

Table of Content

Contents	pages
1. Introduction.....	4
1.1. Definition and Scope.....	4
1.2 Goals of Agricultural Policy	4
1.3. Rationale of agricultural policy	5
1.4 Concept of food security	9
2. Analysis of Food Production Systems	10
2.1 Understanding Food production Issues.....	11
2.2 Characteristics of Agricultural Production	12
2.3 Food Production Analysis.....	20
2.4 Policy Analysis Matrix	35
3. Food security and Nutrition	40
3.1. Understanding the Hunger and poverty	42
3.2. Types of food insecurity	43
3.3. Dimensions of food security	43
3.4. Food Consumption Patterns	46
3.5. The Food Balance Sheet	46
3.6. Food Consumption versus Nutrition.....	47
3.7. Food Consumption Analysis.....	50
3.8. Food Safety and Food Security.....	52
4. Marketing Functions, Markets and Food Price Formation	54
4.1. Marketing Issues	54
4.2. Domestic Markets and Price Policy	55
4.3. Price and Income Policy Analysis	57
4.4. Trade Restrictions	59
4.5. Food Stamps and Rationing.....	59
4.6. Poor Peoples' Foods	60

5. Macro Food Policy.....	62
5.1. Food aid	64
5.2. Stabilizing Agricultural Markets.....	65
5.2.1. Buffer Stocks	66
5.2.2. Increasing Domestic Flexibility	67
6. Policy Analysis of the Product Markets.....	68
6.1. Improving the Marketing System	68
6.2. Price ceiling and Floor	68
6.3. Crop Insurance	69
7. Types of Agricultural Policies	69
7.1. Price policy	69
7.2. Marketing policy.....	71
7.3. Input policy	72
7.4. Credit policy.....	73
7.5. Mechanization policy.....	74
7.6. Land reform policy	76
7.7. Research policy.....	77
8. Agricultural Development Policy in Ethiopia.....	77
8.2. Food Security policy of Ethiopia	78
8.3. Export and Domestic Food Demand.....	78
8.4. Food Consumption in Ethiopia	78

1. Introduction

1.1. Definition and Scope

A policy is a deliberate plan of action to guide decisions and achieve rational outcome(s). The term may apply to government, private sector organizations and groups, and individuals. Presidential executive orders, corporate privacy policies, and parliamentary rules of order are all examples of policy. For the purpose of this course the scope of policy is limited to public (government) policy. From Government point of view, policy is the course of action chosen by government towards an aspect of the economy, including the goals that the government seeks to achieve, and the choice of methods to pursue those goals. Here, Government is the group of people in charge of running a country, and who are responsible for making policy decisions. Similarly, the State is also defined as the whole set of public institutions responsible for the administration and enforcement of policy decision. To describe the policy process, we can say that the government decides on the actions to be taken to reach some implicit or explicit objectives and then it is the responsibility of the state apparatus to implement those actions and to monitor their results.

1.2 Goals of Agricultural Policy

Current, agricultural policy is a critical element in determining the rate and pattern of economic growth. One set of policies (investment in education, health and sanitary facilities, and transportation infrastructure) has a broad impact on agricultural sector productivity. In general, economists, policymakers, and development institutions have reached a consensus on the importance of these investments. A second set of policies affects particular agricultural commodities or techniques of production. These commodity-specific policies include taxes, subsidies, and quantitative controls on particular outputs and inputs, and policies that affect the macro prices (interest rates, wage rates, and exchange rates). For this set of policies, little consensus has emerged on appropriate levels of use.

1.3. Rationale of agricultural policy

Governments in developing countries use agricultural policies to address a wide range of objectives, among which combating poverty, improving agricultural productivity, raising farm household incomes, reducing hunger, increasing food security, promoting sustainable resource use, and promoting gender equality are often paramount. While high income countries may have similar objectives, the scale of the challenge may be of a higher order in low income countries, and relative priorities may differ. Faced with these diverse objectives, and with differing structural circumstances and constraints, governments seek to choose the most appropriate instruments (policies).

Therefore, rationales for Agricultural policy intervention include:

1. accelerate the rate of income growth
2. correction of market failures
3. Promotion of non efficiency objectives.

The first reason that governments impose policies on their agricultural sector is the belief that intervention can **accelerate the rate of income growth**. Investment policies on the provision of public goods, such as the research and development of new technologies and infrastructural development (roads, schools, and health facilities) are examples of public sector interventions essential for increased economic activity. Sometimes, these investments will not be made by the private sector. Private investors may be unable to capture the full benefit from investment in public goods because it is impossible or too costly to exclude those who do not pay for services created. In other instances, consumption by one consumer does not reduce the availability of the good or service for others. Consumers therefore avoid declaring their willingness to pay for the good or service, and a market does not form. Finally, capital requirements of the investment might exceed the private sector's capacity to mobilize necessary financial resources. For most of these investments, the public sector has the potential to recover the costs of intervention through user fees or through taxation of the commodities or the regional populations that benefit from the investment.

The **correction of market failures** represents a second rationale for government intervention in the agricultural sector. If market imperfections are present, the prices of

goods or services will not reflect their true scarcity values because the private sector is unable to develop the institutions necessary for efficient market functioning. Rural credit markets, for example, might be hampered by a lack of information on alternative lending and borrowing opportunities in other regions, or by the absence of formal lending institutions that can mobilize savings. Market power is another example of a market failure; private sector suppliers (or consumers) are able to influence prices because their numbers are small and because buyers (or sellers) have no other market outlets. These conditions are asserted to prevail often in factor markets (those for labor, credit, and land) and sometimes in remote rural commodity markets.

Another type of market failure arises because of externalities-costs or benefits from production activities that are not fully reflected in market incentives. Soil erosion, environmental pollution, and over utilization of common property resources are common externalities. Some form of government intervention-a tax, subsidy, or regulatory control-is justified so that user costs (or returns) will reflect fully the effects of the externality. The value of an externality is often difficult to quantify, and in many cases subjective judgments must be made as to whether externality effects are significant. These measurement problems, combined with the administrative costs of tax and subsidy policies, cause quantitative or legislative regulations to be widespread policy responses to externalities.

Although policies to correct market failures or to provide public goods can be important, the most common rationale for intervention in developing country agriculture is the **promotion of non efficiency objectives**. The establishment of an efficient economy and the maximization of aggregate income are not the only, or necessarily the most important, goals of economic policy. When policy-makers are dissatisfied with the implications of income maximization, policies will be used to alter the economy. In some cases, these interventions will reflect neutral policymakers acting on a mandate from society. But more often, policies respond to the desires of special interest groups within or outside agriculture.

Income distribution concerns are often at the top of the list of non efficiency objectives. Food is the most basic of necessities, and low prices of food are considered an important determinant of the welfare level of poor consumers. Staple food prices influence producer income levels as well, and the manipulation of producer prices may generate a more equitable distribution of income in the economy. Income distribution policies will also reflect the influences of rent-seekers-agricultural commodity producers and input suppliers, consumers of food, and industrialists who view changes in agricultural prices as ways to increase profitability in production or to increase purchasing power in consumption. Government policies can benefit target groups through direct regulation of prices-such as tariffs or subsidies on imports or through policies that provide market power to the target group, such as the designation of monopoly suppliers of particular agricultural products or the allocation of import and export licenses.

Price stabilization is a second common justification for intervention in agriculture, dependence on the whether causes agricultural production to exhibit a relatively large degree of random variation. When combined with inelastic demand, supply variations can cause market prices to fluctuate substantially from one production cycle to the next. The consequent potential income fluctuations for poor producers and variations in expenditure for poor consumers are often unacceptable to policy-makers. To avoid substantial fluctuations in domestic market prices, many governments establish a set of policies, choosing among international trade controls, storage schemes, price fixing, and rationing. Elements of market failure are also partially responsible for interventions of this type. In production, for example, crop insurance and futures and options markets are institutions that reduce the uncertainty of future prices and income. However, these institutions are usually absent from developing country markets.

National concern over the appropriate role for agriculture in the economy provides a third set of non efficiency rationales for government intervention. Food security and self-reliance of staple food supplies are commonly held objectives for agricultural policy. For food-importing countries, the attainment of these objectives requires intervention to increase domestic production. This intervention might involve changes in producer prices of outputs and inputs, investment in infrastructure for production or marketing activities,

or quantitative restrictions on the production of alternative crops. Agriculture also contributes to government revenue and the maintenance of fiscal balance in the public sector. Income taxes are a relatively unimportant revenue source in most developing countries because informal methods of income payment are prominent. As a consequence, the administrative costs of income monitoring and tax collection are often prohibitive, and indirect taxes on commodities are an important source of revenue. Because of its large size, the agricultural sector is usually expected to play a prominent role in the generation of tax revenues.

1.4 Concept of food security

Food security is achieved when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. A focus on nutrition adds care giving practices, health services and healthy environments to the definition of food security. Food security is affected by both physical and temporal factors. The physical factors relate to food flow in terms of availability, accessibility and utilization.

Availability of food is achieved through production, domestic food stocks, commercial food imports or food aid. While Food accessibility is achieved through purchasing power, financial outlays or access to the necessary resources. Food utilization is associated with the socio-economic dimension of household food security. For example, if sufficient and nutritious food is both available and accessible, the household can make decisions regarding what food is purchased, prepared and consumed and how it is allocated within the household. In households where distribution is unequal, even if the measured aggregate access is sufficient, some individuals may suffer from food deficiency. At the individual level, food security also requires consideration of the biological utilization of food: the ability of the human body to convert food into energy which is either used or stored. Utilization requires not only an adequate diet, but also a healthy physical environment, including safe drinking water, adequate sanitary facilities and an understanding of proper health care, food preparation, and storage processes.

The temporal aspect of food security involves stability, the time frame over which food security is being considered. Food and nutrition insecurity can be transitory (short-term) or chronic. Further, transitory food insecurity can either be cyclical (when there is a regular pattern of food insecurity, e.g., the ‘lean season’ or ‘hungry season’ that occurs in the period just before harvest) or temporary (which is a result of short-term, exogenous shocks such as droughts or floods). Thus, food security is defined as the ability of a household to have adequate access to quality food throughout the year, for all individuals.

2. Analysis of Food Production Systems

Agriculture is the basic source of food, and farmers are the basic food producers. Farmers are remarkably diverse people, ranging from near-subsistence peasants to commercial large scale businessmen. Nevertheless, private agriculture is a markedly homogeneous industry in the kinds of decisions that must be made day in and day out and in the kinds of uncertainties that condition those decisions. Much of farmers' daily work is done at their own initiative, and the incentives that induce them to work in a timely and careful fashion strongly influence the quality and quantity of agricultural output. In both private and commercial agricultures the decision making environment is conditioned by incentives to work. Identifying the factors that influence the size and composition of agricultural output is impossible without an understanding of the decision making environment of the farm household.

Analysis of food production system addresses four important questions.

1. **What are the objectives for the sector itself, as opposed to the broader objective of providing food to meet consumption requirements?** Answering this question involves understanding why the agricultural sector is different from other sectors and what the social and analytical issues that flow from these important differences.
2. **How do farmers make decisions?** Only with a decision making framework that incorporates the full range of factors influencing farm households is possible to address the behavior and performance of the food sector as a whole. Most farm households are characterized by joint consumption-production decisions, but not in a tightly defined subsistence setting. Farm households base their consumption and production decisions on farm input prices, cash and food crop output prices, the prices of consumer goods from the market, the opportunity cost of their members' time either in outside labor markets or on farm production (including household work), and demand for leisure. The full context of household decision making is essential to understanding how food production will change when external circumstances change.

3. **What government interventions are available to change household decision making** and thereby change the performance of the food producing sector? Understanding how interventions will affect decision making is more important for agriculture than for any other sector, for the government has very few interventions available that can directly alter domestic food production. An old saying holds that governments do not grow food; only farmers grow food. But governments can import food, subsidize fertilizer, make agricultural research a priority, or "purchase" food surpluses at gunpoint. For better or worse, the farmer's fate is tied to government policy, and the government's fate, or at least the success of its food production plans, hinges on the willingness of farmers to go along.
4. **What are the elements of a successful agricultural development strategy?** Of the wide variety of possible government interventions, what combination will reinforce the achievement of sectoral goals and simultaneously serve the broader set of food policy objectives? This question raises somewhat different issues from those of traditional output-oriented agricultural development literature, for the food policy analyst is concerned with the intersectoral and consumption consequences of a production strategy as well as the impact on yields.

2.1 Understanding Food production Issues

What does society want from its food producing sector? The answers used to be cheap food and cheap labor to foster industrial development and the earning of foreign exchange to buy the capital machinery to make it possible. A host of new complexities, however, has been added. A concern for rural poverty, unstable world markets, and the importance of efficient growth in the rural economy as well as in industry now make the question much more difficult to answer. What works in one location may not work in another, even in the same country, because the ecological setting is different or because farm households face different constraints on their decision making. The food production issues important to the policy analyst begin with understanding why agriculture as a sector is so different from other industries and why agriculture itself is so heterogeneous from farm to farm and even from field to field.

Five features set apart the agricultural sector from other productive sectors of an economy: its large contribution to national income, the large number of participants, the peculiarities of the agricultural production function, the role of the agricultural sector as a resource reservoir, and the importance of home consumption of output. These features are more evident in traditional societies, and their distinctiveness tends to erode during the process of economic modernization. Indeed, the most striking characteristic of agriculture is its almost universal tendency to diminish in importance relative to other, more rapidly growing sectors of the economy. There are healthy and unhealthy declines, however. An urban-biased development strategy that neglects agricultural investments and incentives can force an agricultural decline. The alternative path-rapid growth in both agricultural and industrial sectors-leads to a relative shift in the agricultural sector's importance because citizens with higher incomes consume relatively less agricultural produce. Finding the path that fosters growth in agriculture and industry is the goal of the analysis here.

2.2 Characteristics of Agricultural Production

The only way to produce output is to combine the necessary ingredients (the inputs or factors of production) in suitable proportions so that the overall process yields the desired product. One unusual feature of the agricultural production function (the technical relationship that specifies how much output will be produced from any particular combination of inputs) is the joint combination of labor and management. Knowing what the right inputs are, how to combine them, and how to tend the process is the major function of management. In farming, this management skill is frequently combined with the farm household's own labor power, which is also an important ingredient in growing food. Several other features contribute to the uniqueness of agricultural production functions. The most important are seasonality, geographical dispersion, risk and uncertainty, and sources of technical change.

Seasonality

No agricultural region of the world has an absolutely constant year-round climate. Winter and summer create distinct growing seasons in the temperate zones. Wet and dry seasons and monsoons create conditions in which planting is appropriate, harvesting is difficult, or some crops simply do not thrive. Climatic variations cause agricultural production to follow distinct seasonal patterns even in most tropical areas, but seasonality is not a fixed and rigid constraint. Rice will grow in the dry season if irrigation water is provided.

Seasonality is important to farmers because it is generally cheaper to let Mother Nature provide many of the essential inputs for agricultural production-solar energy, water, carbon dioxide, temperature control, and essential nutrients from natural soils. But it is not always economical to let nature dictate the agronomic environment. One of the major tasks of government policy is to invest in socially profitable interventions, such as irrigation and drainage, that increase farmers' control over the crops that can be grown in particular regions and seasons.

