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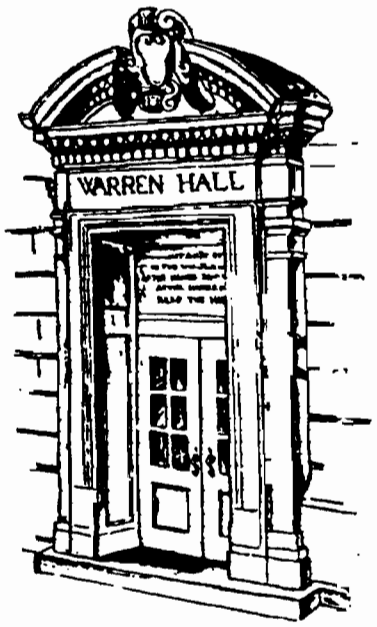

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GLOBAL HUNGER: THE METHODOLOGIES UNDERLYING THE MYTH

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ABSTRACT

The methodologies employed by FAO, the World Bank, and the U.S. Department of Agriculture to quantify the extent of global hunger during the past 50 years are examined. The methodologies are shown to be less than perfect and to contain built-in biases favoring exaggeration. They have also proved amenable to manipulation by those with a political agenda to pursue. Other approaches to measuring world hunger should therefore be sought.

Global Hunger: The Methodologies Underlying the Myth

by Thomas T. Poleman*

Until recently evidence on changes in nutritional well-being was largely anthropometric. That the average American soldier in 1941 had been better fed than his counterparts in 1917, 1898, and 1861 could reasonably be inferred from the larger uniforms the Army was obliged to supply him; and that few of us could squeeze into the medieval suits of armor on display in museums is strong evidence that things have improved since the Middle Ages. Only in the last half century have other data come into existence that might lay the foundation for more precise quantification. These, however, must be handled with care if they are not to be seriously misleading.

Unfortunately caution has not been the watchword and there has been painted for popular consumption a picture of widespread hunger in a world hard pressed to sustain its burgeoning billions. This notion is almost a cliché among journalists and finds extensive support in the literature. We were, for instance, assured in 1950 by Lord Boyd Orr (1950:11), the first Director General of the United Nations Food and Agriculture Organization (FAO), that "a lifetime of malnutrition and actual hunger is the lot of at least two-thirds of mankind;" by one of the many alarmist articles induced by the mis-named "World Food Crisis" of the early 1970s that "the world is teetering on the brink of mass starvation" (Ehrlich and Ehrlich 1975:152); by the Carter Administration's Presidential Commission on World Hunger (1980:182) that the "world hunger problem is getting worse rather than better;" and as recently as 1991 by the UN's World Food Council (1991:5) that "the number of chronically hungry people in the world continues to grow."

How came such views into being? The explanation, surprisingly enough, is not hard to find. For, although pronouncements on global nutrition are legion, few have pretended to rest on original analysis. Rather most have had recourse for their statistical support to a small number of studies carried out by the FAO, the U.S. Department of Agriculture (USDA), and the World Bank. These have had as their aim the *measurement of hunger* and although all pretended to objectivity, it would be naive to presume that this was always foremost in the minds of those who caused them to be carried out.

The findings of the principal FAO, USDA, and World Bank studies, and the methodologies they employed are summarized in Appendix Table 2.1; their main conclusions are shown graphically in Figure 2.1. Boyd-Orr's conclusion that two-thirds of mankind were hungry came from FAO's *Second World Food Survey* (1952). An earlier survey suggested a lower figure (FAO 1946). The USDA's two *World Food Budgets* (1961; 1964) concluded that almost the entire population of the developing world lived in "diet deficit" countries. FAO's *Third World Food Survey* (1963) put the afflicted in such countries at about 60 percent and identified a shortage of protein as the principal problem. The World Bank's first attempt (Reutlinger and Selowsky 1976) saw a problem of roughly the same magnitude--involving about 1.2 billion people--but indicated the prime cause was a shortfall of calories. A subsequent Bank study (Reutlinger and Pellekaan 1986), issued a decade later, had the figure ranging from 340 to 730 million. The last four FAO efforts (United Nations 1974b; FAO 1977; FAO 1987; International Conference on Nutrition 1992) put the number of afflicted at between 330 and 780 million.

The overall trend is thus downward with time and a reasonable presumption would be that the studies confirm that the extraordinary economic change experienced in most parts of the globe since the end of World War II has been accompanied by sharp declines in the incidence of hunger. In fact, the changing estimates reflect nothing more than modifications in analytical technique.

