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Consumption Effects of Agricultural Policies: What Do We Know?

A Review of USAID/Nutrition
Economics Group Research

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Executive Summary

The Consumption Effects of Agricultural Policies (CEAP) Project funded research to identify the mechanisms by which agricultural and economic policies affect food consumption and nutritional status.

Policies Studied

The range of policies studied included the following.

- (1) Producer-Oriented Policies
 - (a) Price supports for specified commodities
 - (b) Subsidies on agricultural inputs, including credit
 - (c) Provision of modern agricultural technology
- (2) Consumer-Oriented Policies
 - (a) Consumer food price subsidies
 - (b) Food-related income transfers (food stamps)
- (3) Marketing Policies
 - (a) Construction of marketing infrastructure
 - (b) Promotion of market competition
 - (c) Elimination of barriers

Economic policies not directly related to food and agriculture, but affecting the sector, were also studied under the project. These included:

- (1) Overvaluation of the exchange rate
- (2) Deficit spending and consequent inflation
- (3) Tax policy
- (4) Trade policy

Conclusions

Major conclusions of the research were the following.

(1) Agriculture and food policies are tightly linked to the broader economy; economic policies interact with those related to food and agriculture.

This means that the effects of a particular policy can be entirely counteracted by other policies apparently unrelated to food and agriculture. For example, government deficit spending can cause

inflation which erodes the benefits of a consumer price subsidy by reducing the purchasing power of consumers.

Because economic policies are linked to one another, economic rigidities introduced by one policy will cause adjustments to be made in other sectors. For example, price subsidies which interfere with consumers adjusting demand in the face of changing supply conditions may cause higher and more unstable prices for the proportion of the good which is not subsidized. A government commitment to meet demand for a subsidized food through imports will restrict imports of other goods, including possibly agricultural inputs or capital goods.

Agriculture and food policies are often called upon to serve conflicting objectives, which can reduce their effectiveness in assuring food consumption needs are met.

The long run effects of policies are often opposite to their short term effects and to their original objectives, because price distortions are gradual and cumulative in their effects on the allocation of productive resources in the economy.

(2) Assessing the consumption effects of policies requires analysis of consumption patterns, disaggregated by income class, and possibly also by sector economic activity. Analysis should also disaggregate food groups into individual foods.

Different population groups are affected differently by policies, depending on how they earn their livings, what foods they consume, and what their patterns of substitution among foods are in the face of changing prices and income. Low income populations in most settings have different consumption patterns and a higher level of price responsiveness than wealthier groups.

The distinctions between farm and nonfarm households, and between producer and consumer households is not a consistent or realistic one. Most farm

households earn a substantial portion of their income off the farm; many households purchase in the market foods they also produce for sale and home consumption. Low-income farmers are more likely to be net purchasers of food.

Policies which are designed without considering the effects on different subgroups may be highly regressive because they reach only wealthier producers or consumers. This may occur if a luxury food is subsidized, for example, or if subsidized agricultural inputs are made available which can only be used on superior land.

(3) The implementation of a policy has as great an effect on the policy outcome as the underlying design.

The specifics of implementation determine who has access to the benefits of a policy. Location, hours of operation, and minimum quantity of sale or purchase required can prevent poor households from using a government program.

Different methods of targeting consumer subsidies exclude different categories of people from the program. Targeting is likely to exclude some members of the target group at the same time as it reduces leakage outside the target group.

Policies which are simple in concept may be extremely difficult to implement successfully. Price stabilization programs fall in this category.

Parastatal and government operated marketing institutions are not more efficient than the private sector. If they keep retail prices low, it is through a subsidy. There are operational problems characteristic of parastatals, including a tendency to allow producer support prices to erode due to inflation.

(4) The time of household members is as important as income and prices in determining food consumption patterns.

Time costs must be added to cash costs to determine the effective price of a good. The time costs of food preparation

or procurement can discourage consumption of that food even if it is cheap. Time costs of using a government subsidy can prevent its use.

(5) Producer oriented policies depend on the availability of needed complementary resources for their effectiveness.

Long run sustainable increases in production, and resultant lower prices, depend on interventions to increase productivity of resources (land and labor), not just on increased production.

Supply response to incentive prices and subsidized inputs may be constrained by risk aversion. One element of risk aversion is a lack of confidence in the continuation of government producer-oriented programs. Long term consistency in policy making is important to its success.

(6) Consumer-oriented policies can be effective in raising household food consumption levels.

Successful programs have been quite expensive. The effect of consumer oriented programs is determined by access to the program.

(7) Marketing interventions have potential for making long-term sustainable improvements in the stability of food prices and agricultural incomes.

(8) The effect of household income in assuring food consumption adequacy is affected by the form, source, earner, and locus of control of the income.

As household income increases, households appear to spend money on diversifying their diets before they have reached 100% of caloric adequacy. This may be a nutritionally rational decision, depending on the composition of the diet.

(9) Household food consumption adequacy does not guarantee individual nutritional adequacy, and food intake does not guarantee nutritional status.

Household food supplies are not distributed equitably among members.

There are determinants of nutritional status other than food intake, including health status, activity level, and individual variation.

Lessons for the Design of Policy Oriented Research

The lessons which may be incorporated into the design of policy oriented research include the following.

(1) *Predicting the effects of a policy on food consumption requires consideration of the broader economic context, as well as the effects of other policies within the food and agriculture sector.*

(2) *Because the economic situation changes over time due both to domestic conditions and to factors outside a country's control, ongoing monitoring of the consumption effects of policies is necessary.*

(3) *There is no substitute for empirical investigation of food consumption patterns.* Assumptions about food consumption patterns have often been proven wrong in a given setting.

(4) *Research on consumption patterns may have different requirements from short term policy studies.* Household level data collection necessary for disaggregated analysis of food consumption determinants is time consuming and costly to collect. Once it has been collected, however, the data continue to be useful to answer a wide variety of policy questions, even though these questions may be different from the ones which were current at the start of the research.

(5) *Research can influence policy* if the results of the research can be shown to be relevant to issues which are currently of interest to policy makers. Involvement of nationals of the country in the research effort makes the application of research results more likely.

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Table of Contents

Executive Summary	i
Acknowledgements	iv
1. Introduction	1
1.1 Background of the Consumption Effects of Agricultural Policies Project.....	1
1.2 Accomplishments of the CEAP Project	1
1.3 Directions for Future Research	2
2. Determinants of Food Consumption and Nutritional Status	3
2.1 Nutritional Status as a Welfare Measure	3
2.2 Determinants of Household Food Consumption	3
2.3 Individual Intake and Nutritional Status	3
2.4 A Note on Measurement of Food Consumption and Nutrition	4
3. The Policy Arsenal	5
3.1 Policies Directly Affecting Food and Agriculture	5
3.1.1 Producer Oriented Policies	5
3.1.2 Producer Price Subsidies and Price Stabilization Programs	5
3.1.3 Subsidies on Agricultural Inputs	5
3.1.4 Technological Change	6
3.2 Consumer-Oriented Policies.....	6
3.2.1 Consumer Price Subsidies	6
3.2.2 Food-Related Income Transfers	6
3.3 Marketing Interventions	7
3.4 Economic Policies Indirectly Affecting Agriculture	7
3.4.1 Currency Overvaluation	7
3.4.2 Deficit Spending and Inflation.....	8
3.4.3 Tax Policy	8
3.4.4 Trade Policy.....	8
3.5 Factors Outside Policy Control	9
3.5.1 Policies of Other Countries	9
3.5.2 Climate and Weather.....	9
4. Major Research Results	10
4.1 Agricultural and Food Policies Interact with the Economy as a Whole	10
4.1.1 The Effects of One Policy can be Strengthened or Counteracted by Other Policies	10
4.1.2 Policies to Stabilize One Sector Cause Adjustments in Other Sectors	11
4.1.3 Agriculture and Food Policies Serve Conflicting Objectives	12

4.1.4	The Long-Run Effects of Policies May be Opposite to the Short-Run Effect	12
4.2	Understanding Policy Effects Requires Disaggregated Analysis	13
4.2.1	Different Population Groups are Affected Differently by a Given Policy	13
4.2.2	Distinctions Between "Farm" and "Non-Farm" Households, and Between "Consumer" and "Producer" Households are Unrealistic	13
4.2.3	Policies Designed Without Consideration of the Need for Disaggregated Analysis May have Regressive Effects	14
4.2.4	Food Consumption Patterns are Different in Different Income Classes	15
4.2.5	The Effect of Price Changes on Food Consumption Are Affected by Substitution Patterns	15
4.2.6	Analysis Must Be Disaggregated By Individual Food as Well as by Population Group	16
4.3	Implementation of a Policy is as Important as Design in Determining Effects on Consumption.....	16
4.3.1	The Specifics of Implementation Determine Who Has Access to Program Benefits	16
4.3.2	Methods of Targeting can Restrict Access Even Within the Target Group	17
4.3.3	Policies Simple in Concept May Face Insurmountable Problems of Implementation	18
4.3.3.1	Price Stabilization Programs	18
4.4	Problems With the Operation of Government and Parastatal Marketing Institutions.....	19
4.4.1	Government and Parastatal Agencies Are Not More Efficient Than the Private Sector	19
4.4.2	Operational Problems of Parastatal Marketing Boards	20
4.5	Time of Household Members is as Important as Income and Prices in Determining Food Consumption Patterns	20
4.6	Conditions for the Effectiveness of Producer-Oriented Policies	21
4.6.1	Effects on Production Depend on Complementary Inputs	21
4.6.2	Effects on Incomes and Prices Depend on Improved Productivity, Not Simply Increased Production.....	22
4.6.3	Risk Management is as Important as Prices in Determining Farmers' Production Decisions	23
4.7	Conditions for the Effectiveness of Consumer-Oriented Policies	23
4.7.1	Consumer Food Price Subsidies Can Be Effective in Increasing Household Food Consumption	23
4.8	Conditions for the Effectiveness of Marketing Interventions.....	24
4.9	Limits on Household Income as a Determinant of Food Consumption	25
4.10	Limits of Household Food Consumption in Determining Individual Intake and Nutritional Status	27

5.	Lessons for the Design of Policy-Oriented Research	...29
5.1	Predicting or Assessing Policy Effects Requires Consideration of the Broader Economic Context29
5.2	Ongoing Monitoring of Policy Effects is Necessary Because The Economic Context Changes Over Time29
5.3	Empirical Information is Required to Assess the Effects of Policies29
5.4	Research on Policy Determinants of Food Consumption Requires More Time than Short Term Policy Impact Studies30
5.5	Research Can Influence Policy30
	References31
	List of Persons Contacted39

1. Introduction

1.1. Background of the Consumption Effects of Agricultural Policies Project

The world food crisis of the mid-1970's focused the attention of development professionals on the issues of nutrition, food consumption, and food supply in developing countries. As food prices rose world-wide, national programs of food distribution in developing countries, many of which relied on imports, became suddenly more expensive, while supplies of food aid around the world contracted. Food security, the assurance of an adequate national food supply, became a pressing concern for many countries. Agricultural policies designed to provide cheap food to the labor force and foreign exchange to the government, with the idea of facilitating industrialization, were increasingly called into question. The central role of the agricultural sector in national economic development began to be more widely recognized.

