

## SEASONAL VARIABILITY IN THIRD WORLD AGRICULTURE

BY DAVID E. SAHN

What is the effect of the seasons on food security and nutritional status? Does seasonality in factor and product markets represent a nutritional risk and contribute to food insecurity? A multiplicity of approaches and perspectives is necessary to answer the question of why seasons matter to researchers and policymakers concerned with the welfare of the poor. These are addressed in *Seasonal Variability in Third World Agriculture: The Consequences for Food Security*, edited by David E. Sahn (Baltimore, Md.: Johns Hopkins University Press for the International Food Policy Research Institute, 1989). In particular, seasonal patterns of nutritional status indicators (measures of leanness and linear growth) and seasonal patterns of household food security (measured by calorie intake) are explored, as are the causes and predictability of seasonal patterns in nutrition and food security. Policy options are presented for mitigating the potential food security and nutritional risks associated with seasonal undulations.

The initial concern over seasonal variability in Third World agricultural and food systems arises because of the considerable evidence that indicators of nutritional status and household food security display pronounced seasonal fluctuations in devel-

more than 4 kilograms lower during the lean season, which in turn contributed to lower birth weights among their offspring. Mean per capita energy intake for households in northern Nigeria ranged from 2,458 to 1,949 calories. Nutritional status indicators show significant increases in the incidence of malnutrition during the rainy season in The Gambia, as well as weight loss for children aged 13-33 months during the preharvest season in Bangladesh. What are the implications of such seasonal changes for human performance?

While severe and sustained levels of wasting and growth retardation are associated with higher probabilities of mortality and functional impairment, the evidence on the functional effects of more moderate declines in nutritional status is ambiguous. This is a consequence of the uncertainty regarding the limits of self-regulation, or adaptability to periods of stress, as manifested in the slowing of growth or increased leanness.

The implications of transitory episodes of food insecurity during the lean seasons, as measured in declines in energy intake, are even less certain than periodic wasting and a temporary slowing of growth. While a growing literature shows that productivity declines in adults as a consequence of reduced food-energy intake, interpreting seasonal decline in consumption is extremely difficult. For example, individuals may regulate their intake to correspond to levels of energy expenditure, resulting in marked fluctuations in intake. And the approach to this self-regulation may have various social and biological determinants, for example, an individual's storing energy in the form of fat, just as one would store grain in anticipation of the coming lean season.

Given the complexity of human adaptation and social behaviors, it is not possible to draw firm conclusions as to the functional consequences of moderate changes in indicators of nutritional status and food security. There are, nonetheless, thresh-

olds beyond which adaptability is no longer possible. Until these are better delineated, it may be more appropriate to focus attention on the other indicators of poor health and social and economic stresses that are strongly associated with the preharvest and rainy seasons.

### CAUSES OF SEASONAL MALNUTRITION AND FOOD INSECURITY

Malnutrition, a concept that is primarily measured at the individual level by weight, height, and age indicators, contrasts with food security, which can be measured at either the national or household level using food-consumption data.

Regardless of the household's overall levels of consumption (that is, food security), children and women may still be malnourished because of unequal access to food resources. For example, the intra-household distribution of food may shift with seasonal changes in the labor force involvement of different household members. The share of income earned by household members may differ from one season to another, and to the extent that the share of income earned corresponds to authority over how money is spent and the subsequent distribution of available food resources within the household, the seasons may also bring about large shifts in the nutritional well-being of children and women.

The major concern is that vulnerable household members are most discriminated against during seasons of stress, as households allocate resources in a manner to maximize productivity rather than equity. This is evident from recent studies

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oping countries. For example, in Bangladesh, women's body weight declined almost 5 kilograms between the preharvest and postharvest periods. In The Gambia, the body weight of pregnant women, controlling for their stage of pregnancy, was

in Nigeria, the Philippines, and India. The opposite was observed in Bangladesh, however, where during the preharvest season the daily energy intake of female children aged 1-5 years, as a percentage of the household level, increased to about 35 percent but was only 25-30 percent of that level during the other seasons, when food supply was more plentiful and household consumption higher. An analysis of the seasonality of malnutrition requires an improved knowledge of the dynamics of household decisionmaking and intra-household food allocation.

