

Poverty, Hunger, and Development Policy

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ABSTRACT

This paper attempts to explain the pervasive problems of poverty and hunger of the developing countries in terms of the internal tendencies of their socio-technical organization. The analysis is based on a generic system dynamics model of an agrarian economy which determines income distribution and food adequacy endogeneously but treats government policy as exogenous. It is suggested that the policies such as agricultural development, financial and technical assistance for the poor, and population control, that directly address the symptoms of the problems of poverty and hunger, may be defeated in the long run since socio-technical arrangements of the system favor persistence of poverty and vulnerability to food shortage. These policies will, however, be successful if concomitant efforts are also made to reduce income inequality through fiscal measures and to build up a food slack in the system through obtaining food calories uneconomically from cereal production.

INTRODUCTION

Barring a few instances of occasional relief, poverty and hunger have continued to be the major problems of the less developed countries in spite of several decades of effort to raise the incomes of the poor and to achieve self-reliance in food. The efforts to increase food production have been quite successful and the production of food has increased severalfold over the past few decades (FAO 1979), but growth in population of these countries seems to have off-set much of the increases in food availability (Bhattacharjee 1976). The efforts to raise the incomes of the poor have been even less successful (Griffin 1979, Haq 1976, Galbraith 1979).

This study explains the problems of poverty and hunger in terms of the internal tendencies of the socio-technical organization in which they occur. With this perspective, the inefficacy of the policies aimed at directly helping the poor or increasing food production is easily understood as these policies may be defeated in the long run by the mechanisms which created poverty and hunger in the first place. This perspective, however, also calls for moving away from policies which address only the symptoms of the problem and searching for appropriate points of entry into the system which should allow affecting the motivations of its actors. This is attempted in this study with the help of a generic system dynamics model of an agricultural economy whose micro-structure incorporates basic mechanisms of production, income disbursement and demographic behavior while it also generates many empirically observed demographic and income patterns.

The study suggests that the tendency of the system to move towards a goal of mass poverty arises from the limited ability of the households to own productive resources, which reduces the potential of their income from self-employment. Since this potential represents their opportunity cost of accepting wage-employment, it also affects the wage rate and the share of income disbursed as wages. The tendency of the system to move towards a goal of food vulnerability arises from the presence of economical food consumption patterns which increase the facility for the population to grow whenever food availability rises. Thus, the solution to alleviating poverty and hunger appear to lie in redistributing income and building up a food slack in the system. The key policies for accomplishing

this include a heavy tax on rent income which should discourage absentee ownership of resources, and obtaining food calories from animal protein instead of cereals, which should limit the abundance of edible calories when cereal production rises.

However, to make a smooth transition from a poverty and hunger ridden pattern to an affluent one, it is also important to simultaneously provide financial and technical assistance to the self-employed, who may use considerable amount of rented resources, to acquire the resources that the absentee owners may wish to withdraw from renting. Programs to increase cereal production must also be simultaneously pursued to assure availability of adequate food at an increased level of per capita cereal consumption.

A policy package incorporating all these measures stimulates high wage rates, decreases birth rate, enhances life expectancy, and leads to higher levels of cereal food availability per capita. Indeed, a high wage rate and a relatively uneconomical food consumption pattern are important features which distinguish developing countries from the developed ones. Ironically, these features of the developed countries are often taken as given and little effort is made to interpret them as manifestations of their social relationships.

2. PATTERN OF POVERTY AND HUNGER

The countries facing the problems of hunger and mass poverty exhibit several common characteristics. These include high birth rates, low life expectancy, wide disparity of income between the rich and the poor, and a concentration of ownership of resources in the hands of a few (Lipton 1977, Griffin 1979). Also common are chronic food deficits, which may temporarily disappear when there is a good harvest, but which have shown a rising trend despite considerable increases in food production and imports (Siamwalla 1980).

The food consumption habits of the populations of these countries can be described as economical. The staples are cereals rather than animal proteins and the caloric intake needed can be obtained very efficiently from farm production (Simontov 1976). Most of these countries have a labor surplus with a large under-employed informal sector and a low real wage rate which has persisted in spite of sizable increases in the gross national product (Griffin 1978a).

The pattern described above has been quite resilient, in the long run, to most policy measures adopted in the past, although, short periods of affluence and food adequacy have been experienced by some countries. These measures have included introduction of modern agricultural technology and inputs, use of improved seed varieties, population control programs, organization of cooperatives and extension service for the small farmers, and setting up financial institutions for reducing reliance on household savings for meeting investment needs. The problems of poverty and hunger continue to persist in spite of these measures (Griffin 1978b).

3. PAST INTERVENTION AND ITS BASIS

Although the problems of the developing countries initially received only a cursory treatment from economics, the subject of economic development currently seems to be quite firmly grounded in the economic discipline (Arndt 1973). Unfortunately, economics has contributed to the discipline little more than a body of normative theories which is grouped together under the label of development economics, but which bears little relevance to the problems they address (Sæed 1982a). These theories have, nonetheless, been the main basis for the design of economic development policy. This basis has been further supplemented by the humanitarian concerns and moralization, which may be

quite well intentioned, although, these have an emotional rather than a logical perspective. All in all, the economic development effort has addressed little more than the symptoms of poverty and hunger and the policies it has issued often require large scale government intervention which has, however, made little impression on the problem itself.

Professor Lewis suggests that attempts to develop theories that exclusively address the problems of developing countries should enable better policy design (Lewis 1984). Such attempts might, however, only generate models which explain social patterns occurring under very specific conditions but which fail to identify mechanisms of change from one pattern to another. This is because there would be a theory exclusive to each pattern (Katz 1978). The actual modelling practice in economics has been even more limited as it has largely incorporated mathematical interpretation of the neoclassical economic theory with minor modifications (Leontief 1977). This has resulted in proliferation of models which have mostly issued stereotype solutions to the problems of under-development.

The stereotyped solutions to poverty often call for increasing economic growth rate, with or without extending direct aid to the poor, and redistributing income. The solutions to hunger call for increasing food production and food aid from abroad, and controlling population. These solutions require enormous amounts of effort by the governments who may be quite genuinely concerned with improving the well being of the public, but are often unable to maintain this commitment due to other political pressures (Saeed 1983a). Weary of their burden, most developing countries welcome food aid as a way to immediately overcome the problem of hunger, so they may concentrate their effort on other problems of development. Past experience shows, however, that food aid reduces self-reliance and encourages continued dependence on aid while it is often offered on the basis of political rather than need-related criteria (Maxwell 1983).

