-scale producers to financing *small-scale producers*. The importance of this thrust is nowhere more evident than in dealing with the rice producers of Asia, especially in, say, West Bengal in India, where there are extremely large numbers of very small producers and where rice production has tended to be stagnant. In our effort to finance improved rice production, years ago we might have merely tried to increase output by focussing on large-scale producers; we did this in pushing wheat production in the Punjab, for instance. Now we give considerable attention to the small-scale producers of West Bengal. Naturally, part of the purpose of this new emphasis is to deal with the second problem which I mentioned—the problem of poor people and low consumption. We strongly believe that if the small producers of, say, West Bengal increase their production of rice—and our projects indicate that this can be done—they will then consume more of this rice and will have a larger market surplus, which in turn will help the country in two ways: by increasing production thereby reducing the need for imports, and by raising the levels of consumption and nutrition of low income groups.

Q. *In this context, what can be the contribution of a plan such as that proposed in the recent task force report to the Trilateral Commission?*

A. I believe that the Commission's report is an important document. It is based on a crucial commodity—rice—and one which is of great importance in South Asia; this is the most populous region in the world and rice is the most popular food in this region. We also believe that the authors are right in emphasizing the need to increase rice production through the improvement and expansion of irrigation. And we also believe that the Commission has done a very valuable service in pointing out the capital requirements for expanding irrigation. It should be noted that the Bank itself has been increasing its lending for agriculture. At present, about a third of all our loans goes to agriculture and, within those loans, by far the largest subsection goes to irrigation. We are therefore very much engaged in financing irrigation development, particularly in South and Southeast Asia, and we recognize that much more needs to be done. In short, we applaud the general thrust of the Commission's report. However, some of the issues which it raises need to be highlighted: The estimate of the costs seem to be too modest; the time horizon may be too short. Most importantly, we are now finding out that, in addition to building new facilities, there is a tremendous scope for improving the efficiency of existing facilities. This requires a different kind of approach, that of developing services, promoting local organization, creating management procedures and systems whereby water can be used more effectively. Here, the major requirement is not so much one of capital, but one of management skills.

Q. *What is a good example of the way the World Bank proceeds in a given irrigation project, and how successful has it been?*

A. The whole range of irrigation projects is extraordinarily diversified. You have, on the one hand, cases such as Indonesia, where our earlier projects dealt largely with rehabilitation since the country has a very substantial irrigation system which had fallen into disuse. Resources and technical assistance were made available by the Bank and ultimately distributed through a government agency working with local authorities. The Bank's loans helped to make the system effective by enabling the water to be brought to the farmers. Most importantly, these were low-cost improvements which resulted in very substantial increases in yields. We have now helped irrigate one million hectares in Indonesia and this should lead to an increase in rice production that could sustain five million people. At the other end of the spectrum there are huge projects, such as the Tarbela Dam, the

largest earth-built structure in the world—a very different kind of operation. Mexico is a very good illustration of a dual approach. Some projects are large irrigation projects—harnessing rivers and capturing the water, then diverting it to bring it to arable or semi-arable areas where it is distributed to farmers. Such projects often take up to eight years to come on stream. Parallel to these, we also have small-scale irrigation projects: Small dams are built across gulleys or, as in the case of South Asia, small tubewells are sunk to reach the ground water which is, then, shared among a small group of producers on the spot. These “minor” schemes are low cost and give quick results.

Q. . . and the capital requirements now involved in agricultural development?

A. A number of exercises have been attempted to evaluate the capital requirements for agricultural development and food production. The major lesson which we have learnt is that we have to reject many previous assumptions about agricultural development in developing countries which were a carry-over from “colonial” thinking. We thought that there was enough land and enough labor, that the indigenous population would be producing food enough for itself, and that the main constraint on food production was a demand constraint: One could easily produce food but there was no market for it. Naturally, we have learnt that this is not true, and are finding out that food production requires more and more capital, and that low-cost means of agricultural production are very difficult to find. In some parts of the world, the Bank has certainly worked very hard to evolve low-cost improvements; we have worked to help governments to improve their research and extension services, their credit facilities and so forth. This has been very effective, but in terms of infrastructure, we have found that there is simply no cheap means of developing agriculture. The amount of this capital requirement varies enormously and it is almost impossible to give a figure at this time. We do know that requirements for irrigation alone are well in excess of \$100 billion (U.S.).

