

WORLD FOOD: MYTH AND REALITY

By

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February 1977

No. 77-4

NEW YORK STATE COLLEGE OF AGRICULTURE AND LIFE SCIENCES
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ITHACA, NEW YORK 14850

DEPARTMENT OF
AGRICULTURAL ECONOMICS
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4 February 1977

This paper was prepared at the request of the British journal World Development as the introductory piece for their forthcoming special issue on food and population problems.

It covers much the same ground as "World Food: A Perspective," written two years ago as the overview article for a similar special issue of Science. The illustrations are the same or merely updated, and complex problems continue to be disposed of with brevity. In both, one's aim is to present a context for detailed treatments to be offered by others in accompanying papers.

But there are differences. The Science issue appeared at a time when emotion about food matters ran high. A dispassionate recitation of cause and effect seemed in order. Today it is not inappropriate to address some of the muddled theorizing and doomsaying spawned by the recent food "crisis." Praiseworthy though the motivation may have been, much of it tackles the wrong problem and utterly misleads.

A handwritten signature in cursive script, appearing to read 'Thomas T. Poleman', written in dark ink.

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The public has every reason to be confused about the food situation. Conflicting pronouncements abound. Depending on whose counsel is sought, it is possible to be informed that "mankind has been led into a nutritional cul-de-sac from which there may be no escape" (1, p. 136), or that "world resources . . . could feed, at maximum [American] standards, 47 billion people" (2, p. 153). Such discrepancies reflect, to be sure, the range of opinion to be found in any subjective evaluation. But above all they mirror the sorry state of our ability to measure those parameters which enter the food equation.

For the developing world, especially, accurate data on such basic components as levels of production and consumption are wanting, and causal linkages defy more than hesitant affirmation. Serious national food evaluations, in consequence, are characterized by great caution and circumspection. The trouble begins when regional or global sums are done. The student, groping in the half-light of imperfect evidence and flashes of perception, is reluctant to add up a series of caveats. Others are not so reticent. The circumstances are ideal for ensnaring the naive and tailor-made for those with a penchant for fitting the data to the thesis.

In such a situation, the function of an introductory paper becomes as much to deny what is not as to lay a foundation for subsequent in-depth analyses of very real problems.

I. THE MYTH OF IMMINENT GLOBAL STARVATION

It is important at the outset to put to rest the notion that the world is no longer able to feed itself and teeters uncontrollably on the brink of starvation. I have elsewhere discussed the failings of the analyses whereby pictures of massive global hunger may be conjured up (3), but as so much devolves from it, repetition is not out of place. Unhappily it traces to the formative years of the Food and Agriculture Organization (FAO) of the United Nations, the agency which, together with the United States Department of Agriculture (USDA), has been responsible for most of the global food assessments carried out since World War II.

Within a year of its creation in 1945 the FAO issued the first in its series of World Food Surveys. The findings of this survey and its

principal successors are summarized chronologically in Table 1. The analytical approach was simple in the extreme, and may be summarized by the equation:

$$\frac{\text{Food available for human consumption}}{365 \times \text{population}} - 15\% \text{ loss} \begin{matrix} \leftarrow \\ \rightarrow \end{matrix} \begin{matrix} \text{average daily} \\ \text{recommended nutri-} \\ \text{ent allowances} \end{matrix}$$

To determine whether or not a country was experiencing a food problem, apparent per capita food availabilities, minus a 15 percent allowance for wastage, were set against estimates of per capita nutrient needs. Where and when availabilities exceeded requirements, all was presumed well; where they did not, the country or region's entire population was considered to be inadequately nourished. Never mind that the rich will eat differently than the poor, and one member of a family differently from another.

The limitations of this approach are many and, when probed, obvious: in addition to the unrealistic assumption of dietary homogeneity, it presumes a sophisticated ability to quantify. To estimate food availabilities, one must construct a balance sheet, incorporating on the supply side measurements of production, trade, and stocks changes, and on the utilization side such items as seed and feed use and losses in storage. Availabilities for human consumption are derived as a residual and thus reflect the totality of error. The evidence is that these errors in statistically underdeveloped countries act in the direction of understatement; minor or exotic foods are often ignored and--because the government official is still equated with the tax collector--farmers tend to minimize production. Detailed evaluations of a number of Asian countries by Cornell students suggest underreporting of from 10 to 15 percent, and preliminary work on Africa points to an even greater margin of error (4, 5, 6).

Compounding this tendency to undercount food availabilities have been the difficulties associated with estimating food needs. These have been overstated. Nutrition is still a young science and our ability to establish minimal or desirable levels of intake is not nearly so precise as we would like it to be. What in fact have been used as surrogates for minimal acceptable levels of intake in most food evaluations have been the recommended allowances prepared as guidelines for dieticians and other nutritional workers. To insure that the substantial variations in food needs among individuals will be covered, these allowances consciously err on the side of caution. They are also periodically revised as new knowledge becomes available. The history of the FAO, the U.S. Food and Nutrition Board, and other responsible organizations has been one of continual--and generally downward--modification. The energy allowances for the U.S. "reference man"--in his twenties, moderately active, weighing 70 kgs.--now stand at 2,700 Calories daily, 500 Calories less than the 1953 recommendation (7, following p. 128).