While the problems of poverty and food shortage and the pros and cons of food aid remain a subject of much debate, there appears to be a general consensus that the problem of food supply can only be solved by raising production and reorganizing distribution within the countries facing the problem. In response to such views, many developing countries have embarked upon programs of agricultural and infrastructural development, which have considerably raised their food production while also improving their distribution facilities (Von Braun 1983, Paarlberg 1975). However, increases in food supply have often not kept pace with the growth in population. As a result food availability has remained low. Large scale population planning programs have also been undertaken in most poor countries, although, their low effectiveness has raised many doubts about their efficacy.

The design of food policies and the debates about their efficacy has, albeit, disregarded any possible relationship which may exist between population growth rate and food adequacy, although, there is much empirical and anthropological evidence to suggest this. There is also evidence of higher living standards suppressing population growth rates since they permit greater social mobility which makes small family size more desirable (Meadows 1974). This relationship has been recognized to some extent in the programs which are specifically aimed at improving the lot of the poor. Many such programs have been implemented in the developing countries, although, these have also been quite ineffective (Morawetz 1977).

4. A SYSTEM DYNAMICS MODEL OF THE SOCIAL ORGANIZATION UNDERLYING POVERTY AND HUNGER

The developing country economies which have experienced the problems of poverty and hunger are predominantly rural while they also appear to have a dualist structure consisting of a worker hiring or land-leasing capitalist sector and a self-employed peasant sector. It has also been observed that

all workers, whether self-employed in tilling their own or rented land or employed as wage-workers, are members of a homogeneous socio-economic group with a common interest, which is to maximize consumption. This group also appears to be the sole supplier of labor in the economy if the small number of working capitalists is neglected. On the other hand, the capitalist sector strives to maximize profit while it is also the sole wage-employer in the economy (Bardhan 1973). This dualist structure is incorporated into a system dynamics model which is capable of generating many patterns of behavior (Seeed 1980). The technical details of this model are available from the author on request. Its main accumulations and flows are shown in Figures 1 and 2.

Figure 1 shows how production factors are allocated between the two sectors of the economy while Figure 2 shows how the income of the economy is distributed. The changes in the quantities of the production factors owned or employed by each sector are governed by the decisions of the producers and the consumers of output and by the suppliers of the production factors acting rationally according to their respective motivations within the roles defined for them by the system. The value of production is shared by the households on the basis of the quantity of the production factors they contribute and the factor prices they can bargain for.