At the same time, the welfare consequences of food scarcity and high food prices began to attract public attention. Poverty and lack of effective access to the food supply were increasingly recognized as limiting factors to household food consumption. High prices, seen as necessary to provide the impetus for increased agricultural production, thus could contribute to the problem, rather than to the solution of nutritional inadequacy. This "food price dilemma" emerged as a central issue in economic development policy (Timmer *et al.*, 1983).

In 1977, USAID funded the Consumption Effects of Agricultural Policies (CEAP) project, to be administered through an administrative agreement with USDA. Over a twelve-year period, the project sponsored a series of long and short term research and technical assistance efforts in some thirty coun-

tries. (A list of the countries and the policy questions addressed in each may be found in Kramer and Rubey, 1989.) This project was designed to answer the questions that were being raised about the relationship between government policies to promote agricultural and economic development, and the welfare (specifically the food consumption and nutritional status) of the poor. The present paper seeks to assess the contributions made by the project to the level of understanding about these issues.

1.2. Accomplishments of the CEAP Project

The CEAP project was unique in providing a focus for research and researchers in an emerging, important policy area. The project framed a simple and important question, and provided the opportunity for a co-ordinated attempt to answer it. The data sets collected under the CEAP project are still in use today, not only as grist for new doctoral dissertations (itself a worthwhile use), but also to address current policy questions in the countries of study. In several countries, the CEAP-funded studies provided the only available information about food consumption patterns. This alone is a valuable resource.

The CEAP project can be credited with providing a number of researchers with the opportunity to start productive careers combining research and policy application. Most of the researchers involved in the CEAP-funded projects are continuing to do related research, at least some of which grew directly out of the questions answered, and the new questions raised by the CEAP studies.

The CEAP studies were responsible for answering some of the critical questions about the relationship between agricultural and food policies and food consumption levels. The answers were complex and conditional, but this does

The CEAP project was unique in providing a focus for research and researchers in an emerging, important policy area.

not take away from their importance, nor from their applicability to real-world situations.

The links between production and consumption of agricultural commodities are neither simple nor direct. It cannot be assumed that improvements in agricultural production will, automatically and under all reasonable circumstances, result in improved nutritional status of the population. The links between production and consumption must be specified and verified for the country and the project or policy in question.

Where are the vulnerable, malnourished populations located? What economic activities do they engage in? What foods do they normally eat, and what are their patterns of substitution in response to changes in incomes and in relative prices? Answering these questions does not resolve the dilemmas which confront developing country governments trying to balance economic growth objectives with concern for the welfare of the vulnerable poor. It does make it possible, though, to identify the trade-offs involved in a particular policy decision, and to anticipate the consequences, both direct and indirect.

It is not realistic to expect accurate, long-term prediction of all the consumption effects of a specific policy, no matter how good the information is. The economic context is constantly changing, and therefore the factors which determine how a given policy interacts with others to affect food consumption also change. This argues for ongoing monitoring of food consumption over time.

1.3. Directions for Future Research

The debate on consumption effects of agricultural and economic policies continues to be lively. The current debt crisis has replaced the world food crisis as a focus of attention for development professionals; the current expansion of structural adjustment programs raises new issues of the links between macroeconomic changes (currency devaluation, exchange rate adjustments, reductions in government spending) and the food purchasing and consumption behavior of poor urban and rural households.

The CEAP studies also raised a new set of issues for food policy analysts concerned with consumption and nutrition issues. These concern the relationship between household and individual level food consumption, and between food consumption and nutritional status. The CEAP studies demonstrated that these links, like those between agricultural production and household food consumption, are not simple and direct. A new generation of research will be required to identify the conditions under which household food consumption reaches vulnerable members, and to explore the circumstances under which adequate food intake translates into acceptable nutritional status. The field of food policy analysis will be fortunate if a program similar to CEAP emerges to deal with this new set of questions, and if it proves to be as productive.

2. Determinants of Food Consumption and Nutritional Status

2.1. Nutritional Status as a Welfare Measure

Nutritional status is in some ways the clearest culture-free indicator of individual welfare. Even though there is some argument over appropriate growth standards for different ethnic groups, the conceptual meaning of malnutrition is not culture specific (as, for example, housing quality or asset ownership is); nor is it dependent on accurate assessment of "true" exchange rates, as is income.

Since all development assistance efforts, ranging from specific projects to broad policy formation, have as their ultimate objective the improvement of levels of welfare, it is appropriate to focus on food consumption and nutrition as central outcomes of any development program.

2.2. Determinants of Household Food Consumption

The primary determinants of food consumption at the household level are: the household's real income (that is, its purchasing power); the prices it faces for foods and other goods; and the resources owned by or accessible to the household which can be used to produce income, including food either for home consumption or sale. The time of household members is also an economic resource of the household. Part of the cost of any item is the time required to obtain it and to consume it (Lancaster, 1966). These variables, household income, productive resources, time, and the prices of food, represent the avenues by which government policies can influ-

2.3. Individual Intake and Nutritional Status

Adequate household food consumption, though, is no guarantee of adequate individual food intake. The links from household food consumption to individual nutritional status are not direct. It has been well documented that food received at the household level is not distributed precisely according to the nutritional needs of individual members; some members' needs may be fully satisfied before others' are met. Some members' nutritional requirements may not be recognized in the distribution rules of the household (for example, the increased needs of pregnant and lactating women), and in some cultures there appears to be systematic discrimination against some categories of household members (children, women, non-relatives, for example). It is not clear that government policies can directly affect these distribution rules (Franklin and Harrell, 1985), although there are certainly policies which can alter the forces which shape them. (For example, policies which increase the returns to female labor; increase the likelihood of child survival; see Rogers, 1983; Rogers and Schlossman, forthcoming for a more complete discussion.)

Furthermore, adequate food intake is only one determinant of nutritional status. Individual metabolic differences, health status, and activity levels are equally important in their effects on nutritional status.

Household income, productive resources, time, and the prices of food, represent the avenues by which government policies can influence food consumption at the household level.

2.4. A Note on Measurement of Food Consumption and Nutrition

Nutritional adequacy in virtually all of the CEAP studies was measured in terms of calorie and protein requirements as recommended by WHO. None

of the studies looked at consumption of micronutrients, though these are critical to nutritional health. Nutritional status, in the few studies which measured it, was assessed in terms of height and weight for age, which reflects primarily calorie and protein adequacy, leaving aside the adequacy of micronutrients.

3. The Policy Arsenal

There is a limited range of policies by which governments can influence household food consumption levels. These include policies directly affecting food and agriculture, and broader economic policies which affect food consumption through their effects on the general level of incomes and prices. In addition, world market conditions not subject to policy control can significantly affect food consumption levels. This section briefly describes the range of policies addressed in the CIAP studies.

3.1. Policies Directly Affecting Food and Agriculture

These policies fall into three categories: producer-oriented policies; consumer-oriented policies; and policies to affect marketing.

3.1.1. Producer Oriented Policies

The rationale for producer-oriented policies to affect food consumption is two-fold. First, increased agricultural production can increase the incomes of farmers. To the extent that farmers are nutritionally at risk, increased production can improve their levels of food consumption either through sale of the food for cash which can be used to purchase food, or through home consumption. Improved agricultural productivity can also increase the demand for agricultural wage labor, thus improving laborers' incomes as well. Second, increased farm production can increase the supply of food. The supply increase may lead to better availability and lower prices of food in the marketplace.

Policies aimed at increasing farm production include the following.

3.1.2. Producer Price Subsidies and Price Stabilization Programs

Producer price subsidies are policies whereby the government guarantees a minimum price to farmers for the production of a particular crop. The guaranteed price is intended both to reduce the level of risk faced by farmers and to provide an incentive for increasing production. Prices maintained above the free-market level require a subsidy, the cost of which may be paid by the government or passed on to consumers. If the cost is passed to producers, there is no effective subsidy.

Producer price supports are commonly implemented by having a government agency guarantee to purchase at the fixed price whatever quantity farmers supply. In some countries, the government agency acts as the sole legal buyer of the crop; in others, the government enters the market in competition with private sector traders.

The arguments in favor of price stabilization are somewhat different from those for price supports above market levels. High risk is as much a disincentive to production as is low producer price. Agriculture faces a level of unpredictability (due to weather) which makes it qualitatively different from the industrial sector (Timmer *et al.*, 1983). Food prices have a significance for welfare which also makes them qualitatively different from the prices of most industrial goods (Rao, 1989). Therefore, even strong advocates of the free market acknowledge the legitimacy of food price stabilization efforts.

The idea is to establish a band of prices for critical foods such that if the highest level is exceeded, the govern

World market conditions not subject to policy control can significantly affect food consumption levels.

ment will release stocks onto the market to reduce prices, and that if prices fall below the floor price, the government will act as a buyer of last resort and build its stocks while preventing the price from dropping further.

