Institutional Obstacles to Expansion of World Food Production

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Over the next several decades the most pressing problems in expanding world food production will be in the less developed countries (LDC's). It is in those that demand is likely to grow most rapidly, reflecting both relatively high population and income growth and a drive to improve nutrition, and where the mobilization and effective deployment of the needed resources will be most difficult. Consequently, this article deals with institutional obstacles to increasing food production in the LDC's. The institutional situation in the developed countries is treated only insofar as it might affect the flow of resources needed by the LDC's to stimulate their rates of increase in production.

It is generally accepted that over the next several decades a rising share of the growth of food production in the LDC's will come more from increasing yields and less from bringing new land under cultivation. The argument is that the amount of land economically suitable for cultivation is now much more limited relative to prospective demands than it was 20 years ago. The essential condition for increasing yields is that farmers increase their use of nonland inputs per unit of land, principally fertilizers, pesticides, improved seeds, water, and often machinery. The focus here, therefore, is on the conditions affecting the use of these inputs by farmers in the LDC's.

Conditions for Adopting New Technology

Three conditions must be satisfied if farmers are to increase their use of fertilizers and the other ingredients of modern agricultural technology: (i) the technology must be invented; (ii) the farmers must know how to use it efficiently; and (iii) they must have incentives to use it efficiently. Incentives are determined by the price and productivity of the technology relative to the prices of the goods it produces, by the ability of the farmer to acquire the ingredients of the technology when, where, and in the quantities he wants, and by the cost to the farmer of moving increased output to market.

The extent to which these three conditions are satisfied depends on the institutional structure within which the farmer lives and works. The more this structure encourages the flow of resources into development of and dissemination of knowledge about new technologies and strengthens farmers' incentives to adopt them, the faster will be the pace of agricultural development. Viewed in this way all obstacles to technological advance are institutional and all institutions may in principle be limiting. It is unlikely, however, that at any given time and place all institutions will be equally limiting. This suggests that a fruitful point of departure in assessing the ability of the LDC's to accelerate the growth of food production is to seek to identify the set of institutions most likely to limit the adoption of new technologies.

Search for Institutional Limits: The Problem of Theory

The search is greatly complicated by the lack of an adequate theory of the relation of institutions to technological change. All students of the subject agree that the relation is important, and probably most would agree that it is reciprocal, institutions serving to limit the pace of technological change at any given time and themselves undergoing modification over time under the impact of new technology. This view underlies all the work of Veblen and of his intellectual heirs among the institutional economists. A similar theory, and with specific reference to agriculture, has been developed more recently by Hayami and Ruttan (*1*) building on earlier work by T. W. Schultz (*2*). In this argument the development of new technology is the sine qua non of the breakout from agricultural underdevelopment. Without new technology, attempts to stimulate agriculture through reform of other institutions such as those relating to land tenure, extension, education, factor and product markets will avail little because the economic return to farmers of these reforms will be low. With respect to land tenure reform, for example, Hayami and Ruttan (*1*) assert that it had little impact in stimulating agricultural modernization in the 1950's and 1960's and attribute this to the fact that, in the absence of appropriate technologies, the economic returns to reform were insufficient to induce the political effort needed to make it effective (*1*, p. 263).

The Hayami-Ruttan theory that new technology creates a demand for institutional change by opening up productive opportunities unrealizable without such change is persuasive. The theory falters, however, in explaining the institutional supply response. The reference to political effort needed to achieve effective land reform suggests the source of the problem. That some minimum political effort was needed to achieve the reforms required to exploit new technological opportunities implies that some social group, namely, those to be "reformed," saw the new technology not as an opportunity but as a threat. Hence they resisted, as indeed they continue to resist in many parts of the less developed world. It follows that a fully adequate theory of the relation of technological and institutional change must include an account of how the resistance of those who stand to lose from change is somehow overcome.

Since no such theory presently exists, the search for institutional limits to technological advance in the LDC's over the next several decades must be halting and the conclusions tentative. I believe, however, that available theoretical and empirical materials are sufficiently strong to support some useful speculation. The focus is on the near-to-medium term—say to 1985—because this is the period of most immediate present concern. However, the concluding remarks contain some comments about the longer term situation.

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Categories of Institutional Limits: A Question of Priorities

In my judgment institutions affecting farmers' incentives to innovate will be more important than those affecting the supply of new technology or the technical abilities of farmers. There appears to still be considerable potential for expansion of production based on the technology underlying the Green Revolution. The key ingredient in this technology is the high yielding varieties (HYV's) of wheat and rice. There is reason to believe that, with the HYV's now in use or under development in the various national and international research centers, large additional increases in production can be obtained, both by planting more acres to these varieties and by increasing their yields on land where they already are used.