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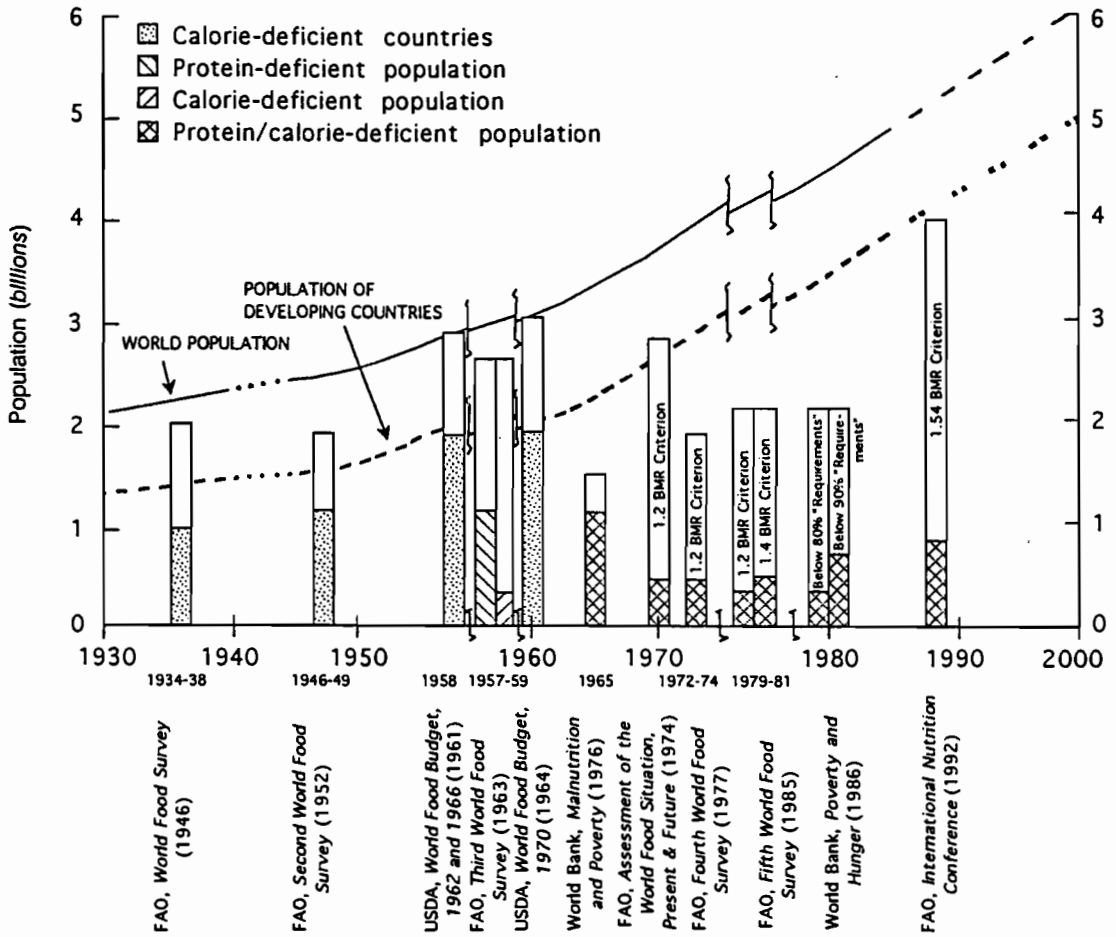
* Professor of International Food Economics, Cornell University. The figures were drawn by Lillian Thomas, to whom credit is also due for the paper's layout. The paper is the second chapter of a projected book on *The World's Food.*



Data from sources listed in Appendix Table 2.1. The size of the populations to which the assessments apply is indicated by the total height of bars.

Figure 2.1. Persons Identified as Nutritionally Deficient in Selected World Hunger Assessments

The Early Analytical Approach

The analytical approach followed in the FAO's first two *World Food Surveys* and the two *World Food Budgets* prepared by the USDA was simple in the extreme and may be summarized by the following equation:

$$\frac{\text{Food available}}{\text{for human consumption}} - \text{Loss allowance} \leq \text{Average daily recommended nutrient allowances}$$

$$365 \times \text{population}$$

To determine whether or not a country was experiencing a food problem, apparent per capita food availabilities 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's or region's entire population was considered to be inadequately nourished.

The failings of this approach are several and, when probed, obvious. First, it assumes that societies are sufficiently homogeneous in their food habits for average data to have meaning. This is certainly not the case in developed economies, where differences in income, locality, ethnic background, and place within the household have long been known to have marked effects on food behavior; and it is now recognized to be no less invalid

for the developing world. A further drawback of the approach is that it presupposed an ability to specify average food availabilities and needs with a fair degree of precision.

Problems of Estimating Food Availabilities

To estimate food availabilities for a region or country one must construct a food balance sheet. This is the basic accounting tool of the food economist, and like its counterpart in the business world, it summarizes the situation as of a particular point in time, usually a year or average of years. Commodity by commodity, the supply of food is set against utilization. Included on the supply side are measurements of production, trade, and stock changes, and on the utilization side, seed, feed, and industrial nonfood use, waste up to the retail level, processing losses, and the amount actually available for human consumption, all in terms of physical quantities. These values are then converted into per capita availability of calories[1] of dietary energy, grams of protein, and appropriate measures of other nutrients. In global estimates, typically only calories and protein are considered. In theory each of the nine components is derived separately; in practice this is possible for only a few industrial countries possessing uncommonly sophisticated reporting procedures and even then imperfectly. In most countries the practice is to estimate availabilities for human consumption not independently, but as a residual. It thus reflects the sum of the failings of the other eight balance sheet components.

The error so introduced is almost invariably in the direction of understatement. Understatement of production is a characteristic of most newly developed agricultural reporting systems. Wheat production in the United States is now recognized to have been 30 to 40 percent above that officially reported during the first decade (1866-75) of the USDA's statistical efforts (Working 1926:260). In Mexico the comparable figure for maize during 1925-34, the *Direccion General de Economia Rural's* first decade, was over 50 percent (Poleman 1977:16, 19).

To this very understandable tendency can be added the further complications that:

- The statistical officer in developing countries is frequently (and not irrationally) equated with the tax collector by the farmer, whose response will be to minimize.
- Output which is not seen is not counted, and where communications are poor a great deal is not seen.
- Much food production is for on-farm consumption and does not pass through commercial channels where it might be monitored.
- In tropical areas especially, many food crops are not grown in pure stands but mix-planted in fields of bewildering complexity.