3.1.3. Subsidies on Agricultural Inputs

Governments also try to provide incentives to farmers to increase production by reducing their costs through subsidies on the prices of agricultural inputs, including improved seed, agrochemicals, irrigation services, and agricultural credit.

Input subsidies are commonly implemented through agricultural cooperatives, agricultural extension services, or agricultural banks, which distribute the inputs as they are available, at below-market prices.

3.1.4. Technological Change

A third approach to increasing agricultural production is to introduce modern agricultural technology to improve the productivity of land and labor. Thus farmers can produce more with the resources they have. The introduction of new technology is implemented by agricultural extension services providing training along with access to modern inputs.

3.2 Consumer-Oriented Policies

Consumer-oriented policies are intended to increase households' access to food in the marketplace, either by lowering prices or by increasing purchasing power.

3.2.1. Consumer Price Subsidies

Consumer price subsidies are government policies which lower the price of one or more foods in the marketplace below their free-market level. Price sub-

sidies may be explicit, which means the government pays the difference between the low retail price and the higher price needed to obtain the food from domestic farmers or the international market. Price subsidies may be implicit, which means the government sets a low price by law, or lowers the price by distributing low-cost imported food, for example, without directly compensating farmers for the revenue lost through the lowered price.

Consumer price subsidies are commonly implemented by governments procuring the food (either from domestic farmers or from the international market, commercially or as food aid) and distributing it through its own outlets or through the private sector. The most important variations in the design of consumer price subsidy programs are (1) *whether the subsidized food is restricted in its distribution to the target group, or available universally*, and (2) *whether a legal parallel market exists for the food, or the government controls the entire supply*.

3.2.2. Food-Related Income Transfers

Direct income transfers in cash are not common in developing countries because of their cost and difficulty of implementation (although an ambitious income transfer program is currently being planned in Sri Lanka). However, several countries have implemented food stamp programs which provide stamps which can be used as income for the purchase of certain specified foods. The food stamps, printed and distributed by a government agency, can be converted to cash by the food seller. Food stamp programs improve household food consumption by increasing the purchasing power of recipients.

3.3. Marketing Interventions

Marketing includes all the processes by which food gets from the farmgate to the consuming household: transportation of the raw commodity; storage; processing; and all the stages of sale from wholesale to retail. The flow of information about availability and prices of products in various markets is also included in the definition of marketing. Competition among sellers and among buyers is considered an essential element of a well-functioning market.

The rationale for using marketing as a means of influencing household food consumption is that well-functioning market services assure that food flows from farms to markets, and that sufficient food is stored to provide supplies all through the year. Poor marketing infrastructure results in farmers having limited access to the market for their products, which reduces their potential incomes. It also results in severe variations in food prices and availability in the market. Poor transportation, processing, and storage result in food losses and higher costs, raising consumer prices without increasing farmer revenue. Information permits farmers to seek the highest available price for their product, and allows consumers to seek the lowest price they can find. Finally, competition among sellers keeps prices from rising above their free-market level, and benefits farmers by keeping prices from being forced below that level.

Marketing interventions implemented by governments include construction of roads and storage facilities; provision of market information in radio and print bulletins; and promotion of competition. A common means by which governments intervene in the market is by establishing retail outlets in competition with the private sector. The idea is that governments, because they do not need to make a profit, can operate at lower

cost than private traders, and thus keep consumer prices low.

3.4. Economic Policies Indirectly Affecting Agriculture

Economic policies not explicitly directed at the food and agriculture sector can have important effects on the prices of food and agricultural commodities, employment and incomes, and returns to investment in various assets and activities.

3.4.1. Currency Overvaluation

Overvaluation of a nation's currency has the effect of making that nation's tradable goods more expensive on the world market, and the good produced by other nations relatively less expensive in domestic markets. This means that the market for exportable goods produced in the agriculture sector is restricted; competitiveness of the nation's exports in the world economy is reduced. Furthermore, imported goods, including food, displace domestically produced goods in the nation's markets, because of their relatively low price.

The long term consequence of overvaluation is loss of income in all sectors producing tradable goods, and limits on the potential for economic expansion, meaning fewer employment opportunities in these sectors. Agriculture produces primarily tradables, and is often the major source of foreign exchange earnings. Overvaluation thus acts as an implicit tax on the agriculture sector.

Overvaluation of a nation's currency is the long-term consequence of keeping a nominally fixed exchange rate while the balance of trade continues to be negative. A fixed exchange rate is a special case of the government maintaining a fixed, below-market price for foreign exchange. A consequence of this policy of below-market pricing is that the avail-

Currency devaluation is a cornerstone of structural adjustment programs.

ability of foreign exchange will fall short of the demand for it. Government will have to develop a way of allocating foreign exchange among competing uses. This can have serious consequences for the agriculture sector if preference is given to the use of foreign exchange for the import of consumer goods (especially food), or if preference is given to industrial goods. In the first case, cheap imported food may cut down the demand for locally produced food. In either case, scarcity of foreign exchange may restrict the quantity of foreign-produced agricultural inputs which may be imported, limiting the potential for productivity increases in agriculture.

Currency devaluation is a cornerstone of structural adjustment programs. In the long run, devaluation should increase the competitiveness of a nation's economy in international markets, promoting increased production, foreign exchange earnings, and employment. The immediate consequence, though, is a rise in prices and a reduction in the purchasing power of the nation's people.

3.4.2. Deficit Spending and Inflation

Deficit spending on the part of the government is one major cause of inflation. Deficit spending in real terms represents an increase in the supply of money; in the absence of changes in productivity, this results in rising prices and a decrease in the purchasing power of a given level of income.

Deficit spending for any purpose can be a cause of inflation. It is particularly relevant to agriculture and food policy because so many of the common policies involve subsidies, which can be extremely costly, and therefore may contribute to a high level of government debt. The loss of real income due to inflation may counterbalance the benefit of a government program.

3.4.3. Tax Policy

The incidence of tax policy determines who pays for a government program. The net benefit of a consumer food price subsidy, for example, may be negative if the consumers of the subsidized food are also taxed to pay for it. It is in many ways ideal to provide the benefits of a government program to all citizens (for political reasons) and use a progressive tax such as an income tax to pay for it.

Few developing country governments have the capacity to implement a progressive income tax. In most countries, export taxes, import tariffs, or consumption taxes provide the bulk of government revenue. The incidence of these taxes—that is, what groups of people end up paying them—is quite variable from one country to another. The net benefit of a government policy depends in part on the incidence of the taxes used to pay for it.

3.4.4. Trade Policy

Restrictions on foreign trade include taxes on exports, tariffs or quotas on imports, and non-tariff trade barriers such as specialized quality requirements. Export taxes distort the returns to different products. Export taxes on one agricultural commodity reduce returns to it, relative to other commodities, resulting in loss of income and, often, reduced production of that crop. Restrictions on the import of agricultural commodities can act as protection to the domestic agriculture sector. They can also distort the returns to the production of different crops, resulting in less efficient use of resources, which means lower income overall. Restrictions on the import of capital goods can raise the costs of industrial production and reduce employment opportunities in that sector. If agricultural inputs are restricted, the same result will be felt in that sector.

3.5. Factors Outside Policy Control

There are factors outside of the control of policy which also affect food consumption levels of households through their incomes, the prices they face, and the returns to their time and other assets.

3.5.1. Policies of Other Countries

One category of such factors consists of changes in the international market (for example, world market prices of agricultural commodities, raw materials, and capital goods) which are subject to policy control, but not necessarily by the countries affected by these changes. The oil price shocks of the early and late

1970's are one example of a change in the world market, outside the control of the affected countries, which had significant effects on incomes, employment and returns to assets.

3.5.2. Climate and Weather

Factors outside policy control also include climate and weather, which certainly affect prices of food and other agricultural commodities on the world market. The world food crisis of the early 1970s, which drastically altered the costs of many government's food policies, was the result of the unfortunate coincidence of bad weather in many major food producing regions of the world.

4. Major Research Results

This section seeks to assess the current state of knowledge about linkages between agricultural and economic policies, and food consumption and nutritional status, taking as its starting point the research funded under the CEAP Project.

4.1. Agricultural and Food Policies Interact with the Economy as a Whole

Food and agricultural policies are tightly linked to the rest of the economy. In a sense, all economic policies are agricultural policies, since they affect the competitiveness and relative prosperity of the agricultural sector.

4.1.1. The Effects of One Policy can be Strengthened or Counteracted by Other Policies

A consequence of this interrelationship among agricultural and other economic policies is that any one policy may have effects which are mitigated or entirely counteracted by other policies, even policies which are apparently unrelated to agriculture. Such policies may also work together in a positive direction, of course. The effects of a given agricultural policy or program on food consumption will depend on the relative magnitude of the effect of each policy on each group affected.

As an example, the negative effects of overvaluation can outweigh the positive effects of producer price policies. In Tanzania, the implicit tax on agriculture due to the overvalued exchange rate was made worse by an explicit export tax imposed by the government (Keeler *et al.*, 1982). The implicit tax on agriculture due to a fixed, overvalued exchange rate contributed to agricultural stagnation in Sudan (Youngblood *et al.*, 1983), Peru (Franklin *et al.*, 1985) and Honduras (Garcia *et al.*, 1988), in spite of explicit producer-oriented price and

input subsidies in these countries.

High levels of government deficit spending, which lead to inflation, can mitigate the effects of policies in the food sector designed to increase incomes by means of consumer subsidies. In Peru, Franklin and co-workers (1985) concluded that inflation more than offset the benefits of controlled prices. Inflation in Jamaica significantly reduced average caloric adequacy; lower real incomes were reflected in changing food demand parameters (Banskota *et al.*, 1984). In Tanzania, the debt incurred by the government to support its system of price and agricultural subsidies increased the money supply by 53%. The consequent inflation reduced real incomes far more than the benefits provided by the system.