Q. . . and the contribution of multilateral agencies such as the World Bank?

A. In a sense, the World Bank is taking the lead in this field. An increasing proportion of the Bank's resources are now going into agriculture: Last year, we lent some \$2.3 billion for agricultural development (or roughly a third of our total lending), and since the local government put in more than half of the monies involved, the total investment last year amounted to 6 billion dollars. The projects which we financed at that time should result in an increase in grain production of 5 million tons. We hope that, as the Bank expands, its lending will continue at this pace—we expect to lend \$3 billion (U.S.) for agriculture this year—and that we will continue to increase the proportion of the Bank's resources which goes

to agricultural development, because we don't see the problem disappearing. Indeed, the problem is becoming more serious and the capital requirements greater. This worsening is due in great part to the population side of the equation, especially when one wants to deal with nutritional issues instead of concentrating merely on the demand issue. On that basis, all our studies show that by the middle of the 1980s, the “nutritional gap” will be very substantial; it will amount to 40 to 50 million tons of grain, which comes right back to why we think a Japanese initiative such as that proposed in the Commission's report is so important, if we are to face this widening nutritional shortage.

Q. . . and the contribution of bilateral assistance?

A. In practice, we work closely with a number of bilateral donors—after all, we are all working for the same objective. We have increasingly been co-financing a number of projects with other donors—some of the OPEC countries, as well as of the big bilateral OECD donors. For my part, I would see very little difficulty in working closely with, say, the Japanese Government on a series of projects such as that in the Commission's report. There is, however, a long lead-time in these matters. Since the Japanese seem to be especially interested in this, I would imagine that a very useful initiative would be to set up a project-preparation facility where engineers, economists, soil scientists, and irrigation experts could form teams; this could help the governments of the countries concerned to plan the projects involved. It is our experience that adequate project preparation and training to enhance capacity to absorb capital are vital problems. Also, one has to have a blueprint against which to lend.

Q. What can be the potential role of the private sector of the industrialized countries?

A. First of all, it is important to remember that the largest private sector in the world is agriculture. One of the problems in developing countries is precisely that of having to deal with millions and millions of individual entrepreneurs, who make decisions themselves. Agricultural development is particularly difficult since these millions of people, especially small-scale producers, have to be persuaded to make certain decisions which involve a risk. They have to be convinced that it is in their best interest, which brings in the entire panoply of agricultural development—prices, markets, storing, and so forth. As far as foreign private investors are concerned, they will not usually be concerned with subsistence agriculture other than as contractors. The private sector, though, has a very huge role to play in providing low-cost inputs, skills and credits. Also, let us not forget that it was the private sector that contributed so much to developing means of manufacturing low-cost nitrogenous fertilizers, and these were an essential factor in the success of the green revolution. ■

Rice Production in South and Southeast Asia THE ROLE OF THE PRIVATE SECTOR

During the debate which followed the presentation of the report of the Trilateral food task force to the Plenary Meeting of the Trilateral Commission in Bonn, in October 1977, several members of the Commission emphasized that the analysis contained in the report could be of even greater value if it took into account “the contribution which can and must be made by the private sector” towards solving the problem of food production in developing countries. In particular, Sir Frederick Warner, Deputy Chairman of Guinness Peat International Limited, stressed that “widespread extensions of infrastructure such as irrigation works, dependent on foreign aid programs, are inevitably very slow to implement.” In his words, “private enterprise, on the other hand, ought to be able to bring about important developments much quicker.”

Subsequent to the Bonn conference, the Guinness Peat Group prepared the following paper to develop this point. The paper was written by Sir Frederick himself and by Messrs. Tainsh, a development engineer and a consultant to Guinness Peat, and Hawkey, an international rice consultant to the same.

I

The fact to which the authors of the Commission report have drawn attention—namely, that there is already a gap between the production of rice and its consumption in South and Southeast Asia—is undeniable. At present, there are net exporters such as Pakistan, Burma, Thailand and China; and some countries, such as India, Nepal, Taiwan and the Philippines have been roughly in balance. But there is an equal number of net importers—Bangladesh, Malaysia, Laos, Kampuchea, Vietnam, Singapore, Indonesia and Sri Lanka. Overall, the region imports about 3% of its needs. It is a shock to recognise the fact that the greatest rice-producing area of the world is in deficit, but it is true; and it is equally true, as the Commission recognised, that the gap could widen rapidly.

However, the 3% gap seems a very low figure when compared with losses in the crop during post-harvest handling. These are variously estimated, but it is extremely unlikely that they amount to less than 25% of the rice produced. In a paper prepared for “World Crop,” Mr. Tainsh has shown that in 1974-75 the losses by pounding and milling alone amounted to 45 million tons (25.5%) and although the rapid replacement of the more inefficient process of pounding will have reduced this figure, one must add the very large losses incurred by inefficient methods of storage. Clearly, a sharp attack on wastage could close the gap speedily and easily, while longer-term methods of raising overall production, as proposed in the Commission report, are brought to bear. This is where private enterprise should be called upon to contribute.