Dalrymple (*3*) indicates that in non-Communist Asia in 1972–1973 roughly 35 percent of the land in wheat and 20 percent of that in rice was in the HYV's. In Mexico almost all wheat land was in HYV's (rice being relatively unimportant), but in the rest of Latin America and in Africa the area sown to these varieties was relatively small. So far, the adoption of the HYV's, particularly in India and Pakistan, has been rather highly concentrated in certain areas. The reason, however, seems to be availability of irrigation rather than limits to the adaptability of the varieties which, according to one observer, have been "surprisingly wide" (*4*). The international research institutes continue to develop new varieties adapted to an increasing range of climatic and soil conditions, and they are giving high priority to support of the national research programs needed to produce even more location specific varieties (*4*). Some of these national programs already are strong, for example, almost all the HYV's of wheat and rice now grown in India were adapted by Indian research (*4*).

The potential from higher yields on lands already planted to the HYV's also looks promising. In the Philippines, even before the Green Revolution varieties became available, under fully irrigated conditions, average yields of rice often exceeded 3.0 metric tons in the wet season and 3.5 metric tons in the dry season (*5*). On farms participating in contests or under experimental conditions the figures for comparable yields for wet and dry seasons range from 4.0 to 4.5 metric tons to 5.0 to 6.0 metric tons. In recent years, the ceiling yields, under ideal conditions, have risen to about 8 to 10 tons. But at any given time yields on the average farm will never equal those achieved under experimental conditions. However, much of the difference is attributable to the average farmer's limited access to a controlled water supply and to the price and availability of fertilizers and pesticides. These conditions reflect institutional limitations affecting farmers' incentives rather than technological limitations. If incentives can be improved, the technology will permit average yields for the HYV's considerably above those now achieved.

The principal reason for believing that the technical ability of farmers will not be a major limiting factor over the next 5 to 10 years is the speed with which the Green Revolution spread and the demonstrated ability of small, poor farmers to use it effectively. Hertford's work on Mexico shows that, where irrigation was available and other conditions for adoption were favorable, the *ejidatarios*, beneficiaries under Mexico's land reform program, shared substantially in the rapid spread of new technology among Mexican farmers over the last several decades. The *ejidatarios* achieved this despite the fact that their farms were on average small (about 15 acres in 1960), their soils were generally of poorer quality than on private farms, their formal education was scant (average of 3.4 years in 1965), and most of them lacked farm management experience before receiving land (*6*, pp. 7, 40, 41). A study sponsored by the International Rice Research Institute (IRRI) (*7*) indicates a similar capability of small farmers in Asia to adopt and profit from the new rice technology where irrigation was available and input and product market conditions were favorable. Other studies point to the same conclusion (*8*, *9*).

The evidence on the ability of small farmers in Mexico and Asia to employ and profit from HYV technology should not be interpreted to mean that managerial capacity of these farmers is generally high. It does suggest, however, that lack of managerial capacity has not been a major factor so far in limiting the spread of the new technology. There still are millions of farmers in the LDC's as yet untouched by the Green Revolution. I suggest this has more to do with their lack of incentive to adopt the new technology than with their technical ability to use it productively.

Incentives

It sometimes is argued, although less frequently now than a decade ago, that because of the force of tradition, farmers in the LDC's will not respond to new technology, even when it is available on favorable terms and they know how to use it. In my judgment the evidence is overwhelmingly against this view. There is not space here to develop the counter argument. For some representative sources see (*1*, *6*, *10*).

Input-output price relations. Future food prices in the LDC's will depend on the growth of demand as well as on government policies. With population expected to grow at 2.7 percent annually, per capita income growth of 2.5 percent, if widely shared, could provide steady long-term annual growth in food demand of 3.5 to 4.0 percent, well above the historical growth of food production in the LDC's and enough to provide strong positive incentives to invest in new technology. Whether per capita income grows at the indicated rate will depend in part on the success of agriculture, but also very much on the entire development effort in the LDC's, a theme beyond the scope of this article. The point of interest here is that the growth in demand for food should be sufficient to support attractive prices for farmers if overall growth targets are achieved. In the past many governments in the LDC's have attempted to repress food prices to hold down the cost of living. Persistence of such policies could weaken the incentives farmers otherwise would receive from healthy growth in demand for food.