There can, of course, be errors of overstatement. These most commonly trace to the exuberance of field staff who feel under pressure to report outstanding results--the classic case in point occurred in China during the Great Leap Forward of 1957-59; grain output supposedly jumped from 185 to 375 million tons in one incredible year (Jones and Poleman 1962:4)--or to governments which for political reasons wish to deny conditions of crisis, as in Ethiopia during the draught years of the early 1970s. But on balance such instances are the exception rather than the rule.

Compared to the problems of estimating production, those relating to the other two components of the balance sheet's supply side are negligible. Stocks--on-farm stocks in particular--are, to be sure, difficult to measure, but the problem of year-to-year changes in carryovers can be minimized by preparing an average

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[1] A calorie is the amount of heat needed to raise a gram of water 1° Centigrade; the large Calorie, written with capital letter, or kilocalorie is the amount required to raise a kilogram of water. It is the kilocalorie in which human energy needs or expenditures are commonly expressed and the capital C is popularly dispensed with. Here it will be written either as "kcal" or "calorie."

balance sheet for a three- or five-year period. The trade figure is usually quite accurate, unless, as in Africa, international boundaries cut rather arbitrarily between traditional trading partners.

On the utilization side the various deductions between gross supplies and availabilities for human consumption tend to reflect whatever error has found its way into the production estimates. This is because seed, waste, and processing losses are usually calculated as percentages of production. Quantities fed to livestock or given over to industrial nonfood uses are still modest in many developing countries.

To generalize about the extent to which food availabilities in the developing countries have been and are now understated is not easy. A reasonable assumption is that the accuracy of production estimates has improved with time, that the extent of understatement is now less than it was when FAO published its first *World Food Survey* in 1946, and that some of the apparent gains recorded in food availabilities are spurious. But the opposite may well have taken place in Sub-Saharan Africa. There independence has frequently been accompanied by a deterioration in the reporting systems established by colonial administrators. When perfection may be anticipated is anybody's guess. It was not until 1902, 36 years after the effort began, that the USDA began reporting wheat output with an acceptable margin of error; and not until the mid-1950s, with 30 years experience in hand, was Mexico able to confidently measure its maize harvest.

Detailed studies of the food economies of Malaysia and Ceylon (Sri Lanka) carried out in the 1960s suggested that energy availabilities in both were officially understated by from 10 to 15 percent (Purvis 1966; Jogaratnam and Poleman 1969). As the staple in both countries is rice grown under irrigated conditions and thus relatively amenable to quantification, and as both countries have by the standards of the developing world an admirable statistical tradition, this 10-15 percent is probably something of a floor. Elsewhere the amount of food actually available may still be undercounted by rather more.

Problems of Estimating Food Requirements

Compounding this tendency to undercount food availabilities have been the difficulties associated with estimating food needs. Until recently these have been overstated. Nutrition is still a young science and our ability to establish minimal or desirable levels of intake is not nearly as precise as we would like it to be.

A person's nutritional needs are a function of many things: age, sex, body size, activity patterns, health status, and individual makeup are the more important. Conceptually, knowing these variables, it should be possible to set minimum levels of intake for protein, energy, vitamins, and other nutrients sufficient to preclude overt deficiency disease in most of a population. As a practical matter, it is not and what were used as surrogates for such minimal criteria in the early hunger evaluations were the recommended allowances prepared as guidelines for dietitians and other nutritional workers. These allowances consciously err on the side of caution, both to incorporate a comfortable safety margin and to ensure that the substantial variations in food needs among individuals will be covered.

The recommended allowances are periodically modified and from the direction and magnitude of change it is possible to infer something of the probable extent by which minimum needs were overstated in the past. With respect to energy allowances, the history of the FAO, the United States Food and Nutrition Board, and other responsible organizations has been one of continued downward modification. The energy allowance for the U.S. "reference man"--in his twenties, weighing 70 kilograms, and not very active--dropped by 500 kcal. between 1953 and 1974, after which the practice of suggesting a single figure for persons of the same sex, age, and weight was sensibly replaced by one more cognizant of individual variations in activity levels (Table 2.1).

Apart from undue initial conservatism, the principal cause of this reduction is the increasingly inactive character of life in industrial societies. Physical effort is less and less demanded on the job and the body moves from place to place less on its feet than on its seat. It is not unlikely that the energy allowances suggested for the developed countries are now quite reasonable. Little remains to be understood of how urban man divides his day--it has become after all depressingly routinized--and, thanks to studies carried out in association with

Table 2.1 Evolution of United States Recommended Energy Allowances for Men and Women

Reference man (*70 kg.; in twenties*) Kcal.	Year	Reference woman (*58 kg.; in twenties*) Kcal.
3,200	1953	2,300
3,200	1958	2,300
2,900	1964	2,100
2,800	1968	2,000
2,700	1974	2,000
2,700[a]	1980	2,000[a]
---[b]	1989	---[b]

Data from Miller, D.F. and Leroy Voris. 1969. "Chronological Changes in the Recommended Dietary Allowances." *Journal of the American Dietetic Association*. 54(2):110-111, and National Research Council. 1974. 1980. 1989. Food and Nutrition Board. *Recommended Dietary Allowances*. 8th ed. Washington, D.C.: National Academy of Sciences: facing 128. *Ibid*. 9th ed.:23. *Ibid*. 10th ed.:25-29.

[a] ± 400 Kcal. depending on activity level
[b] Calculated on basis of activity level

wartime rationing programs in the United Kingdom and Germany, the energy costs of most activities are known (Table 2.2).