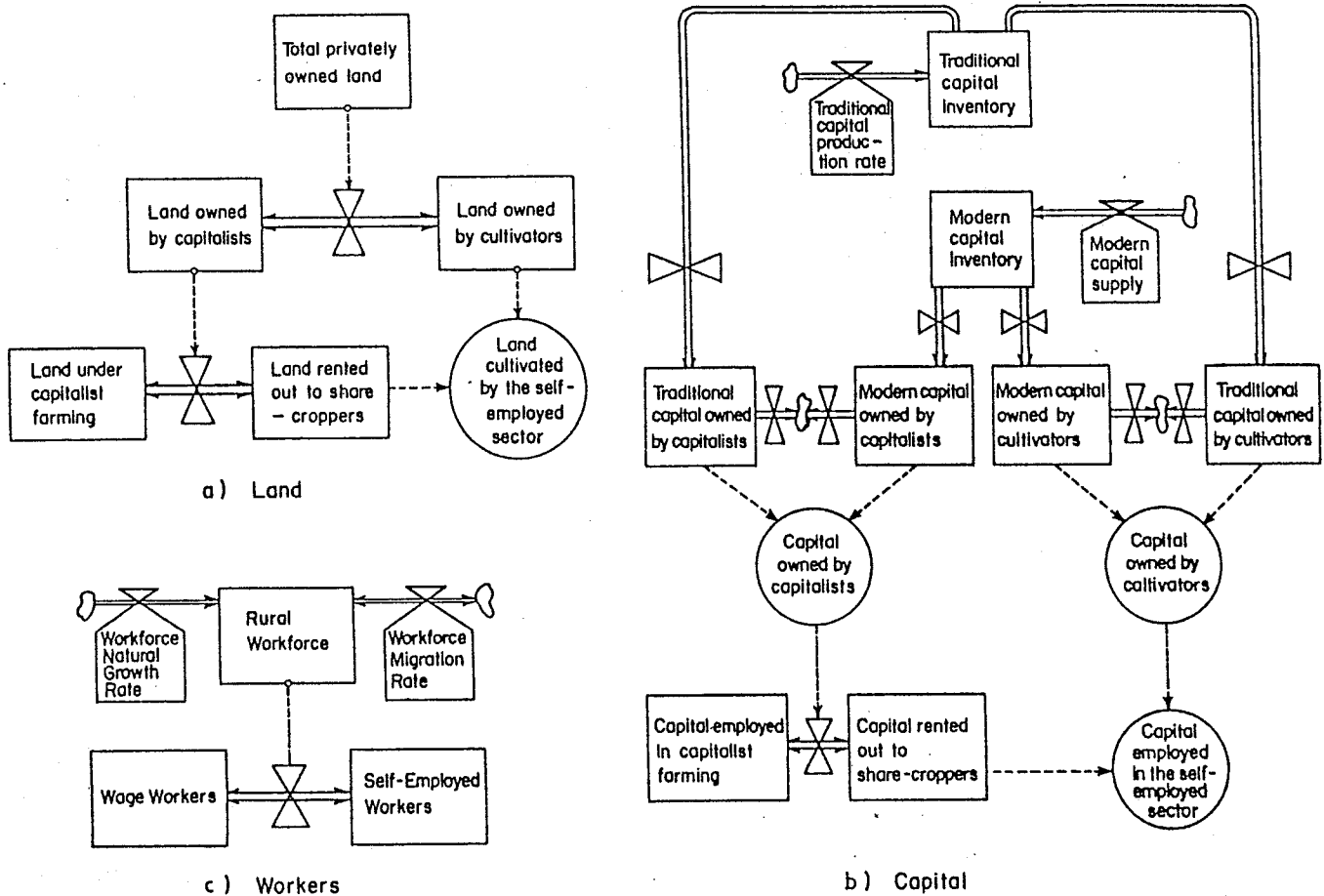


Fig. 1: Allocation of Production Factors in an Agrarian Economy

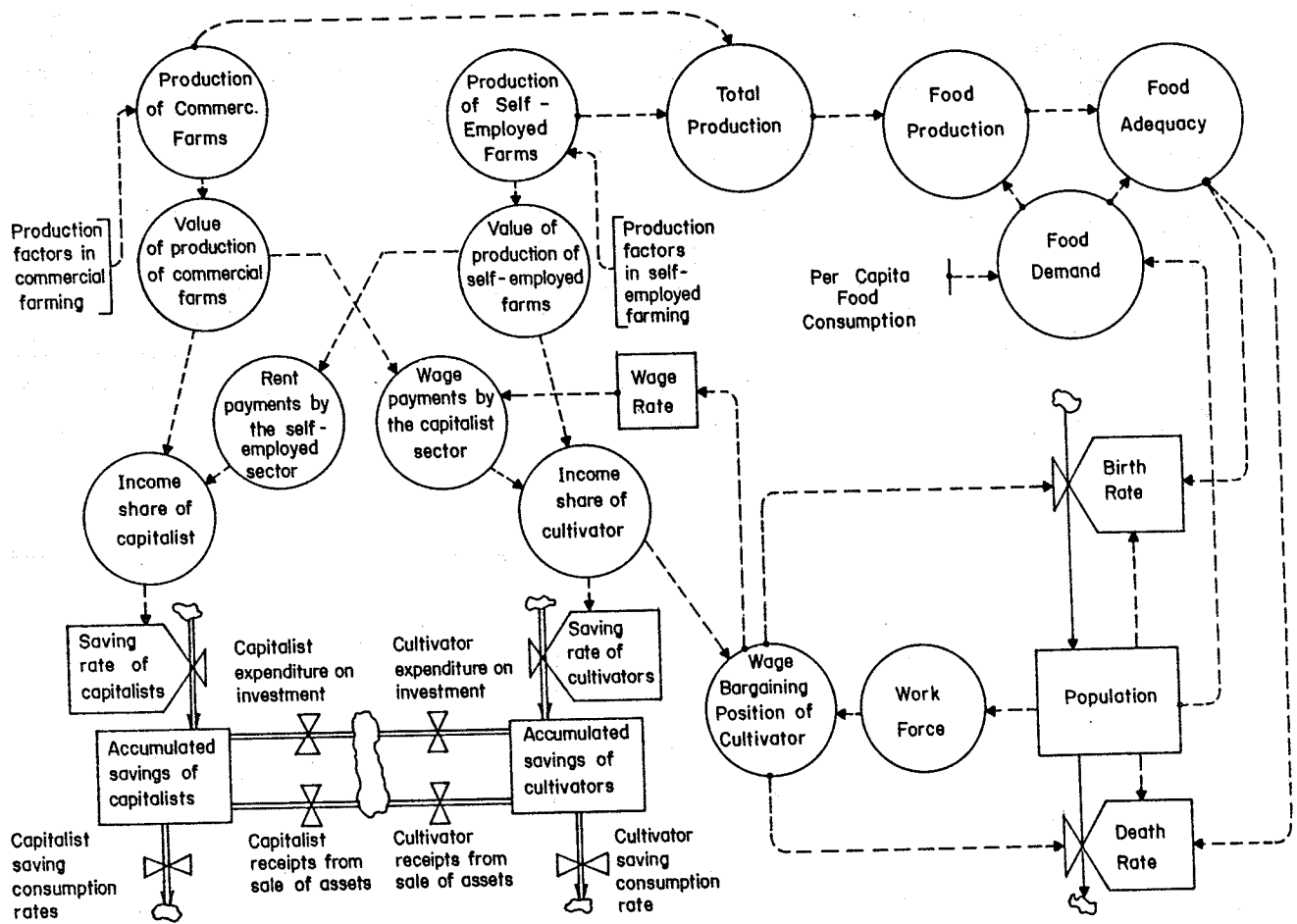


FIGURE 2 : Disbursement of Income and Changes in Population

The capacity allocated to production of food cereals depends on the demand for food generated by the population less food imports or food aid. Prices of output and production factors are endogeneously determined and in turn affect both production and consumption decisions, although, food consumption per capita is relatively inelastic. Food adequacy is determined by the supply of food calories relative to their demand, and in turn, influences birth and death rates. Income share of the workers, less any investment needed to maintain self-employment divided by the total workforce, determines average consumption per worker, which is the basis for negotiating wage rates. Wage rate affects people's standard of living. An improvement in the standard of living reduces both birth and death rates.

The model has been developed and tested in several stages, starting with incorporating in it the substantive assumptions representing the market forces suggested by the neoclassical economic theory and gradually relaxing those assumptions to make the model structure consistent with the actual working of the agricultural economies of the developing countries. The size of each sector is not specified and is determined endogenously by the model depending on the assumptions about the socio-technical environment in which the system operates. The wage and income patterns generated by the model and their relevance to the history of the developing countries is discussed in detail in Saeed (1983b). The following modifications of the neoclassical model are essential to make its decision structure correspond to the actual conditions in the developing countries.

1. Formal ownership is protected by law but land and capital assets can be freely bought, sold and rented by their owners. Each buying and selling transaction between the two sectors must be accompanied by a corresponding transfer of the cash value of the assets. The financial markets are segmented by sectors.
2. Wage rate depends not on the marginal productivity of labor as is assumed in many macro-economic models but on economic bargaining position of workers, which is determined by their opportunity cost of supplying an additional unit of labor to the capitalist sector.
3. The saving propensity of all households is not uniform. Since capitalist households receive incomes which are much above subsistence, their saving propensity is stable. On the other hand, the saving propensity of the worker households depends on their need to save for supporting investment for self-employment and on how their absolute level of income compares with their flexible consumption.

These modifications impart to the model an internal tendency towards concentration of resources in the capitalist sector as shown in the simulation of Figure 3 which also assumes a fixed economy. Such a tendency arises out of a goal of the system to employ resources in the most efficient way while the ownership of those resources can only be in the hands of the sector which has the best financial ability.