Before going on to consider why so much of Asia's rice is wasted, a word should be said regarding the proposition

advanced by the authors of the report—namely, that to obtain adequate output it is necessary to increase the irrigation rate in the area from the present figure of 3% of the land to 79%. We do not dissent from the further statement that the best and most economic way to achieve this would be by renovating and improving the current irrigation systems rather than creating new ones. But we would like to point to the work done by the International Rice Research Institute (IRRI) not only in producing new high-yielding varieties of rice (HYVs) but in growing them in such a way as to produce double-cropping without the use of irrigation. They have shown that two entirely rain-fed crops can be grown and harvested in the Philippines in the seven month period between mid-May and mid-December.

There is no irrigation in this case. The seed for the first crop is broadcast after the first heavy rains and is harvested in mid-monsoon. The second crop is transplanted between the stubbles as the first crop is reaped. There is chemical control of weeds, pests and diseases. The annual (double) crop will be as much, with careful husbandry, as three or more times the normal single rain-fed crop. The IRRI believes that 33 million hectares of formerly single-cropped rain-fed paddies in Southeast Asia could be double-cropped without further irrigation works.

Such predictions, even subtracting a good element of over-optimism, are worth careful consideration before huge sums are committed to irrigation work. But they will in any event be falsified if adequate technology is not available in the cultivation. Part of the whole success of this operation is tied to the method of transplanting, and for this suitable machinery is needed. Here again, this is a field in which private enterprise is wanted. ■

Post-harvest waste, as we have seen, reaches the staggering level of more than a quarter of the edible part of the crop. The explanation for this lies simply in the backwardness of agricultural engineering in the Asian rice industry. It is one of the most inefficient of all the world's major industries and the cause is a lack of engineering innovation. While the scientists have been answering the problems of increased yields—improved plant varieties (HYVs), fertilizers, pesticides, fungicides, etc.—the engineers have not been carrying on a similar war against physical waste. It is almost as if an iron curtain divided plant technology from machine technology—agronomy from engineering. Mr. Louis Renner (now also with Guinness Peat) has reminded us that, when he visited the Philippines in 1975 with the British Agricultural Export Council's rice mission, all the members of the group were equally struck by the fact that, even in the most advanced surroundings such as IRRI headquarters, there was no evidence of an engineering input which would lift the industry out of its low state.

(Continued on p. 15)

Increased Rice Production in Asia— a Contribution to Meeting Basic Human Needs*

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In recent discussions on the means and objectives of economic development, both among development specialists and in the general public, the words "basic human needs" have become so bandied about as to risk losing most of their significance. This is unfortunate, because the ideas underlying the "Basic Needs Strategy" are the distillation of many years' experience of development and, in particular, of the lessons learned from the country studies carried out under the World Employment Programme of the ILO**, leading to the 1976 World Employment Conference, whose discussion paper "Employment, Growth and Basic Needs" presented the first clear and authoritative statement of the relationship of basic human needs to overall development.

With this background, it is surprising and saddening that the basic human needs approach is so often dismissed as being nothing more than a slogan or as a welfare operation, at best irrelevant to economic growth and perhaps even inhibiting it. The strategy in reality is more complex, more constructive and more promising for the future of the developing countries than its critics have perceived.

The principal aid donors among the industrialized countries, at the 1977 High-Level Meeting of OECD's Development Assistance Committee, published a Statement setting out the elements of the basic human needs approach which was intended to clarify international understanding of what was involved. Ideally, this Statement should be read as a whole***, but for the present purpose it may be sufficient to quote two or three of the important points.

First, the Statement stresses that "it is up to the individual developing country to choose and define its own objectives and policies in the light of its circumstances." There is no question of imposing a basic needs approach on countries which do not accept its validity.

Second, "concern with meeting basic human needs is not a substitute for, but an essential component of, more economic growth which involves modernization, provision of infrastructure and industrialization. In particular, policies which contribute to increased utilization of available resources, especially labor, and improvement in their productivity should contribute to both growth and equity. A basic needs approach is not primarily welfare or charity but productivity-oriented, aiming at increasing the productive

income of the poor and strengthening the basis for long-term self-generating development."