TABLE 1. CONCLUSIONS OF MAJOR EARLY POSTWAR STUDIES OF THE WORLD FOOD SITUATION AND SELECTED RECENT PRONOUNCEMENTS

Year Published	Conclusions	Methodology
1946	FAO - "World Food Survey" ^{a/} "In areas containing over half the world's population [prewar] food supplies . . . were sufficient to furnish an average of less than 2250 calories . . . an average of more than 2750 calories . . . were available in areas [with] less than a third of the world's population . . . the remaining areas . . . had food supplies between these . . . levels" (pp. 6-7).	National food balance sheet availabilities minus 15 percent wastage allowance compared with 2,600 Kcal./caput/day allowance (p. 11).
1952	FAO - "Second World Food Survey" ^{b/} "The average food supply per person over large areas of the world, five years after war was over, was still lower than before the war" (p. 2). "59.5 per cent of population [lives in countries] with under 2200 [Calories]" (p. 11).	National food balance sheet availabilities minus 15 percent wastage allowance compared with regional allowances (p. 22): Far East - 2230-2300 Kcal. Africa - 2400-2430 Kcal. Latin America - 2440-2600 Kcal.
1961	USDA - "World Food Budget, 1962 and 1966" ^{c/} "Diets are . . . adequate in the 30 industrialized nations . . . [where] more than 900 million people live . . . For most of the 70 less-developed countries . . . diets are nutritionally inadequate, with shortages of proteins, fat, and calories. These countries contain over 1.9 billion people. In most of them, population is growing rapidly, malnutrition is widespread and persistent, and there is no likelihood that the food problem soon will be solved" (p. 5).	Almost identical to "Second World Food Survey."
1963	FAO - "Third World Food Survey" ^{d/} [As of 1957-59, national food balance sheets and extrapolation of a limited number of budget surveys imply:] "as a very conservative estimate some 20% of the people in the underdeveloped areas are undernourished and 60% are malnourished. Experience shows that the majority of the undernourished are also malnourished. It is believed therefore . . . some 60% of the people in the underdeveloped areas comprising some two thirds of the world's population suffer from undernourishment or malnourishment or both." [Since some people in developed countries don't eat well,] "up to half of the peoples of the world are hungry or malnourished" (p. 51).	National food balance sheet availabilities with distribution around mean inferred from a few surveys in India and elsewhere compared after allowance for wastage with requirements calculated according to the 1957 FAO ^{e/} system.
1964	USDA - "World Food Budget, 1970" ^{f/} "Two-thirds of the world's people live in countries with nutritionally inadequate national average diets" (p. iii).	Little changed from "World Food Budget, 1962 and 1966"
In 1971 an FAO/WHO Expert Panel reassessed energy and protein "requirements" and dropped the protein figure for adults by about one third. ^{g/}		
1973	FAO - "Food Balance Sheets and World Food Supplies" ^{h/} [As of 1964-66, most national balance sheets] "suggest a surplus of protein availability." [However, other evidence] "suggests a very uneven distribution of protein supplies . . . aggravated by seasonal imbalances . . . Furthermore, wherever calories are in short supply, proteins are diverted from their primary function of providing for growth and maintenance of tissues to the supply of energy for other vital functions. This explains the widespread incidence of protein/calorie malnutrition in spite of the apparent excess of protein supplies" (p. 19).	
1974	UN World Food Conference - "Assessment of the World Food Situation, Present and Future" ^{i/} "Taking a conservative view, it would appear that out of 97 developing countries, 61 had a deficit in food energy supplies in 1970 . . . Altogether in the developing world . . . 450 million people [are affected]; a less conservative definition might give a much higher figure" (p. 5). "The poorer segments of the population, and within these segments, the children in particular, will bear the brunt of an insufficient food supply" (p. 64).	National average availabilities with distribution by income inferred from a limited number of surveys compared with energy cost of maintenance (1.5 x basal metabolic rate) minus 20 percent. "It is the use of this very conservative level that leads to the estimate of over 400 million individuals . . ." (p. 72).

Sources: a/ FAO, World Food Survey (Washington, 5 July 1946).b/ FAO, Second World Food Survey (Rome, November 1952).c/ USDA, ERS, The World Food Budget, 1962 and 1966 (For. Agr. Econ. Report 4, October 1961).d/ FAO, Third World Food Survey (Freedom from Hunger Basic Study 11, 1963).e/ FAO, Calorie Requirements (Nutritional Studies 15, 1957).f/ USDA, ERS, The World Food Budget, 1970 (For. Agr. Econ. Report 19, October 1964).g/ FAO, Energy and Protein Requirements (Nutrition Meetings Report Series 52, 1971).h/ "Food Balance Sheets and World Food Supplies," (FAO) Nutrition Newsletter, April-June 1973.i/ UN, World Food Conference, Assessment of the World Food Situation, Present and Future (Item 8 of the Provisional Agenda, November 1974).

With the cards thus stacked, it is not surprising that the early FAO and USDA global food assessments were able to paint a gloomy picture of world hunger--a picture which has persisted despite appreciable changes in the method of analysis.

The first global study to break away from the assumption of dietary homogeneity and to recognize that the key determinant of an individual's (or country's) eating patterns is his level of income was the Third World Food Survey published in 1963. As such it marked an important milestone. It is obviously the poor that suffer. Less obvious is how many and how.

The Third Survey concluded that the problem was with malnourishment: that whereas their energy intake was generally adequate, at least 60 percent of the population of the developing world was too poor to afford the more costly foods which are the principal sources of protein and the essential vitamins and minerals. This conclusion was widely held during the 1960s; the food problem became a protein problem and in some quarters the technical advances which have come to be called the Green Revolution were decried because they emphasized crops which are principally energy suppliers.

But in 1971 there was a flip-flop. An expert panel was convened by the FAO and the World Health Organization to review the international dietary allowances and it revised the adult protein recommendations downward by about one third. The effect was to convert the list of "protein deficit" countries to ones of sufficiency. The footwork in Rome was fast and furious, almost comical. If the protein problem did not vanish overnight, at least its statistical underpinnings had been swept away.

The current consensus seems to be that the old notions of malnutrition (insufficient protein and other "protective" foods) and undernutrition (inadequate energy intake) are no longer valid and nutritionists concerned with the LDCs (less developed countries) now speak of protein-calorie malnutrition. This sees a shortage of calories again as the prime problem and takes into account that an apparent adequacy of protein can be converted into a deficit should a portion of it be metabolized to compensate for insufficient energy intake. The Green Revolution is again acceptable.

The most recent estimate of the extent to which the poor of the Third World suffer from protein-calorie malnutrition was prepared by FAO for the November 1974 World Food Conference and is summarized by region in Table 2. It suggests the problem to be largely an Asian one--certainly true--and indicates that perhaps a quarter of the population of the Third World (ex-China), or in excess of 500 million people today, is inadequately fed. To be sure this is much less than the two-thirds found by the Third World Food Survey, but nonetheless it represents an unconscionable segment of mankind.