The same is not true for developing countries. Very few energy expenditure/activity studies have been conducted among rural or urban people in these regions and useful common denominators are available for only a few tasks. A key reason for this shortcoming is the difficulty of obtaining reliable information on energy expenditure. The traditional method for doing this is to record the energy costs of specific activities with a respirometer and then multiply the resulting factors by appropriate time spans. The problems are many. The respirometer is a clumsy instrument, not unlike an army field pack with a gas mask attached; it can be kept on a subject for only a few minutes and its presence is hardly conducive to normal behavior. Moreover, time span recording must be meticulously accurate in order to be useful. To obtain such information under primitive conditions without an impetus similar to wartime rationing is probably asking too much of the research priorities of most less-developed countries.

In response to criticism that the energy allowances used in its early *World Food Surveys* were unrealistic surrogates for minimum needs, the FAO employed a different approach to establishing floor criteria in its report to the 1974 World Food Conference (United Nations 1974b) and continued this in its *Fourth* and *Fifth World Food Surveys* (FAO 1977; FAO 1987). This was to estimate requirements of the average nonfasting person at 1.5 X his Basal Metabolic Rate and to assume that some individuals might have a BMR as much as 20 percent below the norm.

It is difficult to fault this modification. Certainly the 1.2 BMR factor which results--.8 X 1.5 (BMR)--yields values which bear a clearer hallmark of reality. If anything, it errs on the side of being too low. Applied

to South and Southeast Asia it suggests minimum per capita requirements somewhat below 1,500 kcal., as opposed to the criteria of 2,600 and 2,230-2,300 kcal., respectively, used in the first two *World Food Surveys* (FAO 1987:68).

As an alternative, FAO also employed a 1.4 BMR factor in its *Fifth World Food Survey*. This had the effect of raising the number of persons classified as inadequately nourished from 335 million to 494 million (FAO 1987:22). In its documentation for the 1992 International Conference on Nutrition FAO raised the factor to 1.54 BMR (FAO 1992:7-8). The result of the latter modification was to increase the number reported to be hungry to 786 million (International Conference on Nutrition 1992:v). That such modest modifications in assumption can have so mighty an impact on the number of persons said to be inadequately nourished serves to emphasize the fragility of the hunger quantification methodology employed by FAO even today.

Table 2.2 Energy Costs of Selected Human Activities as Multiples of Basal Metabolic Rate

Activity	Energy Cost	Activity	Energy Cost
Men		Women	
	Household		
Sleeping	1.0	Sleeping	1.0
Sitting quietly	1.2	Sitting quietly	1.2
Walking (normal pace)	3.2	Cooking	1.8
Chopping firewood	4.1	Child care	2.2
	Service and Industrial		
Sitting at desk	1.3	Office work	1.7
Tailoring	2.5	Making tortillas	2.1
Bricklaying	3.3	Laundry work	3.4
Mining with pick	6.0	Walking with load	4.0
	Agricultural		
Driving tractor	2.1	Picking coffee	1.5
Milking by hand	2.9	Weeding	2.9
Repairing fences	5.0	Hoeing	4.4
Cutting sugarcane	6.5	Digging ground	4.6

Energy costs are expressed as multiples of basal metabolic rate (BMR), which may be approximated for adults by multiplying weight in kilograms by 1 (men) or .9 (women) and dividing by 60. Thus the BMR of a man weighing 72 kg. will be 1.2 kcal. per minute; that of a 50-kg. woman .75 kcal. per minute. If the man is chopping firewood he will be expending roughly 4.92 kcal. per minute.

Activity factors from FAO/WHO/UNU Expert Consultation. 1985. *Energy and Protein Requirements*. Geneva: World Health Organization:186-190.

In the early FAO and USDA studies, the terms "undernourishment" ("undernutrition") and "malnourishment" ("malnutrition") were widely used. Undernourishment is generally taken to mean a shortfall in energy intake such that a person cannot maintain normal bodily activity without losing weight. Malnourishment, on the other hand, describes the lack or deficiency of one or more of the so-called protective nutrients--protein, the vitamins, and minerals.

The first two *World Food Surveys* defined the nutritional problems of the developing world largely in terms of energy shortfalls and undernourishment. In the *Third World Food Survey* insufficient protein availabilities and malnourishment were highlighted. Today most nutritionists concerned with the developing countries speak of protein-calorie (or protein-energy) malnutrition. This sees a shortage of energy 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. This major change in problem perception and terminology coincided with a drastic reduction in the recommended minimum allowances for protein.

As with energy allowances, the early FAO protein recommendation contained a comfortable safety factor as well as an allowance to take individual variation into account. In 1971 an expert panel concluded that these had been excessive and reduced the daily per capita recommendation for adults by a third: from 61 grams of reference protein to 40 (FAO Food Policy and Nutrition Division 1973:2).

The effect of this change was dramatic. Prior to the revision, simple comparisons of average availabilities and needs suggested that almost all the world's developing countries were deficient in protein; after it,hardly any of them. If the "protein gap" did not disappear overnight, its statistical underpinnings seemed to.