Third, while stressing that "no sector should a priori be excluded as a target for appropriately designed assistance," the declaration notes that "significant progress towards raising the productive income and welfare of the poor requires that greater emphasis within aid programs be placed on contributing to expanding opportunities for productive employment, rural development, food production and well-designed, broadly accessible health, family planning and education services."

These points have been quoted at length because they indicate the general view of aid donors on the implications of a basic human needs approach for their future aid policies, and are of direct relevance to the suggestions for international action set out in the paper by the Trilateral food task force.

As the last of the three quotations points out, food production is of crucial importance in a basic human needs approach: because an increase to adequate food consumption levels is itself perhaps the most important human need and because food production has barely kept pace with population growth in developing countries in recent years; because production in this sector is the largest single contributor to total income and employment in many developing countries; and because the sections of the population involved in food production tend to be those with the lowest incomes. Food production is, therefore, perhaps one of the clearest examples of the combination of objectives implied in the basic needs approach: increased consumption of basic goods, increased income and employment and improved income distribution. This is not to say that increased food production necessarily meets these objectives—many other conditions, particularly of a distributional nature, have also to be fulfilled for this to be true—but it is a necessary part of any comprehensive basic needs strategy.

Some of these considerations apply with particular force to the countries in Asia covered by the Trilateral Commission task force's study. Although all regions contain distressingly large numbers of poor countries and poor people, it is in Asia that the concentration of needy people is the greatest. Not all these people live in rice-growing countries or have a rice diet, and the problem of meeting basic food needs in Asia has, therefore, a wider scope than the objective of the task force study. The number of potential beneficiaries from increased rice production is nevertheless sufficiently large for the study to present a particular interest in the basic human needs context.

*The views expressed are those of the author and not necessarily those of the OECD.

**International Labor Organization.

***This Statement was originally published as part of the Press Communiqué of the Meeting [PRESS/A(77)47], reprinted as Annex I of the 1977 Development Assistance Committee Chairman's Report and circulated to members of the United Nations as A-32-39.

Not only is the general objective of the proposal in the study directly relevant to the basic needs approach, but it is interesting to note that the authors of the study explicitly included employment and income distribution effects in their arguments for increasing rice production.

Concerning the hypothesis of a doubling of rice production, there are a number of comments to be made in a basic needs context. First, it is not possible to relate this to any numerical objective inspired by the basic human needs approach, because the levels of needs must be determined by the individual countries. This was a fundamental point in the Principles and Programme of Action adopted by the World Employment Conference and is an important reminder that objectives and policies in this as in other fields must be decided by the governments concerned. This is not simply a question of national sovereignty; it also expresses the fact that no development program can succeed without the understanding and support of the policy-makers and administrators of the country concerned. Going further, it is even more important to obtain the support and participation of the people directly involved.

The second comment is that the doubling of rice production is presumably to be taken as showing the impressive order of magnitude of the problem rather than as a precise objective. What is incontrovertible is that even on the extreme assumption of a population growth rate of, say, 2.3 percent and *no* increase in consumption per head, production would have to increase by 40 percent between now and 1993 even to maintain the present inadequate sufficiency levels, i.e., without making any progress towards improved satisfaction of the basic food needs of those living close to subsistence.

The target also implies that overall patterns of food consumption in these countries will remain largely unchanged, continuing to be dominated by rice. However justified this assumption may be, especially in the medium term, it would be unfortunate if it led policy-makers to overlook the possibilities for development of other crops which could be produced in combination with rice or in replacement of it under conditions making better use of the available factor inputs.

The concluding part of the report is addressed to the aid donors, both the OECD countries and the newer OPEC donors. As in the case of the estimates of production increases and irrigation requirements themselves, it is probably preferable to treat the figures of requirements for total capital investment and for foreign capital as indications of orders of magnitude rather than as precise targets for aid in this area. The capital requirement figures are highly sensitive to assumptions concerning capital cost per hectare, and there is an evident, if inevitable, lack of reality in the linear application of costs based on past experience to a program covering a vast geographical area and a wide variety of local conditions. This being said, it is useful to note that the estimated aid requirements, although large, are not out of proportion to the increase in aid flows which can reasonably be expected in the coming years.

The assumptions implicit in the calculation nevertheless call for certain comments. First, they refer exclusively to the capital costs of the projects concerned. The report assumes that the cost of the necessary associated production inputs (fertilizers, agricultural chemicals, mechanization, etc.) are met from the increase in incomes generated by the higher production. However justifiable in theory, this assumption may not entirely hold in practice. It implies, in fact, that mechanisms exist for the supply of inputs at reasonable prices, for credit on acceptable terms and in forms accessible to the poor, for extension services to give instruction on production in the new conditions, etc. These requirements are all mentioned in the report, but it may be optimistic to assume that the associated running costs can be met without appreciable burden on the budget of the recipient country (and hence diminishing the availability of its contribution to capital costs) or without requests for external aid. If these costs can be left to the private sector, as the report assumes, then it is difficult to explain the continuing requests for external aid to help in meeting them. Aid in the form of fertilizer supplies, for example, amounted to \$300 million in 1974-1975.