TABLE 2. NUMBER OF PEOPLE ESTIMATED BY THE FAO TO HAVE HAD AN INSUFFICIENT PROTEIN/ENERGY SUPPLY IN 1970, BY REGION*

Region	Population (millions)	Percentage Below Lower Limit	Number Below Lower Limit (millions)
Developed	1074	3	28
Developing ^{a/}	1751	25	434
Latin America	283	13	36
Far East ^{a/}	1020	30	301
Near East	171	18	30
Africa	273	25	67
WORLD ^{a/}	2825	16	462

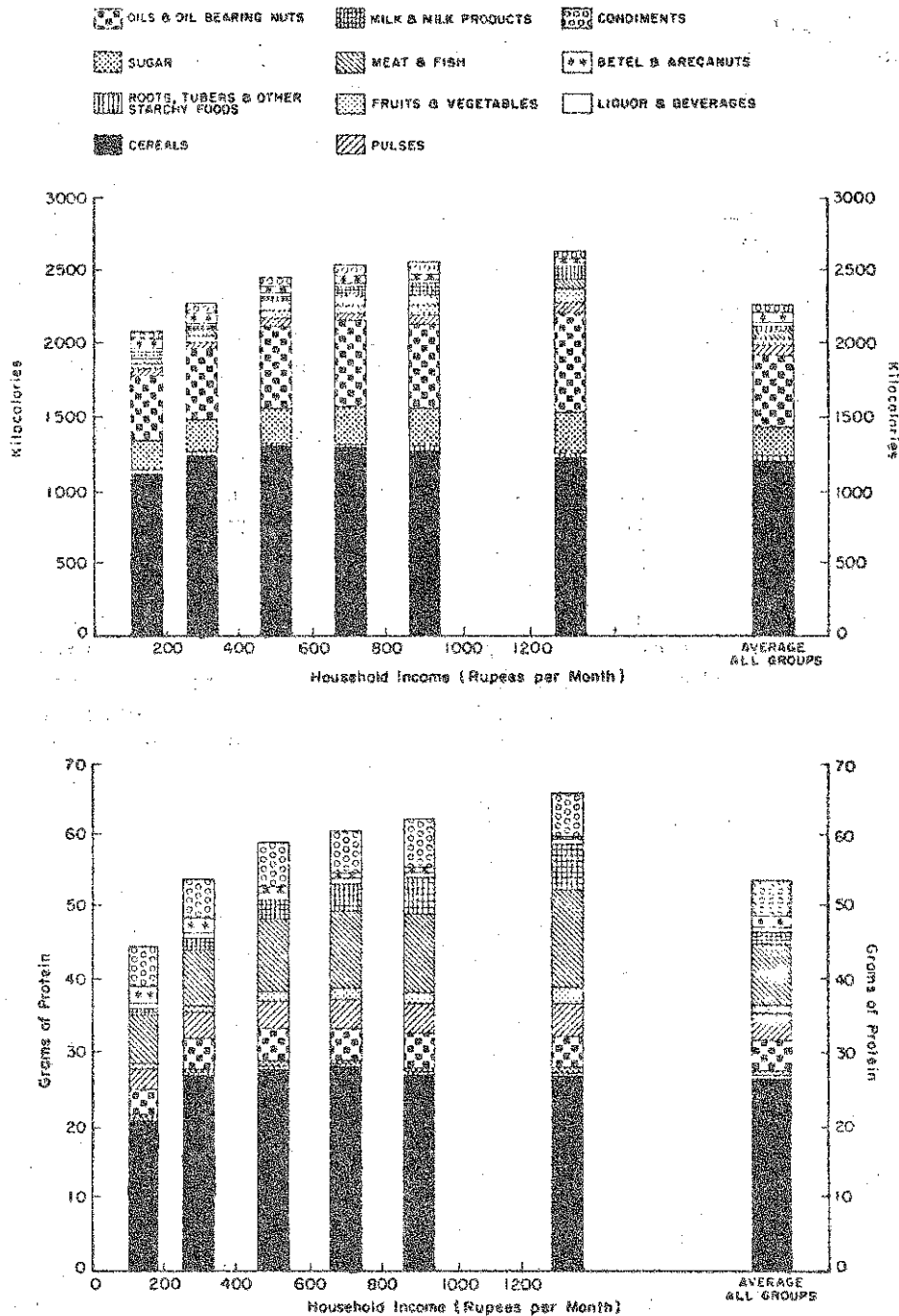
*Source: United Nations, World Food Conference, Assessment of the World Food Situation, Present and Future (Item 8 of the Provisional Agenda, November 1974), p. 66. It is interesting to note that the preliminary version of this document included a similar table suggesting 20 percent of the developing world's population fell below the minimal standard (Far East--22%; Near East--20%). No explanation of the change was given.

^{a/} Excluding centrally planned countries.

It is difficult to evaluate this figure. Certainly the nutritional standards used today are far more reasonable than those employed 30 years ago. Food availabilities no doubt continue to be underestimated. But the real problem is knowing how available supplies are divided across the income range. It is a commonplace among serious pronouncements on the food situation that global supplies are sufficient to feed all. Would that our ignorance on matters of distribution were equally publicized. The survey data from which inferences about the effect income has on eating habits simply do not exist for most LDCs, and until there is a (modest) hue and cry for their generation I see no likelihood of the situation being corrected.

Chart 1, a summary of the effect income has on nutrient intake in Sri Lanka, illustrates some of the difficulties. The survey on which it is based is almost unique; to my knowledge only three or four surveys of equal coverage and integrity exist for the entire Third World. Yet, even with this survey, one can infer precious little about the extent

CHART 1. APPARENT PER CAPITA DAILY ENERGY AND PROTEIN AVAILABILITIES IN SRI LANKA (1969-1970) BY INCOME CLASS*



*Source: T. T. Poleman, Income and Food Consumption: Report to the Government of Sri Lanka (FAO/UNDP, No. TA 3198, Rome, 1973), pp. 18-19.

of protein-calorie malnutrition. The dietary adjustment most commonly associated with rising income is a decline in the importance of the starchy staple foods--read rice in southern Asia--as sources of energy and a shift to the more expensive, flavorful foods such as meat, fish, and vegetables. In Sri Lanka this tendency is observable among only the four uppermost income classes (20 percent of the population), and then, because of recent egalitarian measures, only weakly so. Between the lowest class (43 percent of the people) and the next lowest (37 percent), the sole change is quantitative. There is a difference in apparent per capita daily availabilities of 200 Calories and 10 grams of protein, but none in diet composition.