Inflation can raise the real costs of consumer price subsidies which fix the price of a good in nominal terms. The CEAP study in the Sudan intended to assess the effects of an increase in the price of bread, but they found that, adjusted for inflation, the price of bread in fact was falling (Youngblood, *et al.*, 1983). One of the reasons for the extremely high cost of the subsidies in Sri Lanka (before the shift to food stamps) and in Egypt was that consumer prices were set at nominal levels, so the size of the subsidy increased over time. The deficit spending required to finance the subsidies contributed to further inflation, eventually resulting in an untenable situation.

On the producer side, incentive prices for maize in Tanzania were so eroded by inflation that they evolved into a tax on maize production (Keeler *et al.*, 1982).

The most comprehensive analysis of how the food price system interacts with the economy as a whole was the set of studies in Egypt. Food subsidies in Egypt affect the rate of inflation, the availability of foreign exchange, investment in agriculture and industry, and

In a sense, all economic policies are agricultural policies, since they affect the competitiveness and relative prosperity of the agricultural sector.

international trade. While the researchers on this study concluded that the net effect of the subsidy system was to protect the consumption levels of the poor and to redistribute real income in a progressive direction, they identified numerous elements of the system which by themselves were regressive, including many of the explicit consumer price subsidies.

They also found that the budgetary drain represented by the subsidy system contributed to inflation, thus lowering real incomes. Scobie (1983) concluded that a ten percent change in the level of consumer subsidies would result in a five percent change in the rate of inflation.

The Egyptian subsidy system, because it lowers both consumer and producer prices, leads to a level of demand for food which must be met by imports. While much of the imported wheat is received as food aid, some wheat, and most of the other subsidized commodities, are imported commercially. Because the prices of these foods are subsidized, and are not permitted to fluctuate with changes in the world price, consumers do not receive the price signals that would make them adjust their consumption. Because of the government's political commitment to the subsidy system, it maintains imports to meet demand. This means that adjustments to changing world prices for imported food commodities must be made in other sectors.

Scobie argues that cutting the level of subsidy, by reducing the inflexible demand for imported food, would increase the availability of industrial imports, which would contribute to industrial development, with positive consequences for national income and for employment. He points to similar experiences in other countries (Chile, Indonesia, Tanzania), where the inflexibility of food import requirements

caused a decline in the availability of capital goods and raw materials for industry (Scobie, 1983).

Alderman and von Braun (1986) point out that a cut in the wheat subsidy would probably increase consumption of other foods (rice, lentils, beans) which are imported, and not available as aid. Nonetheless they acknowledge that any policy which encouraged consumers to respond to changing world prices would benefit industrial output and investment. In the long run, the balance between the positive effects of the subsidy on purchasing power and on the incomes of some poor agricultural producers, and its negative effects on industrial development is unclear.

4.1.2. Policies to Stabilize One Sector Cause Adjustments in Other Sectors

The Egyptian case demonstrates that policies which cause rigidity in one sector of the economy require other sectors of the economy to adjust instead. Economic constraints cannot be eliminated. Timmer (1989) has noted that stabilization of consumer prices, implemented for welfare purposes, is likely to destabilize some other market which also affects the welfare of the poor.

Prices in a free market act as signals, communicating to purchasers that a good is abundant or in scarce supply. Price subsidies prevent this communication. As a result, no adjustment in purchases takes place when conditions of supply change. But there must be some adjustment when the quantity demanded exceeds the amount available for sale. In the markets where adjustment does take place, the fluctuations in price and availability may be made more severe.

In Tanzania, a proportion of the maize crop was obtained by the government under forced procurement. This portion of the supply was marketed at

fixed, subsidized prices. The remaining supply was subject to very severe price fluctuations, because the proportion of the crop in which the adjustment of demand to supply took place was so small.

Similarly, policies to control interest rates in order to keep the cost of credit low cause farmers unable to obtain access to the regulated credit market to turn to private moneylenders, who charge extremely high rates of interest, well above any reasonable market rate. In Panama, many small farmers were excluded from the regulated market for credit entirely, because fixed prices prevented demand from adjusting to match the available supply.

4.1.3. Agriculture and Food Policies Serve Conflicting Objectives

Because of the interaction of policies affecting different sectors of the economy, agricultural and food policies are often called upon to serve conflicting, mutually exclusive objectives, such as low food prices, an abundant food supply, and national self-sufficiency (in Panama; Franklin *et al.*, 1984). The "food price dilemma" of whether to serve producer or consumer interests through food price policy is just one example of the tradeoff between equity and growth objectives in many sectors of the economy.

Such conflict, of course, compromises the effects that policies may have in improving the food consumption levels of the poor. The Egyptian study and other CIAP studies show the importance of analyzing a food policy not only in terms of its disaggregated effects on various population groups, but in terms of its multiple links with other economic policies which may enhance or reduce its effectiveness.

4.1.4. The Long-Run Effects of Policies May be Opposite to the Short-Run Effect

The short run and long run effects of agriculture and food policies often work in opposite directions; in the long run, food policies may have effects opposite to those originally intended (Roe, 1983).

Two examples were just mentioned: attempts to lower and stabilize the price of maize in Tanzania resulted in much higher and less stable prices in the parallel market; and attempts to provide low-cost access to agricultural credit in Panama resulted in the exclusion of some farmers from any source of credit. In both these examples, the cause was that prices were held below market levels, resulting in shortages. In Tanzania, the original intent of the policy was to provide incentive prices to farmers, but these prices did not keep up with increases in agricultural input costs and general inflation, so that the policy evolved into an implicit tax. The long run effect of maintaining below-market prices, naturally, was a decline in domestic production of the food and a loss of income to the farmers originally intended to benefit from the policy. Since many of these policies were intended to promote food production domestically in order to reduce the need for imports, another paradoxical effect of the erosion of incentive prices over the long run was that in fact demand for imports grew.

Distorting any price from the level it would reach in an unregulated market may reduce efficiency in the use of available resources (with efficiency indicated by prices prevailing on the world market). The long run costs of these distortions may be extremely high, often resulting in effects contradictory to those originally intended by the project. For example, the Jamaican study (van Blarcom, 1983) found that supporting the price of sugar for export, with the intent

of earning foreign exchange, had a negative effect on the balance of trade, because the diversion of national resources away from food production resulted in increased demand for food imports.

In Peru, overvaluation of the currency, combined with export restrictions designed to keep domestically produced food cheap in order to foster growth in the industrial sector, caused farmers to shift their production away from exportable commodities. The researchers concluded that policies more favorable to agriculture would have increased production of agricultural commodities for export, and that even with the increased need to import food, the balance of trade would have been improved (Franklin *et al.*, 1985).

4.2. Understanding Policy Effects Requires Disaggregated Analysis

4.2.1. Different Population Groups are Affected Differently by a Given Policy

Agriculture and food policies affect different groups in the population differently. A road which provides rural farmers access to higher-priced urban markets, allowing them to increase their incomes, also raises prices in the farmers' rural area, possibly with adverse effects on consumers. Assisting farmers to develop on-farm storage capacity, allowing them to take advantage of seasonal price increases, takes income earning opportunities away from traders. The consumption effects of a policy must be analyzed separately for each population group, because the effects are sure to differ.

A new technology, for example, will affect different categories of farmer differently. In Guatemala, the introduction of terraced farming and some modern

agricultural inputs increased the incomes of farmers growing vegetables by 30%, while those growing corn increased their production only moderately (Smith, 1984).

It is also important, but often difficult, to consider the second-order effects of a policy on wages, employment, and the demand for non-food goods. In some cases, the second-order effects of a policy may outweigh the direct effects.

4.2.2. Distinctions Between "Farm" and "Non-Farm" Households, and Between "Consumer" and "Producer" Households are Unrealistic

The distinction between "producers" and "consumers" is not a clear one; farmers both sell and purchase food, and farm households may be net sellers in one market and net buyers in another, or net sellers in one year and net buyers in another. In many settings, the poorest farmers are most likely to be net purchasers, even of the foods they produce for market (Garcia *et al.*, 1988). Similarly, the distinction between "farmer" and "non-farmer" is equally arbitrary. In most settings, farm households derive a significant proportion of their incomes from off farm sources.

In the Dominican Republic, fewer than 3% of households derived more than 90% of their income from own-farm sources (including home-produced and consumed food in the computation of income [Rogers and Swindale, 1988]). This same study found that among self-defined farm households, whose primary activity was farming, fully 40% of income came from wages (including agricultural wages), transfers, and other off-farm sources.

In Honduras, more than half of all farm households derive over 25% of their incomes off the farm, and this figure is over 50% for smaller (under 2 hectare) farms. Even in much less

developed, rural areas, off-farm income is significant. Jossierand (1982) found 10% of the households in his rural Senegal sample had significant off-farm earnings, and the researchers in Sierra Leone found that wages were more important than prices in determining food consumption (Smith *et al.*, n.d.).

It is also important to note that one cannot assume that the rural population consists primarily of farmers. In Egypt, fully 42% of the rural population cultivates no land at all (Alderman and von Braun, 1984). Researchers in Panama found that the majority of rural households derive most of their income from non-farm sources: 79% of rural households earn more than half of their income off the farm (Franklin *et al.*, 1984). In Honduras, 45% of the rural population are agricultural wage laborers, while 55% are farmers (Garcia *et al.*, 1988). Policies focused on landowners or tied in some way to land ownership may therefore be quite regressive in their effects and fail to reach the neediest members of the rural population.

4.2.3. Policies Designed Without Consideration of the Need for Disaggregated Analysis May have Regressive Effects

The effects of production-oriented agricultural policies can have highly regressive effects on income distribution, if they do not take into account the differential effect on different income and employment classes.

For example, the Honduras study (Garcia *et al.*, 1984) found that price supports for maize benefitted wealthier farmers, while farms of under 2 hectares were hurt by the high maize price, since these households purchased more than they sold. In Jamaica (van Blarcom, 1983), the same pattern was observed with sugar price supports: sugar contributes 19% of calories in low-

income diets, so that the poor find their real incomes reduced by high sugar prices, while production is concentrated in large commercialized farms who benefit from the support price. Van Blarcom also found that the employment increase attributable to the sugar price support was not enough to compensate for this real income loss.

