
Prediction and Prevention of Famine

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Prediction and prevention of famine¹

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The current repetition of famine in sub-Saharan Africa, despite a continuing heavy flow of foreign assistance to the region, focuses attention once again on the prediction and prevention of famine. The ability to predict famine is closely related to understanding its causes. In general, the underlying factors preventing famine continue to weaken in sub-Saharan Africa while they grow stronger in the rest of the world. Thus, we should expect that sub-Saharan Africa will continue to be vulnerable to famine and hence demanding of attention both for means to prevent famine in the long run and to mitigate its effects in the short run through prediction and timely action.

I particularly welcome this opportunity to discuss these issues with biological scientists. Those in your profession can expand our knowledge of how to minimize the long-term effects of famine on the individual adult and child, including understanding the relation between chronic malnutrition and the effects of famine, and contribute to developing better techniques to warn of impending famine. Perhaps most important, you can take part in mobilizing opinion in favor of initiating long-run measures for famine prevention, even though the actions needed lie substantially outside your own professional specialization.

In the past, famines have been accompanied by massive numbers of deaths. In the premodern era, famine and associated pestilence removed large proportions of the total population. More recent famines associated with much less virulent pestilence have had less of an impact although the numbers are still astounding. Probably the best esti-

ABSTRACT

In general, famines have become less frequent and of decreasing magnitude in recent decades, a generalization to which sub-Saharan Africa is the striking exception. The underlying factors preventing famine continue to weaken in sub-Saharan Africa, while they grow stronger elsewhere. The basic elements of famine prevention are: a substantial surplus of agricultural production beyond the subsistence needs of the rural population; highly developed transportation systems within rural areas, between rural and related urban areas, and with the rest of the world; and a democratic form of government. The first makes a shortage of food and income to buy food less likely, the second makes it possible to deal with food and income shortages if they do occur, and the third ensures that necessary and feasible actions will be taken. In a democratic framework a free press brings attention to famine even in isolated areas, and public opinion refuses to countenance inaction by the bureaucracy. Once conditions of famine arise, market mechanisms concentrate food where the purchasing power exists, drawing food from the rural to the urban areas and from the poor to the rich. In such circumstances governments must take direct action to prevent starvation. Famine is predicted by successive years of poor crops, a rapid rise in food prices, a decline in the prices of goods that the poor sell (particularly including the livestock of pastoralists), and a decline in employment.—Mellor, J. W. Prediction and prevention of famine. *Federation Proc.* 45: 2427–2431; 1986.

mate of total human mortality from the Bengal famine of 1943, including death from its effects in subsequent years, is Sen's (7) figure of 3 million. It is notable in view of the recent situation in Africa that the highest British officials estimated deaths at 2000 per day—only one-thirteenth of the actual level. The estimates reported by Sen of 16–23 million deaths attributable to the famine in China in the early 1960's now seems to be roughly correct. Alamgir (2) estimates deaths in the Bangladesh famine of 1974 at 1.5 million. By these standards, mortality in the recent Sahelian famines is quite small: 200,000 is at the upper end of the range of estimates for the Ethiopian famine of 1972–1974 and 100,000 for the Sahelian drought in 1973 alone (10). This record is in

keeping with the expectation that modern famine will tend to be concentrated in areas of marginal production for subsistence, poor transportation systems, and poor political development.

The African drought of 1983–1984 is estimated by the Food and Agriculture Organization of the United Nations to encompass a vast geographic area spread over 20 countries and a population of 150 million people, with as many as 30 million at risk of food insufficiency. Those figures

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also indicate that it is usually the bottom 20% or so of the income distribution that bears the full brunt of a famine, the Dutch wartime famine being an exception wherein the lack of food was broadly shared.

The three basic elements of famine prevention are, first, a substantial surplus of agricultural production beyond the subsistence needs of the rural population; second, highly developed transportation systems within rural areas, between rural and related urban areas, and between those urban areas and the rest of the world; and third, a democratic form of government. The first makes a shortage of food and income to buy food less likely, the second makes it possible to deal with food and income shortages if they do occur, and the third ensures that necessary and feasible actions will be taken.