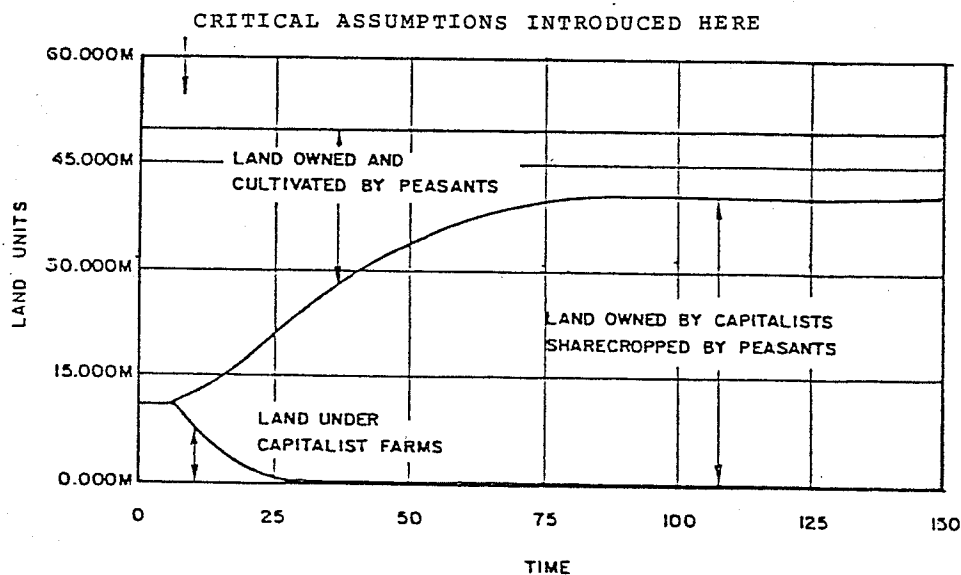


FIGURE 3: Simulation Showing Internal Tendency of the Model Towards Concentration of Resources When Critical Assumptions are Introduced

If land can potentially be farmed by owner-cultivators, share-croppers and wage-workers, the presence of wage-employment opportunities offering wages equal to income in self-employment at the start of the simulation (which is characterised by a general market equilibrium) depresses the saving rate of the self employed. In the long run, this also decreases their ability to own land, which decreases their share of income and hence the wage they can demand. A decrease in ownership of resources by the self-employed, in the face of a decrease in wage-employment opportunities which is caused by high labor costs, also increases demand for renting, which bids up rents. This not only makes it profitable for the capitalist sector to invest in resources for renting them out, it also gives additional financial edge to this sector over the peasant sector whose savings continue to decline as its rent burden rises.

Thus, even when capitalist farming is eliminated due to an initially high cost of wage-labor, resource ownership by the capitalist sector expands. In the resulting end equilibrium, major share of the resources is owned by the capitalist sector and only a minor share by the self-employed. The results of this simulation are borne out by the pervasive occurrence of resource concentration experienced in most developing countries.

When the assumption of a fixed economy is relaxed and birth rate and life expectancy are assumed to be influenced by food adequacy and income level, population change in this system is not significant, although, it is characterised by a high birth rate and a low life expectancy. This is shown in the simulation of Figure 4 in which population growth assumptions were introduced after the system settled down with its characteristic resource concentration. The simulation also shows that wage rate and food per capita stay low while the price index rises since any price increase also pushes up factor costs which, in the face of fixed land, perpetuates further price rise.

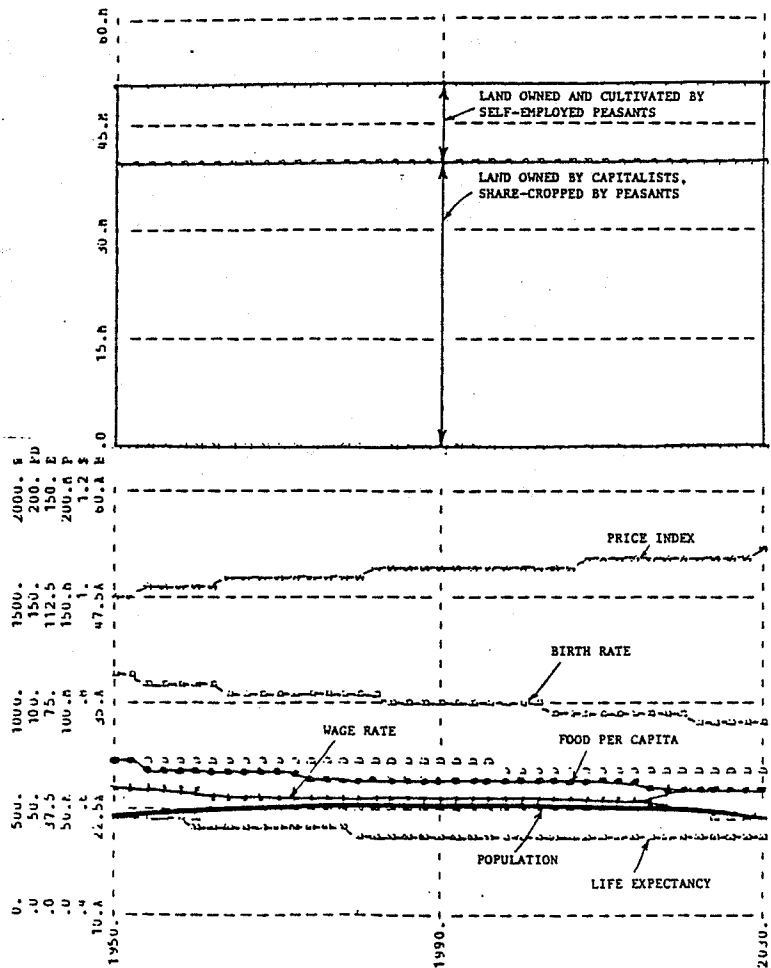


FIGURE 4: Change in Population in the Stagnant Economies of the Developing Countries Before Development Effort Began

The stagnant scenario created in the simulation of Figure 4 might seem largely hypothetical as most poor countries have also experienced high population growth rates along with the other symptoms shown in the simulation. It however, quite adequately describes stagnant economies of the poor countries before they engaged in serious development effort. Besides industrialization, this effort has incorporated an increase in the use of modern equipment and inputs for the agricultural sector, which allowed cereal production to rise substantially. This was also accompanied by corresponding increases in population.

Figure 5 shows a simulation in which modern capital equipment and inputs are made available to the farmers, although in limited quantities, in an effort to promote agriculture. Most of these inputs are allocated by the model to commercial farming whose scale can be easily adjusted to conform to the level required by modern technology.

The behavior shown in Figure 5 bears a close resemblance to the behavior of the economies of most poor countries. The increases in cereal food production are offset by concomitant increases in population. Thus, cereal food per capita (which is a proxy for food adequacy) stays low.

Wage rate also continues to stagnate since it depends on the economic bargaining position of the workers, not on labor productivity. The economic bargaining position of the workers stays low since the ownership pattern does not change even though a considerable part of the share-cropped land is converted into commercial farms. Since ownership of resources is a basis for determining income shares, the benefits of increases in production are largely obtained by the capitalist sector, which continues to own a large part of the resources.