The immediate causes of a household's inability to acquire sufficient quantities of food during certain periods of the year revolve around a decline in real income (either cash or in kind) and an increase in market prices. These variations represent a threat to food security when either or both of two conditions hold: the household does not have the ability to save food stocks or cash between seasons; and the pattern of seasonal variation is not predictable, thus introducing an element of risk into household savings and consumption behavior.

Access to credit institutions represents an important element of any strategy to improve seasonal food security. If credit is quantity-constrained at a given interest rate and the costs of borrowing differ among income groups or landownership classes, one would expect seasonal patterns to vary among groups. This problem is especially likely to arise in the preharvest season, when the need to purchase inputs may coincide with the need for consumption credit to maintain an adequate diet. Financing for processing, transporting, and storing crops after the harvest also increases the demand for credit, which is likely to be limited in most rural areas, thus raising the costs to the borrower.

In-kind, agricultural-based savings have traditionally been relied upon by the rural poor and rich alike, but there are indications that the smaller farmers in most Asian countries, and increasingly in Africa, are net consumers of staple foods. Because these households deplete their stocks well before the next harvest, preharvest wage labor activities become even more vital once family stocks are drawn down, although the need to engage in wage labor is often in competition with preparation of one's own farmland for the next harvest. This circumstance, for example, has been observed in Malawi, where small farmers working for agricultural wages during the planting season fail to attend to their own small holdings, further exacerbating the problem of early depletion of stocks in the following year. Subsequently, the household is increasingly reliant on the wage labor market, and a failure of the small farmer to invest in his own holdings is the result.

Another particularly important form of savings in Africa is livestock. Goats and sheep are relatively liquid modes of savings and compensate for ineffective or nonexistent banking systems in rural areas. Evidence from Burkina Faso has

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amply illustrated that savings in the form of livestock protect the household from dramatic seasonal declines in calorie intake during the long, dry preharvest period. In particular, livestock holdings among food-insecure households in a Sudano-Sahel village were only 53 percent of the value of holdings of households with adequate food-energy intake.

Households employ a variety of other mechanisms to ensure household food security during the lean season: the purchase of durables and semidurables can be timed to coincide with seasons when income is highest; during the preharvest season of stress, households can substitute less-expensive commodities and shift to alternative food sources; and household members can engage in seasonal migration to search for work and food. Thirty to 40 percent of the active population has been shown to migrate from rural to urban areas of Senegal during the dry season. Rural-to-rural migration is also evident in West Africa, where workers migrate from the savanna zone to the forest regions in search of seasonal employment on coffee and cocoa plantations. The same is true in Java, where women find off-season employment on sugar plantations. Migration may even involve searching out government employment schemes during the lean season, as seen in Bangladesh and India. There are also well-documented systems of communal sharing and gift-giving and even feasting to help vulnerable households through the lean season.

In theory, seasonal cycles, unlike interyear fluctuations, are predictable, making it easier for consumers, producers, and traders to respond to the expected seasonal movements of prices, work opportunities, and earnings. In practice, however, seasonal patterns are highly unstable as manifested in year-to-year irregularities in seasonal patterns. To understand why, one must examine the other two components of a data series—trends and random interyear fluctuations. Changes in the general trend level of, for example, food production, are brought about primarily by technological change that also contributes to shifts in the seasonal patterns of output, prices, labor input, and so forth. Random interyear fluctuations also contribute to unpredictable seasonal undulations by making supply and demand conditions in various markets unpredictable. To the extent that the farmer, trader, and consumer confront changing circumstances and uncertainties from one year to the next, this will be reflected in differing seasonal patterns

of production, marketing, prices, expenditures, consumption, and nutritional status.

The implications of being unable to predict patterns of seasonal variability from year to year are manifold. For example, even if credit markets were efficient and other forms of savings available, the ability of a household to avoid periods of seasonal poverty and stress would have to be predicated on information and knowledge of future food availability, income streams, and prices in order to effectively engage in seasonal budgeting.

Interyear instability in the pattern of seasonal price increases can be illustrated with selected data on monthly food prices for six commodities in 12 Third World countries covering a number of years. Using a monthly index of prices and a 13-month moving average to standardize the prices across years and countries, results show that, first, large seasonal price spreads are frequent and differ dramatically from country to country and crop to crop. Second, there is considerable divergence in the range of the price index over the year. Third, a marked instability in seasonal price spreads is attributable to the inability of farmers and traders to formulate accurate expectations about future grain supply and demand conditions and, consequently, prices. When expectations are incorrect, resulting imbalances in supply and demand for foodgrains will contribute to an erratic pattern of seasonal price increases, rather than monthly price increases commensurate with the cost of storage.