In sub-Saharan Africa the margin of food production over the subsistence needs of the rural population has been decreasing for several decades; transportation systems have been deteriorating, particularly those needed to move food to rural areas; and governments of some countries are unresponsive to human needs of major sections of their rural population. In a sense a country's destiny is its own, but it should be noted that sub-Saharan Africa has also been enormously subjected to external forces that have weakened famine prevention.

GENERATING AN AGRICULTURAL SURPLUS

All three of the basic elements of long-term famine prevention are important, and each has been the subject of public confusion that has seriously prejudiced contemporary efforts to improve them. This is no less true of the need to generate an agricultural surplus.

In Africa, people in cities are increasingly fed from abroad. The percentage of food produced in rural areas of African countries that is sold is declining. Food production is becoming less commercial. Extensive migration from rural to urban areas, aging of the remaining rural population, urban remittances increasingly used to meet rural cash needs, and

little increase in the productivity of either labor or land all coalesce to bring about declining marketable surpluses. Thus in Africa, compared with a decade ago, it now takes a much smaller decline in production to convert a rural food-producing area into a food-deficient one. In Asia farmers typically market 30% of their food output whereas in Africa they market half that proportion. Of course in times of food stress, equitable allocation of food within rural areas is a difficult task, but the task is greatly compounded if a rural area has become deficient in food by a large margin. Then traditional transport and marketing systems will be grossly overloaded.

Three principal elements of food surplus in rural regions provide a cushion against decreased supplies. Increasing attention is now being paid to the adaptability of the human body to large variations in food intake (9). In favorable times in more prosperous rural areas, food consumption rises well above minimum biological needs as people choose to spend additional income on food. It is thus argued that when food supplies diminish, per capita consumption can be substantially reduced without major biological cost. It is argued that the adaptation is not just from depletion of body stores, but may be from changes in metabolism as well. We would do well to research both the biology and the economics of such forces. At even higher levels of prosperity, food will be traded to those in urban areas for other goods and services, and such trade can potentially be reduced in periods of food shortage. Farmers also store food physically against the prospect of poor crops, but such storage is expensive and rarely provides for more than a year's crop failure. The larger the surpluses available for these three options, the less likely is famine.

We are now highly knowledgeable about the process for accelerating growth in food production to generate the substantial rural food surpluses that are the essence of famine prevention. The three key elements are research, purchased inputs, and trained personnel. Regional agricultural research is needed because accelerated production growth in traditional farming areas is dependent on technological innovation based on

modern science. Farmers have over the centuries developed the best farming systems possible given the environment and the traditional processes of selection open to them. Modern biology offers major changes not previously available. Purchased inputs such as fertilizer and pesticides are needed to provide an improved environment to which modern science can respond. Most of all, a vast expansion of highly trained people is needed to operate the modern institutions that service agriculture (J. W. Mellor et al., unpublished).

Why do I dwell on the obvious requirements for accelerating food production growth? Because foreign assistance to Africa in particular has been strongly influenced by theses that have been inimical to food production growth. Changes in these attitudes must be strengthened. First, a bias against the green revolution—the modern high-yielding technologies—arose from a misreading of the Asian record. The introduction of high-yielding seed varieties in Asia is thought by many to have had unfavorable effects on the distribution of income. In fact, the effects were highly favorable (5). Second, negativism about the green revolution combined with Western ecological concerns led to a bias against the use of fertilizer and chemicals. Third, concern for equity in the foreign assistance community produced an antielite syndrome, which branded persons with overseas training as elitists. As a result, fewer Africans received high-level training than was the case for Asia in the preceding decade. (The key developmental decades came later for Africa because of the delay in removing colonialism.) Fourth, in keeping with the preceding, there has been a reluctance to invest in the rural infrastructure of roads because of the high costs, a reluctance to allocate resources adequately to agriculture, and an anti-commercial bias with respect to rural development.

A caveat is in order: modernization of agriculture will generally proceed much more readily in areas that are already more productive because they are endowed with better natural resources. Thus regional income disparities tend to be exacerbated. But at least that limits the areas where fam-

ine is likely to occur and allows specific planning for those areas that are not moving ahead. In the very long run, reduced population pressure is the only solution in some of the worst famine areas. Migration will help to alleviate this problem if other areas experience rapidly accelerated growth so that migrants can be received.