What are we to infer from this? Because FAO now (quite reasonably) reckons energy requirements in South Asia to average about 1900 Calories per day, it could suggest either of two very different things. If the standard factor of 15 percent is applied to account for wastage between purchase and actual ingestion, the 200-Calorie gap could be interpreted as implying enforced reduced activity among the poor or actual physical deterioration. But just as reasonably, one might postulate caloric adequacy among that element of society which is too poor to waste anything and which, given the very high rate of unemployment in Sri Lanka, leads a less active life and therefore has lower energy needs. Thus it is possible to have it either way: depending on your assumptions, you can prove beyond a statistical doubt that 43 percent of Ceylonese suffer protein-calorie malnutrition or none do.

Having been fortunate enough to have spent some time in Sri Lanka over the last decade and a half, my impression is that the optimistic interpretation more nearly approximates reality. Overt signs of inadequate feeding are few in Sri Lanka; and it is illogical for people who are short of calories not to satisfy this need from such cheap sources of energy as rice, sugar, and coconut before spending on what to them are luxury items.

Indeed, an implicit presumption of such illogical behavior underlies the whole notion of massive protein-calorie malnutrition, and I for one am skeptical. The more I study food behavior in the developing world, the more impressed I am with the efficient and rational way in which most people allocate their resources so as to get by on what by the standards of the West is very little. There are exceptions, of course: the so-called vulnerable groups--pregnant and lactating women, the preschool child--are truly vulnerable and need assistance. But the great majority of people neither look nor act malnourished, and quite possibly enjoy more healthful (though less tasty) diets than do many of their overweight and underexercised cousins in the West.

Thus, though I can't prove it, there is no doubt in my mind that the picture of 500 million people struggling at the brink of starvation is a distortion. It is, as the title of this section suggests, a myth--a myth whose durability, given the history of the analyses upon which it rests, remains something of a marvel. It is tempting to see a conspiracy

between naive doomsayers eager to sell books and the vested interests of entrenched bureaucracies. In reality, though, I suspect it reflects nothing more than the persistence of honorable men attempting to dramatize their case through exaggeration. Surely it is not wrong to exaggerate the misery of the few by making it seem the plight of the many, if the result is to hasten remedial steps.

Unhappily, the best of intentions can go awry. Instead of galvanizing mankind to collective action, the hunger/starvation myth has rendered the global psyche vulnerable to further distortions and by so doing served to obscure the actual dilemmas of world food and population.

II. THE MYTH OF THE COMMONS

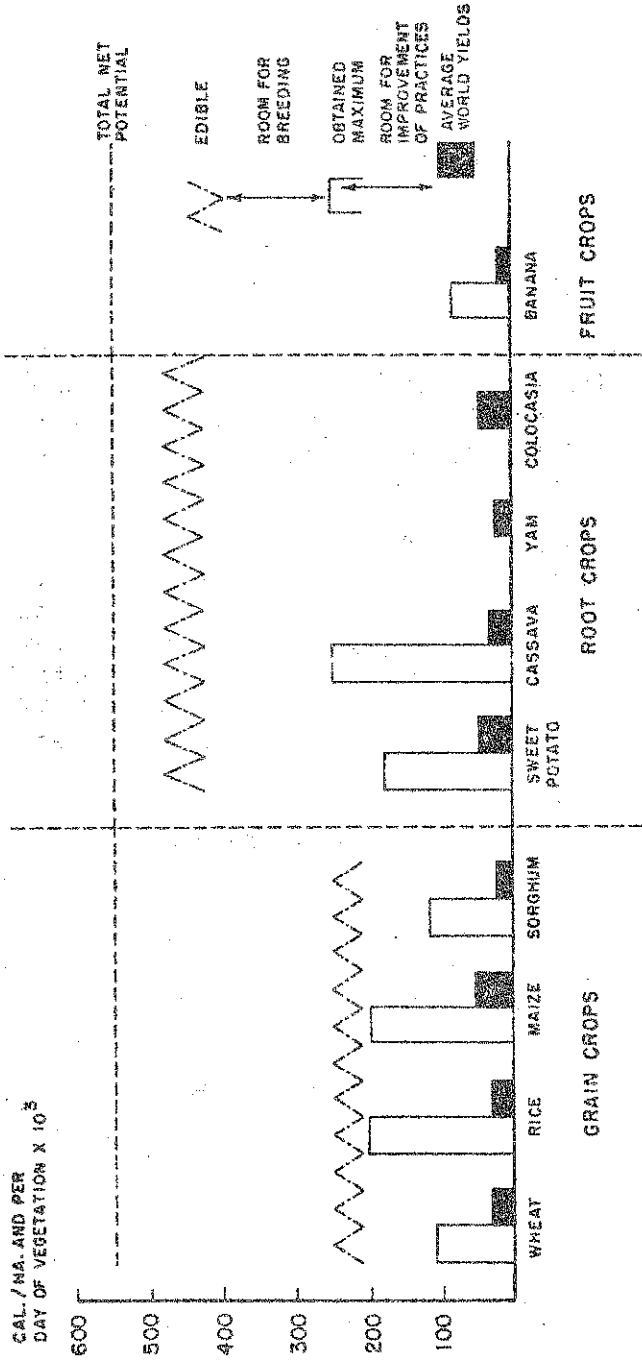
Of the corollary myths the one most flagrantly at odds with reality is popularly associated with the words "lifeboat" and "triage"--the so-called Tragedy of the Commons.^{1/} It sees an already hungry world plunged into even deeper misery as populations grow and agriculture stagnates. The developed countries are confronted with a heart-rending choice between diminishing resources and which among the LDCs to save--a decision to be made in the spirit of triage, the World War I practice of dividing the wounded according to whether they would survive without medical aid, profit from it, or die no matter what. The presumptions underlying this incredible call for lethargy are many, but revolve around a denial of the demographic transition and the eventual control of population growth it portends, and the presumption that agriculture in the Third World is operating flat out and can go no further without massive environmental disruption.

Nothing could be farther from the truth. As anyone who has spent much time in the developing world knows--and I suspect the doomsayers have ventured there hardly at all--the unrealized agricultural capabilities of most LDCs are still substantial. In Africa and Latin America, especially, great expanses of potentially productive land are but superficially exploited, if at all, and yields are everywhere far below what is obtained experimentally or in the West (Chart 2). To the doomsayer Bangladesh is the quintessence of a perennial basket case. Yet it need not be; its soils are uncommonly fertile, and were rice yields raised simply to the world average her problems would be ones of storage and disposition rather than survival. That they are not reflects political, not technical, failings.