High prices of key modern inputs may be a more serious obstacle to continued expansion. About one-third of the fertilizers consumed by the LDC's (one-half excluding the Communist countries of Asia) are imported. These countries have been hard hit by the sharp increases in fertilizer prices in the last few years. A recent study (*11*, p. 62) suggests that fertilizer prices may decline over the next decade as new capacity comes on line. This assumes, however, that the LDC's themselves will achieve sizable in-

creases in fertilizer production, a matter treated below.

The LDC's clearly are not going to have much leverage on world fertilizer prices over the next decade, and except for those few included in OPEC (Organization of Petroleum Exporting Countries), they will have even less on energy prices, also significant because of the importance of petroleum in fueling tractors and driving irrigation pumps. The high price of fertilizer is primarily due to the uneven pace of capacity expansion in that industry rather than to institutional obstacles. The present price of energy, on the other hand, clearly reflects the power of OPEC as an institution. The significance of OPEC and its policies is not limited, however, to their effects on the costs to farmers of energy and fertilizer. Because of high prices, petroleum now absorbs a much greater proportion of foreign exchange than before, thereby limiting the capacity of the LDC's to import fertilizer and other modern farm inputs.

Availability of inputs. Increased domestic production of fertilizer and other inputs would be one response to the reduced ability to import, and many of the LDC's already are moving in this direction. In doing so, however, they face a number of obstacles, some of which appear to be institutional. Lead times for bringing new fertilizer capacity on stream have generally been longer in the LDC's than in developed countries, and capacity operating rates have been lower. As a consequence both capital and operating costs in the LDC's are higher (*12*). Fertilizer production is capital-intensive and complex, requiring high levels of technical and managerial skills to achieve efficient operation. Shortage of these skills may be one of the important reasons why the efforts of the LDC's to expand low cost fertilizer production have faltered.

Pesticide capacity in the LDC's is low relative to demand. Although plans to increase capacity are not known, it seems unlikely that domestic production of pesticide ingredients will satisfy more than a small, if rising, proportion of total demand over the next decade. Seed production capacity may also pose a problem. Few of the LDC's have a highly developed seed industry, leading the Food and Agriculture Organization to suggest that lack of a commercial supply of high quality HYV's has been an important factor limiting the spread of the Green Revolution.

Marketing. Institutions linking the farmer to suppliers of his inputs and final consumers of his products can also have important effects on his incentives. The operation of input and product market institutions in the LDC's has been little investigated, in the case of inputs perhaps because their use in large volume is relatively recent. At a very general level, the rapid spread of the Green Revolution could be taken as evidence that, although we know little about the performance of these institutions, it appears to have been good. The fast increase in acreage planted to HYV's already has been noted. Fertilizer consumption in the LDC's grew at an average annual rate of almost 14 percent between 1961 and 1963 and 1972 to 1973. Less is known about the growth of pesticide consumption, but apparently it lagged not far behind the rate for fertilizers (*13*, p. 39). These are very fast rates of increase, comparing favorably with the experience of any of the developed countries at similar stages of agricultural development. They suggest that, however primitive input marketing institutions may have been, they worked.

With respect to institutions marketing farm products, a study by Hayami and Ruttan (*1*, p. 267) of rice and corn marketing systems in Southeast Asia showed that the system was very effective in transmitting information between producers, wholesalers, and retailers. Hayami and Ruttan cite other studies to the same effect, and conclude that the elasticity of supply of services in these markets was high (*1*, p. 267).

Other recent work supports this view. In Sonora, Mexico, urban based marketing of farm inputs and products expanded rapidly in response to the growth and modernization of agriculture there (*14*). Most of the expansion of the marketing activities was in private hands and was "spontaneous," that is, not planned or directly supported by government. The principal public role was to develop the technology on which agricultural development was based, to provide large supplies of irrigation water and a road-rail network linking the state with principal markets in Mexico and abroad, and through imports and domestic production to assure an adequate supply of attractively priced fertilizers, pesticides, and other modern inputs.

Gibb (*9*), in a study of central Luzon, Philippines, where the Green Revolution was widely adopted, found rapid expansion of both input and product marketing services provided to farmers. He concluded that the expansion was a response to the increased demand for these services following adoption by farmers of the new technology. Private initiative was the motive force for the growth of these services, the role of government apparently being similar to that in Mexico.