IMPROVED TRANSPORTATION

The isolated subsistence community subject to wide swings in weather and income has little hope of famine prevention because costs of food storage are so high. Typically, small farmers in developing countries store an adequate amount of food to manage a single year of greatly reduced production. Storage of enough food for 2 years requires longer storage at much higher cost, and because a second successive year of bad crops is much less likely, it is rarely done. It is a succession of bad crop years that brings famine. Thus famine can be dealt with in the long run only by the more efficient method of transporting food from distant areas with favorable crops.

The world is now building effective mechanisms for international finance and food aid to meet these unusual conditions (through the International Monetary Fund, for example) (1). But there must be efficient means of local transport if relief is to reach the rural poor. Roads, which are needed for increasing food production, also play a critical role in meeting disasters. The commercialization of agriculture increases surpluses and access to trade, and the associated improvement of transport wards off famine. It is the isolated subsistence community so glamorous to the tourist that is the potential victim of famine. It is also in the isolated regions that famines can build up to immense proportions unnoted and without response. It is no accident that modern famines rarely occur in urban regions that are well served by communications and transport.

Adequate communications are expensive and can be supported only by an increasingly commercial orientation of food production, diverse rural consumption patterns, and diverse nonfood production activities. The roads that are so important to famine

protection are crucial to and paid for by the modernization process. One does not proceed without the other.

MORE DEMOCRATIC REGIMES

Emphasis on democracy as an element of famine protection may be tautological, but the importance of the point is no less for that. Democracies are characterized by broadly based political constituencies and relative freedom of speech and press.

Sen (8) is quite correct in noting that the severe famine experienced in China in the early 1960's could not have occurred in contemporary India. A free press would have brought attention to the regional problem and public opinion would not have countenanced inaction. The domestic debate would also have alerted the international community. The lack of such information and discourse had characterized famines in pre- and postrevolutionary Ethiopia and a number of other countries as well. Famine does not strike its victims suddenly or without notice. Famines escalate when the world does not know about them because of restrictions in the movement of information.

Among those countries that provide foreign assistance, there has been an undercurrent of feeling that the development problems of low-income nations and the needs of famine administration can be better solved by nondemocratic governments that can act quickly and decisively. But accelerated production of food needs a strong rural political base that can play a major role in raising local resources and can fine tune general development to specific local conditions. Those attributes go hand in hand with broad political representation. Similarly, the first requisite of famine mitigation is to be able to cut through bureaucratic inaction in response to public outcry.

In most of the world there has been tremendous progress in the three elements of famine prevention. Per capita food production in Asia and Latin America has progressed rapidly, substantially as a result of the continuing scientific advances of the green revolution. Accelerated rural production has been accompanied by accelerated development of rural infrastructure demanded by farmers as part of rising

rural prosperity. These processes are broadening the political process beyond the traditional urban elite, particularly in Asia.

MITIGATING THE EFFECTS OF FAMINE

The problem of purchasing power

As important as market processes may be in fostering the rural development that is so important in preventing famine, those same market processes stand in the way of alleviating the effects of famine. A major need in mitigating the effects of major shortfalls in food supplies is one of equalizing access to the limited supplies of food. It is the maintenance of the delicate balance between the use of the market to foster famine prevention and the intercession of government to mitigate famine conditions that is so challenging to modern political systems.

In times of food shortage, someone must reduce consumption. The well-to-do wish to maintain their abundant consumption nearly as much as the poor wish to maintain their sparse consumption. But the well-to-do have ample purchasing power to transfer from other goods and services to maintain their food purchases. Indeed, when the rich limit their purchases of other goods and services, it reduces employment and purchasing power of the poor, which reinforces their inability to purchase food. The distribution of food becomes much more unequal in times of famine.

Even in times of scarcity, the greater purchasing power in urban areas draws food from the rural areas. And famine in rural areas may be out of mind as well as out of sight. Thus, a prime element of famine relief is to prevent this drawing of food from rural to urban areas when the flow may need to be in the opposite direction. Indeed, sudden increases in urban prosperity may create famine in rural areas even though production may not have declined. The Bengal famine in the 1940's is an example.