Indeed were the doomsayers to examine the record of agricultural change in the LDCs they would find much to give them cause for optimism. According to such generally used series of "world" production as that of the USDA plotted in Chart 3, the LDCs over the past 20 years have

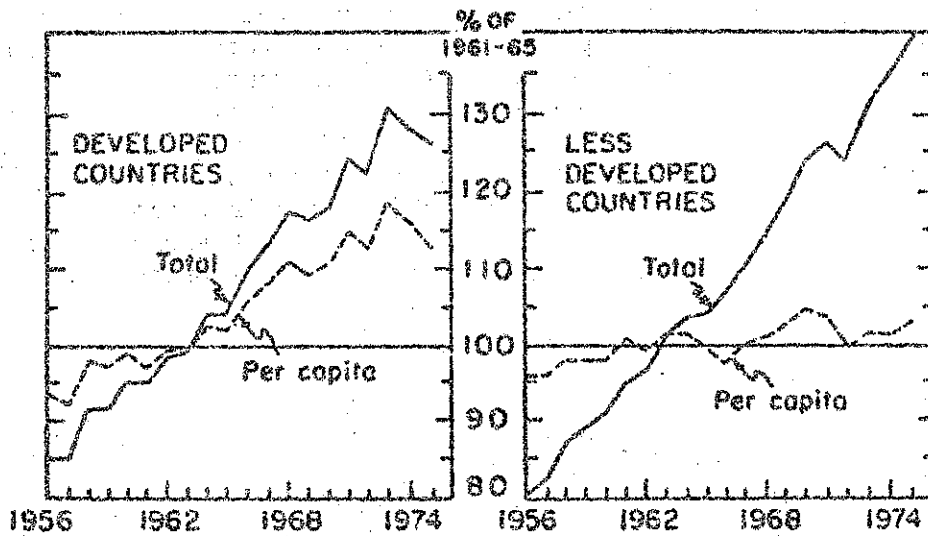
^{1/} Most commonly equated with this sort of thinking are the many writings of Garrett Hardin: 8, 9, to name only two.

CHART 2. AVERAGE WORLD YIELDS, MAXIMUM YIELDS OBTAINED IN SELECTED TROPICAL EXPERIMENT STATIONS, AND ESTIMATED POTENTIAL YIELDS TO BE REACHED THROUGH BREEDING AND RESEARCH*



*Source: C. A. de Vries, J. D. Ferwerda, M. Flach, "Choice of Food Crops in Relation to Actual and Potential Production in the Tropics," The Netherlands Journal of Agricultural Science, November 1967, p. 246.

CHART 3. WORLD AGRICULTURAL PRODUCTION, 1956-1975*



*Source: U.S.D.A., Handbook of Agricultural Charts, 1976 (Agricultural Handbook 504, October 1976), p. 53. Developed countries: North America, Europe, USSR, Japan, South Africa, Australia, and New Zealand; less developed countries: Latin America, Asia (except Japan and Communist countries), and Africa (except South Africa).

expanded output no less rapidly than the developed countries, a remarkable achievement in view of the minimal priority given agriculture. Population growth, of course, absorbed most of the gains, but modest per capita improvement is evident.

Twice, however, the rate of progress seemed to falter and, as has been the case with doomsaying almost since Malthus' time, the pessimists were quick to stage their periodic emergence. The first pause came in the mid-1960s and resulted almost exclusively from two successive droughts in India. Indian production bulks so large in the LDC aggregate that major fluctuations in her output influence visibly the index for all developing countries. This fact, however, was lost on many commentators. Looking at the figures and hearing of massive food aid shipments--of the 30 million tons of grain shipped by the United States under Public Law 480 during the two years ending in June 1967, half went to India--the man in the street was receptive to forecasts of imminent global starvation.

A reaction set in almost immediately and again closely mirrored the Indian situation. A sequence of favorable years in terms of weather was accompanied by introduction into the Punjab of high-yielding varieties of Mexican wheat. The result was that the index of production for all low-income countries rose steeply, as did per capita availabilities. The assessment was as extreme in the opposite direction as it had been in 1965 and 1966. These were the years when we first began to hear of the Green Revolution. The situation in Northwest India, together with the introduction of high-yielding, stiff-strawed, fertilizer-responsive rice in wetter portions of Asia, led many to believe the situation had been fundamentally altered and that feeding the world's rapidly increasing population no longer posed problems. So pervasive was the optimism that the FAO even suggested in its State of Food and Agriculture for 1969 that the food problems of the future might well be ones of surplus rather than shortage (10, pp. 1-3).

The factors underlying the second pause--the "food crisis" so recently ended--were more complex and involved the developed as well as the developing countries. In brief, it resulted from an unhappy coincidence of four main influences: an intentional running down of stocks and a holding down of production in the United States; unprecedented prosperity and rising demand in Europe and Japan; unfavorable weather in the Soviet Union, India and the Sahelian zone of Africa; and a general relaxation of attention to agriculture in the LDCs. The last mentioned is difficult to quantify, but it is evident that the early Green Revolution euphoria was accepted by many governments as justification for redirecting investment and pricing policies away from agriculture in favor of the politically-more-rewarding urban sector.

One is tempted to call the food crisis of the early 1970s the Soviet crisis, since the instabilities of that country's farming sector were responsible for the extreme volatility. Certainly it was triggered by the short crop of 1972 and prolonged by the failure of the 1975 harvest.

But to term it such would be misleading. It was truly "world" in that the price rises were general and in that it exposed the weaknesses of the international agricultural order. "International" is the operative word: most affected were the countries trading in the world market. Least involved were the largely self-reliant economies of the Third World. They were mainly affected in that the surpluses of the West were no longer available to them in abundance on concessional terms.