## POLICY OPTIONS TO REDUCE SEASONAL MALNUTRITION AND FOOD INSECURITY

Policymakers have many options for reducing the seasonal patterns of malnutrition and food insecurity observed in vulnerable populations. They revolve around stabilizing the ability to obtain food during different seasons of the year as well as addressing related factors such as the seasonality of disease.

A household's access to enough food for health, activity, and growth is determined by the level and pattern of income in the form of wages, earnings from the sale of agricultural products, food available for home consumption, transfers, and remittances; by the seasonal pattern of food availability and food prices; and by the household's seasonal savings, whether in the form of money, food, or other physical assets. Policies designed to relax constraints among these three factors fall into two broad categories. The first are untargeted interventions designed to improve the efficiency of factor and product markets. These generally revolve around promoting agricultural growth and market de-

velopment and are the most propitious long-term mechanisms for reducing problems associated with the seasons. The virtual absence of seasonal cycles of malnutrition and food-energy intake in developed countries and the severity of the problem in the most underdeveloped countries in Africa provide ample evidence that the introduction of modern agricultural techniques and the development of markets of inputs, credit, labor, and products hold the key to reducing seasonal stress.

In the interim, however, before commercialization, monetization, and market development address the problems wrought by the seasons, there is a need for more targeted interventions. These initiatives must be designed to mitigate problems that arise during the transition to a modern economy. Targeted nutrition and food security projects will be especially important during the period of household transition from cultivating for home production to earning cash in an environment characterized by inefficient factor and product markets. This period is often accompanied by an erosion in traditional forms of social security and of cultural and agricultural practices and technologies that had served to mitigate seasonal stress.

### Untargeted Interventions

Seasonal price stabilization attempts to reduce the degree of uncertainty about the seasonal price spread from one year to the next and the average seasonal price increase across years. Governments can pursue these objectives through the direct approach, which involves active participation and intervention in markets as a buyer and seller of foodgrains, and the indirect approach, promoting and facilitating market conditions that foster efficiency and competitiveness.

Indonesia and the Philippines provide examples of direct government intervention in the market to reduce seasonal price spreads and increase the predictability of these movements. The keys to their success are found in the marketing agencies: good market intelligence on prices throughout the country; well-timed and comprehensive intervention in the markets, with targets set in terms of prices rather than quantities to be procured; establishment of confidence among traders, producers, and consumers in the activities and reliability of government intervention; and agency access to virtually unlimited credit for the government to achieve its objectives.

Despite the successful attempts of a few governments to stabilize seasonal prices and reduce the spread through direct intervention, the high costs, great demands for trained and skilled manpower, and requirements for well-developed storage, transport, and communication infrastructure cannot usually be met by less-developed countries. Thus it is likely that indirect government intervention should be the focus of their efforts to reduce seasonal price spreads. They should try to increase the competitiveness of markets and marketing opportunities for farmers

and traders by, first, developing infrastructure such as markets, roads, and storage facilities to improve the functioning of commodity markets and encourage risk-sharing over a broader population. Second, governments should concentrate on improving the quality of information collection and dissemination to promote more accurate anticipations of supply and demand for foodgrains, thereby reducing risk and speculative behavior. Third, improved capital markets that would provide access to reasonably priced credit could greatly reduce the costs of seasonal uncertainty.

Technological change in agriculture affects seasonal variability in work, food production, incomes, and consumption. The replacement of traditional forms of cultivation with modern techniques may exacerbate seasonality problems faced by households; mechanization may contribute to increased seasonal labor bottlenecks; and the use of hybrid seeds may increase the perishability and storage costs of agricultural output. Some forms of technological change may destroy traditional ways of coping with seasonality, such as production of root crops, mixed and relay cropping, and participation in mixed livestock enterprises. Nevertheless, technological change, promoted by advances in agricultural research and facilitated by economic incentives and extension services, is one of the major components of any set of public policies designed to improve nutritional status and food security. It is therefore recommended that research and related extension services be reoriented to (1) take advantage of seasons of low labor demand and increase labor efficiency at peak season; (2) promote cropping strategies that minimize input requirements during periods of scarcity; (3) provide for reasonably priced credit through well-organized and accessible institutions at strategic periods of the year; (4) take into account the need for on-farm and other forms of storage between harvest; and (5) improve upon, rather than totally ignore, the traditional cropping strategies employed by the farmer.