One form of recurrent costs which will loom increasingly large in the total expenses of the recipient country are those involved in the repair and maintenance of the infrastructure and equipment of the irrigation projects themselves. This is indeed one example of a phenomenon which is becoming increasingly apparent in the implementation of basic needs programs, namely that basic needs projects tend to involve a level of recurrent costs which is high in relation to the initial capital expenditure. External donors will have to give careful consideration to the recurrent costs associated with such projects in order to avoid imposing burdens which are beyond their own willingness, and the recipients' capability, to bear. Here again, it is easy in theory to assume that the costs are imputable to the community benefitting from the project, but practice may be more complicated. While these are recoverable in theory from the returns from the investment, it may be difficult to do so in practice, either for administrative reasons or because it may mean diminishing the benefits accruing to those sectors of the population whose situation the basic needs approach is intended to improve. In some countries, there is opposition in principle to the imposition of user charges for water supply, as for other basic services. But if the costs of maintenance are recovered neither in cash, through charges, nor in kind, through the provision of labor to local institutions, the result will be a net charge on the recipient government's budget and so affect the amounts available for capital expenditure.

Finally, it is important to point out that the requirements for external technical assistance (research, training, technical advice) are likely also to be high, especially in a basic needs context where the intention should be to improve the productivity of the mass of farmers, rather than a few.

It is perhaps unnecessary to comment in any detail on the estimates of aid requirements and their implications for aid totals and aid distribution, but it should perhaps be pointed

out that the share of aid for irrigation is probably somewhat lower, and the share going to Asia somewhat higher, than the assumptions made in the report. On the basis of CGFPI* and DAC figures, it would seem that the amount of bilateral and multilateral aid, including World Bank loans committed for irrigation projects in Asia, is of the order of \$450 million. This would imply a more rapid increase than is shown in the report if the calculated external aid requirements are to be met.

Given the uncertainties inherent in the calculation of the requirements, however, it is perhaps of greater importance to note the very large proportion of the present commitments which come from the multilateral financial institutions, in particular the Asian Development Bank and the World Bank. These two institutions account for roughly 80 percent of total commitments for irrigation projects in Asia. By comparison, the multilateral agencies' share of total official commitments (concessional and non-concessional) is only about 30 percent. This situation in itself presents no problem—indeed it implies a degree of specialization which may be highly desirable from the point of view of efficiency. It nevertheless is a feature which would have to be taken into account in envisaging any major expansion, since such an expansion would mean *either* an increase in the multilateral activities which would be large in relation to their present total, *or* expansion by bilateral donors which would be less important in relation to present totals but would be in a field in which they are at present relatively inactive, or, as would seem likely, a combination of the two. But even if the approaches are combined, the problems imposed by a major expansion of multilateral activities and a largely new departure for bilateral donors would require urgent attention before a major program could be launched.

Commitments of aid to the agricultural sector have been disappointing in recent years, especially on the part of the bilateral aid agencies. There was a fall in 1976, the last year for which figures are available, in spite of the expressed intentions of many donors to devote more aid to this sector. The explanation is likely to lie in a preference of the recipient countries to use scarce aid for other purposes or in a lack of suitable projects. If the conclusions of the task force report on the scope for high-return irrigation projects are confirmed, then this difficulty should not act as a restraint on the expansion of aid in this sector, especially as aid for rice production in Asia, for reasons explained earlier, is of considerable interest in the context of aid programs designed to meet basic human needs.

Naturally, given the relative scarcity of concessional aid, the objective described in the report will have to compete with other purposes and with other regions. As the DAC declaration points out, implementation of a strategy centered on meeting basic human needs is likely to increase total aid requirements, given the immensity of the task. If the kind of project proposed in the task force report had to compete

with other existing uses of aid within a stagnant total, there would be little chance of achieving flows of the order envisaged in the report. As in all aspects of aid programming, however, it is easier to bring about changes within an expanding total aid volume. Fortunately, there are signs that total aid will increase, not only in current prices, but in real terms, in the next few years; in particular, the Japanese Government has committed itself to a doubling of official development assistance in the next five years, while the United States also plans, subject to Congressional approval, to increase the share of its GNP devoted to aid. These two developments are of great importance in the present context not only because they affect countries which already together account for 40 percent of all official aid, but because each has a special interest in food production: for the United States, this is one of four sectors singled out by Congress as requiring special attention in the aid program; for Japan, because of long technical experience in irrigated rice production and a special interest in the problems of Asia.