Seasonality also tends to place high premiums on the timely performance of such critical agricultural tasks as plowing, planting, cultivating, and harvesting. Even though the available labor pool may seem more than adequate to provide the required number of man-days per hectare over an entire year for all the crops being grown, significant labor bottlenecks may occur if certain tasks must be performed very quickly at specific times to ensure maximum yields. Such bottlenecks frequently induce individual farmers to mechanize specific tasks-plowing or harvesting-even when much rural unemployment exists over the course of the year. Furthermore, a tractor that pays for itself by timely plowing then has a very low marginal cost of operation for other tasks as well, and labor displacement can be much more widespread than would be indicated by the removal of the plowing bottleneck alone.

Two lessons are apparent. First, seasonal aspects of agricultural production frequently constrain yields because of input bottlenecks. Labor is most often the constraining factor, but fertilizer, seeds, credit, or irrigation water must also be available at specific times. When fertilizer reaches the village go down a month after the proper application time, it may as well not have arrived at all. Government authorities responsible for managing the

distribution of agricultural inputs are frequently unaware of or insensitive to the extreme importance of the timely availability of inputs. Suppliers whose incomes depend on providing appropriate inputs to farmers when and where needed are much more responsive to shifts in weather, cropping patterns, and new technologies than are government agencies trying to allocate inputs available from a planned industrial sector. Modern agriculture that uses industrial inputs as the basis for high yields is a dynamic enterprise quite unlike factories. It requires smoothly functioning input and output markets for production in the sector to grow rapidly and efficiently.

Second, there are often very high private economic returns to eliminating seasonal bottlenecks in production. When these private returns are generated at least partly by higher and more stable yields of agricultural products, society is also likely to gain. But if the private gains come from displacing hired labor that has few alternative jobs, the social gains may be small or even negative.

Geographically Dispersed Production

Agriculture is the only major sector that uses the land surface as an essential input into its production function. Like seasonality, this widespread use of land is due to the largesse of nature. It is simply cheaper to let farms capture the free solar energy and rain and provide the light, nutrients, and water from industrial sources. This wide geographical dispersion of agricultural production has an important economic consequence. Transportation becomes essential if any output is going to leave the farm for consumption by others or if inputs, such as modern seeds, fertilizer, pesticides, or machinery, are to be used on the farm to raise output.

In combination, seasonality and geographical dispersion create the need for a marketing system that can store the product from a short harvest period to the much longer consumption period and can move the commodity from the farm where it was grown to the many households where it will be consumed. Both functions require that the commodity change hands and that ownership be exchanged. This transaction can happen

only when both parties agree on the terms of the exchange, that is, the price, for the commodity at the point of sale.

Risk and Uncertainty

Risk is defined as a situation where all possible outcomes are known for a given management decision and the probability associated with each possible outcome are also known. Probabilities are often assigned to other events such as the probability of rain in a weather forecast or the outcome of a sporting event - However they are subjective probabilities based on the judgement and experience of an individual. In any situations the true or actual probabilities can't be determined subjective probabilities are the only ones available, and they may vary from individual to individual.

Uncertainty- Defined as imperfect knowledge. We do not know when it occurs. Exist when one or both of two situations exist for a management decision. Neither all possible outcomes nor the probabilities of the outcomes are known. It is lack of knowledge about the state of the world at some future time. World represents both economic and natural events. There is less uncertainty about tomorrow than is about a year; hence less about a year than about ten years Long term farm-system planning is far more hazardous than seasonal or annual planning.

Farmers of the world over talk primarily about two topics, the weather and prices. On these two variables ride the rewards for the whole year's effort in farming. A failed monsoon, a flood, or a hailstorm can wipe out the crop. A bumper harvest can cause large losses if the price falls too low. No other industry depends on the whims of nature and volatile markets as much as farming does. Farmers who repeatedly make good decisions in response to rapid changes in their economic environment tend to survive and thrive. Those who do not, frequently fail and move to urban areas in search of jobs. Or they become impoverished landless laborers dependent on the rural economy for their incomes and access to food.

The fact that weather is uncertain causes farmers to behave differently than they would if weather were always known. This uncertainty usually leads farmers to choose crops that

will resist the extremes of weather, particularly crop varieties that are more tolerant of weather variations, and lower levels of inputs than would be optimal in a predictable world because of the risk of losing the investment altogether. These individual farmer reactions to uncertainty spill over into the arena of policy concern, for the resulting crop mix and aggregate output might be quite unsatisfactory for meeting government goals.

Equally important, farmers' reactions to weather variations have consequences for aggregate output. A late monsoon may cause millet instead of wheat to be planted, good rains may permit a second or third rice crop, and high temperatures and humidity can bring pests and diseases that force farmers to change crop rotations. As each farmer reacts, the adjustments can spill over into rural labor markets and cause serious shortages if planting must be done suddenly when the weather breaks or the harvest brought in before a flood. A particularly "dry" dry season may mean the second crop is not planted or harvested, and an important source of wage income is eliminated for many rural workers. The reduced harvest may not be the most important consequence of such a crop failure. A famine could result because of the failed income opportunities.

In addition, fluctuations in aggregate production are magnified at the level of marketing (produce available for consumption by non-farm households) because farm household consumption tends to vary somewhat less than production. Consequently, marketing varies considerably more than production in economies where a significant share of food production is consumed directly by the farm household. In years of poor weather, net marketing declines proportionately more than production. Similarly, in good years the percentage increase in marketing is usually substantially larger than the percentage increase in production. These wide fluctuations simply add to the governments' difficulty in stabilizing domestic food prices and provisioning urban areas. A tendency to use food imports for these purposes is certainly understandable, but it frequently discriminates against food producers.

Price uncertainty also adds to the farmer's difficulty in deciding what crops to grow and how many inputs to use in growing them. Unlike the handful of manufacturers in large-scale industries, farmers are unable to set their output prices and then adjust production

and inventory levels to meet the price targets. Unlike consumers, who know with near certainty the price they must pay for a given quantity and quality of a commodity at the time they buy it, farmers must make major input purchase decisions well in advance of knowing what prices their resulting output will bring. At the time many key farming decisions are made-the allocation of land to various crops, fertilizer applications, hiring labor for weeding-the farmer can only guess at the prices for the output.

Reducing weather and price uncertainties is an important task for food policy interventions. Dams and drainage ditches can reduce the impact of rainfall variations, crop insurance can provide a guaranteed income floor even if heavy investments are wiped out, and research on more adaptable but still high-yielding plant varieties can reduce the risks of new technology. Similarly, a government can reduce price uncertainty by providing better price forecasting information, by using import and export policy to provide a band of prices within which domestic price formation can take place, or by implementing a more aggressive floor and ceiling price policy with a government-operated buffer stock program. But these efforts to stabilize prices must be visible in market operations, not just in press releases and legislative actions. Most farmers have learned by painful experience that simple statements of government intentions to stabilize prices, or even to require them by law, are ineffective.

Sources and Dynamics of Technical Change

Technical change is the source of most productivity growth in the long run, as continued investment in traditional technology very quickly faces low marginal returns. Most farmers are inveterate experimenters and tinkerers, always on the lookout for a slightly better way of doing things, whether a different seed spacing or a modified shape to the plow.

Technical change in agriculture shares many of the characteristics of technical change in other sectors, especially the tendency for individual inventors unable to capture the full economic rents from their inventions. The economic returns to innovation are small from the private inventor's point of view unless the new agricultural technology can be

restricted for sale by its inventor or approved licensees. But the social returns to innovation may well be very large. Both the sheer scale of investment required for modern agricultural research and the inability of private research companies to capture the full return to their inventions mean that public agencies should play a leading role in funding and in carrying out agricultural research.

Diffusion of new technology is also a matter of policy concern, especially because not all farm households have equal access either to the knowledge to use new technology or to the agricultural and financial resources needed to make it productive on their own farms. Credit programs designed to improve the access of farmers, especially small farmers, to modern inputs are an essential component of the input programs themselves. Some inputs are "lumpy" and cannot be used efficiently on farms of even average size in many parts of the world. Large-scale tube wells and tractors might contribute significantly to higher productivity even on small farms if institutional arrangements can be found to separate the ownership of the assets from the service flows that such inputs can provide.

This public role can be overemphasized; the evidence suggests that truly profitable innovations spread quickly no matter what the government does. Where the entrepreneurship exists and the economic environment permits, rental arrangements and tractor-hire services frequently emerge spontaneously. But the location-specific nature of much new agricultural technology, especially seed technology, means that large areas of a country may be bypassed by the diffusion process unless government research and extension workers are actively engaged in the on-farm testing and evaluation of new technology. Adapting a general agricultural technology to a specific seed strain or technique that fits individual farming environments is a major responsibility of local research and extension stations.

An important policy concern is the impact of technical change on agricultural employment and rural income distribution. Historical evidence shows enormous variation in both the short-run and long-run impacts of innovations. The issues cannot be addressed satisfactorily by looking only at an individual farm. Because agricultural innovations tend

to be embodied in inputs that must be provided through markets, they have complicated effects on the entire rural economy and eventually on the urban economy as well.

Most technical changes alter the biological processes of plants and animals to increase yield or they improve the efficiency of the mechanical functions needed to tend those biological processes. Primitive agriculture uses natural biological materials and processes in combination with human labor and management to bring in a food crop or livestock product. Modern agriculture uses scientific knowledge to reshape the biological materials so that each plant and animal is more productive, and it increasingly substitutes machines for human labor. Biological-chemical innovations, such as hybrid seeds, fertilizers, and pesticides, tend to increase yields and save land. Mechanical technology can also have a yield effect when it permits heavy soils to be cultivated or water to be pumped to dry lands, but most mechanical technology is designed to make agricultural work physically less burdensome and to save on the labor needed to produce a unit of output.

Because most new agricultural technology is embodied in a physical input—a bag of fertilizer, a new seed variety, a tractor, or an irrigation pump—it can be effective in a farmer's field only if a purchase (or rental arrangement) is made. Several consequences flow from this simple fact. For small farmers to participate in the benefits of technical change, they must be able not only to use the input on their farms (combines, for instance, usually are too large), but also to purchase the input that carries the new technology. Where a new seed-fertilizer package has a 200 percent rate of return, even borrowing from a village moneylender at 10 percent per month may be profitable. But for the full benefits of modern technology to reach small farmers, a credit program accessible to the farm household with only half a hectare or less may be essential.

Equally important, since new technology is embodied in inputs, a marketing and distribution system will be essential for both socialist and capitalist farmers to be able to purchase the inputs. Many traditional agricultural societies have a long history of small-scale marketing of surplus output to urban regions in exchange for consumer items, such as cloth, kerosene, or pots and pans, needed by farm households. There is no similar experience with large-scale movements of inputs, such as fertilizer or modern seeds, to

those same dispersed farm households. The embodied nature of agricultural technology means that farmers cannot just be told about it. The marketing system must also deliver the inputs when needed.

Complementary fixed capital investments are required to achieve the maximum benefits from the innovation. Usually this investment takes the form of better water control, land leveling, and drainage. Better control of seed bed preparation may sometimes require tractors with modern implements. Combines or threshers may be needed for faster and more sensitive harvesting techniques to avoid shattering and other harvesting losses. Shorter-maturity cereal varieties are often ready to harvest while the rainy season is still under way and solar drying is difficult or impossible. In such cases mechanical dryers and added storage capacity are essential.

2.3 Food Production Analysis

With an understanding of the features that make agriculture a unique sector, analysts are ready to address the basic production decisions farmers must make to function effectively year in and year out: **what crops to produce, what combination of inputs to use to produce them, and what total output to produce.** These decisions are related to each other in an economic decision making framework that provides a rationale for farmer response to changed incentives. This section focuses on each of the decisions individually and then combines all three to relate output decisions to changes in output (or input) prices in order to construct a supply curve. The supply curve is a very convenient conceptual and empirical tool which summarizes a great deal of complicated producer decision making in a simple two-dimensional diagram.

Product-Product Decisions

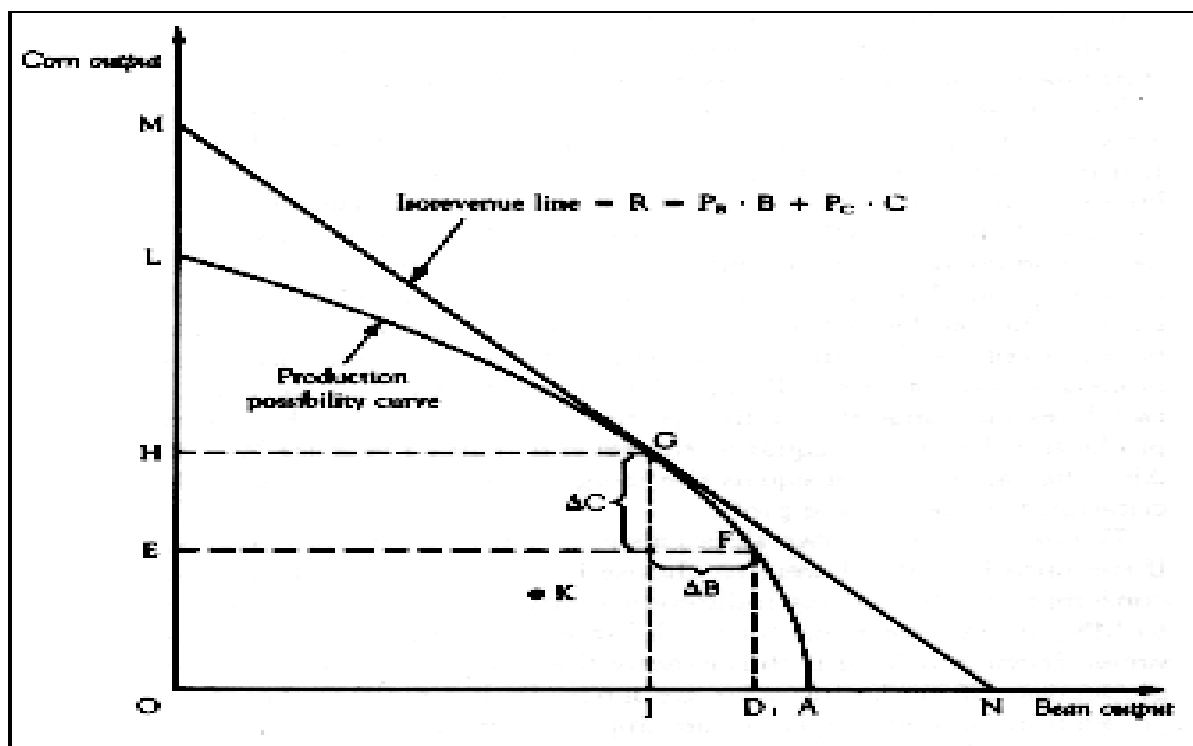
From wide array of possible crops, farmers must decide what commodities to produce. Except for perennial tree crops and pastoral livestock systems, these choices about which products to grow (often called product-product decisions) are faced annually, sometimes even monthly, by farmers. To make such choices in a rational fashion, farmers must assess the opportunity cost of growing more of one crop at the expense of another.

The production possibilities available to a farmer are depicted graphically in figure 3-1. A production possibility curve, LOFA, is drawn to show the various combinations of two crops that are technically possible for a farm household to grow using its available resources on a given plot of land in a single season. In this example, a farmer could choose to grow only beans (OA kilograms) and no corn. At the other extreme the choice could be to grow only corn (OL kilograms) and no beans. Point F represents a farmer's decision to grow some of each, OD kilograms of beans and OE kilograms of corn.

A rational and knowledgeable farmer would consider only points actually on the production possibility curve. A point such as K, which is inside the curve, represents an output level substantially less than the available farm resources could produce. It is not uncommon, however, to observe a farmer operating at an interior point such as K. The reasons might include bad weather or a pest infestation, lack of knowledge about appropriate production techniques, or an experimental new technique that failed. Understanding why some farmers are not on the production frontier is one step in determining the constraints on expanding output.