This reduction in food-aid availabilities is central to the lifeboat thesis and hinges on the not unreasonable supposition that food aid is what the name implies--charity to those otherwise unable to feed themselves. In fact, about 80 percent of such shipments have moved from the United States under Public Law 480 and apart from the Indian bailout of the mid-1960s have been flagrantly political exercises in dumping; "surplus disposal" rings better to the bureaucratic ear. South Korea, South Vietnam (until recently), and post-Allende Chile have been major recipients. True emergency relief, as to Bangladesh following hurricanes, Biafra after its unsuccessful bid for independence, and more recently to the Sahelian states, has amounted to less than a tenth of the total (11, pp. ii, v).

Most responsible commentators view this sort of food aid with skepticism. About a fifth of the U.S. rice harvest now finds its way abroad under concessional terms and the disruptive effects this million tons can have on the world rice market is well known to the trade; I travelled through Southeast Asia in early 1976 and heard about little else. But the principal objections center on the disincentives to increased production in recipient countries. If the farm sector in developed countries seems possessed of political clout all out of proportion to the number of people involved, it is just the opposite in the LDCs. There it is the urban dweller who has the power to make or break, and though their numbers may be small, the politician is at pains to assure them cheap food. What more painless way to do this than with cut-rate imports from abroad? Thus it was the politically articulate few who objected mightily (and brought down the government in Thailand) when in the early 1970s the run-down of surpluses in the West and signs of local agricultural stagnation caused many governments to reverse their pricing policies and offer greater incentives to farmers. And so it may be that foundations for the next food crisis--of the late 1970s?--may be laid by a clamor, now that things no longer look so bad, that these incentives are no longer necessary.

It does not follow, however, that all food aid need be harmful. By implying that populations will expand to the point where they run out of food, the proponents of triage ignore the evidence that rapid population growth can be controlled rather quickly once certain preconditions have been achieved. Among the most important of these preconditions is a reduction in infant mortality, so that parents need no longer plan on two live births in order to feel reasonably assured that one child will reach maturity. To this end there are no more effective means than clinics which provide supplemental food as well as medical services to mother and child. Recent changes in Public Law 480, requiring that 75 percent of concessional sales go to countries with per capita GNPs of less than

\$300, make support of such programs a greater possibility. But whether the recipient countries can muster the technical expertise and administrative competence to implement them--particularly at a level commensurate to the 10 million tons of food aid annually called for by the World Food Council (12, p. 2)--is open to question. It is a priority matter which should be pursued with extreme care.

III. THE MYTH OF THE FOOD-POPULATION RACE

The doomsayers' silence on population control is symptomatic of the widespread acceptance of a second myth encouraged by the hunger/starvation distortion: the old Malthusian one of a (losing) race between food and mouths to feed. One calls it Malthusian with reluctance, because it is impossible to believe that Malthus, had he today's evidence on matters about which he could only theorize 175 years ago, would have had much truck with what is said in his name. Few have paid so high a price for original thought.

Malthus wrote at a time when very little was known about population trends. Censuses had only begun to be taken and the good Reverend seemed quite prepared to go along with Bishop Ussher's timing of the Creation at 4004 B.C. (13, p. 6). Evidence on food production was even sketchier. Nonetheless Malthus was bold enough to perceive in them tendencies sufficiently strong to upset the then prevailing notions of man's perfectibility.

His theory was most succinctly stated in the first edition of his famous Essay (13, pp. 6-8):

I think I may fairly make two postulata.

First, That food is necessary to the existence of man.

Secondly, That the passion between the sexes is necessary, and will remain nearly in its present state . . .

Assuming, then, my postulata as granted, I say, that the power of population is indefinitely greater than the power in the earth to produce subsistence for man.

Population, when unchecked, increases in a geometrical ratio. Subsistence increases only in an arithmetical ratio. A slight acquaintance with numbers will show the immensity of the first power as compared with the second.

By that law of our nature which makes food necessary to the life of man, the effects of these two unequal powers must be kept equal.

This implies a strong and constantly operating check on population from the difficulty of subsistence The

race of plants, and the race of animals shrink under this great restrictive law. And the race of man cannot, by any efforts of reason, escape from it. Among plants and animals its effects are waste of seed, sickness, and premature death. Among mankind, misery and vice. The former, misery, is an absolutely necessary consequence of it. Vice is a highly probable consequence . . . I see no way by which man can escape from the weight of this law which pervades all animated nature . . .

Such was the (uncommon) wisdom of his youth. In later editions, as Malthus grappled with the question of how populations controlled their size, the argument expanded and became less tidy. As with most prolific writers and thinkers, he at one time or another seemed to be on most sides of most questions. But it was his original perception that first captured the world's attention and it is this perception which has been used by so many to dramatize the problems posed by the current spurt in population.

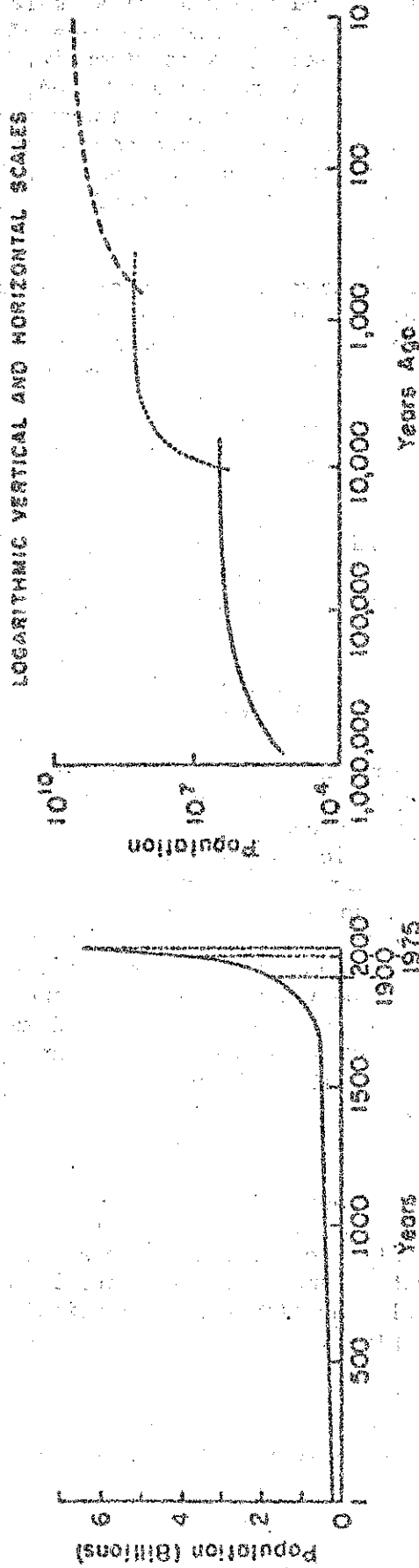
We are all familiar with drawings, such as the left figure in Chart 4, which indicate that the world's population remained essentially stable from biblical times to about 1650. Such drawings are valid in that they drive home the magnitude of the current explosion in numbers, some 80 percent of which is taking place in the LDCs, but they mislead in several important respects. The current upturn is not unique, and growth (and contraction) prior to 1650 took place not gradually but in spurts.