Development and improvement of infrastructure is essential to reducing the harmful effects of seasonality in the food system. Enhancing market, transport, and storage infrastructure will raise productivity and improve the efficiency of marketing. Development of irrigation infrastructure is a key element of any strategy to increase food availability. Better means of providing credit would enable households to smooth out consumption by budgeting in the face of lumpy incomes and seasonal price increases. Improved infrastructure also reduces search and transport costs for off-

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season employment, facilitates transfer of remittances to families from temporary migrants, improves access to health clinics, and eases travel for health workers who combat seasonal diseases such as malaria.

### Targeted Interventions

There are limits to the speed with which the untargeted interventions for reducing seasonal malnutrition and food insecurity can be realized. Even if the performance of input and product markets improves dramatically, a large number of indigent households may still be unable to cope adequately with the stress and strain of seasonality in their environment. Thus there remains a role for targeted interventions during the transitional period.

The wide range of options to assist households in coping with marketing inefficiencies, dislocation, and other factors that imperil households during the lean season falls into three categories: generating income through productive work; transferring income directly to households; and moderating prices faced by consumers. Of these three categories, generating income is usually preferred. Projects that generate employment and income during the slack season offer considerable opportunity for raising consumption and reducing malnutrition. Labor-intensive works are the most promising of these types of interventions; other means of generating income during the slack season include home gardens and cottage industries.

Public works benefit not only the individuals directly participating but also those engaged in the wage labor market, since the projects effectively support a wage floor during the slack season. There is also the long-term potential of promoting self-sustaining development and addressing seasonal constraints through development of infrastructure and economic assets.

While generating income is the ideal, these interventions often carry high costs, both in terms of the payment to workers and the necessary complementary inputs in the form of tools and equipment as well as management. It is frequently necessary to resort to transfer programs and price subsidies to reach the poor. Such intervention schemes provide an opportunity for seasonal targeting. Food subsidies, for example, can provide a flexible price wedge, being relatively larger in the lean season than during the period after the harvest. It may be possible to focus consumer subsidies on self-targeting foods, such as cassava and other roots and tubers. Food stamps and mother-and-child feeding programs can be targeted to coincide with the season of greatest food stress.

Other initiatives not generally considered nutrition and food-security interventions also warrant attention: providing consumption credit to needy households during the preharvest season; facilitating seasonal migration through improved child-care services and housing for migrant families; augmenting health-care service for mothers and children in response to seasonal fluctuations in disease; spreading

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out tax collection to avoid periods when the household purchases inputs; and adjusting the school calendar so that a vacation coincides with the peak demand for labor. The need for these programs should be determined on a community-by-community basis and the nature of the problem should be carefully assessed before selecting the appropriate interventions.

## CONCLUSIONS

A number of salient conclusions emerge from this discussion of the patterns and stresses that lead to seasonal episodes of malnutrition and food insecurity. First, further research is needed to better understand the functional implications of seasonal reductions in food energy intake and to provide a sound basis for judging the urgency that should be accorded to the observed variability in food consumption and nutritional status.

Second, even if the extent of impaired performance and physical damage remains ambiguous, it is important to recognize that there may also be long-term deleterious economic and social consequences of seasonal stress faced by rural populations. During the preharvest season when resources are depleted, poor households have been shown to sell off their assets to avoid going without food. There may be high social costs to seasonal migration that leads to a dissolution of the family structure. While such outcomes are not measured by nutritional status and consumption indicators, they may contribute to chronic impoverishment and despair.

Third, there is little question that agricultural growth and market development represent the long-term means of reducing seasonal food insecurity; one need only witness the almost total lack of seasonal cycles of malnutrition and food-energy intake in developed countries. The magnitude of seasonal fluctuations in consumption is also generally smaller in middle-income countries, where agricultural and market development are more advanced. This reduction in transitory seasonal food insecurity occurs despite the highly seasonal nature of agriculture itself. Seasonal patterns of work, incomes, and food security are most pronounced in the lowest-income countries, especially in Africa, where a combination of environmental factors and economic stagnation contributes to acute seasonal fluctuations in

food security. The evidence from Asia indicates that in the poorest countries, such as Bangladesh, seasonal food insecurity is predominantly a characteristic of poor rural communities.