The production possibilities are shown as a curve, rather than a straight line, because the farm household's resources cannot produce corn and beans equally well. If the two crops were perfect substitutes, the production possibility curve would be a straight line. The greater the curvature, the less easy it is to substitute one crop for another. Nearly all crops are substitutable for others to some degree if suitable investments are made in providing an appropriate growing environment. Whether such investments should be made for a particular crop is a crucial issue for agricultural policy. If self-sufficiency

Figure 3-1. Product-Product Relationship



in corn is an important objective, it is possible to tear out rubber trees or tea bushes and plant corn. The decision to do so is only partly an agronomic issue. Policy and economic incentives are often the determining factors.

A farmer represented in figure 3-1 who wants to increase the production of corn, from point F to G, that is, by $\sim C$, must give up $\sim B$ units of beans. This opportunity cost is shown by the slope of the production possibility curve. As drawn in the figure, this slope is measured in physical units (such as bags, bushels, or kilograms). But farmers want to know the relative values they gain and give up, not weights. For this comparison, they need to know unit prices for the output. Whether the farmer's decision to grow more corn and fewer beans produces greater revenue can be determined only by comparing the value of bean output forgone ($\sim B \cdot PB$) with the additional revenue expected by growing more corn ($\sim C \cdot PC$), where PB and PC are the sale prices of beans and corn, respectively. If the gain exceeds the loss (if $PC \cdot \sim C > PB \cdot \sim B$), the farmer will find point G more profitable.

The combination of corn and bean output that maximizes revenue is tangent to the highest possible iso revenue line. This line is shown as MN in figure 3 - 1. It represents the combined value of output of both corn and beans ($P_B \cdot B + P_C \cdot C$). Along this isorevenue line the total revenue is constant. The farmer prefers higher isorevenue lines to lower ones but is equally content with any position along a particular line (in the absence of differing variable costs and assuming the same risks for each crop).

The slope of this iso-revenue line is $-P_B/P_C$ and represents the rate at which corn can be exchanged for beans in the market. This property is identical to the price relationship facing consumers with a given income, or budget, constraint. In fact, for the simple decision making environment illustrated here, line MN is the farm household's budget constraint as well as its maximum revenue possibility. When this isorevenue line and the production possibility frontier are tangent, as at G, the slopes of both lines are equal. The production possibility frontier represents the physical tradeoff between corn and beans, or $\Delta C / \Delta B$, and the isorevenue line represents the monetary tradeoff, or $-P_B/P_C$. These two ratios must be equal when the two lines are tangent. At this point, G in figure 3-1, the revenue of the production lost is just equal to the revenue gained because $P_C \cdot \Delta C = P_B \cdot \Delta B$. The marginal cost equals the marginal revenue, the standard economic criterion for maximizing profit.

The equality of the two slopes also has implications for consumer welfare. If the farm household were to choose between corn and beans for its home consumption, the highest indifference curve it could reach would be tangent to MN, its income constraint. The rate of commodity substitution in consumer decision making is thus exactly the same as the rate of substitution in production (if marketing costs are ignored). No reallocation of resources in production or consumption can improve on this result without lowering output or welfare in some other part of the economy. Such a result is said to be a Pareto Optimum.

Relative prices are clearly a major factor determining important decisions of both consumers and producers. Since government policy frequently uses import or export controls to alter relative commodity prices, as well as exchange rate policy to alter the

level of prices, it is apparent that farm-level decisions about how much of which crops to grow can be directly influenced by such indirect government interventions. Extension agents may be urging farmers to grow more corn, but if government price policy favors beans, many farmers will ignore the advice.

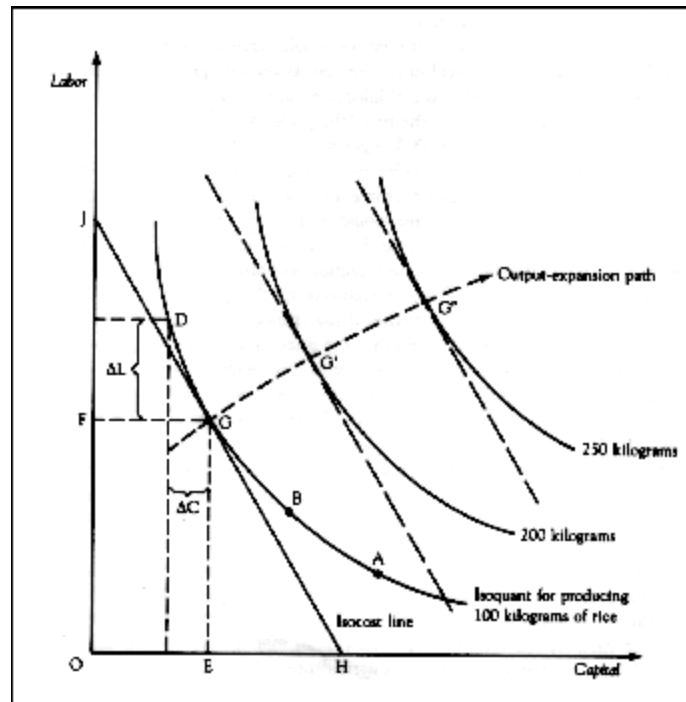
Factor-Factor Decisions

When the farmer has decided which crops to grow, the next decision is how to grow them. To a significant extent farmers can use varying combinations of factors of production, or inputs, to produce a given crop. When the inputs are labor and capital, these factor-factor decisions have important consequences for employment and income distribution in rural areas. The extent to which labor and capital might substitute for each other in the agricultural production process is represented graphically in figure 3-2. The curved line DGBA represents all the different combinations of labor and capital that could be used to produce, for example, 100 kilograms of output. Point A would be a relatively capital-intensive technique. Point D would use more labor to produce the same amount of product.

An infinite number of input combinations is theoretically possible on the 100 kilogram iso quant that shows equal quantities of output. In practice, however, only a limited number of combinations are likely to be important to farmers. Figure 3-2 illustrates four alternative techniques: hand labor (point D), oxen (point G), a small tractor (point B), and large mechanized equipment (point A). The isoquant connecting these points portrays the possible technical alternatives for growing 100 kilograms of rice.

The appropriate combination of labor and capital is determined by the prices of the inputs. A farmer cultivating with human labor, who contemplates using oxen, wants to know how much labor is saved and how much

Figure 3-2. Factor-Factor Relationship for Growing Rice



oxen time is needed. Schematically, this is shown as a move along the isoquant from point D to G, to represent a change in the combination of inputs, with $\sim L$ less labor and $\sim C$ more capital. If labor and capital were priced so that the cost of the labor given up were greater than the cost of the additional capital used, that is, if $\sim L \cdot PL > \sim C \cdot PC$ where PL and PC represent the prices of labor and capital, respectively, the farmer would find the switch to the more capital-intensive combination is profitable.

With the prices for the two inputs known, it is possible to construct an isocost line connecting points of equal costs. This line represents the various possible combinations of labor and capital that have the same cost. Like the slope of the isorevenue line, the slope of an isocost line is the negative of the price ratio of the two inputs. In figure 3-2, where the isocost line is tangent to the 100 kilogram isoquant, at point G, the farmer has determined the least-cost combination of labor and capital that will produce 100 kilograms of output. At any other point on the same isoquant, it will cost more to produce that amount of output. When marginal costs equal marginal revenue ($\sim L \cdot PL = \sim C \cdot PC$), a farmer is using the least-cost combination of inputs to produce a given level of output.

To produce any more output, the farmer would have to use more capital, more labor, or both. Each level of output has its own isoquant, represented in figure 3-2 by isoquants labeled 200 kilograms and 250 kilograms. A dashed isocost line is shown parallel to the first (the price ratio of labor and capital is the same) and tangent to the 200 kilogram isoquant. **The point of tangency at G' represents the least-cost combination of labor and capital to produce 200 kilograms of output.** In this example a farmer using the least-cost combination to produce 200 kilograms would employ relatively more units of capital than labor in expanding output from 100 kilograms to 200 kilograms.

Farmers make decisions about their techniques of production-their factor-factor choices-according to the price relationships that prevail for the factors relative to their productivity. Whether those choices are "appropriate" in a broader social sense depends on whether the prices and available technology that led to the decision reflect the total costs to society of the techniques chosen. If capital is subsidized, either directly or indirectly, farmers are likely to choose techniques that use more capital than otherwise. If labor policy tries to push up wages, fewer workers will be hired.

The actual prices for factors of production faced by rural decision makers-wages, the cost of capital and imported equipment-are influenced significantly by macro policy. Such policy is often made by government officials who have little knowledge of whether the resulting rural decisions produce appropriate or inappropriate technology choices in agriculture. In many developing countries macro policy is designed to keep capital cheap to favor investment, to raise wages to increase incomes of workers, and to provide direct or indirect subsidies to imported capital machinery, such as tractors or combines, to raise productivity in agriculture.

If unskilled labor is widely available in both rural and urban areas, however, these policies often have exactly the opposite effect from that intended. The number of jobs created for each dollar of capital invested is low, wages outside the large-scale, formal sector are depressed, and mechanized farming exists side by side with rural unemployment and extreme poverty. The economic incentives determined by macro policy influence thousands of decisions about how to plant, cultivate, and harvest crops.

These decisions in turn influence how many workers can find productive jobs directly. The breadth of rural purchasing power, largely a function of agricultural prices and the choice of technology in agricultural production and processing, determines the indirect and second-round employment effects. Together, the direct and indirect employments effects reflect how dynamic the rural economy is and how widely shared are the benefits of growth.

Factor-Product Decisions

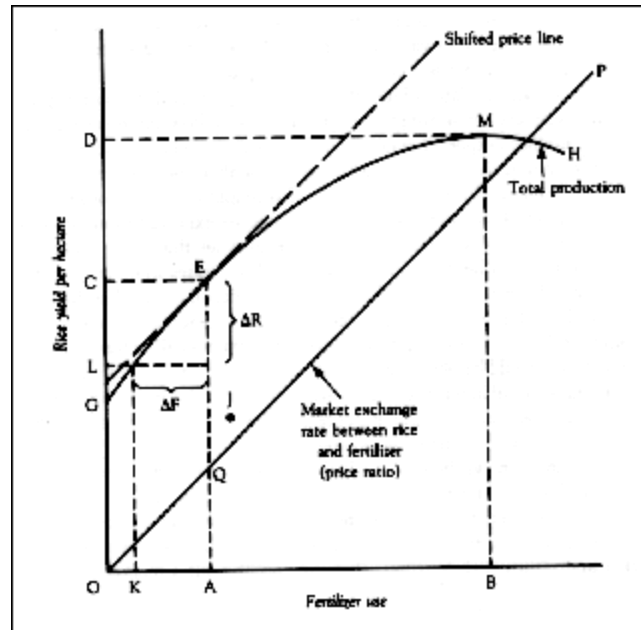
Agricultural performance is linked to macro policy not only through farm-level decisions about which crops to grow and how to grow them, but also through the overall response of total farm output to the economic environment that determines the profitability of more intensive agricultural effort. Policymakers are concerned about the outcome of farmers' decisions, for they determine the level of food grain supplies, the availability of foreign exchange earnings from the agricultural sector, and incomes in rural areas. To understand how these decisions are made and how they affect such important variables of policy concern, a production function relating inputs to output is a convenient conceptual tool.

Various technical relationships, the prices of inputs, and the output price the farmer expects are all weighed in the decision of how intensively to use factors to produce output-the factor-product decision. The production function is the basic technical relationship used to analyze these issues, and it is illustrated by curve GEMH in figure 3-3. This simplified one-factor function shows the yield of rice per hectare which could be expected from applying different amounts of fertilizer. This function assumes that other factors of production (such as land) are fixed and that all increases in output are due to fertilizer, the variable input shown on the horizontal axis. The figure is drawn to show diminishing marginal returns, that is, each additional unit of fertilizer results in a smaller increment in output. If no fertilizer were applied, a yield of OG would be obtained. The physical maximum yield of OD would be attained with OB application of fertilizer. Informal talks in the countryside with farm households and agricultural research workers can give the analyst some insight into what these values might be.

Curve GEMH shows the rate at which fertilizer can be converted into rice at varying levels of fertilizer input. This conversion is nature's exchange relationship between rice and fertilizer. The exchange can also be made in the other direction, from rice to fertilizer. When farmers take rice to the market and return with fertilizer, they are carrying out a market exchange even if they use money as an intermediary for convenience. The rate at which farmers can exchange rice for fertilizer is also shown in figure 3-3 as the line OP. It reflects the ratio of the price of fertilizer to the price of rice. When fertilizer prices rise, the line becomes steeper, reflecting the fact that more rice is required to buy a unit of fertilizer. Inversely, if rice prices rise, the line becomes flatter as each bag of rice buys more fertilizer.

For most farmers the price line is more or less straight. Except for quantity discounts for large purchases and price premiums for very small purchases, rice and fertilizer prices are little affected by individual farmer decisions. Because prices are nearly the same whatever the level of use, the line OP can also be thought of as a total cost curve in this example, for fertilizer is the only input. (The generalization to many inputs provides similar insights but with more complicated mathematics.) Here costs are measured in the same units as output, and so any excess of output over input costs for a given level of input use means the farmer is earning a profit. When the cost curve is above the production function, net revenues are negative and losses occur.

Figure 3-3. A Production Function Illustrating the Factor-Product Relationship



In a riskless world where farmers maximize profits, figure 3-3 can be used to determine how much fertilizer a farmer should use and how much output would result. The maximum profit occurs when the distance between output and input costs is the greatest. This point can be found by shifting the price line OP upward in a parallel fashion until it is just tangent to the production function. The dashed line shows this point of tangency at point E , where total rice production is OC and fertilizer use is OA . An amount of rice equal to AQ must be exchanged for the fertilizer used (OA), thus leaving an amount of rice equal to QE left over to repay the farmer's labor and use of land. AQ plus QE add up to OC , which is total output.

Of course, the degree of risk faced by farmers varies enormously—collective agricultural systems often significantly cushion individuals against risk, while market systems expose small farmers to substantial risks that affect their use of inputs. Also, pure profit maximization is an extreme case of rational behavior not likely to be found in the complicated world in which farm households make decisions. But an alternative formulation of the decision-making framework of profit maximization can illustrate how farmers adjust their fertilizer use and output decisions in response to inappropriate starting points or changes in prices or technology: the farmer simply seeks to move in a direction that increases net revenue. By comparing the additional revenue any increased

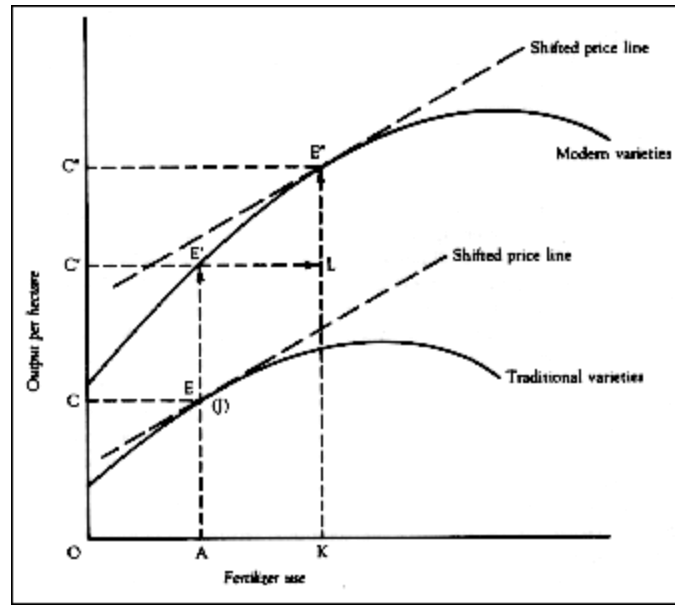
yield will bring with the cost of the additional fertilizer required to produce that output, the farmer can decide whether additional fertilizer is profitable. If the marginal cost of the fertilizer is less than the marginal revenue (if $\sim F \cdot P_f < \sim R \cdot P_r$) the additional fertilizer is profitable. The farmer will continue to use fertilizer up to the point where the slope of the production function equals the slope of the ratio of the price of fertilizer to the price of rice ($\sim R / \sim F = P_f / P_r$), which is reached at E in figure 3-3.