The cultivation pattern changes as modern equipment make commercially-run farms profitable. However, since this also creates a shortage of land which is available for rent, renting out land again becomes profitable after some of the

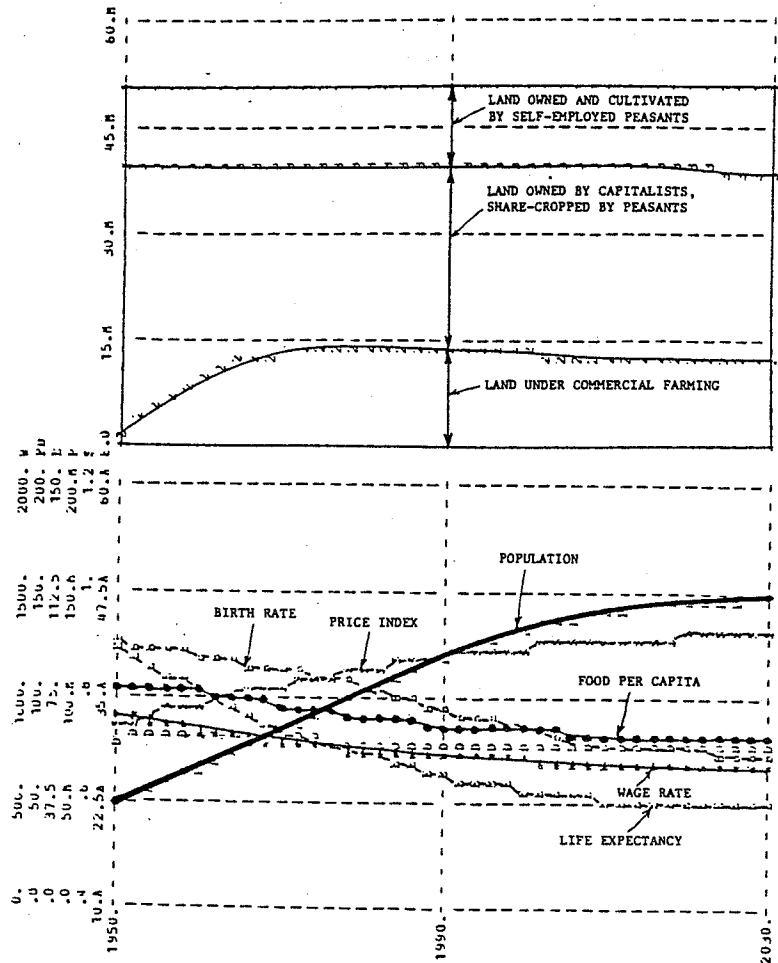


FIGURE 5: Behavior of the Model Incorporating Introduction of Labor Efficient Modern Technology.

share-cropped land has been converted to commercial farms. Hence the side by side existence of share-cropped and commercial farms, which seems to have surprized many observers (Alavi 1976).

5. WHY WELL-INTENTIONED POLICIES DID NOT WORK

The development policies implemented in the developing countries to date have incorporated several measures which were explicitly aimed at alleviating poverty and hunger. Although a very large variety of policies have been proposed, most of these can be placed in three categories on the basis of their intent. These are: policies aimed at increasing food production which is, sometimes, also supplemented by food aid and imports; policies aimed at limiting population; and policies which strive to help the poor target groups.

The outcome of the first set of policies is evident in the simulation of Figure 5. If food supply were also supplemented by food aid, indigenous food production would decrease, which would allow transfer of the scarce resources to the capital and consumption goods producing sectors, although the increased availability of food would lead to population levels for which indigenous food resources are inadequate. Thus, the dependence on food aid would continue.

Birth control programs introduced simultaneously with the policies that increase production are simulated in Figure 6. In the short run, this set of policies increases availability of food calories since it limits demand for food. In the long run, however, increased availability of food calories aids birth rate and increases life expectancy, which off-sets the effect of the birth control effort. The resulting increases in population bring down food availability to the old level. Thus, food availability and life expectancy patterns towards the end of the simulation do not differ substantially from those in Figure 5. Also since no changes occur in the ownership pattern, wage rate

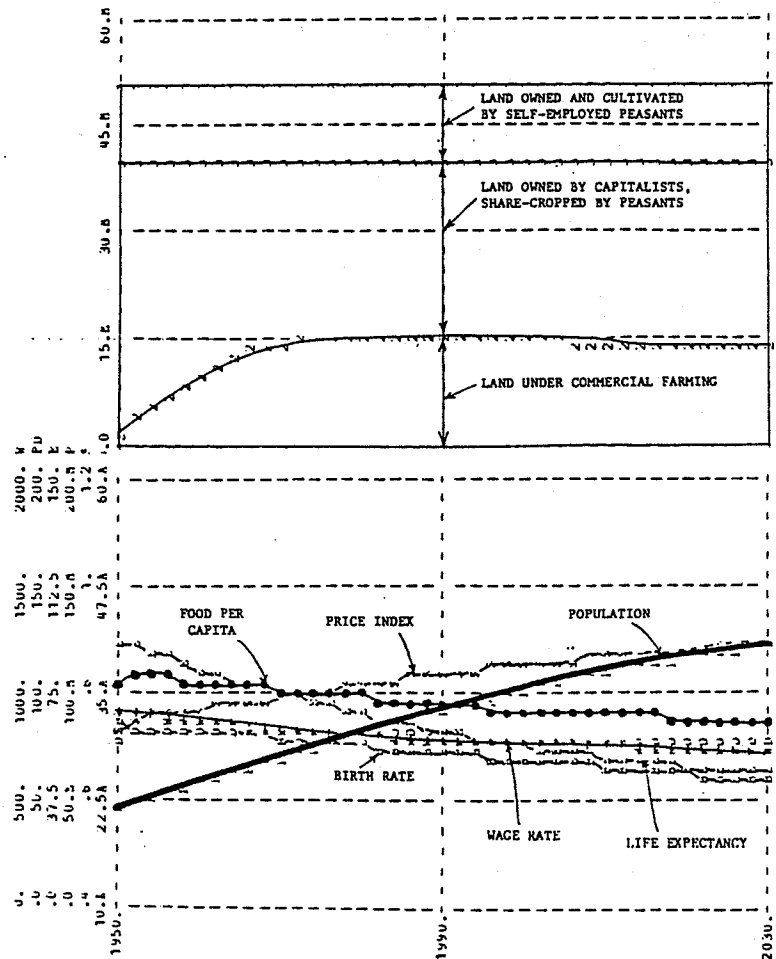


FIGURE 6: Behavior of the Model Incorporating Introduction of Modern Technologies and Population Control.

continues to be depressed. The efforts to assist poor target groups often translate into eliminating the technological and financial differences between the capitalist and the self-employed sectors. These efforts incorporate programs that attempt to organize small farms into cooperatives, introduce small scale technology, deliver extension services, and provide institutionalized financial assistance to the small farmer. It should, however, be borne in mind that the technological differences between the capitalist and the self-employed sectors were initially created when agricultural modernization policies were introduced as a part of the development effort. It was observed in the simulation of Figure 5 that these policies led to a change only in the cropping pattern, without changing appreciably the ownership or the wage rate. Because financial institutions invariably require collateral, while they also need to minimize the risk of a default in the payment of a loan, financial ability cannot be completely decoupled from ownership and household savings. Thus, financial policies may also not radically change ownership patterns.