Franklin and co-workers concluded that the system of price supports in Panama did not benefit the rural, low-income population, because even those who farm have little land, work at farming only part time, and market little of what they produce (Franklin *et al.*, 1984).

By contrast, the Egypt study found that price supports on meat had a progressive effect on income distribution, because beef is produced primarily on small farms. Even landless agricultural workers engage in livestock production, and these are the poorest employment class. The meat and milk price supports represented a transfer accounting for 14% of these workers' incomes (Alderman and von Braun, 1984). Other elements of the pricing system implicitly tax farmers by forced procurement and the import of wheat at concessional prices, but these elements disproportionately affected larger farmers, contributing to the net progressive effect of the subsidy system (Alderman and von Braun, 1984).

These observations are extremely important for the design of agricultural policies to affect food consumption. Food prices pose the dilemma that they affect people in opposite ways as producers and consumers. An attempt to improve household incomes through price supports can backfire because households may find the reduction in their purchasing power as buyers more than compensates for any income benefit they receive as sellers. Off-farm opportunities provide a possible alternative means to

improve rural household incomes, given that both farm and non-farm households are likely to participate in the wage labor market as well.

4.2.4. Food Consumption Patterns are Different in Different Income Classes

Consumer response to price changes varies by income class (Timmer, 1981; Alderman, 1986). Low income consumers are ordinarily more price responsive, because food represents a larger share of their total expenditure, and they have less flexibility to reallocate non-food expenditures to food in order to preserve their consumption levels. However, these effects depend on what foods are being considered, and what other foods are available on the market as substitutes. Price changes for foods which are relative luxuries may not cause much change in low-income consumption patterns, because these foods were hardly consumed at all due to their high price relative to other foods.

Price subsidies on foods disproportionately consumed by the poor may be cost effective in improving the consumption adequacy of the vulnerable group, since better-off consumers choose not to purchase the food in spite of its low price, because of its lower quality. (This mechanism for targeting the benefits of a price subsidy has been found to be effective in Pakistan [Rogers, 1978], Bangladesh [Karim *et al.*, 1980], Peru [Franklin *et al.*, 1985], and elsewhere.

It can work, however, only where an inferior food, one consumed by the poor but not by the wealthy, can be identified. In Mali, for example, there were no foods which displayed the consumption pattern of an inferior good.

Subsidies on different foods will reach different population groups, depending on the group's likelihood of consuming each food. The Egyptian study found

that each individual food price subsidy had different effects on the consumption levels of different groups. Subsidies on bread reached largely the urban population, while whole wheat flour subsidies affected the rural population more; subsidies on frozen meat and poultry disproportionately benefitted the wealthier population, as did a subsidy on white flour (Alderman and von Braun, 1984).

The bread price subsidy in Sudan was found to have a highly regressive impact on consumption, since the wealthy consumed much more of this commodity than the poor (Youngblood *et al.*, 1983).

4.2.5. The Effect of Price Changes on Food Consumption Are Affected by Substitution Patterns

Some subsidies may have no direct effect on food consumption in vulnerable groups. Depending on consumption patterns, a food price subsidy may even have the paradoxical effect of reducing overall food consumption. The Dominican Republic study found that a price subsidy on low-quality rice reached the low-income population disproportionately, but that a price subsidy on chicken would have the effect of reducing calorie and protein consumption among the poor, because they would substitute the lower-priced chicken for significant quantities of the basic dietary staples: rice, beans, oil, and plantain (Rogers and Swindale, 1988). Conversely, the elimination of chicken subsidies, with a consequent rise in the price of chicken, would have beneficial effects on the dietary adequacy of poor consumers, because of these substitution effects.

Substitution patterns can cause fairly complex responses to the change in any single price. In some cases, the major effects of a price change in one food will be observed in consumption of a different food. In Senegal, one of the consequences of a rising rice price was reduction in peanut production and

The net effect of a price change depends on whether the substitution effect or the income effect is larger; this is an empirical question, and there is no way to predict it *a priori*.

consumption. The reason for this effect was that rice is largely purchased from the market, while millet and groundnuts are produced for home consumption (groundnuts also for sale). Households facing a rising rice price try to ensure their household food supply by shifting their own production from groundnuts to millet, given their uncertainty about the price they will receive for groundnuts in any given year (Josserand, 1982).

Price changes have effects which are more complex and difficult to predict among farmers who produce for subsistence and for the market. The Sierra Leone study found that a ten-percent increase in the price of rice would reduce the rice consumption of the poor, but increase their total caloric intake because of increased income from the sale of rice (Smith *et al.*, n.d). These researchers observed that for some foods, consumption increased when the price went up, because the income increase from sales of the food had an effect larger in magnitude than the negative effect on consumption of the higher price.

Of course, the net effect of a price change depends on whether the substitution effect or the income effect is larger; this is an empirical question, and there is no way to predict it *a priori*.

The scope for consumers to substitute cheaper foods for foods whose price is rising clearly depends on the specifics of the situation: what foods are available, and which foods are experiencing price rises. In the case of Sri Lanka, consumers were able to reduce the average cost of calories consumed in the face of rising prices, but not by enough to preserve their caloric intake level. As prices rose on average 93%, the cost of calories fell only 7%, and caloric intake in the lowest income quintile fell by 8% (Edirisinghe, 1987). Consumers already buying the least expensive acceptable diet have

limited opportunities for substitution if the cheapest foods experience a rise in prices.

4.2.6. Analysis Must Be Disaggregated By Individual Food as Well as by Population Group

Substitutions are often made between one quality of a food and another, or between two different foods in the same category, such as grains, or roots and tubers. To assess the consumption effects of a price change, analysis must be disaggregated not only by population group, but also, as much as possible, by individual foods. Studying the substitution effects among whole classes of foods (between meat and grains, for example) will mask many of the nutritionally significant substitutions. In the Dominican Republic, for example, "common" rice is substituted for "superior" rice as income falls. Rice is not an inferior food, but "common" rice is. This has policy relevance, because common rice may be a self-targeting food. If all rice had been treated as a single commodity, this information would have been lost.

4.3. Implementation of a Policy is as Important as Design in Determining Effects on Consumption

4.3.1. The Specifics of Implementation Determine Who Has Access to Program Benefits

Both producer-oriented and consumer-oriented food and agriculture policies often involve direct provision of services. How these services are provided determines who is able to take advantage of them. For example, price supports to producers are usually administered through government purchase. However, there may be institutional constraints to farmers receiving

the supposedly guaranteed price. Small farmers may be unable to reach centralized procurement posts where government purchases are made, or they may not be able to sell the minimum quantity required in some price support schemes.

There may be other restrictions on access as well. In Honduras, the majority of farmers were not registered to sell to the parastatal BANASUPRO (Garcia *et al.*, 1988). In Panama, it was found that many of the smaller farmers were not eligible to participate in the government's price support program because they were considered "part time" farmers, since they derived much of their income from off-farm wage employment (Franklin *et al.*, 1984), and in Peru, registration requirements excluded the majority of farmers (Franklin *et al.*, 1985).

Consumer price policies are subject to the same considerations. Details of implementation can restrict access to the benefits of a program even to those who are in principle eligible. In the case of the Dominican Republic, government-run distribution centers for subsidized food were hardly used by consumers, because travel time, lack of credit, and the minimum purchase necessary to make the trip worthwhile all limited access them (Rogers and Swindaie, 1988).

Similarly, the subsidized public distribution program in Honduras was limited in its effect by the inconvenience of making purchases there due to short hours, limited inventory, frequent shortages, lack of credit, and the fact that the stores were not located in the low-income areas (Garcia *et al.*, 1988).

4.3.2. Methods of Targeting can Restrict Access Even Within the Target Group

A policy which involves the provision of price subsidies or services to producers or consumers can be a costly drain

on the budget of the government. If the benefits of the policy can be restricted to those in need, that is, the target group, and if leakage outside the target group can be limited, cost-effectiveness will be improved.

The objective of targeting is cost control. However, there are several tradeoffs involved in targeting. Even when programs are designed to improve the incomes and food consumption levels of the poor, there are political costs to narrowing the benefits too much. A program whose benefits are enjoyed by a wide range of population groups will have stronger and more effective political support than one which reaches only the very needy.

Narrow targeting of a benefit to a particular group, while excluding the ineligible, risks excluding some members of the eligible population as well. The more rigorously the targeting is implemented, the more likely that it will reduce coverage of the target group along with leakage outside the group. The method of targeting will determine who within the target group is excluded.

This was demonstrated in the study of Sri Lanka's shift from an untargeted, rationed food subsidy system to a food stamp program targeted on the basis of reported income (Edirisinghe, 1987). The earlier program was extremely costly, and a high proportion of the benefits of the subsidy reached the relatively well-off population. It was estimated that in 1978-79, just prior to the shift to food stamps, only about 50% of the benefits of the subsidy reached the lowest two income quintiles. The shift to food stamps was intended to concentrate benefits of the program on the needy population, but the evidence is that the degree of targeting improved only slightly, while coverage was substantially reduced. Under the food stamp program in 1981-82, about two thirds of the benefits went to this group.

However, segments of the population whose income was well documented, including tea-estate workers (who are disproportionately members of an ethnic minority subject to discrimination) and employees in the formal sector, were excluded from the program, while those whose exact income was easier to hide were more likely to receive food stamps. As a result, calorie consumption in the tea estate sector declined more than that in other regions after the shift. Administrative targeting thus created problems of coverage and of equity, with only a moderate reduction in leakage.

Targeting by geographic location can be effective, but excludes target group members living outside the area.

Targeting by self-selection is theoretically an appealing alternative because the benefits of the subsidy can be made available to the entire population, with consequent political benefits, but only the needy will choose to take advantage of it. This mechanism for targeting has been effective in a number of settings. Quality-based targeting was tried in Egypt when the government switched to a higher-extraction-rate flour for the universally available subsidized balady bread (Alderman and von Braun, 1984). However, the feasibility of quality-based targeting depends on being able to identify a food which has the consumption pattern of an inferior good in the diet of the region. No such food was identified in urban Mali, for example, so there was no scope for such targeting (Rogers and Lowdermilk, 1988). In Sri Lanka, the only food which could be identified as self-targeting was wheat, all of which would have to be imported. Increasing imports was considered an unacceptable price to pay for achieving this targeting effect (Edirisinghe, 1987).