This is the same point found by maximizing profits in a single, all-knowing decision, but this time the farmer arrives at E by a more plausible route of incremental trial and error. When farmers compare additional costs with the expected additional benefits, a natural and rational way to make choices, their behavior approximates that predicted by these simple economic models. Consequently, thinking about how farmers will respond to changed economic or technical circumstances with this basic production function model is likely to provide analysts with considerable insight into what will actually happen.

Figure 3-4 shows how this framework can help in understanding likely farmer reactions to significant changes in the underlying technology available for rice production. The development of modern fertilizer-responsive seed varieties shifts the entire production function up, allowing more output to be produced even with the same fertilizer input. But something else has happened in the shift as well, for even at the same fertilizer-to-rice price ratio a larger application of fertilizer is now profitable. The optimal point is E" where OK fertilizer is used to produce OC" rice.

The increase in output is composed of two separate effects of the technical change. As figure 3-4 shows, there is a neutral increase in yields from C to

Figure 3-4. Effect of Technical Change on Fertilizer Use and Yields



C' even when fertilizer use stays constant at the previously optimal level OA. This increase occurs because the production function has shifted upward from E to E'. Second, because of the fertilizer-using nature of the technical change, optimal fertilizer input shifts from E' to E'' even though the price relationship between rice and fertilizer remains the same. Fertilizer use expands from OA to OK (for those farmers who can afford it), and output reaches its new optimal level of OC''. A shift can also occur through simple learning. As they observe other farmers' results with fertilizer or experiment with small amounts themselves, farmers gradually shift their own production function and demand for fertilizer upward.

The availability of different technologies may also explain why some farmers appear to be "inside" the production function, as at point J in figure 3-3. As figure 3-4 indicates, such farmers may be using the traditional seed varieties either for lack of knowledge or for lack of access to the appropriate inputs needed to use the modern varieties efficiently.

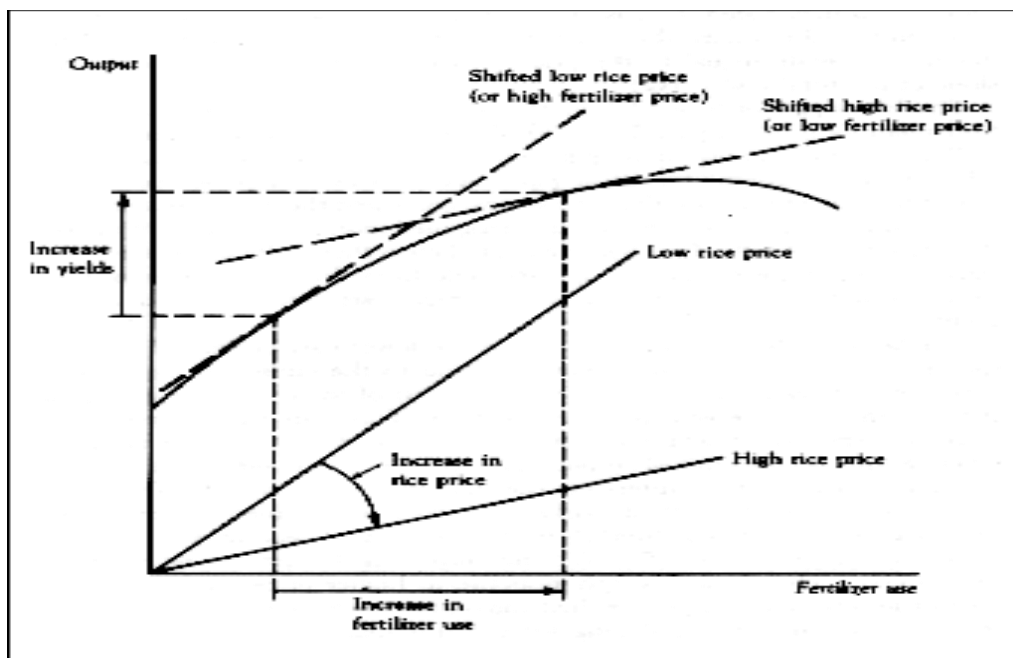
Output-Price Relationship

The second major factor influencing the farmer's decision making environment shown in figure 3-4 is the relative price of fertilizer to rice, for this relationship determines the economic incentives to use more fertilizer. In most countries these prices are heavily

influenced by government policy. Figure 3-5 illustrates what happens when the price of rice increases or the price of fertilizer falls (the two are equivalent in this two-dimensional world, and hence only the price ratio is important here). As fewer units of rice must be exchanged for a unit of fertilizer, the farmer is encouraged to use more fertilizer to grow more rice.

As long as the farmer can convert one unit of fertilizer into enough rice to buy more than that unit of fertilizer, it makes sense to expand fertilizer use. When an additional unit of fertilizer fails to produce enough rice to pay for itself, the farmer has gone too far. The appropriate stopping point is where

Figure 3-5. Effect of Relative Price Change on Fertilizer Use and Yields



the exchange ratios are the same, a lesson already learned. Lowering the amount of rice needed to buy fertilizer—lowering the price ratio—normally leads to increased fertilizer use and higher yields (and vice versa). According to the theoretical model, farmers are expected to apply inputs more intensively in order to increase their output of a commodity when its price goes up, if other prices remain constant. This positive supply

response can also be illustrated within this framework, and the result is shown in figure 3-6.

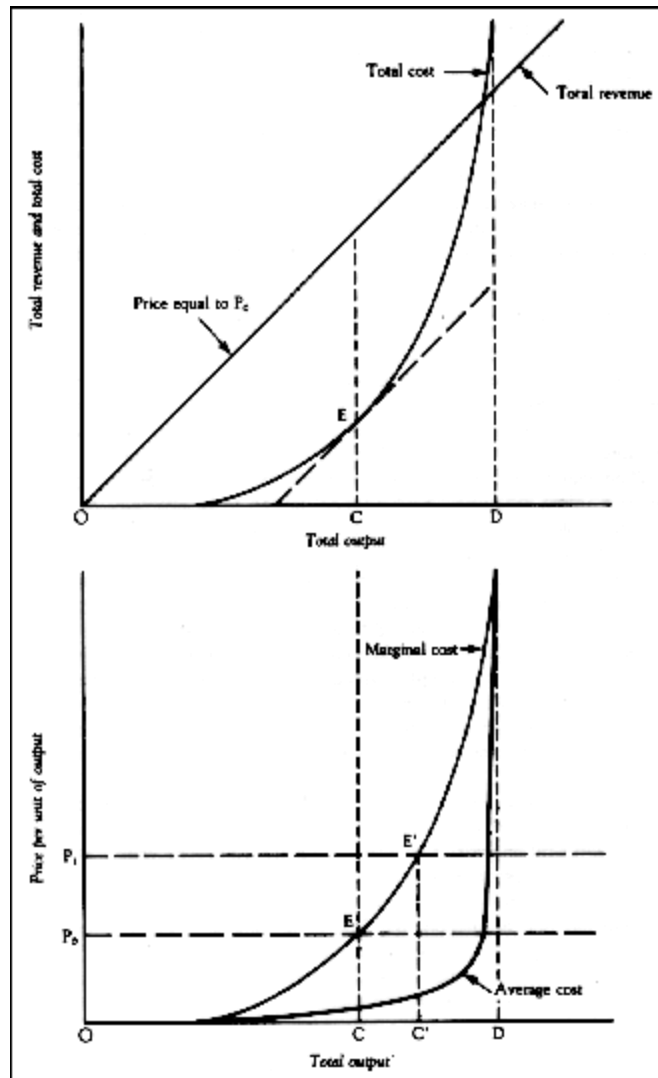
The upper part of figure 3-6 is constructed from the technical relationship between inputs and resulting output that is shown in the production function in figure 3-3. Because the price of rice in this example does not depend on quantities sold, the total revenue line for the farmer is a straight line, where the angle indicates the rice price itself. At higher prices the angle is steeper, indicating more revenue per unit of output. The total cost curve is constructed from the production function and a given price of fertilizer. At each level of output a particular level of fertilizer is required. The cost of purchasing this fertilizer determines the cost of producing that output. As in figure 3-3' the optimal output is at point E, where the excess of total revenue over total cost is maximized, that is, where profits are greatest. As noted before, this point is also where the slopes of the two curves are equal, or where marginal revenue (equal to the price of output) equals marginal cost (the slope of the total cost curve).

The lower part of figure 3-6 shows these marginal conditions directly as they relate to total output. The vertical axis now measures cost per unit, as well as the price per unit of output. Since the price at which the farmer can sell output is constant for all output levels, it can be represented by the horizontal line at PO . Both the average cost curve and the marginal cost curve rise as output rises because inputs are being used more intensively with lower marginal productivity. The higher marginal costs then pull up average costs. Because output greater than D is impossible from this particular farm with its available technology, marginal and average costs become infinite at that point.

The farmer's choice of output level in the lower part of figure 3-6 corresponds to the choice in the upper part (and to the choice in figure 3-3). This point is again E, where the marginal cost of increasing output equals the marginal revenue gained by producing it. This marginal revenue is the price of output-each additional unit of output sold by the farmer brings in revenue equal to the price of output-and so the farmer's best choice is where the marginal cost curve intersects the market price of output. This is an extremely important result. If market demand or government policy caused the price of output to

rise from P_0 to P_1 the optimal decision point for the farmer would change from E to E' , and output on the farm would rise from OC to OC' . The farmer's supply response to higher price incentives-the relationship between output supplied and output price-is simply the farmer's marginal cost curve for producing additional output.

Figure 3-6. The Relationship between Farm Output of Rice Supplies and the Price of Rice



Note: The farm area planted in rice is held constant.

With all the provisos noted about the simplified nature of these two dimensional diagrams, the farmer's supply curve is the same thing as the marginal cost curve.

Anything that shifts the marginal cost curve, for example, new technology, access to new irrigation facilities, or even the weather, will also shift the supply curve. Many of these shifts result directly or indirectly from government policy or investments, and so the interest of analysts in farmers' responses is clear. Because the supply curve summarizes so much of farmer decision making in terms of two variables of great relevance to the rest of food policy-output and price-knowing more about the elasticity of supply for important commodities is the next step for food policy analysts.

2.4 Policy Analysis Matrix

Policy analysis matrix contains a number of theoretical assumptions and empirical simplifications essential for useful application. In most situations, the advantages of the method outweigh its shortcomings. Results are comprehensible to policy-makers and yet are theoretically consistent. The method allows measurement of the effects of policy on producer income as well as identification of transfers among key interest groups-producers in agricultural systems, consumers of food, and policy-makers controlling allocations of the government budget. Results can be easily disaggregated to focus on particular regions, types of farms, or technologies. These items represent critical information for any evaluation of agricultural policy.

The PAM is composed of two sets of identities: (1) defining profitabilities and (2) defining the difference between private and social values. The selection of an empirical method to estimate PAM is therefore a matter of choice. Traditionally, empirical policy analysis has relied heavily on the estimates of supply and demand curves for various inputs and outputs. In principle, these estimates provide an accurate assessment of market behavior and response. But in practice, sufficient historical data of reliable quality are only rarely available. Even when parameters describing the response to output price changes can be estimated, input demands and the impact of various interventions on production costs are usually overlooked. Further, data are not sufficiently disaggregated among regions or types of farms. Hence, analysts are unable to assess satisfactorily the impact of government policies on the behavior of a particular commodity system. The resulting analysis is incomplete and often incomprehensible to policy-makers.

Practical Issues Addressed

Practically, three principal issues can be investigated with the PAM approach:

1. The impact of policy on competitiveness and farm-level profits
2. the influence of investment policy on economic efficiency and comparative advantage
3. the effects of agricultural research policy on changing technologies

The results can be used to identify what kinds of farmers, categorized by the commodities they grow, the technologies they use, and the agroclimatic zones in which their farms are located, are competitive under current policies affecting crop and input prices and how their profits change as the policies are altered. This issue of farm policy, how agricultural prices affect farming profits, is of primary importance to ministries of agriculture. In the PAM approach, farm budget data (sales revenues and input costs) are collected for the principal agricultural systems. The determination of profit actually received by farmers is a straightforward and important initial result of the analysis. It shows which farmers are currently competitive and how their profits might change if price policies were changed.

A second issue concerns the economic efficiency (or comparative advantage) of agricultural systems and how additional public investment might change the current pattern of efficiency. In what commodity production systems, defined by technology and agroclimatic zone, does the country currently exhibit strong or weak comparative advantage, and how might new investments, using government revenues or foreign aid funds, improve this picture? Investment policy is of primary interest to economic planners who allocate capital budgets, including foreign aid, in attempts to increase efficiency and speed the growth of national income.

With the PAM method, the analyst reassesses the revenues, costs, and profits indicated in farm-level and marketing budgets. Efficiency valuations of outputs and inputs are meant to lead to the highest possible levels of national income. The difference between revenues and costs for a system—both valued in social prices—is social profits, a measure of economic efficiency. New investments that reduce social costs also increase social profits.

and improve efficiency. An understanding of the array of social profitabilities of agricultural systems greatly reduces the number of detailed benefit-cost analyses needed to evaluate investment alternatives.

A third and closely related set of issues is how best to allocate funds for agricultural research. How can economic analysis be used to help determine the most fruitful directions for primary and applied research to raise crop yields and reduce social costs, thereby increasing social profits? This question is faced by decision-makers in the international agricultural research centers, in several international organizations, and in the agricultural research establishments of certain countries. It is a question also asked by central planners who make allocations to agricultural research budgets.

The approach used in PAM analysis begins with the calculation of existing levels of private (actual market) and social (efficiency) revenues, costs, and profits. This calculation reveals the extent to which actual profits are generated by policy transfers rather than by underlying economic efficiency. Next, agricultural scientists need to project changes in yields and inputs resulting from alternative research programs. The effectiveness of such changes can then be gauged by an examination of how they alter private and social profits of current technologies.

The Policy Analysis Matrix

The policy analysis matrix is a product of two accounting identities, one defining profitability as the difference between revenues and costs and the other measuring the effects of divergences (distorting policies and market failures) as the difference between observed parameters and parameters that would exist if the divergences were removed. By filling in the elements of the PAM for an agricultural system, an analyst can measure both the extent of transfers occasioned by the set of policies acting on the system and the inherent economic efficiency of the system.

Profits are defined as the difference between total (or per unit) sales revenues and costs of production. This definition generates the first identity of the accounting matrix. In the PAM, profitability is measured horizontally, across the columns of the matrix, as

demonstrated in Table 1.1. Profits, shown in the right hand column, are found by the subtraction of costs, given in the two middle columns, from revenues, indicated in the left-hand column. Each of the column entries is thus a component of the profits identity-revenues less costs equals profits.