Analyzing the experience of the Pakistan Punjab in the second half of the 1960's, Child and Kaneda (*15*) found rapid growth of small-scale industry providing diesel engines, pumps, and other hardware to farmers in that region. The growth was a response by private initiative to the spread of the Green Revolution and the associated increase in demand for tube wells and equipment. Development was spontaneous, with no subsidies, no tax concessions, no special credit arrangements, and no technical assistance.

Credit. The failure of credit institutions to provide adequate financing to farmers, particularly small farmers, is frequently cited as a major obstacle to the adoption of new technology. There is no question that adoption requires increased funds to purchase the needed inputs. It is also clear that formal credit institutions discriminate against small farmers in allocating loans. What is not clear is whether the elasticity of the supply of funds is as low as commonly thought. Hayami and Ruttan (*1*) cite evidence from the Philippines, Taiwan, and Korea which shows, in their judgment, that the elasticity of supply of rural savings has been grossly underestimated. They argue further that concern with formal credit institutions has led to underestimation of the importance of informal credit sources: suppliers of inputs or purchasers of outputs, friends, relatives, or local moneylenders. The IRRI study (*7*) also turned up evidence of the importance of informal credit sources despite increased government efforts in each of the six countries to strengthen formal credit institutions. The author of the study found that credit was a constraint in many places, but drew no conclusions concerning its importance relative to other constraints.

Land tenure. Probably no institution has been more written about as an obstacle to technical progress in agriculture in the LDC's than systems of land tenure. The argument takes a

variety of forms, but the common core is that in largely rural societies control of land conveys political power and that this power is used to shape the whole structure of a nation's agricultural policies and institutions to favor the interests of large landowners (*1*, *16*). Obviously these interests, as the large landowners perceive them, are not necessarily those of small farmers or of the nation as a whole. While the large farmers may have been innovative, they have tended to adopt capital intensive technologies, even though in the LDC's rural labor is abundant and capital scarce. Moreover, the structure of policies often has weakened the incentives of small farmers to innovate.

There is no question that these arguments about land tenure systems as obstacles to technical change in LDC agriculture have weight. The problem is that their weight varies from place to place and time to time in imperfectly understood patterns. A number of countries that have made significant progress in agriculture, for example, Taiwan in the postwar period, and Mexico, also have had significant land reforms. However, Taiwan also enjoyed impressive technical progress from the early 1920's until about 1938, before the land reform (*5*). Hertford (*6*) credits the Mexican land reform as an important factor in Mexico's good showing, but he points out that irrigated *ejidos* have performed much better than those lacking irrigation. Then, of course, there are countries, or parts of countries, where substantial technical progress has occurred in the absence of significant land reform, for example, India, Pakistan, the Philippines, and Thailand.

We have too little understanding of the relationship between systems of land tenure and technological innovation to predict how important present tenure systems may be as obstacles to future technical progress in LDC agriculture. That they may impede progress seems certain, but it is equally certain that land tenure reform is not a generally necessary condition for innovation. This discussion of land tenure systems thus ends on a note of uncertainty. I will return to it briefly in some concluding comments below.

Irrigation institutions. It is a commonplace that irrigation is a key ingredient in the Green Revolution technology. The institutions determining the availability of irrigation water to farmers in the LDC's may increasingly impede the rate of technical innovation in those countries. The institutions are of two general sorts: (i) those concerned with mobilization of the resources needed to increase the supply of irrigation water, and (ii) those concerned with the allocation of water to farmers and their management of it. I will call these irrigation building and irrigation management institutions, respectively. By and large, irrigation building institutions have performed better than irrigation management institutions. Investment in irrigation projects in arid zones of Asia, Latin America, and Africa increased rapidly in the decades after World War II with corresponding increases in the amount of land at least nominally irrigated. The management of these projects, however, has frequently been inefficient in two senses: (i) the amount of land actually receiving water is a small proportion of the design amount (*17*), and (ii) the productivity of the water received bears little relationship to its social cost (*18*, *19*).

The reasons for these inefficiencies are complex, but a major element is that the management of large irrigation projects is generally in the hands of public officials who are too far removed from the on-farm situation to know the conditions of efficient use, who lack economic incentives to achieve it even if they knew how, and who typically are bound by inflexible operating rules of water allocation impeding their response to economic incentives even if they had them. The inflexibility of operating rules is the most obvious of these limitations and in itself would be sufficient to explain inefficient use of water (*18*, *19*). The institutionalized rigidities in irrigation management systems may become increasingly important obstacles to the spread of new agricultural technology. More land clearly will have to be brought under irrigation, but the real costs of doing so by building new projects is likely to be far higher than in the past. For example, existing irrigation works in Southeast Asia are inadequate to support the continued rapid spread of the Green Revolution; because the terrain in the principal rice-growing regions is characterized by broad river valleys and plains, particularly large investments in storage, transportation, and drainage works will be required (*5*).