Misleading Conclusions

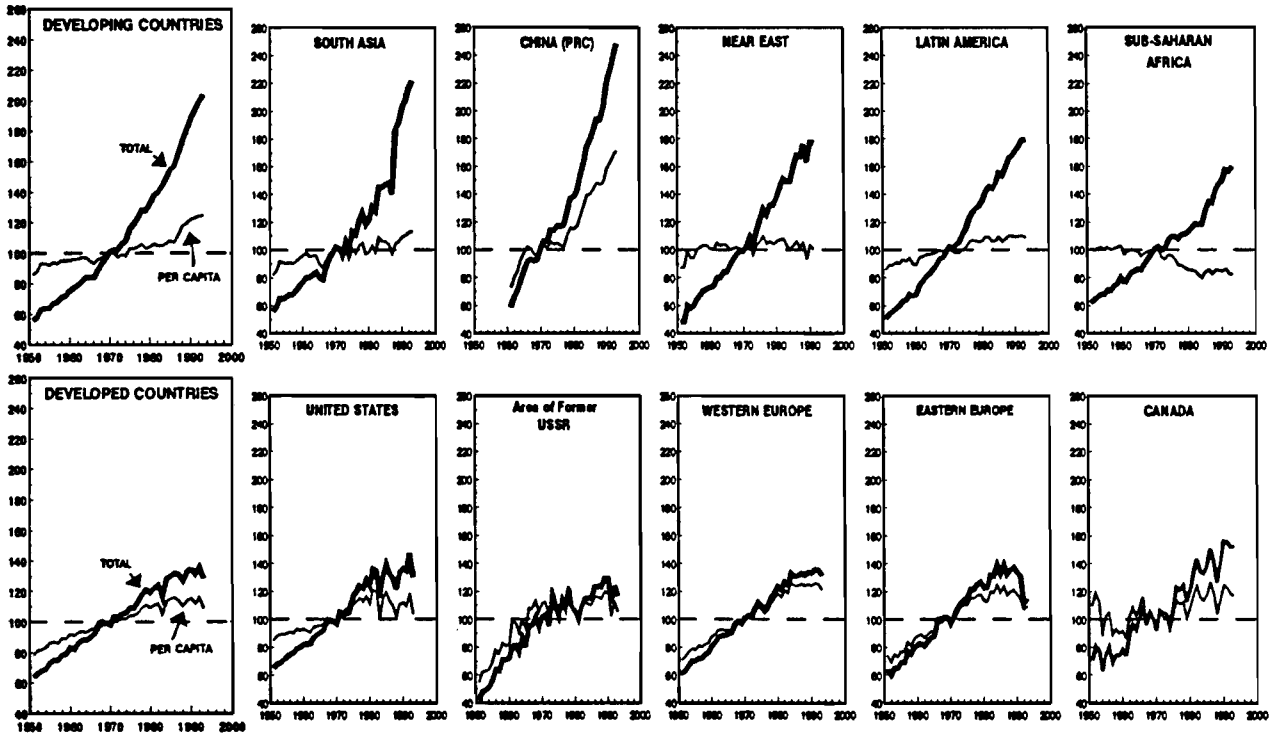
Since they used food availability estimates that *understated* to compare against food requirement figures that *overstated*, it is not surprising that the early global food assessments painted a gloomy picture of world hunger. The picture conveyed was one of hungry countries and of a world unable to feed its rapidly growing population. Insufficient production was seen as *the* problem. As the second of the USDA's *World Food Budgets* put it (1964:iii-iv):

> Two-thirds of the world's people live in countries with nutritionally inadequate national average diets . . . The diet-deficit countries are poor and food deficiencies merely reflect the low level of income in general. . . The basic problem of the diet-deficit countries is one of productivity. The people cannot produce enough food to feed themselves or produce enough other products to buy the food they require. Food production has barely been able to keep ahead of population growth, much less provide for the expanded demand resulting from some improvement in per capita income most of which goes for food.

We now know that such conclusions seriously distorted reality. Redone with truly accurate food availability and requirement figures it is probable that the early methodology would have classified few countries as "diet deficit." Further, the subsequent record of agricultural productivity in the less-developed countries has been quite impressive. Indeed, according to the widely used indices of global food output issued by the USDA and FAO (Figure 2.2) the developing countries have expanded production rather more rapidly than the developed ones--significantly so during the 1980s, when saturated markets constrained farmers in the United States. Population growth, to be sure, absorbed much of the gains--some of which no doubt reflected nothing more than improved statistical coverage--but with the exception of Sub-Saharan Africa per capita improvement is evident.

There have, of course, been year-to-year fluctuations about this level and twice the rate of progress seemed to falter. As each time this gave rise to a spate of pessimistic pronouncements about the world's ability to feed itself, it is worth examining the causes. The first pause came in the mid-1960s and resulted almost entirely from two successive droughts in India. Indian production bulks so large in the developing countries aggregate that major fluctuations in its output influence visibly the index for all countries. Conditioned to think of the developing world as hungry 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 casual observer was receptive to forecasts of imminent global starvation. One author went so far as to specify 1975 as the year in which this would take place (Paddock and Paddock 1967).

The factors underlying the second pause--the "World Food Crisis" of the early 1970s--had little to do with the developing world. In brief, it resulted from an unfortunate coincidence of several influences affecting the



Data from FAO. 1994. Index Numbers: Production. *AGROSTAT-PC 3.0.* (Computer data set). Available on diskettes from FAO, Rome, Italy.

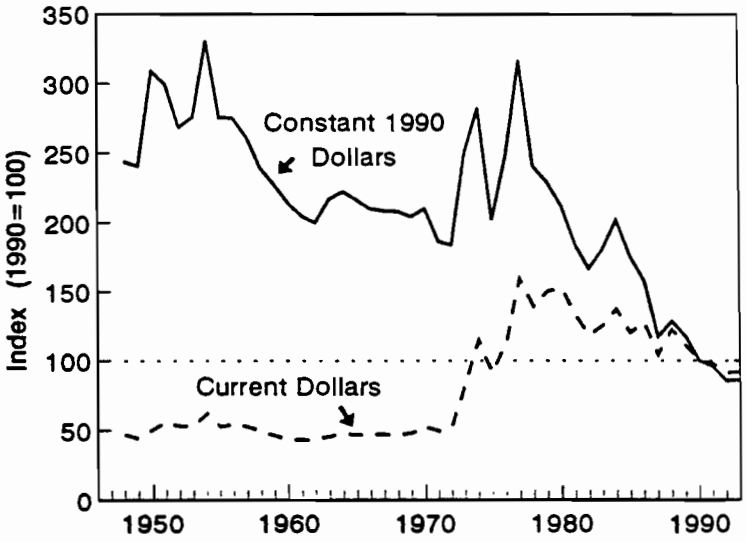
Figure 2.2. Indices of Total and Per Capita Food Production, 1951-1993. (1969-71 = 100)