It is not a coincidence that the consumer price subsidies most often cited for their effectiveness in raising food consumption levels are the untargeted

programs in Egypt and Sri Lanka before the shift to food stamps. Unfortunately, neither is it a coincidence that these very programs are noted for their high cost, reaching one third of government current expenditure in Sri Lanka in the early 1970's.

Most food policy analysts have concluded that targeting is essential to the design of a sustainable subsidy program, whether the subsidy is on consumer prices, producer prices, or inputs. (See, for example, Timmer *et al.*, 1983.) The lesson to be learned from these studies is that targeting is usually desirable, and often feasible, but that the methods of targeting must be adapted to the local situation, and that the costs of leakage of program benefits need to be weighed against the costs, financial and other, of attempting to limit program participation. Perfect targeting is not a reasonable goal, but some degree of targeting can usually be achieved.

4.3.3. Policies Simple in Concept May Face Insurmountable Problems of Implementation

4.3.3.1. Price Stabilization Programs. The idea behind price stabilization programs is simple and appealing. The government purchases stocks when prices fall too far below the trend level, and releases them when the price rises too far above it. Extreme fluctuations in price are dampened, but long-run price signals are not distorted.

In practice, stabilization is extremely difficult to administer without distorting the price away from long term trends. In the face of long-term downward trends in most agricultural commodity prices (due to generally improving levels of productivity world-wide), and a long-term trend of inflation which raises nominal prices even as real prices fall, it is hard to identify the appropriate floor and ceiling prices to use in any given year. Border price parity (the inter-

national market price adjusted for the costs of transportation and marketing) is often used as a benchmark for determining free-market prices, but there is a great deal of distortion in these prices due to subsidy policies on the part of the major exporting countries (Rao, 1989).

There will always be political pressure from the organized agriculture sector to allow prices to rise and protect them from falling, while consumers will, to the extent that they can, exercise political pressure to keep prices low. Pricing guidelines are subject to political pressure precisely because it is so difficult to know what the true price in terms of domestic resource costs ought to be.

Government price policy, being a political variable, is in fact less predictable than price variation due to weather and other natural fluctuations in supply. This is especially true because of the high cost of price stabilization. Unless the government can be sure of having the budgetary resources to be a reliable purchaser of last resort, efforts at price stabilization are sure to fail.

Experience with government attempts at price stabilization has demonstrated that these problems are often insurmountable. Such programs have either collapsed from lack of funds (for example, Mali in 1987), or evolved into a tax on agriculture (as in the Dominican Republic before the dismantling of INESPRES, the price stabilization institute [Allen, 1985]). By focusing on a particular subset of crops, such programs can also distort the incentives within the agricultural sector, resulting in overinvestment in some crops at the expense of others (as happened in Jamaica with sugar [van Blarcom, 1983]). The conflict between the legitimate need for a degree of price stability and the high cost and difficulty of implementing stabilization has yet to be resolved (Timmer, 1989).

4.4. Problems With the Operation of Government and Parastatal Marketing Institutions

A number of the producer and consumer oriented policies discussed above were implemented by means of government-run marketing institutions. Government marketing agencies have had a poor record of success in implementing price support and price control programs, nor have they been effective in providing more efficient competition to private sector marketing.

4.4.1. Government and Parastatal Agencies Are Not More Efficient Than the Private Sector

The idea that marketing costs can be reduced if market functions are taken over by government (which, it is supposed, does not need to make a profit) has been discredited by experience. When such institutions have survived, it has been because funds were available from external sources, not because they were able to distribute the foods more efficiently.

For example, the price stabilization institute in the Dominican Republic, INESPRES, was able to sell low-cost rice by charging a high price for vegetable oil received as food aid from the U.S., or imported under a greatly overvalued exchange rate preferentially available to the government (Allen, 1985). The Honduran direct sales institution, BANA SUPRO, operated at a deficit which was financed by the sale of butter oil from European Community (Garcia *et al.*, 1988).

Other such agencies have operated at a deficit financed by transfers from the government budget. This was the case of the Pakistan ration shop system before it was dismantled (Rogers, 1978; Rogers and Levinson, 1976). In all these cases, a subsidy has been required to maintain

costs below those of the competing private sector. These results suggest that marketing margins in the private sector, even when high, reflect true costs rather than exploitive pricing practices.

4.4.2. Operational Problems of Parastatal Marketing Boards

Price supports are commonly implemented by means of the establishment of a state-run or parastatal agency which purchases the product at the support price and then takes responsibility for distributing it. Like retail marketing agencies run by the government, these boards usually operate at a loss, requiring a government subsidy to continue in business.

Parastatal marketing boards have been plagued with other problems as well. In Honduras, the Dominican Republic, and Tanzania, CEAP studies identified late payment to farmers as a barrier to the boards' effectiveness in administering price supports. In some cases, price supports administered by parastatals were lower than prices in the parallel market (legal in some cases, illegal in others), so that these agencies could not procure enough to meet their export or domestic distribution objectives. This was the case in Peru (Franklin *et al.*, 1985), for example.

There is an inherent tendency for the prices paid by parastatal marketing agencies to be maintained below free-market prices, because of their bureaucratic nature. Administrators are not rewarded for running their agencies into a deficit position, and they often have the legal power to enforce the sale of at least some portion of the commodity produced, so that competition with other buyers does not necessarily raise the price. Of course, the long-run consequences of enforcing producer prices below the market are reduced incomes to farmers and reduced production of the price-controlled product, often con-

trary to the original intent of the policy.

4.5. Time of Household Members is as Important as Income and Prices in Determining Food Consumption Patterns

Among the most significant research results to come out of the CEAP studies is the critical importance of non-price factors in determining consumption patterns. The purchase price of a food on the market can be a very misleading indicator of its true cost, if the time costs of purchasing and preparing the food are not taken into account.

The Mali study mentioned above calculated that the price difference between rice and the coarse grains substantially overstated the true cost difference between the two grains, because millet and sorghum (as they are prepared in Mali) require much more time and labor in preparation than does rice. They also take more time, and thus more fuel, in cooking, and they require milling, which involves either time or money, which rice does not. Rice is also considered to be more filling than millet and sorghum, so housewives purchase less rice to feed the same number of people than they would of sorghum. With these differences taken into account, the ratio of rice to coarse grain prices falls from a range of 1.16–2.07 to a range of .73 to 1.28, providing a clear explanation of the lack of substitution observed (Rogers and Lowdermilk, 1988).

Similar reasoning underlies the consumption preference for rice observed in rural Senegal (Josserand, 1982), even though the purchase price of millet was considerably lower. Because of local marketing patterns, millet was available only at large weekly markets, whereas rice could be bought close to the village every day, reducing both time and transport costs and the amount of the

minimum purchase needed at one time. As in Mali, the time costs of preparation were also significantly lower for rice.

The changing value of time, particularly women's time, has been shown to be an important factor in altering how prices affect consumption. The increased participation of women in the urban paid labor force has been suggested as the explanation for increased rice consumption in Burkina Faso (Reardon *et al.*, 1988), and may be at work in Mali as well. The CEAP study of Sudan suggested that women's market work, which reduced their time available for food preparation, was part of the explanation for the increasing importance of bread in the diet (Youngblood *et al.*, 1983), although falling real prices also contributed to the trend.

In Sierra Leone, households were more likely to consume cassava if they were producers of palm oil, because the processing of palm oil is a labor intensive task performed by women, and cassava required less time in preparation than millet (Smith *et al.*, n.d.).

An important determinant of the distribution of benefits in the Egyptian subsidy system was found to be the time cost of queuing at the ration shop (Alderman and von Braun, 1984). The researchers concluded that using time rather than administrative or other means for allocating access to the consumer subsidy resulted in an inequitable distribution of the benefits.

4.6. Conditions for the Effectiveness of Producer-Oriented Policies

4.6.1. Effects on Production Depend on Complementary Inputs

Farm households respond to market prices. The CEAP-funded study of farm household behavior in Sierra Leone (Smith *et al.*, n.d.) demonstrated respon-

siveness of even primarily subsistence farmers to changing price incentives. Support prices can thus be a means to increase production of a food or other crop. Prices are only part of the picture of determinants of farm production, however.

One reason is that farmers may not have access to the support price as it is administered. Many farmers, especially smallholders, obtain the credit they need by committing themselves to private sale at a price agreed upon before harvest. They are not free to look for the best price for their product at harvest time (Smith *et al.*, 1981a). Even aside from the issue of loans, farmers often have long-standing agreements with buyers which they cannot or will not violate in order to take advantage of a government-guaranteed price.

For example, in one region of Mali, farmers chose to sell to their traditional trading partners, while government procurement posts paying a higher price were located right next to them; the traders were able to sell the product immediately to the government's buyers at the higher price (Statz and Dione, 1987). The explanation for this apparently irrational behavior is that farmers often correctly lack faith in the continued availability of the government's price support program; they do not dare risk the loss of their guaranteed buyer for the sake of short-term gain. In the case of the Mali price-support program, lack of funds forced the government to abandon the program after only a few months, demonstrating the validity of farmers' concerns.

There may be binding constraints on the ability of farmers to respond to high prices by increasing production. Supply response may be limited by farmers' access to land, water, or other inputs. In Panama, price supports had a positive effect on rice yields and area planted, resulting in increased production,

Agricultural production can affect food consumption through its effect on employment and wage rates among the agricultural labor force.

because subsidized inputs were available. Corn production was not responsive to higher prices, in part because corn is produced primarily by part-time small farmers who were not eligible to receive these inputs (Franklin *et al.*, 1984).

Similarly, new technologies are often highly dependent on the availability of a whole set of complementary inputs, the lack of any one of which can jeopardize the expected improvements in yields. Usually, these complementary inputs need to be purchased with cash, making the use of improved technology dependent on the availability of credit. If access to credit and to inputs cannot be assured, the introduction of a new technology may fail, or may even have negative consequences for farm incomes and production.