There is much evidence that, because of the high and rising costs of building new irrigation projects, the payoff to improved management of existing ones will look increasingly attractive (*13*). It is difficult, however, not to be pessimistic about the likelihood that significant improvements in irrigation management institutions in the LDC's will be achieved. These institutions reflect a deep-seated view that patterns of water use hold more potential for social conflict than those of other agricultural resources; hence, water management requires a greater measure of social control. There is an important truth in this view. Unlike fertilizer or tractors, water is a moving, or "fugitive," resource. Consequently, it is difficult for any individual to establish an unambiguous property right in it, but many individuals may establish many ambiguous rights. This is the source of potential conflict.

There obviously is a case for a greater degree of social control in water management than in management of other agricultural resources. It seems apparent, however, that water managers have given far greater weight to avoidance of conflict than to capturing the full economic gains from efficient use of water. Unless there is a shift in the balance, more efficient use will not be achieved. There is no obvious mechanism by which to effect this shift since public managers would reap no direct economic benefits from improved efficiency.

Perhaps the best hope for achieving the needed institutional changes is the rising economic value of water and hence the increased payoff to improved management. This is the essence of the Hayami-Ruttan (*1*) theory of institutional change. Its weakness in this instance is the one noted above: Public water managers would not capture the economic gains from greater efficiency. Hence this powerful incentive to change is inoperative.

The persistence of inefficient management institutions may also be partly explained, however, by ignorance of the rising economic value of water. Since water markets are rare, there are no obvious measures of its economic value. The increasing importance of groundwater as a source of irrigation may help to heighten public awareness of the value of water, however. Private initiative, for example, in the Punjab region of Pakistan and India, has played a far greater role in devel-

opment of groundwater than of surface water. So far as I know, studies have not been made of the cost to farmers of this source of water, but it must have been greatly above the charges for water from publicly managed surface systems. That the investments were nevertheless undertaken indicates that the value of the water obtained was well above the prices charged for surface water. If private development of groundwater continues perhaps the significance of this fact will eventually heighten public awareness of the high value of irrigation water and hence of the payoff to improved efficiency in water management.

Development of groundwater deserves more attention in its own right. A recent survey stressed the advantages of groundwater because its social costs generally are lower than those of surface systems (*13*). The much greater role possible for private initiative also makes groundwater development look attractive because it avoids the institutional rigidities built into surface management systems. It is noteworthy that the tube well phenomenon in the Punjab penetrated even into areas with well-developed surface irrigation systems, quite possibly because the tube well gave the farmer command over a reliable supply of water when and in the quantities he wanted, something the publicly managed surface system did not provide (*19*).

A strategy giving increased emphasis to groundwater development thus may be the most promising way for reducing the now powerful institutional obstacles to more efficient irrigation management. Not only would it reduce the relative importance of rigidly managed surface irrigation systems but it could also serve to heighten public awareness of the rising economic value of water, thus generating pressure to move those systems toward greater efficiency.

Conclusions

It was argued that over the near-to-medium term—roughly to the mid-1980's—there is enough potential for growth in existing Green Revolution technology and in technical capacity of farmers that institutions affecting these two sources of increased food production probably will not be seriously constraining. The principal bottlenecks likely will be found among those institutions affecting farmers' incentives to innovate. There is impressive evidence that when other conditions for innovation are favorable the supply of marketing services, for both inputs and outputs, is quite elastic. This seems to include the supply of funds from rural saving and informal credit sources, although the evidence is less clear in this respect.

The situation concerning price relations and availability of inputs appears mixed. If national income growth targets are achieved, then the growth in total demand for food in the LDC's should be fast enough to support incentive prices for farmers. This advantage could be lost, however, if governments adopt policies to suppress food prices to keep down the cost of living. The price of fertilizers is expected to fall from the high levels of 1974, the amount of the fall depending in good measure on the success of the LDC's in increasing fertilizer production. Historically, their efforts to expand capacity have been relatively inefficient. Moreover, many countries still lack adequate capacity to produce the HYV's and pesticides.