major trading countries: an intentional running down of stocks and limiting production in the United States; unprecedented prosperity and rising demand for feed imports in Japan and Europe; and unfavorable weather in the Soviet Union. The role of Russia was particularly destabilizing. The failure of its 1972 harvest triggered a run on world supplies--it no longer being politically feasible for the Soviets to mask their agricultural failings behind belt tightening--and for the first time since the Korean conflict the long-term decline in food prices was reversed (Figure 2.3).

Save for continuing difficulties in the former Soviet bloc of countries and Sub-Saharan Africa, and intentional cutbacks and weather induced shortfalls in the United states, the trend in production has been upward almost everywhere since the mid-1970s. The secular decline in global food prices has been resumed, and an extension of the irrigated area in India seems to have insulated that country from vagaries in the weather. The failure of the monsoon in 1987 resulted in only a marginal (five percent) drop in Indian grain production, and accumulated reserves were more than adequate to tide over the shortfall, which was more than made up for by gains in the 1988 harvest. Progress in China can only be described as phenomenal; the first 15 years following the market reforms of 1978 saw grain production increase from c. 250 million tons to over 400 million. Although some have perceived the upturn in the quantity of grain moving from North America to the developing world as a sign that the latter continues to be in trouble, this interpretation is incorrect. The great bulk of the increase is not going as food to the poorest countries, but as feed to those middle-income countries whose populations are becoming sufficiently affluent to effectively demand more meat in their diet.

If this story of steady progress in the less-developed countries does not tally with the pessimism of the early hunger assessments, it does not follow that the post-war years have witnessed a reduction in the number of people nutritionally distressed. For the suggestion that increased production alone could eliminate hunger was only one of the misconceptions conveyed by early studies.

A second unfortunate legacy was the notion that *countries* could be classified as hungry or well fed. It is individuals, not countries, who experience nutritional deprivation, and since the early 1970s it has become a commonplace in serious pronouncements on the food situation that, equitably distributed, global supplies are sufficient to feed all. The problem is that all within a country do not have equal access to existing supplies. Access to food is a function of income. Those with adequately paying jobs are easily able to afford an acceptable diet; their less fortunate neighbors sometimes cannot.



Source: World Bank. 1994. *Commodity Markets and Developing Countries.* 1(2):43-44.

Figure 2.3. Indices of Real and Current Food Prices, 1948-1993

Measuring the Impact of Income: The Recent Studies

The first study which attempted to take account of the income effect was FAO's *Third World Food Survey* (1963). Largely the work of the eminent Indian statistician, P.V. Sukhatme, then Director of FAO's Statistics Division, the study was spotty in its description of methodology. This was understandable. Our insights into the effect of income rest largely on household budget surveys, and if there are few of these today of acceptable quality, there were even fewer three decades ago.

Nonetheless, on the basis of evidence from Maharashtra State in India and elsewhere, Dr. Sukhatme concluded (FAO 1963:51):

> . . . as a very conservative estimate some 20 percent of the people in the underdeveloped areas are undernourished and 60 percent are malnourished. Experience shows that the majority of the undernourished are also malnourished. It is believed therefore. . . some 60 percent of the people in the underdeveloped areas comprising some two thirds of the world's population suffer from undernutrition or malnutrition or both.

This, of course, was before the recommended allowances for protein were lowered; with revision, the 60 percent malnourished presumably disappeared. On the other hand, Dr. Sukhatme's 20 percent undernourished is not too much different from FAO's current estimate of persons suffering protein-calorie deprivation.

In its documentation prepared for discussion at the World Food Conference of November 1974 (United Nations 1974b) the FAO took due account of the 1971 reduction in protein allowances and also employed the 1.2 BMR criterion for minimum energy needs for the first time. Though this yielded floor values well below the energy requirement figures used by Dr. Sukhatme--1,500 as opposed to 2,300 kcals. for the Far East--the proportion of the developing world's population whose estimated intake fell below it somehow rose from 20 to 25 percent (United Nations 1974b:66).

The FAO offered no explanation as to how this increase came about, but the evidence strongly suggests the figures were derived less through research than through a political decision imposed from on high. The findings would appear to contain a suspicious element of arbitrariness. *Between April 1974, when the preliminary documentation was released, and the conference itself in November, the estimated number of persons with intakes*

falling below 1.2 BMR was raised from 360 million to 434 million--or from exactly 20 percent of the population of the developing countries to exactly 25 percent (United Nations 1974a:39; United Nations 1974b:66).

I confess to similar skepticism regarding the findings of the five subsequent attempts to measure the impact of income. Although they employed broadly similar analytical techniques, the two studies published in the mid-1970s--the FAO's *Fourth World Food Survey* (1977) and the World Bank's *Malnutrition and Poverty* (Reutlinger and Selowsky 1976) came to wildly different conclusions. The FAO report concluded that about 450 million people were suffering from protein-calorie malnutrition (FAO 1977:53); the World Bank put the number at almost 1.2 billion (Reutlinger and Selowsky 1976:2). Shortly after the two studies appeared, President Carter appointed his Commission on World Hunger (1980). Not knowing what to do about this discrepancy in the magnitude of the problem it was supposed to investigate, the Commission mentioned both figures in its report (Presidential Commission on World Hunger 1980:16).