In Mali, and in other countries of the Sahel, marketing infrastructure rather than price is the binding constraint on incentives to increase production. Transportation and storage are so inadequate that producing a surplus for sale beyond the local market is pointless; the surplus will simply rot before it can be marketed (Bremer, 1986). In a similar vein, the study of Egypt's food price and subsidy system concluded that the price of wheat, kept well below world market prices by a variety of government policies, was not the reason for lagging growth in output; rather, lack of irrigation, poor management practices, and resource constraints were identified as the causes (Alderman and von Braun, 1984).

4.6.2. Effects on Incomes and Prices Depend on Improved Productivity, Not Simply Increased Production

Production-oriented agricultural policies can affect income in several ways. Increased returns to the production of agricultural commodities can raise farm-

ers' incomes; improvements in the productivity of agricultural labor (through improved technology or increased prices for their products) can raise agricultural wages; if increased production lowers food prices, wage rates may fall, increasing employment. Lower food prices themselves have the effect of raising real incomes, that is, the purchasing power of consumers.

All of these positive effects have potentially negative ramifications, however. The specific effects depend on the nature of the agricultural policy and how it is implemented.

Increased production of a crop does not necessarily result in lower prices. If local production is marketed outside the area in which it is produced, or if it is exported, there may be no effect at all on prices within the region. If increased production is the result of an effective government price-support program, then obviously the price of the crop will be higher than it was prior to the government's intervention, unless the high support price is balanced by a lower consumer price paid for by an explicit government subsidy. While this high price may increase returns to some farmers (those able to produce the crop and able to take advantage of the support price), it will result in higher prices to consumers.

Agricultural production can affect food consumption through its effect on employment and wage rates among the agricultural labor force. Technologies which displace labor or shift the relative returns in favor of capital equipment are likely to have a negative effect on rural incomes and employment.

In developing countries, food is such a major share of total expenditure of the low income population that its price (that is, the prices of the major low-income staples) is the key determinant of wages. Thus any technology which lowers food prices by increasing

productivity should have the second-order effect of increasing the demand for labor, because wage rates can fall if the price of the key wage good falls. This effect, at least in the short and medium term, depends in part on the capacity of the economy to absorb increasing amounts of labor, even at lowered prices.

New technology which enhances the productivity of agricultural resources is the most satisfactory approach to resolving the conflicting objectives of policies affecting the agricultural sector. Cost reducing technology makes it possible for production to increase and prices to fall at the same time, without distorting economic incentives or creating a long term drain on government resources to finance subsidies. This apparently occurred for both rice and poultry in Panama (Franklin *et al.*, 1984). Price incentives coupled with technological change increased local supplies and lowered the prices of these foods. Technological change was also a factor in increased milk production lowering milk prices in Panama (Franklin *et al.*, 1984).

A technology which enhances the productivity of labor should also raise wage rates of hired workers, as well as real returns to farmers' own time.

4.6.3. Risk Management is as Important as Prices in Determining Farmers' Production Decisions

Risk management is an important factor in determining farmers' responsiveness to price changes. Farmers and consumers alike are rightly skeptical of any new, untried government intervention in the market. Especially in countries where policies have been frequently changed in the past, there will be reluctance on the part of farmers (or others) to change their behavior in ways which risk the loss of their subsistence if government commitments are not honored. This is an argument for govern-

ments to be extremely cautious in making commitments, and even more cautious in changing them once they have been made. Confidence in the reliability of government policies is hard won and easily lost.

The CEAP study in Senegal (Josserand, 1982) found that farmers changed their production mix in response to changes in relative prices, but one of the factors determining their production choice was the need to produce food for their own consumption. As market prices for rice increased, farm households increased their production of millet for home consumption, perceiving higher rice prices as a threat to their food security. In addition to confirming the importance of risk-reduction as a motivating factor for farm households, this case also demonstrates that price policies can have significant cross-effects, with sometimes paradoxical consequences.

Another case of risk reduction occurred among farm households in Kenya (von Braun *et al.*, 1988), who responded to the high returns on sugar by increasing production, but they still reserved some of the household's land and labor resources for production of food for home consumption. This decision represents less than absolute maximization of profit, and it demonstrates that both profit maximization and the minimization of risk enter into farm household decision-making.

4.7. Conditions for the Effectiveness of Consumer-Oriented Policies

4.7.1. Consumer Food Price Subsidies Can Be Effective in Increasing Household Food Consumption

The category of price-lowering strategies which has received the largest

share of attention in the CEAP policy studies is that of direct consumer food price subsidies. CEAP studies of consumer price subsidies were conducted in Egypt (Alderman and von Braun, 1986) and Sri Lanka (Edirisinghe, 1987). The study in the Dominican Republic (Rogers and Swindale, 1988) also addressed subsidized consumption issues, although subsidized food distribution was not a significant factor in most households' food consumption.

The Egyptian food price subsidy system, despite its web of complex and sometimes contradictory effects, does raise food consumption levels, according to the CEAP study (Alderman and von Braun, 1984). Calorie consumption in the lowest income quartile was 2,300 calories per capita per day, a very high level compared to other countries at a comparable income level. These researchers point out, however, that caloric and protein consumption levels well above those of comparable countries without widespread subsidies are not enough to reduce Egypt's infant and child mortality rate below that of comparable countries. They conclude that food consumption is only one determinant of child growth, and that the sanitation and health care situation in Egypt must also be addressed, if child health goals are to be reached (Alderman and von Braun, 1984).

The effectiveness of the Sri Lankan food price subsidy system in improving food consumption levels was demonstrated by the significant drop in caloric consumption resulting from cutback in subsidy levels after the government switched to a food stamp program in 1979 (Edirisinghe, 1987). In this case, negative effects of the subsidy cutback included a rise in infant mortality rates within a year after the switch to food stamps (McGuire, 1988), suggesting that the program had had a health effect.

The effectiveness of food price subsidy

programs, however, depends on the specifics of implementation discussed above: what foods are subsidized; how are they distributed; who is likely to consume them; and who has genuine access to the subsidized supplies.

4.8. Conditions for the Effectiveness of Marketing Interventions

Services included under the rubric of marketing include all the processes whereby a food gets from the producer to the consumer. Transportation, processing, storage, distribution, and sale are all areas of marketing. Interventions to promote the free functioning of the market include provision of market information (prices and availability in different markets), and encouraging competition.

Among the marketing interventions which have been implemented to foster growth in the agriculture sector are the following: opening the border to international trade; reducing restrictions on trade; providing improved storage and transportation services; improving farmer and trader access to market information; promoting competition by establishing parastatal marketing agencies which operate alongside a legal parallel market; and liberalizing the market by eliminating government or parastatal monopolies and monopsonies.

Marketing improvements can have enormous impact on local food prices and availability. In the CEAP study of Cameroon, one of the few explicitly focusing on marketing changes, the researchers concluded that extremely poor roads between northwest Cameroon and Nigeria caused such costly damage to vehicles that opening the border to legal trade in rice would not substantially increase the flow of rice to Nigeria, in spite of much higher prices in the latter country (Ariza-Nino

et al., 1982). They concluded that improvements in the roads would both dampen price differences among towns and make cross-border trade profitable, by opening the Nigerian market to Cameroonian producers. The impact of these changes on different groups of consumers in the region was not measured in this research. The effects would be hard to predict, since high prices in Nigeria would raise the incomes of producers and traders, but also probably raise prices in Cameroon. The effects would vary for different groups, and would depend on the relative magnitude of the two factors.

In Mali, numerous studies have identified poor marketing infrastructure as an important cause of the very wide year-to-year fluctuations in food prices and availability on the market (Bremer, 1986; Dembele *et al.*, 1986). Since much of Malian agriculture is rainfed, and rains are quite variable in this part of the world, production fluctuates greatly from one year to another. Transportation and storage are so limited that farmers have little incentive to produce more than they need for their own consumption and sale locally. In good production years, local gluts drive prices down drastically, but limitations on storage and transport prevent farmers from seeking higher-priced markets outside the region, which could presumably raise their incomes.

In poor production years, many small farmers switch from being net sellers to net buyers, putting pressure on market prices. This situation exacerbates normal price variations due to climate and season, and reduces household-level food security. Improvements in marketing could have a significant positive impact on food consumption.

The effects of any marketing intervention, like those of other interventions, depend on the local situation. In Guatemala, researchers found that the

construction of rural access roads, intended to facilitate marketing, had quite variable effects depending on the region. In one area, where soil is poor, farmers were unable to increase their production, and their incomes were unaffected. Non-farmers, however, received significant income benefits from their improved access to labor markets outside the area. In another region, marketing of agricultural products expanded significantly.

However, the effect of improved market access on farm income was extremely limited except when other activities were implemented at the same time to permit increased production for the newly available markets. Where irrigation and terracing were combined with access to roads, farm incomes increased by a factor of ten (Smith, 1984).

Conditions in the local and world markets at the time of implementation can also alter the consequences of a particular marketing intervention. Franklin *et al.*, (1985) concluded that the liberalization of trade in Peru in the late 1970's and the '80's did not raise consumer prices because during that period food prices were falling on the world market.

4.9. Limits on Household Income as a Determinant of Food Consumption

Household income is a primary determinant of household food consumption. In every one of the CEAP studies in which variation in income was observed, caloric and protein adequacy were found to be strongly associated with income level. The association between income and food consumption, a major if not the major consumption item in most household budgets in poor countries, should not be surprising.

Nonetheless, there are limits to the effectiveness of income change as a mechanism for assuring adequate food

The effect of improved market access on farm income was extremely limited except when other activities were implemented at the same time to permit increased production for the newly available markets.

consumption. One reason is that marginal income changes may not be large enough to result in significant food consumption increases. Households have many priorities for expenditure, of which food is only one; even with regard to food, households may prefer to use increases in income to improve the variety and (perceived, not nutritional) quality of their diets rather than simply the quantity of food consumed.