Each PAM contains two cost columns, one for tradable inputs and the other for domestic factors. Intermediate inputs-including fertilizer, pesticides, purchased seeds, compound feeds, electricity, transportation, and fuel-are divided into their tradable-input and domestic factor components. This process of disaggregation of intermediate goods or services separates intermediate costs into four categories-tradable inputs, domestic factors, transfers (taxes or subsidies that are set aside in social evaluations), and non tradable inputs (which themselves have to be further disaggregated so that ultimately all component costs are classified as tradable inputs, domestic factors, or transfers)

Table 1.1: Policy Analysis Matrix

	Revenue	Cost		Profit
		Tradable inputs	Domestic factors	
Private prices	A	B	C	D
Social prices	E	F	G	H
Divergences	I	J	K	L

Table Notes:

Private profits (D) = A -B - C.

Social profits (H) = E - F - G.

Output transfers (I) = A - E.

Input transfers (J) = B - F.

Factor transfers (K) = C - G.

Net transfers (L) = D – H; Also equal I minus J minus K

Research results in the PAM approach flow directly from application of either the profitability identity or the divergences identity. Since these accounting principles govern the relationships in the PAM matrix, the key results are obtained from straightforward subtraction among entries of research inputs.

The first two results – private profits (D) and social profits (H) – are obtained from application of the profitability identity (revenues less costs equal profits). Private profits (D), a measure of competitiveness, equal private revenues (A) less private costs (tradable input costs (B) and domestic factor costs (C)). Similarly, social profits (H), a measure of efficiency, equal social revenues (E) less social costs (tradable input costs (F) and domestic factor costs (G)). The calculation of social profits (H), however, must await the estimation of social factor prices (G), itself a research result.

The next two results – output transfers (I) and tradable input transfers (J) – are obtained from application of the divergences identity (entries in private prices less entries in social prices equal the effects of divergences). Output transfers (I), a measure of the implicit tax or subsidy on outputs, equal private revenues (A) less social revenues (E). In turn, tradable input transfers (J), a measure of the implicit tax or subsidy on tradable inputs, equal private tradable input costs (B) less social tradable input costs (F).

The last two results – social factor prices (G) and net transfers (L) – are less straightforward. As noted above, social factor prices (G) are found by adjusting private factor prices (C) for observed divergences causing factor price transfers (K). Because the divergences identity requires that $(C - G) = K$, it is also true that $(C - K) = G$. The final result, net transfers (L), can be found by applying either the profitability identity ($I - (J + K) = L$) or the divergences identity ($D - H = L$). The net transfer (L) thus can be interpreted either as the net effect of all divergences or as the difference between private and social profitability. This single measure thus shows the extent to which distorting policies and market failures implicitly subsidize an agricultural system (by transferring

resources into the system) or tax that system (by transferring resources away from the system).

An example illustrates the process of disaggregating intermediate goods or services. Fertilizer is for most countries a tradable intermediate input. If a particular country is a net importer of fertilizer, the social valuation of a specific kind of fertilizer for its agricultural system is given by the cif (costs, insurance, freight) import price for that fertilizer plus the social costs of moving the input to the representative location in the system. Finding the import price is usually straightforward. Finding the social valuation of the domestic marketing costs is another story, however. It is necessary to study the transportation industry-road or rail and disaggregate the costs into labor, capital, fuel, and so forth. Each type of cost then needs to be further broken down through use of an appropriate world price and an estimate of local transportation costs.

3. Food security and Nutrition

3.1 definition and concepts of Nutrition

Define the following terms:

- | | |
|------------------------|--------------------------|
| ▪ Food | ▪ Nutrition |
| ▪ Diet | ▪ Malnutrition |
| ▪ Balanced diet | ▪ Over nutrition |
| ▪ Nutrients | ▪ Under nutrition |

Food

- **It is any product obtained from plants or animals that can be taken into the body to yield energy and nutrients for the maintenance of life and the growth and repair of tissues. Includes all foods and drinks acceptable to be ingested by a certain society.**

Diet:

- **is defined as the sequence of meals in a day. It is concerned with the eating patterns of individuals or a group.**

Eg: breakfast and dinner; breakfast, lunch, and dinner; and other may add snack

Balanced Diet:

- is a diet that contains all the nutrients in the proportion that is optimal for long-term health and survival.

Nutrients

- Chemical substances that are essential to life which must be supplied by food to yield energy and nutrients for the maintenance of life and the growth and repair of tissues

Nutrition

It is the scientific study of food and its nutrients; its functions, actions, interactions and balance in relation to health and disease.

Malnutrition

- **Under nutrition:** results from inadequate intake of macronutrients and micronutrients or inability to fully utilize the food they eat due to illness.
- **Over nutrition:** results from excessive intake and deposit of nutrients (carbohydrate and fats)
- **Micronutrient deficiency:** Deficiency in one or more minerals or vitamins

Type	Appearance	Cause
Acute malnutrition	Wasting or thinness	Acute inadequate nutrition leading to rapid weight loss or failure to gain weight normally
Chronic malnutrition	Stunting or shortness	Inhibited linear growth in height and cognitive development caused by under nutrition over long period of time leading to failure of linear growth
Acute and chronic malnutrition	Underweight	A combination measure, therefore, it could occur as a result of wasting, stunting, or both

Some Malnutrition Related Disorders

- **Kwashiorkor**

- Some children with acute PEM develop oedema

Oedema is an accumulation of fluid in the tissue, especially the feet and legs

- **Marasmus**

- Other children, for reasons not entirely understood, develop thinness without edema

- **Mixed (Marasmic-kwashiorkor)**

Some children have signs of both kwashiorkor and marasmus

3.1. Understanding the Hunger and poverty

In searching for the causes of hunger, it must be recognized that hunger is not a disease or a single biological state, but an individual problem caused by inadequate food intake. For purposes of food policy, which deals with the decisions made by food consumers and producers, inadequate food intake is defined relative to the individual's own perception of the food needed to maintain good health, provide for growth, and allow a choice of physical activity levels, including work levels. Hunger among children too small to make food intake decisions for themselves is obviously a more complicated question that must be treated in a general household decision making framework. Hunger as discussed in this case encompasses the entire range of conditions related to food deficits-from acute starvation during famines, to elevated morbidity and debilitation, and to milder forms of energy deficits.

From this view, hunger is caused by restricted choices of basic food quantities available to individual consumers. Solving hunger involves expanding the available choices, which are a function of incomes, food prices, food supplies, and consumer knowledge. Although the hunger of any particular individual can be solved fairly easily by providing more income or more food directly, solving the problem of hunger for a whole society is much more complicated because the direct approach is either too expensive or too disruptive to the rest of the economy in which hungry people function.

The more general problem of hunger is enmeshed in the set of processes that produce (and consume) agricultural commodities on farms, transform these commodities into food in the marketing sector, and sell the food to consumers to satisfy nutritional as well as

aesthetic and social needs. These processes make up the food system. The actual functioning of this system frequently leaves many poor people inadequately fed because of a network of connections that determine their employment and income status, the prices they must pay for food and other goods and services, and their ability to move in search of better opportunities. The same food system, however, offers vehicles for the policy interventions that reach poor people with sustainable improvements in their access to food. Thus the nutrition issue has increasingly been used as a lever for mobilizing development efforts to deal with poverty and the basic needs of the poor.

3.2. Types of food insecurity

Food insecurity can be transitory (seasonal) or chronic. Transitory food insecurity is common during the period just before harvest. It includes temporary food insecurity resulting from natural disasters or other negative shocks. In contrast, chronic food insecurity is associated with enduring conditions such as poverty or complex emergencies. In transitory food insecurity, food may be unavailable during certain periods of time. At the food production level, natural disasters and drought result in crop failure and decreased food availability. Civil conflicts can also decrease access to food. Instability in markets resulting in food-price spikes can cause transitory food insecurity. Other factors that can temporarily cause food insecurity are loss of employment or productivity, which can be caused by illness. Seasonal food insecurity can result from the regular pattern of growing seasons in food production.

Chronic (or permanent) food insecurity is defined as the long-term, persistent lack of adequate food. In this case, households are constantly at risk of being unable to acquire food to meet the needs of all members. Chronic and transitory food insecurity is linked, since the reoccurrence of transitory food security can make households more vulnerable to chronic food insecurity.

3.3. Dimensions of food security

The WHO states that there are three pillars that determine food security: food availability, food access, and food use. The FAO adds a fourth pillar: the stability of the first three

dimensions of food security over time. In 2009, the World Summit on Food Security stated that the “four pillars of food security are availability, access, utilization, and stability”.

Availability

Food availability relates to the supply of food through production, distribution, and exchange. Food production is determined by a variety of factors including **land ownership** and use; soil management; crop selection, breeding, and management; livestock breeding and management; and harvesting. Crop production can be impacted by changes in rainfall and temperatures. The use of land, water, and energy to grow food often competes with other uses, which can affect food production. Land used for agriculture can be used for urbanization or lost to desertification, Stalinization, and soil erosion due to unsustainable agricultural practices. Crop production is not required for a country to achieve food security. Nations don't have to have the natural resources required to produce crops in order to achieve food security, as seen in the examples of Japan and Singapore.

Because food consumers outnumber producers in every country, food must be distributed to different regions or nations. **Food distribution** involves the storage, processing, transport, packaging, and marketing of food. Food-chain infrastructure and storage technologies on farms can also impact the amount of food wasted in the distribution process. Poor transport infrastructure can increase the price of supplying water and fertilizer as well as the price of moving food to national and global markets.

Access

Food access refers to the affordability and allocation of food, as well as the preferences of individuals and households. The UN Committee on Economic, Social, and Cultural Rights noted that the causes of [hunger](#) and [malnutrition](#) are often not a scarcity of food but an inability to access available food, usually due to [poverty](#). Poverty can limit access to food, and can also increase how vulnerable an individual or household is to food price spikes. Access depends on whether the household has enough income to purchase food at

prevailing prices or has sufficient land and other resources to grow its own food. Households with enough resources can overcome unstable harvests and [local food](#) shortages and maintain their access to food.

There are two distinct types of access to food: direct access, in which a household produces food using human and material resources, and economic access, in which a household purchases food produced elsewhere. Location can affect access to food and which type of access a family will rely on. The assets of a household, including income, land, products of labor, inheritances, and gifts can determine a household's access to food. However, the ability to access to sufficient food may not lead to the purchase of food over other materials and services. Demographics and education levels of members of the household as well as the gender of the household head determine the preferences of the household, which influences the type of food that are purchased. A household's access to enough and nutritious food may not assure adequate food intake of all household members, as intra household food allocation may not sufficiently meet the requirements of each member of the household.

Utilization

The final pillar of food security is food utilization, which refers to the metabolism of food by individuals. Once food is obtained by a household, a variety of factors impact the quantity and quality of food that reaches members of the household. In order to achieve food security, the food ingested must be safe and must be enough to meet the physiological requirements of each individual. [Food safety](#) impacts food utilization, and can be impacted by the preparation, processing, and cooking of food in the community and household. Nutritional values of the household determine [food choice](#). Access to healthcare is another determinant of food utilization, since the health of individuals controls how the food is metabolized. For example, intestinal parasites can take nutrients from the body and decrease food utilization. Sanitation can also decrease the occurrence and spread of diseases that can affect food utilization. Education about nutrition and food preparation can impact food utilization and improve this pillar of food security.

3.4. Food Consumption Patterns

Assembling food consumption data could provide a scholar a lifetime's work, but most food policy analysts will think in terms of days or weeks. Shortcuts are inevitably necessary, and fortunately most countries have a surprising wealth of information about food consumption patterns scattered among various ministries. Food is not the province of any single sector or government agency. It is important to statistical bureaus which calculate cost of living indices, to commerce bureaus which monitor and regulate trade, to agricultural departments which project food requirements to justify agricultural investments and intensification programs, and to health departments which frequently establish a relationship between the size and character of their patient load and the diets of those patients. Nurses in clinics dealing with sick children often know a great deal about what those children eat.

3.5. The Food Balance Sheet

The food balance sheet is the primary device for showing average food consumption levels. It can also be used to determine the representativeness of sample surveys. If the per capita intakes measured by sample surveys (when "blown up" to national levels by multiplying by total population) do not correspond to food balance sheet data, then something is amiss. In the past, food balance sheets tended to understate the average level of food consumption because of biases against full measurement of food production for household use and the tendency to tax farmers on the basis of output. But with recent heavy pressures on government agencies to increase domestic food production, it is no longer clear that all the biases in reported food production statistics are downward. Some upward biases, especially for basic food grains which supply the bulk of calories in most developing countries, might also be present as local officials try to show positive results from government agricultural development efforts.

The information in food balance sheets identifies the general priorities for consumption analysis and overall food policy attention. Disaggregation by income class sharpens these priorities and brings the hunger problem into clearer focus, primarily because the poor are

so much more sensitive to changes in incomes and prices than are the better-off groups in the society. Constructing the equivalent of food balance sheets by income class is the next step. Household budget surveys are the main source of information. In recent years they have used improved methodologies and field techniques to measure expenditures more accurately

3.6. Food Consumption versus Nutrition

Food policy uses household food consumption as the primary variable to improve the nutritional status of individuals within the household. This policy perspective is based on a hierarchical division of malnutrition into two broad and overlapping stages. In the first stage, the entire household suffers from inadequate food intake, although the distribution of the energy deficit among individuals in the family may be quite uneven. In the second stage, chronic calorie deficits at the household level have been eliminated, but nutrient imbalances such as vitamin and mineral deficiencies remain and vulnerable groups within the household may still not receive adequate food to meet their special nutrient requirements for pregnancy, lactation, or growth. Both types of households may be seriously affected by endemic disease and parasites or poor public health environments, especially with respect to water and sanitation.

Strategies for improving nutritional status are likely to be quite different depending on whether a household is classified primarily as stage one or stage two. Stage one households, those suffering significant energy deficits, generally respond somewhat to efforts designed to improve the efficiency of the connection between food available at the household level and the resulting nutritional status of individual family members—problems associated with stage two households. However, the fundamental problem of the level of food resources will dominate such environments. The variables that intervene between food consumption and nutritional status are just as important as for stage two households, but interventions to improve water supply, sanitation, and health are not likely to be effective in improving nutritional status until the basic issue of caloric adequacy is addressed.

The situation for stage two families is quite distinct (although the two stages are clearly just points along a continuous spectrum). With adequate food within the household to meet the daily energy needs of all family members, nutritional concern shifts to a complex of synergistic variables that simultaneously condition the nutritional well-being of each individual.

These variables make up what is now commonly called the "basic needs package": clean and abundant water supplies, proper waste disposal and sanitation facilities, housing sufficient to provide protection from the local climate, local health care facilities to treat infections and provide midwife services along with family planning materials and information, and education programs designed to achieve functional literacy. The overall relationship between a basic needs package and improved nutritional status is obvious, but the actual connections are quite complicated when it comes to quantifying the variables and precisely determining the effects.

The more obvious connections among these variables include: the relationship between the extent of gastrointestinal infections and the efficiency with which food is digested and made available to the body for work and growth; the connection between water and sanitation standards and the extent of such gastrointestinal infections; the role of functional literacy in mothers' knowing the food requirements of their children when sick and well; and the overall role of an accessible clinic in maintaining health levels of the community.

Improving any one of these factors for a household would permit a higher nutritional standard for any given level of food availability. Providing a package of such services will undoubtedly improve the connection between food availability and nutritional status. The total effect of a package will probably be greater than the sum of individual contributions. But nobody knows the extent to which these statements hold or their quantitative dimensions. There is only the loosest sense of what the tradeoffs might be within the package. The debate over a package of basic needs is productive when it focuses on the role of the poor in an economy—"why poor people stay poor," to use Michael Lipton's phrase. For this reason, **food policy analysts are likely to find it more**

productive to deal with stage one of the malnutrition problem rather than with the more household-specific stage two problem.