The report has performed a service in focussing attention on the needs and possibilities in a sector which is vital for the satisfaction of basic consumption needs and for increases in income and productivity in one of the poorest regions of the world. To pursue this initiative, it will now be necessary to translate general estimates into a detailed basis for concrete action and, in particular, to prepare for practical implementation based on collaboration between the governments of the developing countries, the people most immediately concerned and the potential external suppliers of capital and technical expertise. ■

(Continued from p. 6)

Since hunger is closely tied, as indicated earlier, to jobs and income, and 80 percent of those living in absolute poverty are in the rural areas, this overcoming of mass poverty can only be accomplished through a massive increase of labor-intensive agricultural production in the developing countries. Such programs as this can also relieve the ever-growing inflationary pressures on the industrial democracies which threaten their continued prosperity and growth.

Thus the task force's proposal to increase rice production in South and Southeast Asia, as an example of what *can* be done, is a critically important program worthy of the priority attention of governmental and private authorities throughout both the trilateral and the South/Southeast Asian countries.

And a \$54 billion pricetag, though seemingly high, is not only economically manageable over the proposed fifteen year period, but seems altogether small in comparison to the costs if we fail to start. ■

*Consultative Group on Food Production and Investment in Developing Countries.

Increasing Rice Production in South and Southeast Asia

Remarks by Kenzo Henmi

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Much has been said about the causes of the world food problem. Rapid rates of population growth, a lack of resources in both land and capital, inadequate development policies and inefficient storage and distribution systems are some of its most notorious causes. And in the end, winning the war against world hunger will require a great deal of far-sightedness and political will and an ability to make hard decisions on the part of the leaders of this world.

Without going into the details of each of these causes, two very important aspects of the world food problem should be constantly kept in mind. One is the chronic lag in infrastructure investment in most developing countries; as a result of this lag individual producers cannot promptly increase or decrease their production to respond to the fluctuations of private food markets. This is particularly true of rice production, where individual producers can do practically nothing to raise their output without efficient irrigation and water-control systems.

Another important factor to be stressed in this equation is the lag which exists between the time when a given investment is actually made and the time when it comes to fruition; in the area of food production, this lag is known to be often very large. As a consequence, it is particularly difficult for the governments of the developing countries to increase their food production rapidly when a food shortage first appears in their domestic markets. Aid transfers of food from the developed countries is therefore important to overcome shortage situations resulting from both this failure to invest in food production and these lags in responding to the market.

The projected shortage of rice in South and Southeast Asia is too great, however, to be met solely by food aid from the developed countries; and to further complicate the problem, most local governments, for a variety of economic and political reasons, seem to lack the ability to deal with long-term problems such as that of food production. Precisely because of the considerable lag between investment and fruition, these governments can hardly afford the sums needed for, say, the development of irrigation and water-control systems which would help them solve the rice shortage foreseen ten or fifteen years later. The problem becomes even more serious when a major portion of the sums to be disbursed have to be foreign currencies.

In this sense, the case study chosen by the Trilateral food task force—namely, the production of rice in 16 countries of

South and Southeast Asia—illustrates dramatically the seriousness of the world hunger problem and the need for concerted and immediate action on the part of the Trilateral countries. These countries can indeed contribute greatly to the solution of this problem—by drawing attention to the investment needed to avoid the projected shortages; by offering appropriate grants and soft-loans to the Asian countries concerned; and by promoting the investment projects which are needed to ensure the productivity of rice cultivation. The program contained in the Commission report could be a major breakthrough in our war against world hunger. The grants and loans by the developed and the OPEC countries to the Asian developing countries would greatly assist these countries in undertaking long-term programs to ensure an increase in rice-yields. Considering the many years which are required to develop and build the various types of irrigation systems which are needed, such a program should be given immediate consideration and, hopefully, be pushed forward now.

In exploring ways and means to implement this program several critical points should receive further attention:

- It should be kept in mind that rice farming in Asia is characterized by extremely varied environmental changes, and that a program such as this is likely to require: 1) hundreds of individual irrigation projects, each designed according to the particular local situation; and 2) a great number of highly skilled personnel, familiar with each and every particular environment. It may therefore be overly optimistic to assume, as the report does, that the nations of Asia possess most of the skills and capacities required to carry out the irrigation proposals. In any case, we should fix ourselves extremely ambitious targets for the training of the personnel needed in the development of irrigation projects—another factor which makes the early start of such a program all the more urgent.