This was the case in the Sierra Leone study (Smith *et al.*, n.d.), where researchers observed that at low income levels, marginal increases in income resulted in slightly *lower* total caloric intake, but increased diversity in the diet. With the information provided in that study, it is impossible to say whether this decision was nutritionally wise or not; it would depend on the composition of the diet before and after the change. Many nutritionists argue that the caloric levels recommended by WHO/FAO (1985) are higher than necessary, so that diversifying the diet at only 80% or 90% of these levels could be beneficial, by providing more varied micronutrients, with no negative consequences for energy and protein levels.

These researchers did not address this issue. However, they concluded, based on their computed income elasticity of caloric demand, that it would take 22 years for income growth alone to bring low-income households to a consumption level of 1900 calories per capita per day.

The source of the income change is another factor determining the degree to which income increases are translated into increments in food consumption. It is increasingly recognized in the economic literature that household income is treated differently depending on its form, its period and reliability, and who earns it. (See Rogers, 1983; Rogers and Schlossman, forthcoming, for a review of the literature on this subject.)

For example, the Sierra Leone study found that increases in production of a particular food resulted in increased consumption of that food well above the increase that would be expected from the same amount of income received as cash (Smith *et al.*, 1981a). (This analysis computed the income value of the crop at the farmgate, not the retail price.) In the Dominican Republic, income in the form of home-produced and consumed food had a significantly greater impact on household caloric and protein adequacy than did income from other sources (Rogers and Swindale, 1988), but the valuation of home production at retail prices weakens this conclusion.

While income is typically measured at the household level, control over the income may be assigned to different individual household members, depending on a number of factors, including who earned it. Real income changes due to a general rise or fall in the price level do not change the balance of influence and power within the household, but most income changes arise from a change in the employment conditions or employment status of one or more members. With these changes come changes in the relative value of the time of some members (Rosenzweig, forthcoming), and changes in their degree of influence over household decision-making. These changes may provide some explanation of the "loosely meshed" relationship between nutritional status and income observed by some researchers (Behrman, 1987).

There is limited scope for government policy to affect directly the patterns of decision-making within the household. There are, though, policies which can alter the forces which shape these patterns. For example, policies which increase the returns to female labor, or the likelihood of child survival, may increase the amount of household food allocated to these members (Rogers,

1983).

If it is true, as frequently asserted in the literature, that women have a higher preference for food consumption than men, then income increments under the control of men will be less likely to result in increased spending on food. Indirect support for this hypothesis comes from the CEAP study in Egypt, which found that female-headed households consumed more calories than male-headed households at the same income level (Alderman and von Braun, 1984). A follow-up to the Dominican study found the nutritional status of preschool children higher in female than in male-headed households in the lowest income quartile, at equal level of calorie availability per adult-equivalent (Johnson and Rogers, forthcoming).

4.10. Limits of Household Food Consumption in Determining Individual Intake and Nutritional Status

Even if income increments translate directly into increases in food purchases, changes in the level of expenditure for food are a poor proxy for changes in individual dietary adequacy. First, expenditure may be devoted to improving the variety and quality of the diet rather than its quantity, as was the case among low-income consumers in Sierra Leone. It has been observed that even at quite low levels of food intake, marginal income increases are divided between quality and quantity of the food consumed. Franklin and co-workers found that households in the Dominican Republic diversified away from the lowest-cost acceptable diet after they had reached about 90% of caloric adequacy (Franklin *et al.*, 1976). Edirisinghe reports similar results for Sri Lanka at about 80% of caloric adequacy (1987).

Furthermore, increases in food intake are not necessarily distributed equitably

among household members. There is considerable evidence that in some cultural settings, some members receive less than their nutritional requirements, while others receive more. Pinstруп-Andersen and Garcia (forthcoming) found in the Philippines that average per capita caloric intake measured at the household level was a poor predictor of caloric intake of children. Edirisinghe (1987) found that the income increase represented by the food stamp program increased adult calories by 10%, but children's calories by only 5%. He found that once adults reached about 20% of caloric adequacy (between the second and third quintiles of income), children began to receive a larger proportion of the increase in household caloric intake.

Finally, there are many determinants of nutritional status other than the amount of food eaten. The Egyptian study found relatively high levels of infant mortality in spite of quite high caloric intake among the lowest income quartile, which they attribute to poor sanitary conditions and inadequate health care (Alderman and von Braun, 1984). A study of the effects of a commercial sugar farming project in Kenya (Kennedy and Cogill, 1987) found children's nutritional status unaffected by substantial income increases among households participating in the project, possibly also because of health conditions. Similar studies in four other countries, however, found significant nutritional improvement associated with increased household income (von Braun *et al.*, 1988). Jøsserand's study in rural Senegal (1982) found that income was a good predictor of caloric intake, but that nutritional status of children measured anthropometrically correlated with neither of these variables.

These results taken together suggest that poverty is indeed the major determinant of inadequate food consumption, but that policies or projects which raise

household incomes may not be enough by themselves to assure nutritional adequacy for all members within in reasonable period of time. This suggests that there may be a role for targeted food programs to complement income interventions, if food consumption is a serious concern.

The important point for this discussion is that the chain of variables leading to the determination of one individual's food consumption and nutritional

status contains many links, each of which is critical. Guaranteeing adequate food supply at the national level is no assurance of household food security; similarly, adequate household food supply may not be a guarantee of adequate nutritional status for each member. This reinforces the assertion that, to predict any policy's impact on nutrition, all the linkages need to be specified and their validity assessed.

5. Lessons for the Design of Policy-Oriented Research

5.1. Predicting or Assessing Policy Effects Requires Consideration of the Broader Economic Context

Assessing the consumption effects of a policy involves an understanding of a whole range of economic variables not directly related to food or agriculture. The close interactive relationship among the various sectors makes it imperative to consider not just agriculture but those aspects of the economy which may affect it, in order to have an accurate picture of the potential for any one policy to improve food consumption levels.

However, econometric models which incorporate the whole economy are too expensive to develop, and require too sophisticated a staff of economists to interpret; they are not feasible for most developing countries (Ivenson, 1983). More importantly, most general equilibrium or linear programming models which attempt to model the whole economy require too many simplifying assumptions to be useful for making predictions at the disaggregated level required for consumption analysis (Timmer, 1986).

The resolution to this dilemma is to perform the econometric analysis of various elements in the system (disaggregated demand analysis; disaggregated determination of income sources; analysis of the incidence of various trade and tax policies; descriptive investigation of the operation of institutions implementing food and agriculture policies), and to combine it with a solid understanding of the local situation, and a degree of sophisticated intuition about how these policies have worked in the past.

Past research on the consumption effects of agriculture and food policy has provided a wide range of experience on which to base hypotheses (to be empirically tested, of course) about how a pol-

icy might operate, and the important variables to consider: exchange rate, government deficit spending and inflation, the design and incidence of taxation, and trade restrictions.

5.2. Ongoing Monitoring of Policy Effects is Necessary Because the Economic Context Changes Over Time

It is not possible to assess the consumption effects of a policy once, and conclude that this assessment is valid over the long run. As the international and domestic economic situation changes, the dynamics by which a policy influences food consumption will also change. Assessment of the consumption effects of policies must therefore be updated on an ongoing basis.

5.3. Empirical Information is Required to Assess the Effects of Policies

There is no substitute for disaggregated analysis of demand parameters, based on detailed, household-level data from the country and region in question. Since it is increasingly recognized that food demand may be affected differently by different sources of income, it is desirable to have data not only on individual foods consumed and their sources, but also on the sources, forms and earners of household income. Household size and composition are also important for analyzing consumption effects. Because of the recognition that household food consumption levels are imperfect indicators of individual intake, information on the food consumption of individuals at risk of dietary inadequacy is important for assessing the probable nutritional consequences of a policy.

A clear lesson of the CIAP studies is that predictions about food consumption parameters based on experience in other countries are often wrong, and

The close interactive relationship among the various sectors makes it imperative to consider not just agriculture but those aspects of the economy which may affect it, in order to have an accurate picture of the potential for any one policy to improve food consumption levels.

need to be verified for each new location. The cost (which is substantial) of obtaining the needed data is very likely to be lower than the cost of a policy recommendation based on incorrect assumptions about consumer behavior.

5.4. Research on Policy Determinants of Food Consumption Requires More Time than Short Term Policy Impact Studies

Research is not always compatible with the need for quick-turn-around, focused studies to answer specific, pressing policy or program design questions. Research, especially if it requires household level data collection, requires years rather than months to complete in a responsible manner. A research project formulated with a particular policy application in mind may be completed under completely different conditions.

This was the case with the Mali study, which was formulated at a time when the policy debate focused on liberalizing the rice market by eliminating price controls and allowing the price to rise. By the time the study was completed, two years later, the international market price of rice had fallen, and the issue of concern was whether to keep prices high to protect domestic farmers.

This study, though, demonstrated the value of conducting research on food consumption patterns. The data on consumption patterns collected under the project is a continuing resource which has been of significant use to donor and government policy makers to answer different questions from those of concern earlier.

5.5. Research Can Influence Policy

Results of the CEAP studies were used to inform policy decisions in several

countries. In Sri Lanka, the government accepted researchers' advice about redesigning targeting methods and eligibility criteria for the food stamp program. The research in Mali provided an empirical basis for the dialogue between the Malian government and a multilateral donor group advising on cereals price policy; consumption effects could be explicitly considered for the first time. In the Dominican Republic, information on consumer purchasing patterns and sources of food was used in the design of a proposed targeted subsidy program under consideration.

Research results are most likely to be used if they have clear relevance to current policy questions. The research team should work closely with government counterparts so that they are aware of the issues currently receiving attention, and those that are likely to emerge in the future. They should spell out the ways in which their results can be used to shed light on these questions. (This is not to say that their role is to advise the government; it is not. But they may be able to clarify the probable consequences of some of the alternatives being considered.)

The involvement of nationals of the study countries in the research makes the incorporation of research results into policy more likely. The principal investigator of the Sri Lanka study was a Sri Lankan national, and was familiar not only with the policy questions, but also with the mechanisms of government operations, and the relevant people. This made him more effective in presenting the research conclusions in such a way as to make them useful.

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