Even with good progress in expanding domestic production of inputs, imports will continue to be an important source of supply. Maintenance of present high prices of petroleum products could be a major obstacle to financing these imports on the necessary scale because of the drain it would place on available foreign exchange. I conclude, on balance, that prices and availability of fertilizers, pesticides, and seeds could have important negative effects on farmers' incentives to adopt Green Revolution technology.

Rigidities in water management institutions may be even more limiting, for reasons noted in the previous section. The role of existing land tenure institutions is not clear. The tentative conclusion, however, is that over the near-to-medium term the maintenance will not be a major obstacle to further spread of the Green Revolution. Over the longer term, it could become more seriously limiting. The reason is that continued expansion of food production will eventually require the invention and adoption of new technologies and a higher level of technical and managerial skill than most farmers in the LDC's now possess. To do this will require substantial investments in domestic research and extension institutions and in rural education. In countries where a small class of large landowners wield substantial political power, these investments may not occur on the necessary scale because the large farmers have their own means of acquiring the technology and little perceived interest in supporting the upgrading of the skills of small farmers.

This review of institutional obstacles to expansion of food production in the LDC's must end on a tentative note. The review does suggest some observations about the process of institutional change, however. There is impressive evidence of strong latent potential in the private sector of the LDC's for mobilizing the resources and effort needed for agricultural progress when the private economic rewards for doing so are high. Under these circumstances, needed changes in the institutions required to mobilize the resources and direct the effort seem relatively easy to achieve. Institutional resistance is stronger in situations where influential interests perceive change as a threat or where there is no direct personal economic reward to change, as in the typical public institution.

The latter point is particularly important because the performance of public institutions is critical. Development of new technology, the fundamental condition for continued long-term growth, is basically a public responsibility because the gains from adoption usually cannot be sufficiently captured by private institutions to justify their assuming the cost. Although private firms often have incentives to impart technical knowledge to farmers as a way of widening the market for their products, the broadening and strengthening of the institutional structures concerned with both the general and technical education of farmers is a public responsibility. This is true also of the development of large irrigation systems, both because of the scale of the needed investments and the potential for social conflict in water management. The lack of a well-defined mechanism that would link responses of public institutions to the large social payoffs to increased public investment in irrigation, new technology, and technical abilities of farmers may prove in the long run to be the most important single obstacle to adequate growth of food production in the LDC's.

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Difficult Issues Underlying Food Problems

Lasting solutions require changes in social and economic imbalances and in political decisions.

Harry Walters

World food problems developed with disturbing suddenness in 1972. Two decades of sufficient food—indeed surpluses, stable or declining food prices, large grain stocks, and large amounts of food aid seemed to indicate an increasing capacity to produce more food more efficiently. But in 1972 food prices rose sharply, food shortages developed, food aid shipments declined, and grain stocks fell to dangerously low levels. Subsequently, fears were expressed that the world might be nearing the limit of its capacity to increase food production while population continues to increase, so that some must starve (*1*) or the world's rich will have to share their food with the world's poor (*2*). In the background, climatic changes have been predicted that suggest even more ominous prospects (*3*).

Surprisingly, major studies carried out in 1974 to investigate the causes and character of present world food problems—one of them being the United Nation's own assessment for the World Food Conference in Rome in November 1974—did not reflect these cataclysmic anxieties (*4*). While the problems are serious, these studies all concluded that over the next decade more food can be produced and that the conditions existing now can be corrected.

The difference between the issues that attract popular attention and the conclusions drawn from them and those that surfaced in these studies have been attributed to the differences between "pessimists" and "optimists." But concern about food problems and solutions is shared by both groups; what differs is the explanation of the causes of the problems and the types of solutions proposed.

Among the major food problems the most important are an imbalance in the growth of food production between the developed and developing countries, inadequate food stocks to insure against serious disruptions in food production, malnutrition, and an imbalance in food policies among countries. Neither the causes nor the solutions of these problems are simple. A much better understanding of these problems is needed as a preamble to sound, lasting solutions. Such understanding requires an appreciation of how people respond to the commodity food and how the commodity food is affected by the economic forces that operate on it and on other commodities. It also requires an understanding of the combination of factors that came together in 1972 to 1974 to produce the food problems the world faces now.

Food, the "Special" Commodity

Food, like water and air, is the staff of life. When we have less than we need we are hungry, our growth is stunted, and our capacity to deal with living itself is impaired. There are an estimated 460 million malnourished people in the world for whom these conditions apply in varying degrees. Below a certain minimum, people starve. Looked at this way, food is special.

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