Nutrition education programs may be useful at stage two, once adequate amounts of food are available at the household level. Programs to improve the mothers' nutritional knowledge (such as what foods to buy, how to prepare them to retain maximum nutritional value, what to feed child, the efficacy of breast-feeding) almost certainly can have a high payoff in certain village environments. The situation is similar to farmer extension programs which find a wide variation in the skills farmers have in growing crops. In both cases the program must have something to extend. Through painful experience development specialists have learned that "bad" farmers frequently are behaving quite rationally for their own environment, and many apparently irrational food customs turn out to have a similar wisdom behind them. Other ways may certainly be better, but understanding why a mother behaves the way she does is just as important as understanding why a farmer applies only half the recommended fertilizer.

Food policy analysis of nutrition and consumption issues can be seen as a task of establishing priorities. In particular, the descriptive data from food balance sheets and household budget surveys, when linked to available nutrition survey data, will indicate whether the nutrition problems are primarily stage one (chronic energy deficits at the household level) or stage two (nutrient imbalance or maldistribution within the household). The food policy perspective presented here is designed mostly for stage one environments. When a country's nutrition problems are primarily of the stage two type, the nutrition task can be assumed by the public health and education specialists. Until then, much of the specialists' efforts will be ineffective. Consequently, the analytical focus of this topic is, therefore, on understanding food consumption patterns as the major connection between nutrition problems (and interventions to address them) and macro food policy.

3.7. Food Consumption Analysis

For the food policy analyst, the analysis of food consumption data serves two specific functions.

1. The analysis provides the parameters to understand consumption adjustments in the macro food economy. What happens to total cereal demand when prices fall or incomes rise? If cereal availability changes, what will happen to prices?
2. The analysis helps to determine the likely nutritional impact of changes in the economic circumstances of the poor. What happens to the consumption bundle of the poor when their incomes change and prices fluctuate for the commodities they consume?

Empirical investigation of food consumption data provides some answers to these questions. Economic theory can be of great assistance in the empirical research by establishing a rational decision making framework in which to organize the range of potential consumer choices and by providing some simple and plausible assumptions about what constitutes rational behavior. Both the framework and the assumptions are subject to verification from actual performance. The basic assumptions about rationality and the importance of prices and income have been confirmed.

Food policy analysis focuses major analytical attention on food consumption patterns because of the relationship between the quantity of food consumed and hunger. The market demand parameters for basic foodstuffs that are an early product of food policy analysis are used to answer several important questions. When average per capita GNP rises, how much is market demand for rice likely to increase? What will be the effect on market demand for wheat? How will demand for cassava, corn, or meat change? How much meat is grain-fed, and what will growing meat demand do to grain demand? How sensitive is market demand to absolute and relative food prices? If all food grain prices rise relative to nonfood prices, how much does demand drop? When rice prices rise, does wheat consumption rise while rice consumption falls?

Answering these questions is important because the resulting income, own price, and cross-price elasticities provide necessary linkages from macro price policy and macroeconomic performance to food consumption and, through the food marketing sector, to incentives for agricultural production. Estimating these aggregate market demand parameters with any real confidence is seldom easy. Time series data are frequently short and of dubious accuracy when domestic food grain production makes up a significant part of total consumption. Mechanical regression analysis seldom gives plausible parameters. A combination of intuitive judgment, talking to traders, evidence from household surveys, simple graphical and statistical analysis of available data, and familiarity with similar parameters in other countries is frequently the best that can be achieved.

The second step in food consumption analysis disaggregates the first step. The motivation for this step is quite different from the need to know aggregate market demand parameters to understand the macro linkages in the food sector. The disaggregated consumption understanding is needed to trace the effects of various price and income policies on the food intake of the poor. For designing programs that target food subsidies efficiently, knowledge of how the consumption parameters of the poor differ from those of the middle-and upper-income households is essential.

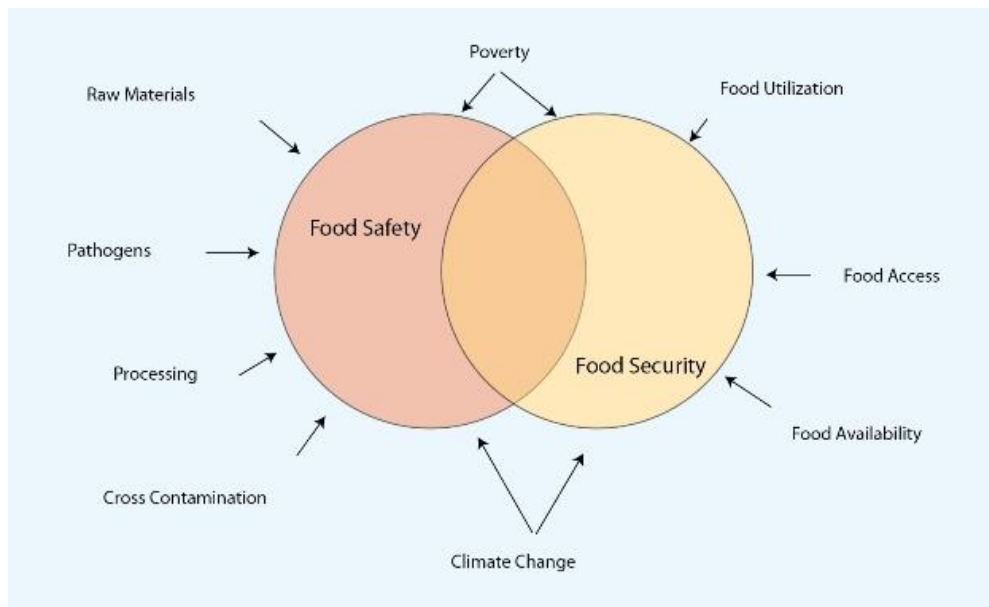
The ultimate goal of food consumption analysis is to **improve the potential for and efficiency of government interventions to increase staple food intake** among the very poor. Such interventions have two effects: the change in food intake among the target population; and secondary and usually unintended ramifications for food production, marketing, and even for the rest of the economy. For example, generalized food subsidies through low food prices have potentially negative effects on food production. The mechanisms by which subsidies and food price policies are implemented usually have an enormous impact on the food marketing sector. An overvalued exchange rate that is maintained partly to hold food costs down can have very wide-spread ramifications for overall economic growth. Likewise, policies and interventions in the rest of the economy, including but not limited to the food system, frequently have unintended consequences

for food consumption among the poor. The disaggregated food consumption parameters permit analysts to predict, if only roughly, how important this impact might be.

3.8. Food Safety and Food Security

Food Safety and food security

Food safety and food security are interrelated concepts with a profound impact on quality of human life, and there are many external factors that affect both of these areas (Fig 1 below). Food safety is an umbrella term that encompasses many facets of handling, preparation and storage of food to prevent illness and injury. Included under the umbrella are chemical, microphysical and microbiological aspects of food safety.



Food safety is receiving heightened attention worldwide as the important links between food and health are increasingly recognized. Improving food safety is an essential element of improving food security, which exists when populations have access to sufficient and healthy food. At the same time, as food trade expands throughout the world, food safety has become a shared concern among both developed and developing countries. Governments in many countries have established new institutions, standards, and methods for regulating food safety and have increased investments in hazard control. This set of policy briefs describes how developing countries are addressing food safety issues in order to improve both food security and food trade, and discusses the risks, benefits, and costs when such policies are implemented.

Enhanced food safety is key to improvements in health and nutrition, which, after all, is the ultimate goal of enhanced food security. Improvements in food availability will not benefit many of those at nutritional risk without corresponding improvements in the nutritional quality and safety of food as well as a reduction in food- and water-borne illness.

WHY IS FOOD SAFETY RECEIVING GREATER ATTENTION?

Food safety is receiving increased attention due to several worldwide trends affecting food systems. The growing movement of people, live animals, and food products across borders; rapid urbanization in developing countries; increasing numbers of immune-compromised people; changes in food handling and consumption; and the emergence of new or antibiotic-resistant pathogens all contribute to increasing food safety risks. Changes in food handling and consumption, for instance, include more frequent preparation of food outside the home, increased consumption of fresh and minimally processed foods, and greater consumption of fish, seafood, meat, and poultry around the world. These trends have altered both the nature and incidence of food safety risks in the world's interdependent food production and marketing system. Concerns about intentional adulteration of food from bio-terrorism have also increased attention to food safety.

As the sources and consequences of food-borne illness are better understood, developed countries are strengthening their food safety control efforts. New regulatory standards have been introduced for previously unknown or unregulated hazards, such (mad cow disease) in cattle. Existing food safety standards in developed countries, such as those for aflatoxins in the E.U. and pesticide residues in the U.S., have been made more stringent during the past decade. Many new regulations involve requirements for process controls such as the Hazard Analysis Critical Control Point (HACCP) system an approach for the prevention, monitoring, and control of hazards that can be applied to any production process. New regulatory measures are based on a scientific assessment of risks, and because hazards can enter the food supply at any one of several points, such assessments are now undertaken from farm to table.

The food system is also changing in developing countries themselves, because new food safety standards required by the developed world shape expectations among urbanizing consumers. Moreover, food processing and preparation has tended to move outside the household as economies develop. Supermarket chains increasingly dominate urban food retailing in middle income countries, creating new supply chains that coexist with traditional food processing and retailing. Many kinds of hazard-mitigation activities are shifting from the household to the food industry as the food system changes, and it is not always clear who bears responsibility for food safety or its cost.

4. Markets, Marketing Functions, and Food Price Formation

The food marketing sector transforms the raw agricultural commodities produced by farmers into the foods purchased and eaten by consumers. The costs of storage, transportation, and processing (the marketing transformations) are an integral component of food price formation. Because the producer and consumer are typically different individuals, commodities must pass from one owner to another, frequently many times, before reaching the family table. This process of exchange takes place in markets and can be conducted only when a price has been agreed on between buyer and seller. In any but a purely subsistence economy, these three topics are inextricably linked: the productive functions of marketing, the role of the market as an arena of exchange, and the formation of food prices at which exchange takes place.

4.1. Marketing Issues

Just as with food production, marketing is a means to an end. The objectives a society can reasonably hold for its marketing sector are analogous to the four basic objectives for the food system as a whole: efficient economic growth, a more equal distribution of incomes, nutritional well-being, and food security. Because it links the production and consumption sectors, marketing can contribute to all four objectives through the efficiency with which it communicates signals of scarcity and abundance to decision makers. Because it is the source of productive activities involving many jobs, marketing can contribute directly to economic growth, income distribution, and nutritional objectives. Because of its capacity to link domestic markets to international markets and

to provide signals to policymakers concerning food shortages, the marketing sector is integral to the design of mechanisms to improve food security.

Why is it, then, that marketing activities are frequently thought to be unnecessary and against the interests of society, especially the interests of poor people in developing countries? The labels "middleman" and "speculator" almost universally carry negative connotations or actual opprobrium. The tendency is too widespread to be attributed wholly to a bad press. In fact, markets do not always function in the best interests of a broad cross section of society, especially in poor countries where communications and transportation facilities are poor, markets are highly segmented, and access for marketing participants is greatly restricted, sometimes to particular ethnic groups. Highly unequal financial bargaining power is often brought to the exchange relationship between seller and buyer. In short, the efficiency and economic gains potentially available from successful market coordination of a society's food system are an empirical issue, not a matter of faith and logic.

Because the public image of marketing is so negative, especially in most developing countries, it is important for the food policy analyst to determine how effectively marketing institutions and marketing agents are performing their dual roles of transforming commodities in time, space, and form while reflecting relative abundance and scarcity through the price signals communicated to producers and consumers. These price signals can be generated in the process of exchange in markets, in which case the competitiveness and efficiency of the markets must be examined. Alternatively, if governments set these prices to reflect other criteria and objectives, their effectiveness and costs in other dimensions must be examined.

4.2. Domestic Markets and Price Policy

"Food prices are too high." "Crop prices are too low." Both complaints are heard in virtually all countries. All consumers would like food prices to be lower, to take a smaller portion of their family budgets. All farmers would like their crop prices to be higher, to provide them greater return for their effort and investment. The tension between the two,

the food price dilemma, inevitably focuses the attention of consumers, producers, and policymakers alike on the margin between farm prices and consumer prices. All these groups point to the middleman and say "marketing costs are too high."

Several factors common to all food marketing systems lead to this impression, whether it is true or not. First, the marketing system is the narrow point in an hour glass-shaped distribution pattern which first concentrates the crop sales from millions of farmers and then disperses the food to millions of consumers in the time, place, and form in which they want it. Politically, millions of farmers or millions of consumers are forces to be reckoned with; the hundreds or thousands of middlemen usually are not.

Second, operating as a middleman is a very risky business even in developed countries where information is excellent. In developing countries the risks are even larger. Only the highly skilled can survive for very long in such circumstances, and the economic return to these skills is large. In short, many middlemen are quite rich, in sharp contrast to the poverty of both their supplying farmers and consuming households. It is a very short step between the observation of rich middlemen and the conclusion of high-cost, inefficient, and monopolistic marketing. The conclusion, however, is wrong as a logical necessity, and, in a broad array of developing countries, wrong as a matter of fact.

A third reason for the strong perception that marketing margins in developing countries are too high is that they are high. Marketing costs are high when roads and communications are poor, when interest rates and storage losses are high, and when processing facilities are poorly maintained and operated because of difficulties in obtaining working capital or spare parts. In other words, marketing margins are high because the real costs of marketing are high. It is not a matter of short-run private inefficiency and monopoly profits accruing to a few greedy middlemen. Significant opportunities exist for socially profitable investment in the marketing system that will reduce these high costs. The purpose of marketing analysis is to locate these areas of high costs, to identify any inefficiencies and monopoly profits if they exist, and to propose policy initiatives and investments that will lower the real costs of marketing.

Marketing analysis is concerned with both price levels and price margins since the marketing system connects farm prices to consumer prices; in market economies it serves as the arena for price formation at each level. Governments can attempt to set all the important prices to reflect social priorities, or, through a variety of trade and subsidy policies, governments can affect the level of the overall price structure. This analysis is relevant to socialist economies as well as to market economies because allocating resources efficiently and generating and utilizing information are important to both kinds of societies.

The market and welfare aspects of price level interventions are outlined to provide the analyst with a set of tools for assessing the impact of trade and subsidy policies on the welfare of producers and consumers and on the national budget. Determining the welfare impact requires the use of world prices as a standard of reference to judge the opportunity costs of particular policies. Government policies can significantly affect both price levels and margins, and this chapter also presents a wide range of potential interventions that subsidize marketing margins and thereby deal with the food price dilemma.

4.3. Price and Income Policy Analysis

In market economies nearly all government economic policies influence the rural-urban terms of trade, defined roughly as the price of food crops relative to the prices of goods and services, including consumer products and farm inputs, purchased by farmers growing food crops. The rural-urban terms of trade is a major factor determining incentives to increase agricultural output while simultaneously signaling consumers about the relative costs of food. For convenience and clarity, the terms of trade will be called the "food parity price." This term is a reminder that farm incentives can be raised in two ways: higher output prices or lower input prices (or lower prices for consumer goods that farmers purchase with their incomes).

The food parity price is principally influenced by two sets of policies: foreign exchange rate, interest rate, and wage rate policies (the macro price policies discussed in chapter 5); and the subsidy and trade policies that drive a wedge between the world price of a

product (output or input) and its domestic price. These price policies are illustrated here with food crops in mind; although the reasoning applies equally well to manufactured goods or agricultural inputs, such as fertilizer.