This is of fundamental importance and is perhaps most easily appreciated when visualized in terms of the right-hand drawing of Chart 4, a simplified graphing conceived by E. S. Deevey. The drawing, which is plotted on logarithmic scales to make great differences in time and magnitude manageable, summarizes much of what we have learned since Malthus' time. The present upsurge in numbers is not the first but the third in a sequence of bursts that have been associated with major breakthroughs in man's ability to cope with his environment. The first occurred several million years ago--Deevey plotted it at one million, although today he would no doubt move it back--and attended man's emergence from the primate line into a maker of tools able to hunt and gather over a range of conditions. The second marked his domestication of plants and animals some 10,000 years ago and the beginnings of agriculture--the "Neolithic Revolution."

These breakthroughs, of course, did not take place simultaneously around the world, but were staggered in their impact. Just as the industrial and scientific revolution occurred first in Europe, food gatherers and hunters first became agriculturists in the Fertile Crescent and South-east Asia. Still, the effect in a particular locality was rapid and profound. For example (14, p. 26),

Twenty thousand people would probably be an extreme estimate of the population of hunter-gatherers the Egyptian section of the Nile valley could have supported at the end

CHART 4. TWO VIEWS OF WORLD POPULATION GROWTH*



*Source: E. S. Deevey, Jr., "The Human Population," Scientific American (September 1960), p. 198.

of palaeolithic times. The population of the Old Kingdom two thousand years later has been variously estimated at from three to six millions.

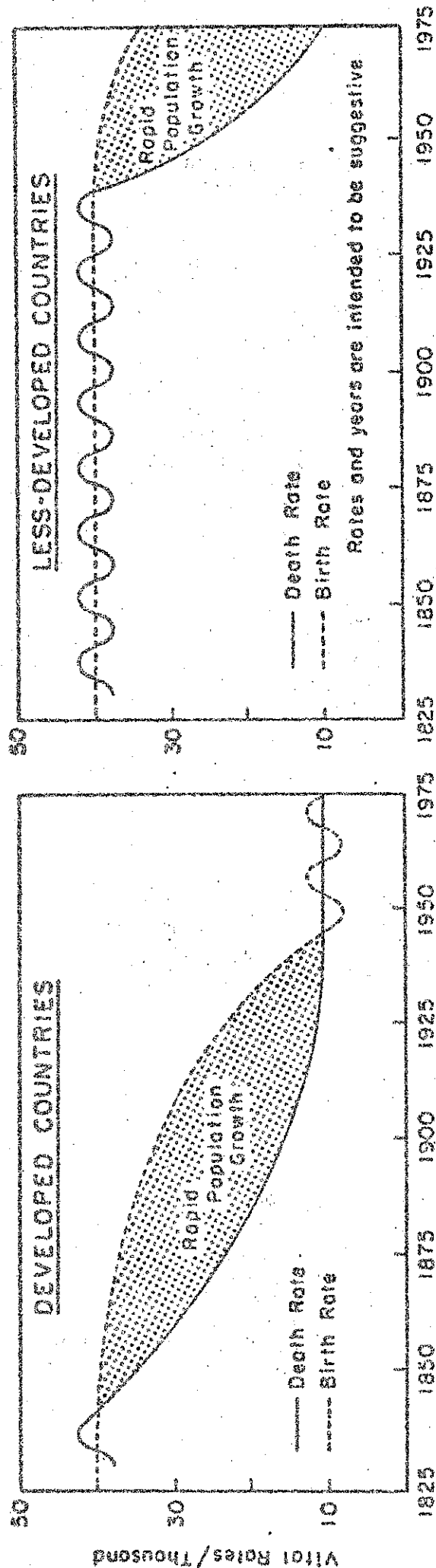
That such epochal technological breakthroughs would be accompanied by rapid population rises seems obvious. What is less obvious is the nature of the forces that ultimately acted to force a leveling off. Malthus' food supply, together with such other essentials as space, water, and air, clearly set an upper limit, but one wonders how frequently an operative one. The long-term population equilibria of the past would seem to have been at levels below those associated with marginal starvation. Thus, "a Paleolithic man who stuck to business should have found enough food on two square kilometers, instead of [the] 20 or 200" believed to have been available per capita, respectively, in the Upper and Lower Paleolithic ages (15, p. 198). And it is not weather but changed political circumstances that are most clearly linked to the great swings in China's population over the last two millennia.

If the parameters of the demographic transition associated with the Neolithic remain to be satisfactorily generalized, those associated with the third of the great upheavals, the industrial and scientific revolution, would seem fairly clear cut (Chart 5). Initial population stability is characterized by high birth and death rates. Then, as public health measures are introduced, the death rate drops. Birth rates, however, remain at their old level, and a period of population "explosion" sets in. Then birth rates in their turn fall, and the population again approaches stability, but at a much higher level.

Most of the industrialized states of the West have passed through this transition and seem fairly near the new level of stability--"zero population growth" in the idiom. For them the transition averaged between 50 and 100 years. Virtually all the LDCs have passed through the stage of declining death rates and are in the interval of maximum population growth. For them the "population problem is essentially whether or not [they] will follow Europe and North America in reducing birth rates . . ." (16, p. 76).

The evidence from some of the smaller, more prosperous LDCs (notably Singapore, Taiwan, Mauritius, and Sri Lanka) is that they can reduce birth rates and probably much more quickly--within 20 or 30 years. Contraceptives are becoming available at little or no cost to users in the Third World, and birth control information is widespread. However, for family planning to be rapidly introduced, people must consciously want fewer children and for this to happen there are certain preconditions. That one of these is a reduction in infant mortality we have already noted. Others revolve around a reduction in the economic attractiveness of large families, both as sources of labor and as old-age insurance, and the availability of opportunities for life styles involving more than just growing food and raising children. Expressed more positively, the preconditions imply access to health facilities, social security, and education--all of which we tend to equate with "improved living levels," "urbanization," and "development."