Central to the analysis in both studies was the concept of calorie-income elasticity; that is, of the increment in caloric intake associated with an increment in income. The elasticity or elasticities used by the FAO were not stated; the World Bank study postulated a range of from .10 to .30 for people just meeting their minimal food needs. Although the reasons for its selection were not specified, a calorie-income elasticity of .15 was deemed most appropriate, and on the basis of it and some heroic assumptions about income distribution in Asia, Latin America, Africa, and the Middle East, the study concluded (Reutlinger and Selowsky 1976:2):

> . . . that 56 percent of the population in developing countries (some 840 million people) had calorie-deficient diets in excess of 250 calories a day. Another 19 percent (some 290 million people) had deficits of less than 250 calories a day.

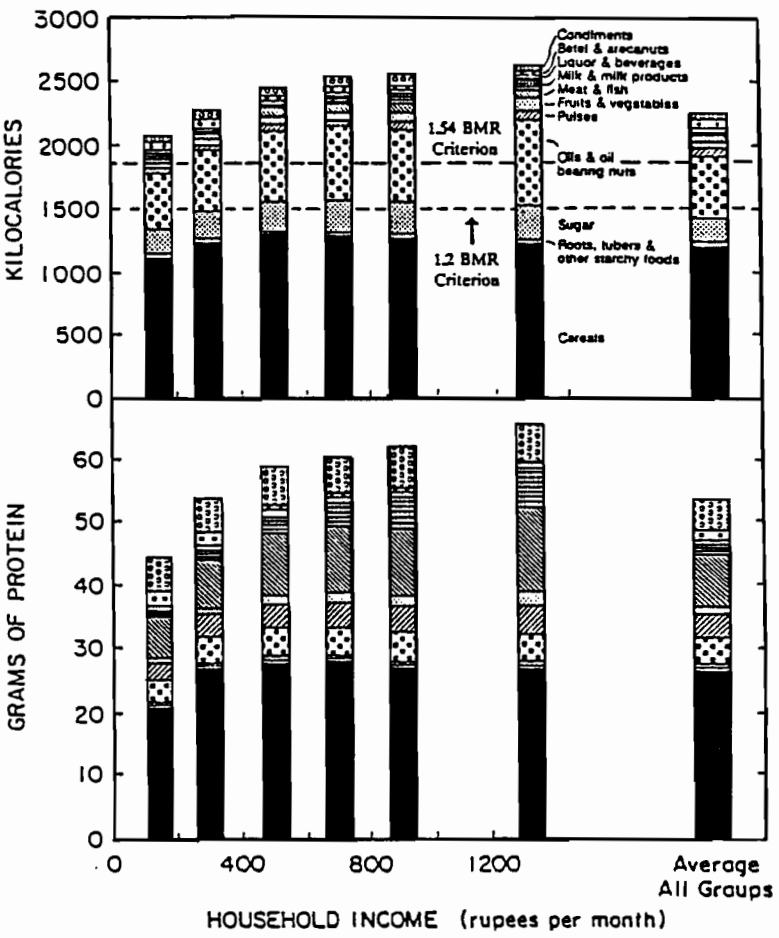
There are a number of reasons for giving minimal credence to the resulting figure of almost 1.2 billion hungry people. The World Bank analysts were apparently unaware of the tendency for food production in developing countries to be underreported; and unlike the FAO, which used the 1.2 BMR benchmark, they continued to employ recommended dietary allowances as surrogates for minimal needs. The latter error was corrected in the Bank's subsequent *Poverty and Hunger*, published in 1986, with the result that it dropped the number of persons said to be nutritionally deprived to between 340 million and 730 million, depending on whether 80 or 90 percent of energy needs was used as the benchmark (Reutlinger and Pellekaan 1986:17). FAO's *Fifth World Food Survey*, which appeared a year earlier, had the range running from 335 million (1.2 BMR) to 494 million (1.4 BMR) (FAO 1987:22).

By raising the minimum energy criterion to 1.54 BMR FAO was able to increase the estimate of persons chronically undernourished to 786 million in the documentation used at its 1992 International Conference on Nutrition (FAO 1992:8-9). This works out to be exactly 20 percent of the Third World's population, the same conclusion reached by Dr. Sukhatme three decades earlier. This 20-percent figure would appear to have a powerful hold on the thought processes in FAO's higher echelons. Dr. Sukhatme has admitted that he reached it not through objective study, but on the instructions of his superiors (Sukhatme 1984).

What, then, of these attempts to incorporate the impact of income on hunger quantification? After almost 50 years at the task, is the international bureaucracy in a position to give us reasonable estimates of the extent of global hunger? Unfortunately, no--even assuming the system could be freed of self-serving exaggeration. Even if we accept that food production save in Africa may now be quantified with a fair degree of accuracy in most of the developing world and that the 1.2-1.54 BMR range probably contains a reasonable approximation of minimal energy needs, serious problems remain with the measurement of income distribution and the concept of calorie-income elasticity. While the concept itself is valid, it misleads by suggesting that the relationship between income changes and changes in energy intake may be reduced to one tidy figure. Not the least of the limitations of such a notion is the implication that the richer one gets the more calories one ingests. Visions are conjured up, not just of skeleton-thin poor, but of 400-pound millionaires.