Price policies are judged by their effects on the four food policy objectives-promoting economic efficiency and hence faster growth of income, distributing incomes more equally, guaranteeing adequate nutritional status for all people, and providing security of food supplies. Empirical analysis of a policy requires measurement of the size as well as the likely direction of its impact. In addition, the weights given by governments to the several objectives and the constraints on choice of policy, including international repercussions, determine the actual feasibility and efficacy of a price policy.

Each price policy uses a subsidy or a trade restriction to cause the domestic producer or consumer price, or both, to differ from the world price. A simple consumer subsidy causes both producers and consumers to face lower prices than those in the world market. A specific producer price subsidy can raise the farmers' decision price above world levels while leaving the consumer price at the world price. In the absence of specific policy intervention, the domestic price and world price for a commodity will be the same for both producers and consumers.

A price policy intervention has an impact on the four food policy objectives in the following ways: **it affects economic growth by the extent of efficiency losses; income distribution by the direction of income transfers; food security by increases or decreases in quantities traded internationally; and nutritional status by the income transfers price policies effect** to or from consumers. (The differential impact on poor consumers of food price changes is not captured within this analytical framework.) The effect of the policy on the food parity price itself depends on whether the policy is applied to a food crop or to a manufactured product purchased by farmers and on whether the policy raises or lowers the domestic price of the commodity. A subsidy on rice imports lowers the food parity price by reducing the food price. A subsidy on fertilizer raises the food parity price by lowering the cost of an important input for food crop production.

4.4. Trade Restrictions

A trade restriction can be applied to either the price or the quantity of the commodity to reduce the amount traded internationally and to drive a wedge between the world price and the domestic price. For imports, the trade policy imposes either a per unit tariff (import tax) or a quantitative restriction (import quota) to limit the quantity imported and raise the domestic price above the world price. Likewise, trade policy for exports limits the quantity exported through imposition of either a per unit export tax or an export quota, and the result is to cause the domestic price to be lower than the world price.

If, for example, a trade policy restricts imports of textiles through imposition of a tariff, producers of textiles gain because the domestic price rises above the world price. In response to higher local textile prices, production expands, consumption declines, and the quantity of imports is reduced. Since the domestic price is raised, consumers transfer income to producers and to the government budget because of the duties paid on imports. As with the consumer subsidy on rice, efficiency losses occur in both production and consumption because the policy-adjusted price is higher than the world price, which represents the actual opportunity costs of imports. A tariff on textiles reduces the food parity price because textile prices rise for farmers, thus increasing the price index of manufactured items purchased by farmers. Hence the relative food parity price falls.

4.5. Food Stamps and Rationing

Food stamps have been widely used in developing countries as the main government program for reducing hunger among poor people. This large government program remains very controversial, and widely publicized reports of fraud and cheating as well as evidence of significant disincentives for food stamp recipients to take low-paying jobs have eroded public and congressional support. Strongest support for the program comes from labor and social welfare groups and farm lobbies. Farmers have found that the food stamp program adds to demand through the regular food marketing system and thus contributes significantly to farm incomes.

Only a few developing countries have attempted to subsidize their poor consumers by using food stamps. Despite the theoretical efficiency of food stamps in providing food subsidies targeted precisely to those most in need, the actual implementation record so far is quite mixed. If no serious attempt is made to implement a means test, then food stamps transfer commodity-specific income to a broad range of consumers. If poor consumers are already allocating much of their budgets to these commodities, the transfer serves as a general income transfer rather than as a food-specific transfer. Of course, without a discriminating means test, a large proportion of the population may try to use the program.

Where serious attempts are made to limit food stamps to the most impoverished households, all the problems of implementing an honest and efficient means test arise. Many relatively well-off households slip into the system, many of the most destitute fall outside, and the bureaucratic costs become very large. Food stamp programs as an efficient targeting mechanism for food subsidies can probably be used effectively only in middle-income countries with a skilled civil service and accurate statistical records on at least the urban population. For poorer countries and in the rural areas of even the middle-income countries food stamps are not likely to be effective

4.6. Poor Peoples' Foods

The poor in most societies eat different foods from those consumed by middle- and upper-income groups. Even in those countries where 70 to 90 percent of calories come from starchy staples, the diets of the poor are remarkably different from the average availability shown in a food balance sheet. Poor people's foods tend to be root crops (cassava, sweet potatoes, Irish potatoes) or coarse grains (corn, sorghum, millet, and others). The preferred staple in most societies is either rice or wheat although corn is preferred in some African and Latin American countries. In rice cultures wheat is sometimes regarded as an inferior good.

Such sharp contrasts in food consumption patterns by income class within a country are not caused by differences in taste but by economic necessity. The poor in Indonesia eating cassava and corn would prefer to eat rice, as would the barley eaters in the

Republic of Korea in the early 1970s. If a society does not have the bureaucratic and financial resources to provide subsidies for the more expensive preferred foods, subsidies to poor people's foods can be effectively self-targeting. If only the poor choose to eat the subsidized inferior staples, only the poor capture the subsidy.

At the same time, many of the inferior foods are produced by very poor farmers on marginal lands at considerable distance from major urban centers. Marketing subsidies that raise the returns to these farmers while lowering the costs to the consumers may work simultaneously on both dimensions of poverty. Simply forcing down prices, however, would have a devastating impact on the incomes and welfare of some of the poorest of the rural poor.

Such subsidies have both short-run and long-run costs. In the short run, implementing subsidies for commodities that do not travel or store well (root crops) or for which well-developed marketing systems do not exist is usually not feasible without significant investment in food technology and improved marketing infrastructure. Because farmers tend to switch to growing more profitable crops, obtaining supplies of these commodities when market prices are being forced down is an obvious problem. Providing subsidies to poor consumers via commodity-specific food stamps (available with minimal bureaucratic processing) while allowing incentive prices for farmers in commercial markets might be more feasible. Alternatively, an imported commodity can be an efficient carrier of subsidies to poor consumers and have less impact on domestic farmers. Subsidized low-quality wheat flour might have this effect in Sri Lanka, for example.

The longer-run effects are more troubling and suggest that disaggregated commodity price policies probably can serve only as short-run bridges across the food price dilemma. The distortions introduced by significant subsidies on a single commodity can eventually be very powerful. Low prices for high quality wheat at one time led to almost one-third of Sri Lanka's calories being provided by a foodstuff it could not grow. Livestock industries find heavily subsidized corn or wheat a cheap, high-quality animal feed. Such grain-fed livestock industries redirect the subsidy from poor people to rich people. The

lower prices for these inferior foods almost inevitably dampen incentives for research and development of new technology for the crops and reduce the profitability of growing them.

The implementation of food subsidies for poor consumers through the regular channels of the marketing system is the most efficient way to protect food intake of the poor when price incentives to farmers are improved. But both the analytics of the design and the historical implementation record suggest great difficulties in isolating the targeted food subsidy programs for poor people from more general food subsidies for all consumers, or all urban consumers. Such general subsidies have enormous fiscal effects and serious disincentive consequences for agriculture. Both the problems and the potential rewards of successfully implementing targeted food subsidy programs explain the extensive attention in this book to these topics.

5. Macro Food Policy

Public policy is the major factor in solving the problem of hunger. This potential for policy to influence the lives and well-being of vast numbers of people explains much of the dominance of ideas and ideology, rather than experience and empirical result, in attempts to improve global food security and in the efforts of individual countries to reduce the number of hungry people. A better understanding of the world food system and the potential for domestic food policy can help bridge this wide gap between ideas and actual results.

The goal is to understand how all the strands of national policies and programs affect the food system food production, consumption, marketing, and especially food prices for farmers and consumers.

Food systems are made up of highly diverse producers and consumers connected by a network of markets that function in a macro and international context. The diversity of producers and consumers is important to the design of effective food policies. Much of the micro-level analysis done by food policy analysts is intended to discover how differently situated decision makers react to changes in their economic environments,

particularly the poor who have greater sensitivity to changes in their incomes and the prices they face. The food consumption patterns of the poor usually include large proportions of cheap starchy staples. These people are forced by economic circumstances to be more flexible in their choices as market signals reflect varying degrees of commodity scarcity and as prices rise or fall.

Similarly, food producers are also remarkably diverse. They include rural households with less than one-tenth of a hectare of cultivated land who must earn most of their incomes from off-farm jobs. These households purchase a significant proportion of their food from rural markets, and it is a mistake to think that all small farmers are benefited by incentive price policies that raise the market cost of food. Most food available in rural markets comes from larger farmers who do profit from greater incentives and who typically respond enthusiastically to them with greater output.

The link between these two types of farmers, who represent points along a continuum, is often the rural labor market. Price incentives for agricultural output raise demand for labor in these markets directly through additional wage labor demanded on farms that produce marketed surpluses. At the same time, the labor market is affected indirectly because less labor is supplied from small-farm households that find it profitable to use more household labor on their small plots. In a roundabout way demand for labor is increased by the higher farm incomes because rural household expenditure patterns usually reflect a demand for labor-intensive goods and services. This positive effect of price incentives on job creation and rural wages causes a major dilemma, however, for the incentives also mean higher food prices.

The solution to poverty and hunger is jobs and access to food. Many of the productive jobs will be in the rural areas, and access to food is a function of its price as well as household incomes, especially in the short run. Rural labor markets and food markets are the primary connecting mechanisms between employment and food prices in market economies, and even socialist countries must find some mechanisms to connect workers with jobs and to signal producers and consumers about the opportunity cost of growing and consuming food.

When the actual signals convey misleading information in either kind of economy, the resulting decisions distort resource allocation and lower economic welfare on average. Distorted macro prices may protect the interests of the poor in the short run to some extent, but the future welfare of a society, especially the welfare of its poorest members, depends on the efficient use of resources, including human resources. Policies in the agricultural sector—for example, prices for fertilizer, charges for irrigation water, or the commitment of resources to agricultural research—directly affect the efficiency of resource use. These are all important elements in how rapidly agricultural output grows and who benefits when it does.

At the same time, many of the factors influencing the efficiency of resource use in agriculture and the distribution of benefits are reflections of the macro economy and the various policies and programs that affect it. Consequently, food policy analysis includes the connections between the food system and the rest of the macro economy. Ignoring the macro aspect of food policy virtually guarantees partial and simplistic solutions that can be sustained only at high economic and political cost. A "macro food policy" approach is required for a society to find a satisfactory reconciliation of its producer and consumer interests.

5.1. Food aid

In some circumstances the foreign exchange needed to import food can be provided by food aid through grants or long-term loans. Such food aid is attractive to recipient countries, for it reduces the import bill, ensures supplies especially for urban food markets, and generates domestic currency revenues for the government treasury when the food is sold. The attractiveness of food aid to donors depends very much on the commercial outlook for grain sales. When international markets are weak, as in the early 1960s and early 1980s, the opportunity cost of grain provided as food aid is quite low, especially if it can be delivered in a manner that adds to effective global demand. Then food aid is a very attractive way for the United States and the European Economic Community to provide foreign assistance. It is doing well by doing good.

Despite the appeal of food aid to both donors and recipients, the disincentive effects on domestic producers and the problems of implementing food aid agreements are so serious that they vitiate much of the usefulness of food aid. Especially as a way to cope with fluctuations in grain import needs in countries with serious foreign exchange shortages, food aid is simply not available with sufficiently flexible timing to be helpful. Emergency food aid for famine relief is a separate story, but routine food aid-Title I in the U.S. PL-480 program, for example-is not an instrument for dampening macro fluctuations caused by instability in food import needs.

Food aid provided under longer-term arrangements might be useful in providing temporary outside resources to assist a country in transition to a balanced macro food policy. This typically means moving from a consumer-based price policy and producer-based projects orientation to a mirror image-the incentives-based price policy and food subsidy programs targeted to poor consumers that form the policy focus of this book. In this sense, food aid will be much more important as a bridge between short-run problems and long-run solutions than as a mechanism for coping with short-run instability directly.

5.2. Stabilizing Agricultural Markets

Even in periods of scarcity in world markets, higher prices have stimulated increased exports from food-exporting countries where commodities had alternative domestic end uses. Food-importing countries are generally less concerned with the physical availability of grain in world markets than with budget costs and amounts of foreign exchange needed to pay for the grain the country needs. The fundamental need of most importing countries is for mechanisms to deal with budgetary and balance of payments problems caused by unexpected variations in domestic production or international prices.

Since the basic problem is price and not export supplies, financial schemes have been designed at the international level to help low-income importing countries solve food problems caused by variations in production or price. In 1981 the IMF expanded its compensatory finance scheme to cover balance of payments problems associated with rising costs of cereal imports. By adding grain import costs to previous provisions that

had applied only to export shortfalls, the IMF recognized a basic international problem. For low-income countries with highly variable domestic food production and a weak balance of payments position, the buffer fund approach could be of considerable help.

5.2.1. Buffer Stocks

Another element in coping with fluctuating internal production and external prices is the maintenance of domestic grain reserves. Public storage capacity and emergency stocks are a sensible investment for several reasons, not the least of which is insurance for policymakers who otherwise would be exposed to the whims of international markets. Grain stocks can be used to buffer short-run fluctuations in import deliveries and prices, but they cannot smooth out major year-to-year movements in world market prices except at extremely high cost. Nor do such modest reserves insure a country against food price changes that come from fluctuating domestic production, except by providing several months' planning time to make decisions about import or export levels needed to defend domestic price policy.

A buffer stock program involving domestic price stabilization operated in conjunction with a public storage system can help increase the flexibility of low-income countries in using international markets to improve their own welfare. Having sufficient storage capacity allows a country to import grain when prices are relatively low, rather than during emergency conditions. In addition, the grain reserves permit more flexibility in coping with short-term lags in delivery, and the additional storage facilities increase the domestic marketing system's capacity to handle local surpluses. Especially if domestic production strategies are successful, an expanded storage and marketing system will be needed to help supply large cities from the hinterlands, rather than from imports. The location of new storage capacity should be determined by both potential sources of stocks. It is apparent that a buffer stock is most effective when used for implementing a domestic price policy that uses world markets effectively, not for isolating price policy from world markets.

A buffer stock program can be designed to defend floor prices to farmers and ceiling prices to consumers as well as to smooth year-to-year price fluctuations. For it to operate successfully, however, the government must stand ready to perform a variety of economic functions simultaneously. It must buy from farmers at the guaranteed price if private millers or middlemen find this transaction unprofitable. Grain must be injected into retail markets if private storage is exhausted or if there is any evidence of collusion among merchants to drive up prices. A buffer stock agency must carry stocks both to carry out these day-to-day logistical operations and to dampen price fluctuations from one year to the next caused by variations in the size of the harvest relative to domestic and international demand.

These tasks require administrative skills and budgetary resources. An efficient food logistics operation might cover most of its costs by purchasing at the floor price and selling at the ceiling price if adequate margins are permitted. But so would the private trade, which would then carry much of the burden. As the margin narrows under the pressure of keeping urban food prices low and farm prices high, the financial and administrative role of the government increases. If the government has defined its objectives clearly and understands the budgetary requirements, its enlarged role can pay social benefits. Conversely, the failure to plan and budget for government food logistics operations can result in reliance on fiat and coercion, actions which fragment markets and stifle the necessary signals between producers and consumers.

5.2.2. Increasing Domestic Flexibility

Although domestic buffer stock policies can cope with some of the instability in international markets, greater flexibility in planning and allocating budget resources and foreign exchange can also help. Financial and logistical flexibility in scheduling and contracting for imports or exports offers substantial opportunities to conserve foreign exchange if short-term market trends are read correctly. Many countries buy desperately in a rising market and thus push prices higher. Similarly, commodity exporters frequently sell aggressively into a soft market in the fear that it will fall further, which it does because of their cumulative actions.