CHART 5. THE DEMOGRAPHIC TRANSITION SCHEMATIZED



Hence the quandary faced by the LDCs is best visualized not, as the doomsayers have it, in the sterile terms of race in which food and population push relentlessly toward some hypothetical saturation point. Rather it is a very malleable competition between population growth and economic participation on the one hand, and between economic participation and food on the other.

IV. THE REALITY OF THE INCOME/EMPLOYMENT DILEMMA

If increased economic participation--read more and better paying jobs--lies at the heart of both controlling population growth in the LDCs and transforming dietary patterns, the goal should obviously be to carry out development in such a way that its benefits will be widely shared. So far this has rarely happened. Progress in both the rural and urban sectors has tended to benefit only a portion of the population.

The equity problem in agriculture has its roots in the selectivity of the various breakthroughs of the Green Revolution. The high-yielding varieties in particular are not designed to be introduced alone, but require a host of complementary inputs: fertilizers, adequate water, and effective control of disease, insects, and weeds to mention the more obvious. The "miracle" rices, for instance, are highly responsive to fertilizer--as the Indica varieties they replace are not--and yield well only under irrigated conditions. To the degree that any of the new systems are suited to specific ecological conditions, benefits will obviously be restricted. Equally obvious is that participation will tend to be confined to those classes best able to command the new inputs: the larger farmers and landowners.

None of this is new. A similar selectivity characterized the innovations which transformed agriculture in Europe and North America during the 19th century. The difference lies in the cities and the opportunities they offer the displaced countryman. One has only to read Dickens to appreciate the misery that accompanied 19th century urbanization. But there was also promise: industry was growing and, since industry then had high labor requirements, virtually all who left the land found new jobs. Today the movement to town rests on less solid foundations. Though urbanization in the LDCs is proceeding at a breakneck pace--major centers are probably doubling in size every eight or ten years--most of the cities are "cities that came too soon" (17, p. 56). To a remarkable degree they remain administrative and trading centers, built up to dispatch raw materials to the developed countries and to receive and distribute manufactures in exchange. That the bulk of what little industrialization is occurring is capital- not labor-intensive is apparently a necessity if foreign competition is to be warded off. Jobs are far fewer than the bodies in search of them.

The proportion of the population that finds itself either bypassed by rural development or without a job in town defies quantification. Governments in the Third World do not collect data on unemployment and

underemployment, and if they did the findings would be too distasteful politically to permit release. World Bank officials speak of the "lower 40 percent," and even if this figure is a very rough estimate, it is still a fair one. Somewhere between a quarter and a half of the population is probably being excluded from the forward march of development.

If solutions to their plight are not obvious, we at least can take comfort from the fact that it is seen in responsible quarters as the central problem confronting the LDCs. With the World Bank and the U.S. Agency for International Development in the van, the search has begun for investments that will benefit the poorest classes. "Growth with equity" is the watchword, and a number of schemes for labor-intensive development have been launched. These focus on the rural disadvantaged, and though one sometimes suspects the true aim goes no further than keeping them down on the farm, the targets expressed are lofty. It is on "eight-acre man," Barbara Ward writes, that "the hopes of feeding most of mankind in the longer term depend" (18, pp. 24-25); and the Maoist model is widely proclaimed.

One can only hope there is an alternative. China has been able to reconcile today's revolution of rising expectations with what Marx termed "the idiocy of rural life" only by repressing the individual's right to choose. Elsewhere the record of labor-intensive development has been so unimpressive that one is tempted to dismiss the theorizing in its behalf as an intellectual cop-out.^{2/} Yet the dilemma is very real. If the disadvantaged cannot somehow be persuaded to behave as if they were participating in the development process, there is the possibility that they will continue to breed as before.^{3/} The tragedy of our times is that the LDCs experienced the benefits of the scientific/industrial revolution before its causes.

V. CAN FOOD PLANNING BECOME A REALITY?

With the developing world seen as more hungry for jobs than food, what guidelines ought to be followed by the multiplicity of agencies concerned with food and agriculture? I venture to conclude with a few which may not be on everybody's list:

1. It would be helpful if the notion of a world food problem were played down. Problems there are aplenty, but the extent to which those of the West and the LDCs impinge on each other is minimal. In the industrialized nations they revolve around the perennial questions of managing reserve stocks, price maintenance, and in many capitalist countries, holding down production. In the developing world the need is to expand production quickly. That the requisites of the latter are pricing and investment decisions which may prove politically painful should be emphasized, something that the FAO and the World Food Council are only beginning to do.

^{2/} An excellent discussion of the limitations of the labor-intensive approach is to be found in 19.

^{3/} The experience of Sri Lanka and the neighboring Indian state of Kerala suggests it may in fact be possible to so persuade them. See 20 and 21.

Just as the trumpeting of global disaster by Western doomsayers has misled, so many LDC politicians have for too long been allowed to ignore their country's food problems.

2. To the extent that food aid is pursued as a means of surplus disposal (or conscience assuagement), steps should be taken to minimize the effect on producer price incentives. An ideal mechanism for doing this, and simultaneously for improving nutritional well-being and the prospects for population control, would be to channel this aid through maternity and child health clinics.

3. The real aid from the West, however, should take the form of technical assistance to agricultural research institutes and credits to underwrite the capital works needed to complement the new varieties-- irrigation systems, fertilizer plants, and the like. To a maximum degree these works should be designed to benefit the smaller farmers. But no matter should they not. Probably the best way the West can improve the lot of the disadvantaged of the LDCs is not--as seems the aim of recent modifications in the U.S. aid legislation--to invest solely in projects oriented toward them. Rather it would be to reduce the incredibly high tariffs on processed and manufactured items which have prevented the LDCs from exploiting their one true comparative advantage in labor-intensive manufactures.

4. A final activity where minimal investment could bring high returns would be a crash program for the generation of reliable statistics. Not until we are in a position to truly understand the situation of the LDCs can policy planning be confidently undertaken, and not until then, I fear, will we hear the last of the food myths.

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