Fourth, in order to ameliorate the extent and consequences of seasonal variations in Third World agriculture, government should endeavor to improve the functioning of markets, avoiding the failures and distortions that so frequently are observed in Third World factor and product markets. Creation of an economic and social climate that encourages private-sector initiatives to improve seasonal food security involves a key government role in gathering and disseminating information to improve competition and the efficiency of seasonal arbitrage among traders. Farmers also need assistance through promotion of systems that ensure the availability of inputs at reasonable prices, encourage the development of small-scale irrigation and water management schemes to reduce the seasonality and uncertainty of production, support national agricultural and farming systems research institutions that promote technological change that takes into account the seasonal constraints and bottlenecks faced by farmers and observed in factor markets, and disseminate knowledge through extension services. Government also has a key role in expanding infrastructure that allows the private sector to carry out its storage, marketing, and processing functions more effectively. The development of institutions that facilitate, rather than impede, the functioning of credit markets is fundamentally important and can best be achieved by adherence to policies that reward savers and encourage borrowers through interest rate reforms. Rationalizing capital markets will also promote investment, and subsequently growth, further mitigating the seasonal stresses faced by households.

Efforts should be made to exploit traditional social and cultural arrangements that afford a degree of protection from seasonal stress, and to promote indigenous agricultural practices that provide some protection from high prices and reduced incomes during the lean season. In practice, however, as economic development moves forward, many of these traditional practices will give way to reliance on product and input markets to cope with seasonal fluctuations.

Vulnerability during such a transition is the basis for the fifth conclusion—that there is a role for seasonally targeted interventions such as food-for-work, food subsidies and stamps, and mother-and-child feeding projects. The difficulties of targeting needy households, the propensity for such efforts to be poorly planned and administered, and the high budgetary costs involved suggest the need for great care in designing and implementing such initiatives. The same underlying factors that contribute to seasonal stress, such as poor infrastructure, acute policy distortions, and limited human and financial resources, will impede effective targeted intervention schemes. This is a vexing problem that

highlights the need for donor assistance to overcome these constraints.

Sixth, it appears that rural populations are most susceptible to the deleterious effects of seasonality. Rural agricultural and wage employment, and therefore incomes, are linked to variability in the agricultural calendar. Rural consumers also confront greater fluctuations in market prices because imperfections in marketing systems are likely to be greatest in remote areas, partly because of the dearth of physical and social infrastructure.

Seventh, seasonalities vary from year to year, country to country, region to region, village to village, and household to household. This implies the need to decentralize policymaking and to develop and promote versatile responses to seasonal stress. Emphasis must be placed on creating a social, economic, and political environment at the local level that will facilitate initiatives among villages and households to cope with the changes and hardships brought by the seasons. This applies both to indirect efforts, such as development of technologies that allow greater flexibility in planting and harvesting dates, and to direct interventions, such as consumption credit to households when they are in greatest need.

And finally, an underlying theme of many of these policy recommendations is that the seasonal variability that threatens the food security of the poor does not necessarily require seasonal solutions. Similarly, it is emphasized that seasonal undulations in consumption and other welfare indicators become a less urgent policy concern as the overall level of dietary intake and related measures of living standards improve. Thus, a careful balance must be struck to the extent that measures to smooth out seasonalities in Third World agriculture and food systems impede economic growth. To illustrate, while scarce budgetary resources can be used to stabilize seasonal prices, doing so will have important opportunity costs in terms of other production investments that may, for example, promote technological change that will serve to moderate prices throughout the year. These types of tradeoffs are somewhat analogous to balancing present consumption with investment for future growth and present a challenge to policymakers in their effort to reduce seasonal episodes of deprivation and hunger.

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*Contributors to the book are Mohammed Abdullah, Harold Alderman, Jere R. Behrman, Timothy J. Cole, W. Andrew Coward, Christopher Delgado, Anil B. Deolalikar, Lynn Ellsworth, Jane Guyer, Robert W. Herdt, Mauricio Jaramillo, Françoise Lawrence, Mark Lawrence, Michael Lipton, Richard Longhurst, Peter J. Matton, Ellen Messer, Dow Mongkolsmai, Jon R. Moris, Philip Payne, Per Pinstrup-Andersen, Thomas Reardon, Mark W. Rosegrant, David E. Sahn, Kenneth Shapiro, Jane Singh, and Roger G. Whitehead.*