- A number of detailed feasibility studies are likely to be needed to assess further whether the cost-benefit ratios given in the report (derived mainly from the experience of irrigation works financed by the Asian Development Bank) can indeed be applied to the program as outlined in the report. Generally speaking, enlarging the number of irrigation projects implies that one increasingly adopts projects which are both more costly and more time-consuming. However, as

the report argues, the more cost-effective alternative is certainly to improve current inadequate irrigation systems by insuring irrigation canals within the farms to provide better distribution of the available water supply . . . and the next most cost-effective alternative is to provide adequate irrigation for current rain-fed paddies.

- It may be that the report's projected increase in rice consumption between the base-year and the target-year will vary considerably from region to region. And the authors may be overly optimistic as to the availability of capital resources from both the DAC and OPEC countries.

- The importance of non-rice foods in South and Southeast Asia, and the fact that tens of millions of the poorest people there are not rice-eaters, should not be forgotten when trying to assess the potential results of a program such as this. As the authors themselves point out, in a longer time perspective, the importance of non-rice grains in total grain consumption will increase with the increasing consumption of livestock products among the Asian population.

* * *

The world food problem is likely to be with us for a very long time. It is important to note that the *low international* prices for grains in recent years will not necessarily result in a better-fed and healthier population in the developing countries. The rise in the prices of petroleum has led to a very unfavorable balance of payments situation in many developing countries, which can hardly import enough grain to feed their people in spite of lower grain prices. Furthermore, the poorer people in these countries, because of endemically low income, are still unable to buy enough food, even if it is abundant and reasonably priced in their domestic markets. There is no doubt therefore that the only way to increase the income of the poorer peasants, who constitute the major part of the population in these countries, is to increase their capacity to produce food. Hence the important contribution which a plan like the one proposed to the Trilateral Commission could make in our efforts to fight hunger and malnourishment.

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In our opinion, the main need of the rice industry in South and Southeast Asia in the next few years is for specifically designed methods to improve all the post-harvesting processes—namely, threshing, drying, cleaning, storage, processing, transportation at all stages, distribution and marketing. There is great scope for improvement on every one of these points.

We do not believe that the improvements to be made lie in large-scale industrialization of the processes. Rather, the innovations will mostly need to be introduced at the village or commune level: What is required is agro-industrialization at the level of the production unit, with the formation of cooperatives where they do not already exist. Not only does this make sense from sociological and political points of view, but it accords with the kind of developments for which we believe rice engineering is long overdue.

III

Before turning to the specific contributions which private enterprise can make in solving the engineering problems of cultivation and post-harvest handling, we should mention one other inadequacy of the industry: its failure to find an economic use for the rice hulls which form such a large part of the total weight of the paddy. Unlike the inner skin of rice-bran, which is used commercially, the hulls are discarded after the milling process and serve no further use. Indeed, they form a major problem of rural pollution, smouldering away in burning piles by the mill, rotting in the monsoon rains or blowing over the countryside on the wind. Yet, adapted to proper methods of burning, they can form an important source of energy and replace the far more expensive sources of electricity for driving machinery or petroleum fuels for crop-drying. Here again, enterprising engineers are wanted to turn rice hulls into steam, heat and power—surely an opportunity for private enterprise.

IV

One can now look more closely at some of the engineering requirements to which we have drawn attention, at the present state of technology to meet them, and at the improvements which may be in the pipeline.

**The Transplanting of Rice Seedlings.* Present field technology over most of Asia provides for growing the seedlings in a nursery and then transplanting them in the paddy-field by hand. Fertilizer and pesticides are applied by conventional broadcasting methods. There is much waste of seed, labor and chemicals. Clearly, the farmer is not getting the full (or anything near the full) benefit of his allocations of these precious commodities, and much of the effort which agronomists and chemists have put into producing them is being lost.

In the United Kingdom, a private sector development team has been at work for the last thirty months to ensure, as far as possible, that this wastage is overcome. It has to be made virtually impossible for the farmer to use his inputs ineffectively.

There has been recognition for some time that the solution lies in packaging seed, fertilizer and weedkillers so that all are sown together, in close proximity where they work

best together. Two full-sized prototype machines have been developed for this operation and are under trial. There is nothing expensive or elaborate in the concept since it is intended that the farmer should be able to use a magazine-loaded hand tool for planting his packages. This simple machine can be used to row-plant in wet soil at the commencement of the monsoon, using early-maturing seeds, and then to plant later varieties in flooded fields between the harvested rows of the first crop. Tests have been shown that the hand tool requires only one quarter of the man-hours per hectare which are required for the nursery transplant system.