Figure 7 shows a simulation incorporating the technological, organizational and financial policies discussed above in addition to the policies of Figure 6. As expected, the only significant change from Figure 5 appears in restoration of the earlier cropping pattern with predominance of share-cropping practice while the rest of the behavior remains unchanged.

The resilience of the system to the well-intentioned policies discussed above is indeed frustrating. The inefficacy of these policies has generated arguments for and against the theories and the data used in policy design. The debate resulting from this has probably been quite interesting, although not very useful from the standpoint of helping policy design.

The advantage of having a model, whose behavior must be interpreted as a logical deduction of its micro-structure, is that the resilience of a policy must be explained in terms of the anatomy of the day-to-day actions in the system instead of being attributed to personal and incidental factors.

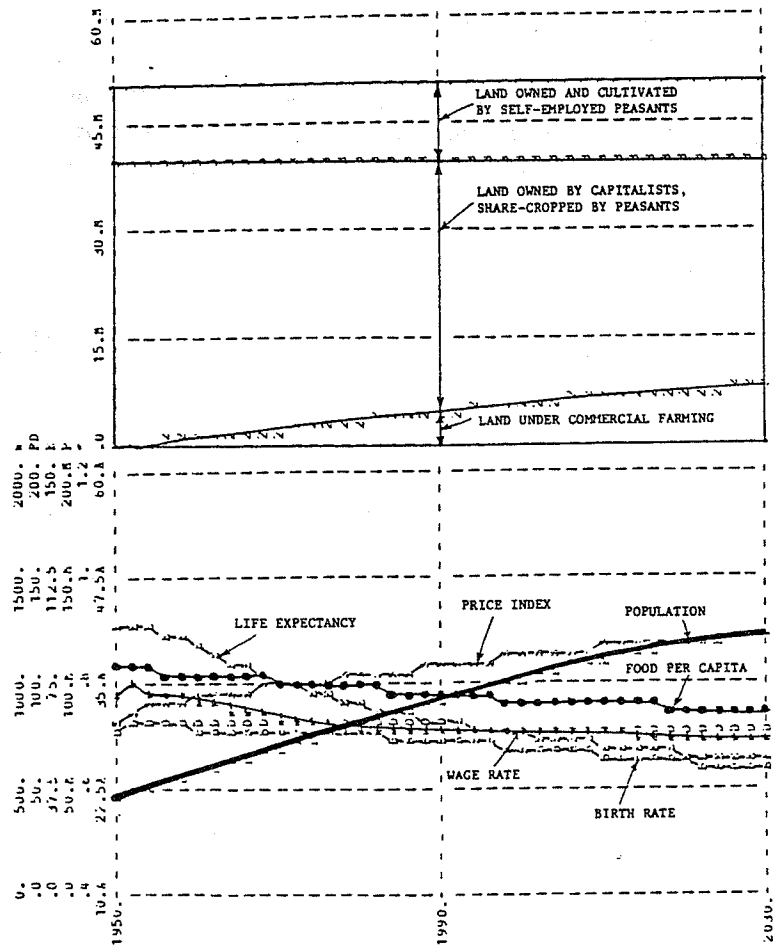


FIGURE 7: Behavior of the Model Incorporating Modern Technologies, Population Control, and Programs to Help the Poor.

The source of resistance in the model to well-intentioned policies appears to be its critical assumptions about ownership and wage determination, and the relationship between population growth, food adequacy, and living standards.

When decision making is viewed without reference to the macro-behavior created by it, a debate may arise about the appropriateness of a decision criterion. However, when both micro-structure and macro-behavior are observed, this debate can be readily resolved by selecting a basis for which evidence exists both at micro- and macro- levels. Thus, the correspondence between the policy resilience of the model is a source of confidence in its structure which was developed on the basis of micro-level evidence, although this disqualifies well-intentioned policies and rejects popular theories. It also calls for redefining the role of public policy, from that of direct intervention to counter macro-behavior, to that of finding appropriate entry points for influencing the day to day decisions of the system.

6. IDENTIFYING ENTRY POINTS INTO THE POLICY RESISTANT SYSTEM

Since the internal tendency of a system arises from the powerful feedbacks which dominate the behavior of its actors, the efficacy of a policy depends on how effectively it changes the relative strengths of those feedbacks. Figure 8 shows the important feedbacks in the model of this paper.