Having the financial capacity to stand back from purchases or sales for a month or so until short-run market trends are clarified can pay very high financial returns in terms of lower average import costs or higher export receipts. Alternatively, the use of futures markets to establish rolling purchase or sale positions for either import or export commitments can, for relatively modest cost, insure a country against being caught in short-run market dislocations. The Peck paper cited in the bibliography introduces analysts to the workings of commodity futures markets in a food security context. More effective understanding and use of futures markets to buffer against short-run fluctuations will require investment in the education of managers who will be responsible for day-to-day operations and new bureaucratic procedures which maintain their financial accountability but give them freedom to take forward positions.

The efficient use of futures markets may require new operating skills and procedures in food logistics agencies, but the result frequently is greater financial flexibility in the use of domestic budget revenues and foreign exchange. This internal financial flexibility is an important component of the policies and programs that buffer a country's long-run food price environment from short-run import price fluctuations. Foreign exchange contingency funds can earn interest in international credit markets until needed to accommodate the times when international prices rise for imports or fall for exports or when domestic production is substantially less than expected. When such instability occurs in the face of planners' overly optimistic projections of production or prices, development plans must be curtailed or abandoned unless contingency funds are available to increase financial flexibility.

6. Policy Analysis of the Product Markets

6.1. Improving the Marketing System

6.2. Price ceiling and Floor

6.3. Crop Insurance

7. Types of Agricultural Policies

7.1. Price policy

This is concerned with government policies that influence the level of prices received by farmers and paid by consumers for farm outputs.

Functions of farm price

Farm output prices are generally recognized as having three main functions in the economic system. These are allocation of farm resources, distribute of income, and encouraging or retarding investment and capital formation in agriculture.

- i. **The resource allocation function** - An increase in the general level of output prices, *ceteris paribus*, increases returns to all inputs in production, encouraging higher use of variable inputs, as well as providing higher returns to the fixed inputs of land, capital and family labor. A change in the relative price level of one output against other results in substitution between outputs as farm households adjust to the changing relative profitability of different outputs. For peasant households that consume a proportion of their own output, these adjustments may be modified by food security another household goals.
- ii. **The income distribution function**- High farm prices raise produces incomes and lower the real incomes of consumers though this is a debate.
- iii. **Investment and capital accumulation role** -This is a long term affect. High farm prices relative to those in other sectors increase the rate of return to capital in agriculture and encourage investment in various ways. At the household level, higher farm incomes may permit saving across seasons which in farm permits increased use of purchased cash inputs. Higher incomes also encourage the flow of credit into agricultural activities by improving the risk natures of household. At an inter sectoral level, higher food prices lower the relative rate of return to capital in the non-farm economy via their impact on non-farm wage levels and raise the relative rate of return in agriculture.

Objectives of output price policy

There are three primary objectives of farm output price policy, which correspond to the three roles or functions of output prices already identified. These are to influence agricultural output, to achieve desired changes in income distribution and to influence the role and contribution of the agricultural sector to the overall process of economic development.

Instruments of price policy

Many types of instruments can be employed but the main ones can be the following.

- i. Trade policy instruments**_- These affect domestic agricultural prices by operating on the prices or quantities of either imports or exports. They include: import taxes or subsidies increase or decrease domestic prices by raising or lowering the cost of imports in domestic currency; quantitative restrictions on imports raise the domestic price above the import price, and export taxes which are taken out of the fob export price and which lower the domestic price passed back to producers.
- ii. Exchange rate policy** - These include higher exchange rate (i.e., less domestic currency can be purchased for a given amount of foreign currency) results in a lower domestic currency equivalent of the world market price for both food and export crops; and lower exchange rate (i.e., more domestic currency for a unit of foreign currency) results in a higher domestic currency equivalent of world market prices.
- iii. Taxes and subsidies** - In addition to import or export taxes, already mentioned, farm output price levels can be affected by many types of domestic tax or subsidy imposed at differing points in the marketing chain. Example- consumption tax levied on the commodity in wholesale outlets or at retail outlets.
- iv. Direct interventions** - In addition to fiscal or exchange rate policies, governments frequently seek to influence prices by direct controls on the price formation, marketing, and storage of agricultural commodities. These controls require the creation of public marketing agencies in order to secure control

over part or all of the marketed supply of designated commodities. Some common direct controls are marketed output confined to sale through state channels at fixed prices, these often being uniform fixed form gate prices announced in advance of the crop season; fixed or maximum retail prices for staple foods, with supplies being confined mainly to state outlets and penalties for illegal pricing by private retailers; and fixed or minimum price to producers (floor prices)

Although these categories and lists of instruments cover many different types of intervention influencing farm price levels, they are by no means exhaustive since variations on them can be found at work in one country or another.

7.2. Marketing policy

Objectives of marketing policy

Marketing policy is a policy that will act on marketing. Objectives of the marketing policy include:

1. protecting farmers or consumers from parasitic traders,
2. to establish or increase farm gate price
3. to reduce the marketing margin
4. to increase food security.

Instruments of marketing policy

- i. **Monopoly parastatals** -This include all those government owned institutions that represent some form of monopoly control over one or other stage of the marketing system. E.g. marketing boards
- ii. **Non-monopoly parastatals** - This category includes a wide range of different institutions that provide one particular channel but not the exclusive channel, through which crop sales by peasants are transferred to consumers. E.g. The buffer stock authority for staple food grains. Such an authority is employed to implement food and ceiling prices for major food grains.
- iii. **Farmer cooperatives**
- iv. **Trade licensing**

- v. **Instruments to improve market conduct and performance**_through provision of improved information to marketing system participants; regulatory function of setting and enforcing quality standards, weights and measures, hygiene regulations; provision of marketing facilities such as floor spaces in towns and villages for retail and wholesale markets.
- vi. **Instruments to improve market structure** - This could be interpreted is to increase the amount of competition in the marketing system by encouraging new private entrants at each level of the system. The most effective means of increasing participation and reducing barriers to entry appears to be for the government to provide credit or seed money to enable new entrants to get started.

7.3. Input policy

This is an action where governments try to influence the quantities and combinations of purchased variable inputs used by small farmers in developing countries. Variable input policies have three main dimensions.

- √ The first, is the price level of variable inputs, and concerns state actions to influence the prices paid by farmers for inputs like fertilizer or pesticides.
- √ The second, is the delivery system for variable inputs, and concerns state actions to improve the physical flow of inputs to farmer.
- √ The third is information available to farmers concerning the type, quantity, and combination of inputs appropriate for their farm system.

Objectives of input policy

In general, an objective of Input policy is to accelerate and to make more uniform the successful adoption of new technology by farmers, in situations where (i) farmers are thought to underestimate the gains to be made by adopting new input combinations and (ii) markets are considered unable to deliver the new inputs with sufficient competitiveness, timeliness, quality, accuracy of information, and geographical coverage.

Instruments of input policy

Instruments used by governments in order to implement input policies may be grouped according to the three dimensions of input policy.

- √ The first is to influence the prices that farmers pay for variable inputs, especially the critical inputs like seed and chemical fertilizers.
- √ The second consists of interventions in the delivery of farm inputs, where by the state may wholly or partially replace private agents in the distribution system for inputs.
- √ The third concerns the provision of information on inputs to farmers, which in most developing countries is the task of the state agricultural extension service.

7.4. Credit policy

Credit is a sum of money in favor of the person to whom control over it is transferred. The provision of credit involves two parties' lender and a borrower. It also involves a price for the transfer of control over money, which is the interest rate charged by the lender to the borrower.

Objectives of the traditional Credit policy

The major objective is the creation of a self-sustaining rural financial system. But it can also include:

- √ to allocate a critical constraint hampering growth in agricultural output, this constraint being lack of cash to make needed farm investments (immigration, drainage, pumps, tractors, building) and to purchase variable inputs like fertilizers;
- √ to replace the fragmented and incomplete rural financial market represented by private money lenders, these credit sources supposedly having the effect of impoverishing their clients rather than arresting and
- √ to accelerate the adoption of new technology by peasant farmers, by providing working capital for the seasonal purchase of variable inputs,

Institutions of the traditional credit Policy

The institutions created or regulated by the state in order to deliver credit to farmers represented by themselves a type of instrument for implementing credit objectives.

Instruments of traditional Credit policy

The major instruments can be low interest rates: one of the most popular instruments of credit policy in developing countries has been to subsidize the rate of interest on loans to

farmers. But today to sustain the financial system the interest rate on loan should be sufficient to cover interest rate paid to savers, average cost of making transaction, and the risk margin to cover probability of default; credit targeting: the target group may be defined according to various criteria such as farm area or family income, loan portfolio regulations: various devices may be used by governments to restrict the decision making flexibility of financial institutions, or to they to enforce compliance with state objectives. One device is to set a minimum to the proportion of agricultural sector loans out of total loans. Another device is to stipulate maximum permissible loan sizes, in order to avoid too large a share of total loans going to large borrowers. A third device is to place restrictions on the term structure of the loan portfolio, such that the major proportion of total loans is short term loans. Other policies: like provision in kind of bag of fertilizer; and savings mobilization.

7.5. Mechanization policy

Need for mechanization

As agriculture is the largest sector in the economy in sub Saharan Africa, large proportion of population lives and ekes out a living in the rural areas, then its performance has a significant effect on output and the corresponding income and poverty levels of the majority. The improvement of the sector is paramount in poverty reduction as actions that increase agricultural production will ensure availability and access to food and improve farm incomes and hence reduce poverty.

However, over many decades, the performance of agriculture in these countries has not been impressive, being constrained by several factors, among them low utilization levels of mechanization inputs, which considerably limits the area cultivated. Hence leading to low crop production. The shortage of farm power has been identified as one of the limiting factors to increased crop production in several countries.

Mechanization generally enhances human capacity, leading to intensification and increased productivity as a result of timely planting, weed control, harvesting, post-harvest handling, and accessibility to markets. It also reduces drudgery, making agriculture a more attractive enterprise. Timely farm operations are becoming crucial in view of the rainy season becoming shorter in many parts of SSA. This put much pressure

on farmers to accomplish their field operations in the shortest possible time in order to capture the short growing period.

Mechanization is also becoming increasingly important in addressing the shortage of farm power in rural areas as a result of the declining agricultural labor force, caused by rural urban migration, increase in non farm employment opportunities, and HIV/AIDS and malaria.

Given the generally abundant land resource in SSA, efforts to increase agricultural production and productivity should include both technologies in order to expand the utilized land area and intensification of the existing cultivated area. This might be achieved through increased mechanization and adoption of other improved technologies, such as improved seeds, use of fertilizers, agroprocessing, and accessibility to markets.

Main Constraints in Agricultural Mechanization

1. Low purchasing power of most small scale farmers: A low level crop production leads to low incomes, which considerably limit the purchasing power of the majority of small holder farmers, making investment in agricultural machinery and implements difficult.
2. Low producer price: Farmgate prices offered to farmers, especially at harvest time, are generally low. This further reduces farm income limits, thus limiting investment capabilities.
3. High cost of Agricultural machinery: The price of agricultural machinery has risen sharply in the last 20 years, making it unfavorable for the majority of farmers. Massive devaluation of local currencies and high inflation rates in most SSA countries have sharply increased the prices of agricultural machinery.
4. Lack of agricultural credit: Many commercial banks in SSA are reluctant to finance agriculture as they claim that the risks involved are too high, especially in small holder farming. Where such credits are available, stringent conditions have been tied to the loans, making borrowing difficult for farmers as the majority lacks the required securities as collateral for the loans.
5. Lack of well trained operators and mechanics for agricultural machinery: Many of the operators and mechanics who handle agricultural machinery are not well trained.

Strategies

The following key strategic action areas have been identified:

- Improved access and availability of mechanization inputs
- Commercialization of agriculture through mechanized farming
- Promoting agro-processing and rural based agri-industries
- Improving livelihoods and land management through conservation agriculture
- Improving farmers' access to technologies and services

7.6. Land reform policy

Nature, Scope and definitions

Land reform policy covers a wide range of social change involving the access of people to land, the ownership structure of land, the size structure of land holdings, and legal and contractual forms of land tenure.

Objectives of land reform

The two main economic objectives of land reform are to reduce absolute poverty and to increase agricultural output. These are the equity and efficiency goals of land reform. Land reform can be an important potential instrument of poverty reduction because it eliminates the near slavery nature of certain types of land tenure, and because a reduction in the inequality of land ownership should increase the real incomes of farm families, and may increase the number of farm families able to obtain an acceptable livelihood from the land.

The main social objective of land reform is usually some concept of 'social justice'. This is allied to both political and economic reasons and motivations. On the political side, in different ways and for different reasons, increased social equality may feature as an argument of both liberal and socialist advocates of land reform. On the economic side, social justice is linked to questions of employment, income distribution, efficiency and the size of the domestic market.

Instruments of land reform

The main groups of land reform instruments include

- Instruments of tendency policy
- Instruments of land redistribution

- Instruments of land settlement
- a. ***Tendency reform*** does not involve the redistribution of existing private titles to land; it merely means changing the rules concerning legal and illegal types of contract between landowner and tenant.
- b. ***Land settlement*** does not involve enforced redistribution of previous private titles to land. It usually involves the release of state land for settlement, the opening up of new lands for settlement, or the resettlement of land abandoned by former owners. Land settlements requires a set of criteria and rules for deciding the categories of rural dwellers who should be eligible to apply for a farm; the size of holding that is appropriate given the soils, climate, and crop choices of the settlement area; the amount of capital required by each settler in the form of loans to get started on cultivation; the repayment rules for those loans; whether to lease or sell the land to its new occupiers; and the price and method of recoupment in the case of transfer of freehold title.
- c. ***Land redistribution***: does mean reallocating the ownership of land between people and the rules for this are a great deal more difficult to formulate and to implement than in either of the other more modest types of land reform. There are four main components expropriation, compensation, exemption, and distribution.

Expropriation: this is politically the most difficult action amongst all instruments of land reform. Where land reform comes about as a consequence of a socialist revolution, expropriation may be automatic and widespread with few exemptions. In all other cases, expropriation is the outcome of a political process involving many trades-offs and compromises. The most common instrument is to set a willing for the amount of land that landowners can retain for their own contained use, and to expropriate all land.

7.7. Research policy

8. Agricultural Development Policy in Ethiopia

8.1. Overview of the Rural Development and Agricultural Policy Framework

Agriculture is critical for poverty reduction and the performance of the economy as a whole. To pursue agricultural growth, the government has adopted an Agriculture Development Led Industrialization (ADLI) policy, with the primary focus on an intensified production system. Stimulating agricultural growth has numerous direct and indirect benefits and links. History provides two important lessons:

1. no country has solved its problem of poverty through agricultural development alone,
2. yet no country (with the rare exceptions of countries like Singapore and Hong Kong), has solved its problem of poverty without creating a dynamic agricultural sector

In line with these arguments, the government's rationale for ADLI is:

- Higher rural productivity will raise *rural incomes*, providing a market for (urban-manufactured) consumer products and inputs;
- Higher incomes generate *savings* that may be mobilized via a rural financial system to finance higher return investments (usually urban);
- Higher production means *cheaper food* that helps keep wages down and *cheaper raw materials* for industry and agro-processing, raising country competitiveness; and
- Higher rural productivity (and limited access to land) will cause *labor to exit* from agriculture to urban areas.

8.2. Food Security policy of Ethiopia

8.3. Export and Domestic Food Demand

8.4. Food Consumption in Ethiopia