Pastoral people are particularly likely to be victims of famine, especially in Africa. They tend to be poor with only small margins above subsistence, and they exchange livestock

products for cereals. When cereals are scarce and expensive, those who purchase livestock spend less on livestock and more on cereals. The consequent price ratio changes are devastating to livestock producers who, in the face of drought, may be forced to dump their livestock on the market, which further depresses livestock prices. A disastrous drop in the purchasing power of pastoral people may then result in exports of grain to areas better able to pay, which creates famine.

Similarly, a sharp decline in food production results in a much reduced need for labor in harvesting and in other aspects of crop production. In areas with a large landless labor class, as in much of Asia, the poorest rural people lose their income and hence their capacity to purchase food.

Another problem that arises is more indicative of Africa. In Africa labor productivity is typically half as high as in Asia, labor is used much more fully to meet peak seasonal requirements, and the labor force may barely have enough food in normal times to provide the energy needed for food production. As a result, a poor crop year and consequent rural food shortage may be followed the next year by lower planting levels because labor may lack the energy to plant the normal area. This downward spiral in food availability is potentially serious.

Thus, we can see a major need for government intervention if famine conditions are to be mitigated. Modification of the market system is needed to move food supplies to those with inadequate and greatly deteriorated purchasing power. For that, complex administrative structures are needed. It is unlikely that they can be set up from scratch under emergency conditions. Thus, famine must be prepared for ahead of time as in British and postcolonial India (3). Also, some warning of the onset of famine is needed. A highly perceptive review of contingency planning needs for famine mitigation is provided by Sarma (6).

INTERACTION OF FAMINE RELIEF AND FAMINE PREVENTION

Once famine begins, the urgency of moving food to areas of stress and

distributing it to seriously affected people probably precludes specific attention to long-term development. One should not, of course, underrate the effects of preventing deterioration of human health as a long-term development impact. However, when relief efforts start, early attention is profitably given to use of food aid to prevent future disaster, for example, by paying labor to build irrigation and water control schemes (4), and by building the base for future growth through food-for-work projects that build rural roads and other elements of infrastructure. It would also be well to use food in this manner after the passing of the emergency, taking advantage of administrative structures built for the emergency and thereby maintaining those structures for rapid expansion with the onset of subsequent famine.

FAMINE MONITORING AND WARNING

The onset of bad weather, particularly for a second year in a row, can be monitored and gives a good indication of the potential for famine. Local people know what is happening and need to be included in the structure of national communication. Where local political structures are inadequate, those monitoring other activities such as disease could play a significant role in noting changes in diet patterns and quantities for at-risk groups.

However, the onset of famine is best indicated by a pattern of rapidly rising food prices, inasmuch as high food prices signal the incapacity of the poor to command food supplies. Because lack of employment by the poor or a decline in prices of what they sell blunts the price signal, a further monitoring of employment and other prices, such as those of products sold by pastoralists, must form an important link in the chain of monitoring activities.

Of course, the underlying conundrum is that if there is not a concerned political structure to use technical information, of what use is it? And if that political structure exists, why can it not do the job without the technical apparatus? The correct answer is probably that the technical apparatus

can strengthen the efforts of an existing but weak political structure but will not substitute entirely for a responsive political structure.

THE INTERACTION OF FAMINE AND FAMINE PREVENTION

We need more knowledge of the long-run effects of inadequate food intake on human development. I suspect that an expansion of such knowledge will result in increased emphasis on raising the food intake of poor people and from that, more emphasis on rural development, with favorable effects on famine prevention. Famine is the extreme of poor nutrition. To what extent do periodic famines not only destroy livestock and other assets needed for later growth, but human capabilities as well? To what extent do famines beget famines? We need to know more of the biology of these processes. Perhaps social and political processes will respond favorably to such knowledge.

CONCLUSION

Given the present state of human knowledge and global food supplies, there is no excuse for not eliminating famine over the next few decades. I say this not from a naive view of what can be done by redistributing present production flows, but because we have the broad knowledge to achieve the kind of development needed to prevent famine, and we have the supplies and the knowledge to largely alleviate the effects of famine once it arrives. To do so, however, we must have a correct sense of priorities and political acumen that extends across the populace of developing and developed countries alike. Famine is an affront to the dignity of all her mankind and more so if we know how to prevent it. 

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