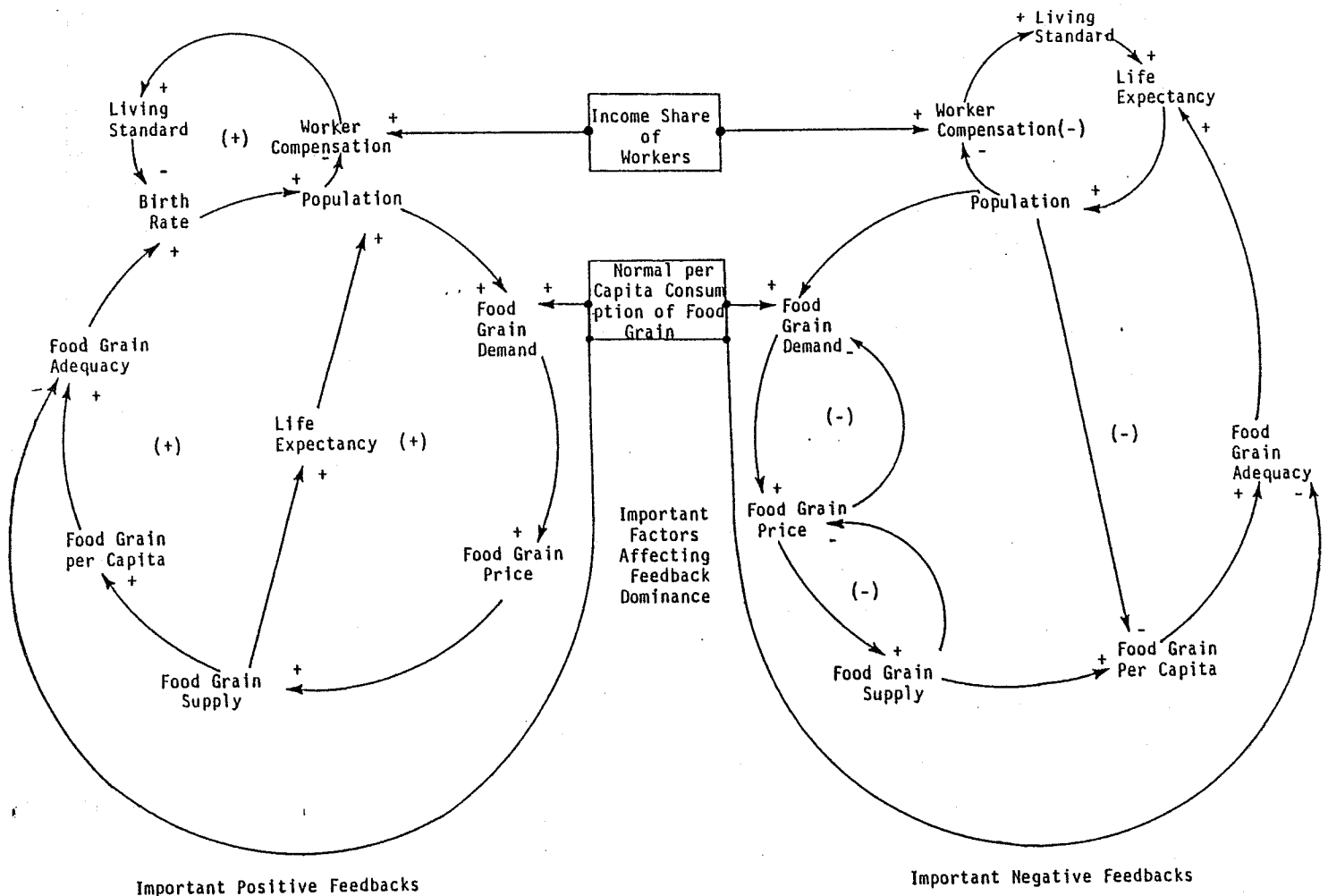


FIGURE 8

Important Feedbacks Affecting Population; Food Production; and Worker Compensation

Positive feedbacks, which are self-reinforcing and negative feedbacks, which are self-correcting, are shown separately. It will be noticed that price is not the only market-clearing mechanism in the system which strives to balance supply and demand. Population changes which are driven by adequacy of food calories and living standards, also strive to achieve this balance. The internal forces attempting a balance are, thus, embodied in four negative feedback loops, only two of which are recognized in the models treating population exogeneously. The remaining two negative feedback loops make it difficult for the system to move away from an internal goal of equilibrating at low levels of wages and food adequacy. The positive feedback loops, which are coupled with these negative feedback loops only speed up the process of adjustment.

Unless the internal goals of the system are changed, any direct effort to increase food supply, change population, or help the poor will be resisted by the forces embodied in the feedback loops of Figure 8, although, these policies may create temporary gains. The internal goals of the system may be influenced only by changing income shares of the workers and the ambient cereal food consumption per capita, which emerge as promising entry points for directing efforts to counter poverty and hunger.

Policies for raising incomes of the poor have been discussed in detail in Saeed (1982b). These policies, at the outset, call for a change in the ownership pattern that should allow workers to obtain a larger share of the total income of the economy, which also enhances their wage bargaining position. This, however, may not be achieved through radical means since current ownership patterns are also the result of the system's internal tendency.

On the other hand, if the cost of being an absentee owner of the resources is increased through fiscal measures such as a heavy tax on rent income, resources which cannot be employed efficiently under the commercial system are offered for sale to the self-employed sector. Purchase of these resources by the self-employed raises the entitlement of the worker households to the income of the economy, which increases their opportunity cost of supplying wage labor to the capitalist sector. This raises wage rate, which makes commercial farming even more uneconomical. Such changes spiral in the long run into transfer of a substantial amount of resources to the self-employed sector. Provision of technological, organizational, and financial assistance to small farmers accelerates this process, although without the fiscal measures which increase the cost of being an absentee owner, such assistance only results in a change in the cropping pattern.

Figure 9 shows a simulation of the policy package incorporating taxation of rent income in addition to the policies of Figure 7. The scenario generated by the simulation incorporates an increase in the ownership of the resources by the self-employed sector as well as an increase in wage rate. This policy package does not limit the rise in population, because, even though a higher standard of living has a limiting influence on birth rate, the temporary abundance of cereal food calories offsets this influence. Furthermore, life expectancy rises on account of a better living standard. The quality of life improves because of these changes. There is, however, little change in the trend of cereal food available per capita since food consumption pattern continues to be economical and extra food production only helps to generate additional population. Thus vulnerability to food shortages is not overcome.

Since the population goal of the system partly seems to be determined by food availability, a higher level of ambient per capita cereal consumption would limit population in the long run for a given level of cereal production. This policy essentially translates into obtaining food calories from animal proteins instead of cereals, which will limit availability of edible food calories for a given level of cereal production. The writings on hunger often dub this method of generating food calories

as uneconomical or even decadent and moralize against it. However, it should be borne in mind that the objective of the policy is not to achieve efficiency in production of edible food calories in the short run, but to provide food security in the long run.

Figure 10 shows a simulation which also incorporates a higher per capita cereal consumption as compared to the earlier simulations, in addition to the policy package of Figure 9. The results are quite appealing. The birth rate is lowest, and life expectancy and wage rate are highest, of all previous simulations. Increases in population are limited as extra cereal production is used up in generating edible calories uneconomically instead of facilitating population growth. Thus, food cereal production per capita approaches a much higher level and a large slack is created between the cereal food calories produced and edible calories actually consumed, which reduces food vulnerability since in case of a shortage people can always resort to more economical sources of caloric intake.

An uneconomical food consumption policy, in addition to limiting growth in births, also raises the demand for cereals, and through prices, the level of their production. When ownership is transferred to the working households, the additional income from increased production is accrued to these households which adds to the opportunity cost of labor in the self-employment sector, thus pushing up further compensation demanded for wage-employment. A higher wage rate, in turn, further raises living standard which further limits births and raises life expectancy.