The reader also comes away from the studies with the impression that the income-hunger relationship is a simple one, amenable to clear-cut evaluation. This is not the case. Figure 2.4, which summarizes the effect

income had on nutrient intake in Sri Lanka two decades ago is suggestive of the real world. The household budget survey on which it is based was then almost unique. It covered almost 10,000 households representative of the entire country and was conducted and analyzed with uncommon integrity. Yet, even with this survey, one can infer little about the extent of protein-calorie malnutrition. The most important dietary adjustment 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, flavorous 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 egalitarian measures imposed by the government, 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.



Reproduced from: Poleman, T. T. 1973. *Income and Food Consumption: Report to the Government of Sri Lanka*. FAO/UNDP. No. TA 3198. Rome. Pp. 18-19. Based on data from: Sri Lanka. 1972. *Socio-Economic Survey of Sri Lanka, 1969/70, Special Report on Food and Nutrition Levels in Sri Lanka*. Department of Census and Statistics.

Figure 2.4. Apparent Per Capita Daily Energy and Protein Availabilities in Sri Lanka, 1969/70, By Income Class

What are we to infer from this? Because increased quantity not quality was purchased with increased income, the 200-calorie jump could be interpreted as implying behavior consistent with enforced reduced activity among the very poor (or actual physical deterioration) and that a 1.2-1.54 BMR energy floor range of 1,500-1,850 kcal. is an unrealistically low for minimum energy needs in Sri Lanka. But just as reasonably, one might accept the 1.2-1.54 BMR floor range and postulate caloric adequacy among that element of society which is too poor to waste anything and which, given the very high rate of unemployment then 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.

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Appendix Table 2.1 Conclusions of Major Early Postwar Studies of the World Nutrition Situation and Selected Recent Pronouncements

Year Published	Conclusions	Methodology
1948	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 90 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 . . . . The basic problem of the diet-deficit countries is one of productivity. The people cannot produce enough food to feed themselves or produce enough other products to afford to buy the food they require. Food production has barely been able to keep ahead of population growth, much less provide for the expanded demand resulting from some improvement in per capita income" (pp. iii-iv).	Little changed from "World Food Budget, 1962 and 1966"
1971	An FAO/WHO Expert Panel reassessed energy and protein "requirements" and dropped the protein figure for adults by about one third.[g/]	
1974	UN World Food Conference - "Assessment of The World Food Situation, Present and Future"[h/] "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 . . . 460 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 energy availabilities with distribution by income inferred from a limited number of surveys compared with energy cost of maintenance (1.5 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).
1976	World Bank (Reutlinger and Selowsky) - "Malnutrition and Poverty"[i/] [As of] "the mid-1960s, it is estimated that 56 percent of the population in developing countries (some 840 million people) had calorie-deficient diets in excess of 250 calories a day. Another 19 percent (some 290 million people) had deficits of less than 250 calories a day" (p. 2).	Regional average energy availabilities with distribution by income derived from country income data and alternative (.15 and .30) calorie-income elasticity estimates for the consumer just meeting his requirements compared with recommended energy allowances calculated according to the 1971 FAO[g/] system.
1977	FAO - "Fourth World Food Survey"[j/] "The evidence . . . indicates that the overall supplies of food . . . could be adequate to meet nutritional needs of the world's population if the distribution . . . were ideal . . . It is clear that the malnourished are found particularly . . . in the poorest section of urban population and in rural areas where adverse ecological conditions, land tenure systems and other economic factors lead to . . . large landless and unemployed groups . . . . Within these groups, it is the pre-school children, younger women and school-age children who suffer most" (pp. 45-46). "Calculations indicate an order of magnitude of about 400 million as a conservative estimate of the number of persons undernourished in the developing countries, excluding the Asian centrally planned economies" (p. 54).	National average energy availabilities with distribution by income derived from national income distribution estimates and unspecified calorie-income elasticities compared with energy cost of maintenance (1.5 BMR) minus 20 percent.
1985	FAO - "Fifth World Food Survey"[k/] Assuming a minimum maintenance allowance of 1.2 BMR, the undernourished "totalled 335 million in 1979-81 . . . [assuming 1.4 BMR] the corresponding [figure was] 494 . . . . According to the estimates, the numbers of the undernourished rose slightly during the 1970s in all the developing regions except the Near East, the greatest increase being observed in Africa . . . . In terms of proportions of the total population, there was fall in all regions, but by 1978-81 Africa had replaced the Far East as the region with the highest portion of the undernourished." (p. 22).	National FBS, distribution by income derived from national income distribution estimates compared with minimum maintenance allowances of 1.2 BMR and 1.4 BMR.
1986	World Bank (Reutlinger and Pellekaan) - "Poverty and Hunger"[l/] "Estimates of the prevalence of energy-deficient diets are deduced from data on the energy content of average diets in eighty-seven developing countries in 1980 . . . If the energy standard adopted is merely enough calories to prevent stunted growth and serious health risks, an estimated 340 million people, or a sixth of the people . . . had energy-deficient diets. If the standard is enough calories for an active working life, some 730 million people, or a third of the people in the same countries, lived with dietary deficits." (p. 17).	National FBS, distribution by income derived from national income distribution estimates for 35 countries compared with 80 and 90 percent of energy requirements established by the 1985 FAO/WHO system.[m/]
1992	FAO, International Nutrition Conference[n/] "One out of five persons in the developing world [786 million people in 1988-90] is chronically undernourished; 192 million children suffer from protein-energy malnutrition, and over 2,000 million experience micronutrient deficiencies" (p.v).	National FBS, distribution by income derived from consumption surveys compared with an energy allowance for minimum activity calculated at 1.54 BMR.[o/]

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