If this system proves effective, there will be other advantages. The total material inputs will weigh about 500 kilograms per hectare, whereas in nursery transplantation 5,000 kilograms of seedlings are commonly required in addition to the weight of fertilizer and chemicals. A reflection of this is that the cost of the inputs per hectare can be reduced by as much as \$160 per acre.

**The Drying of Rice.* Under single-crop conditions, the paddy is sun-dried, but with double-cropping there is harvesting under heavy cloud or rain and the need for driers is evident. With normal methods of oil-heated driers, this can add significantly to costs, and much thought is being given to using rice-hulls to supply the hot air. This presents considerable difficulties because of the composition and consistency of this fuel. However, a privately designed and manufactured drier with a furnace capable of using clean hulls has now been sent to Indonesia for assembly and testing. It has a designed capacity of seven tons of paddy per hour and can use straw or paddy-panicles if required.

**It is probably in improved methods of mechanical milling that most progress is to be made.* As we have noted earlier, nearly a quarter of the crop may be lost at this stage. The traditional process of pounding carried out by the farmer's wife could be even more wasteful and, in any case, yields mostly broken grains. A great technological advance at the village level was the Engleberg mill, originally introduced over 100 years ago, with its enormous saving in labor. An up-to-date mill on this pattern electrically or diesel-driven, with a crew of two men, can handle a ton of paddy in 8 man-hours (in contrast to the man-hours of field operations required to produce it by traditional methods). To pound and sift the same amount of rice by hand used to require 1000 woman-hours. But despite the great advance represented by such mills and the good service they have given, they do leave about 200 kilograms per ton of powdered rice which is not recovered. They are, moreover, heavy users of power and yield a product too hot to hold in the hand. Somewhat more efficient multi-stage mills are available in large towns, but the problem remains at the village or commune level. The need for a new advance is obvious but so far unsatisfied.

Two new designs have now been built in the United Kingdom to overcome the existing defects. However, power requirements and low-grain breakages are incorporated, partly due to less work being done on the paddy. Yields of rice per ton of paddy are, therefore, likely to be high. Tests are now being carried out to see how much work remains to

be done before new and improved milling surfaces can replace the standard steel-cum-abrasive used for many years in multi-stage mills.

If improvements can be made to hullers, they should also be available for removing the valuable rice bran by polishing—another field under investigation.

**Finally, thought must be given to long-term storage of rice.* Milled rice rots quickly in the humid tropics. When all the natural protective packaging of each grain has been removed, the finished rice is not much more than nodules of pure starch. It is not possible at present for South and Southeast Asian countries to build up long-term reserve stocks in this form and rice has to be held as unmilled paddy. This rice is therefore not readily available for dealing with emergencies such as typhoons, floods, earthquakes or a failure of the monsoon.

Present methods of storage, even for the unmilled paddy, present several factors of wastage, not the least of these is that induced by relative costs. Mills are best sited in rural areas to serve small units and should be within easy walking or carting reach of the small farmers, who still lack the facilities even at low utilization. Market forces, therefore, keep up a supply of fresh, cheaply milled rice going from the country to the towns. Reserve stocks, however, tend to be held in or near the cities where the large mills operate. Since these mills provide no economy, but rather the reverse, there is a tendency for rice to return to the villages for milling when needed. This toing and froing leads to considerable losses in transport.

It is to be hoped that improved methods of storage, leading to a more logical distribution and transport-system for rice, will be devised.

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We believe that in all the fields which have been discussed here, there is great scope for private enterprise to contribute. Indeed, the private sector must take the lead, for the funds required are not on the scale needed for the more cumbersome and expensive process of infrastructural development with international aid. The private sector should, therefore, be able to act with speed and enterprise to meet the challenge.

This does not mean that the South and Southeast Asian countries are going to become totally dependent on Western firms for their rice machinery. The Engleberg mills are now almost entirely manufactured by local entrepreneurs in the regions where they will be used and the same will happen with the new machines to be devised. They will not be so complicated as to make the process a long one, though certain components will, no doubt, have to be supplied by the original designers for a good while to come. Our concept, therefore, is that engineering research must be organized in developed countries to resolve these urgent problems, that a transfer of technology under license should then take place, and that new manufacturers of agricultural machinery should grow up in the producing areas with the design, some supply and the initial management coming from the country of origin—perhaps through the agency of joint ventures.