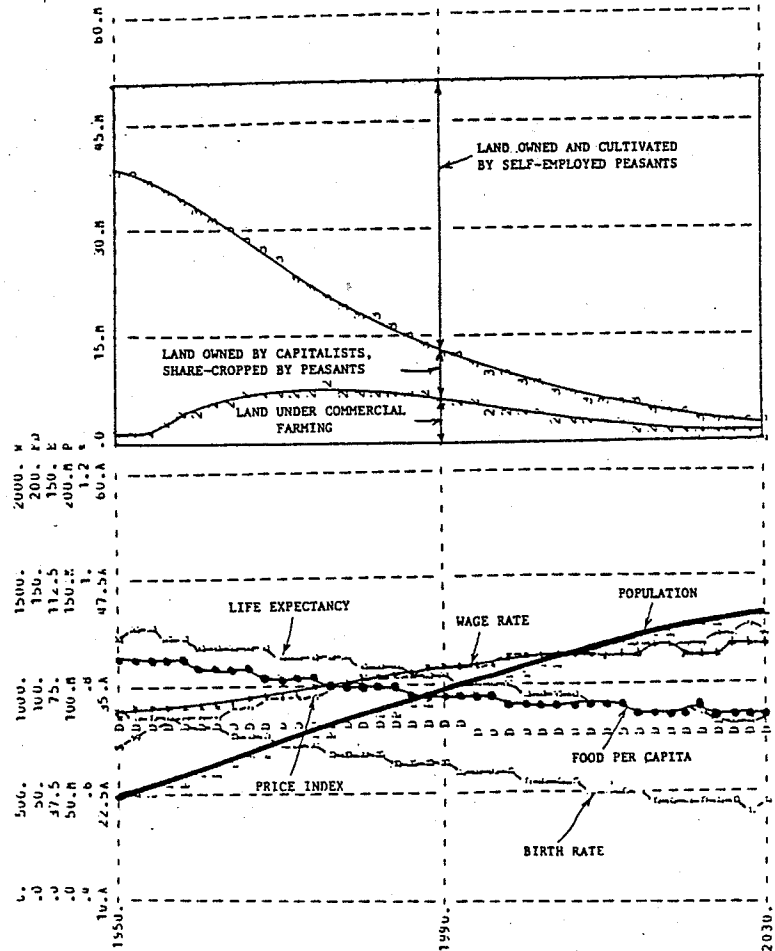


FIGURE 9: Behavior of the Model Incorporating the Policies of Figure 6 Together With the Fiscal Measures that Change Ownership Pattern.

An effect similar to that of uneconomical food consumption can possibly be achieved by exporting surplus food. However, in that case, the endogenous availability of food calories would become dependent on export market for food on which the society has little control. Shocks in the export market would mean that excess calories are absorbed at home and fuel indigenous population growth. As a consequence, the ability to export food would soon atrophy.

7. CONCLUSION

This paper has attempted to examine in a holistic framework the various macro-policies that underlie the development programs which have been implemented in the developing countries for alleviating poverty and hunger. When these problems are viewed as manifestations of the powerful feedbacks which govern the behavior of the actors of the system, the inefficacy of the various development programs does not appear surprising.

It would be fair to say that the solutions to hunger and poverty attempted in the past and being proposed now have a phenomenological perspective that addresses the symptoms instead of the organizational arrangements that create those symptoms. Hence, these policies could be easily defeated by the powerful tendencies created by those organizational arrangements which remained intact.

The clues to the solutions of problems of poverty and hunger have always existed in the form of the differences in the ownership and income distribution patterns of the rich and the poor countries. The traditional development effort has tried to remove these differences without first understanding their causes.

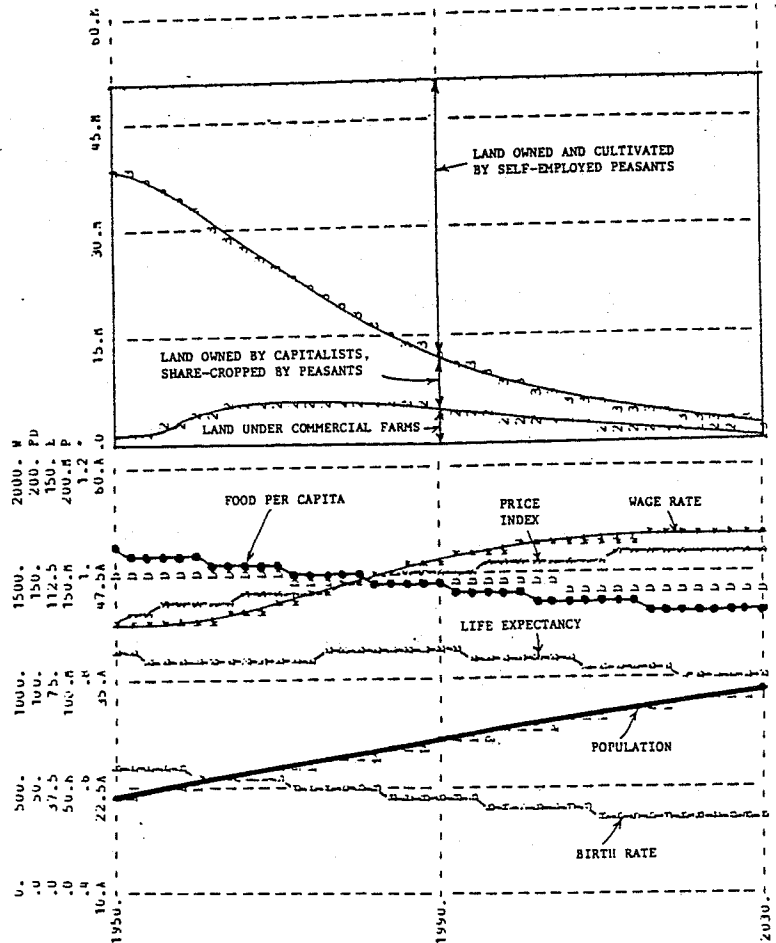


FIGURE 10: Behavior of the Model Incorporating Policies of Figure 8 Together With an Uneconomical Food Consumption Pattern.

The solution to the problems of poverty and hunger appear to lie neither in providing direct aid to the poor nor in raising food production and introducing population control. These policies are defeated in the long run by the internal goals of the system. However, it appears that the internal goals of the system can be influenced by introducing policies that encourage ownership of resources by the workers (by taxation of rent income) and build up a food slack (by obtaining food calories from cereal production inefficiently).

The analysis of this paper also provides a point of departure from the traditional policy design effort in economic development. A realistic formal model of the system helps one to understand the nature of the problems and identify appropriate points of entry into the system. The solutions suggested require mobilization of the internal forces of the system rather than countering system tendency through direct intervention. Thus, an additional inference to make from this analysis concerns the development role of the governments. It lies in motivating the public instead of engaging in direct action.

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