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AN APPROACH TO POLICY EVALUATION IN THE EGYPTIAN AGRICULTURAL SECTOR: SIMULATION OF EGYPTIAN VILLAGE ECONOMY

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OUTLINE

I. Introduction

The purpose of this research project is to develop a detailed micro-level model of an Egyptian village economy that can be used to investigate the impact of alternative agricultural price and food rationing policies, and the effects of technological and institutional change on the distribution of income, consumption patterns, and levels of production.

The village simulation project is one of three closely related investigations based at UC Berkeley: a partial equilibrium household analysis (Shennowy, Lane, Benito), a national level macro-model (Amir, Nassar, de Janvry, Sarris), and our general quasi-equilibrium village level model. In all three projects the effects of existing government policies on the agricultural sector are analyzed, but at three different levels of aggregation and with emphases on different variables.

Thus, one important concluding effort will be to comparatively explain and interpret the findings of these related investigations and draw their overall implications for designing successful agricultural policies.

The design of an appropriate and consistent agricultural policy for the Egyptian economy becomes especially crucial in the context of the recent emphasis on rapid development in Egypt. Accelerated development of the Egyptian economy will place extensive strains on the agricultural sector in terms of its capacity to produce sufficient quantities of food to reduce large food imports and, at the same time, produce sufficient quantities of exportable agricultural commodities to generate the foreign exchange needed for necessary industrial imports (Child and McCalla [1978]). The need for agricultural policy review in this era of expansion is underscored by the fact that per acre yields have been constant or declining for a number of crops since the early 1970s (Waterbury [1978]). As a result, it is essential that policy makers have a detailed knowledge of the actual workings of the agricultural sector. The village simulation project is one step in obtaining this knowledge.

At this point there are no integrated models of a village system. There have been several agricultural sector models built for developing countries (for surveys, see Neunteufel [1977], Thorbecke [1973], and Heady [1971]). Linear programming (Duloy and Norton [1973]) and simulation have been the two prevalent methodologies used, although some alternative techniques like recursive programming (Day and Singh [1977]) have been applied for dynamic simulations. Yotopoulos and Lau (1974) have recently proposed a modelling methodology for the agricultural sector that is based on estimation from microdata, but they do not distinguish between products in their estimation of agricultural output.

Another branch of research on the microeconomic level has concentrated on imperfections in the labor, credit, and other factor markets. The research of the economists surveyed by Bardhan (1980) concentrates on how the interlinkage of various factor markets reinforces poverty, on how individual transactions are interlocked and result in maintenance of stagnant subsistence agriculture, and how differential adjustment mechanisms operate in the different markets. The work of Hayami (1980, 1978) and his colleagues has emphasized the economic determinants of institutional change and its effect on the allocation of resources.

The model to be designed for the village simulation project will be a synthesis of the work on institutions by Bardhan, Hayami and their colleagues and more traditional models such as those designed or proposed by Yotopoulos and Lau and others.

The model will be an empirically based mathematical model constructed at the household level with key institutions (e.g., land tenure) directly incorporated and where possible endogenous to the system. The model will be dynamic, but for practical purposes will be designed to have a lurching equilibrium (see Adelman and Robinson [1977]). This means the model will consist of two components or stages. Stage one is the static model which solves the system of equations for a specific point in time. Stage two contains the dynamics of the system which solves to update the variables which constitute the initial condition and institutional and technical parameters.

The end objectives of the project are twofold. First, the investigation aims at understanding the interaction of current Egyptian rural institutions and the previous development of the agricultural sector; in particular, issues of income distribution, crop patterns, technology, risk, labor and credit markets, migration patterns, etc. Second, it is hoped to produce an empirically based medium-run policy simulation model suited for policy analysis in the agricultural sector of Egypt that is firmly based on the structure of Egyptian rural institutions.

II. Egyptian Villages and Agricultural Production

An Egyptian village is typically comprised of five or six abzias (rural communities) consisting of approximately 20 households, or 100-150 people, which are five to six kilometers apart. At the center, or hub, of the village is the khara, which usually contains a police officer, school, the agricultural bank, a privately owned store, any cooperative stores, the main road, bus lines, and mail delivery. In many ways the abzia is quite isolated, and therefore any significant social relations or social exchanges are likely to occur internally.

Average land holdings are small, with over 90 percent of land titles for lots of 5 feddans or less. Also, in spite of a series of land reforms since 1952, the distribution of land ownership is fairly skewed. However, over half of the Egyptian agricultural households operate their own farms.

The agricultural year consists of 3 seasons: summer, flood, and winter. The major summer crops are cotton, rice and onions. Maize is almost the only crop grown during the flood season. The winter crops are berseem (clover), wheat, beans, and barley.

The structure of Egyptian agriculture is impacted significantly by government intervention, with the result that village households interact with government institutions on a regular basis. Most agricultural inputs are purchased from government-operated agricultural banks at fixed prices and quantities. With respect to the major agricultural crops, berseem, beans, fodder, vegetables and fruits can be sold legally on the open market. The remaining agricultural outputs have output quotas that must be sold to the government; the residuum can then be offered on the market.

This high degree of government involvement in the agricultural sector presents two challenging questions for the design of a village simulation. First, how does government involvement affect risk levels? Normally one would expect extensive price controls to result in a substantial lowering of price fluctuations. However, such actions may simply transform price fluctuations into quantity fluctuations. This is obviously true for consumption goods, and it is strongly suspected that it is also the case for agricultural inputs. Second, what is the extent of unofficial or illegal responses to extensive controls? It is highly probable that procedures for circumventing the rules will evolve in a heavily regulated environment, and it is therefore reasonable to expect black markets to exist for every regulated commodity (Waterbury [1978]). Thus, a meaningful model must also incorporate these unofficial markets.

In addition to the influence of the regulatory environment, the unique characteristics of the physical environment also substantially impact agricultural production. Extensive irrigation and relatively predictable climatic patterns tend to significantly lessen the risks associated with forces of nature. However, these favorable conditions are somewhat offset by the considerable risk of output variation due to pest problems. Clearly the impact on agricultural output variations due to both the physical and regulatory environments must be articulated in the village simulation.

III. Overview of Model

The village simulation project will be based on a quasi general equilibrium model, which will consist of two stages, the static model (Stage 1) and the dynamic model (Stage 2). See Figure 1.

The purpose of the static village model is to determine agricultural production and agricultural surplus, consumption, the distribution of income, relative prices, and the balance of trade between the local community and the rest of the country. The model of the village will be a general equilibrium model with imperfect markets engaged in external trade with a large country.

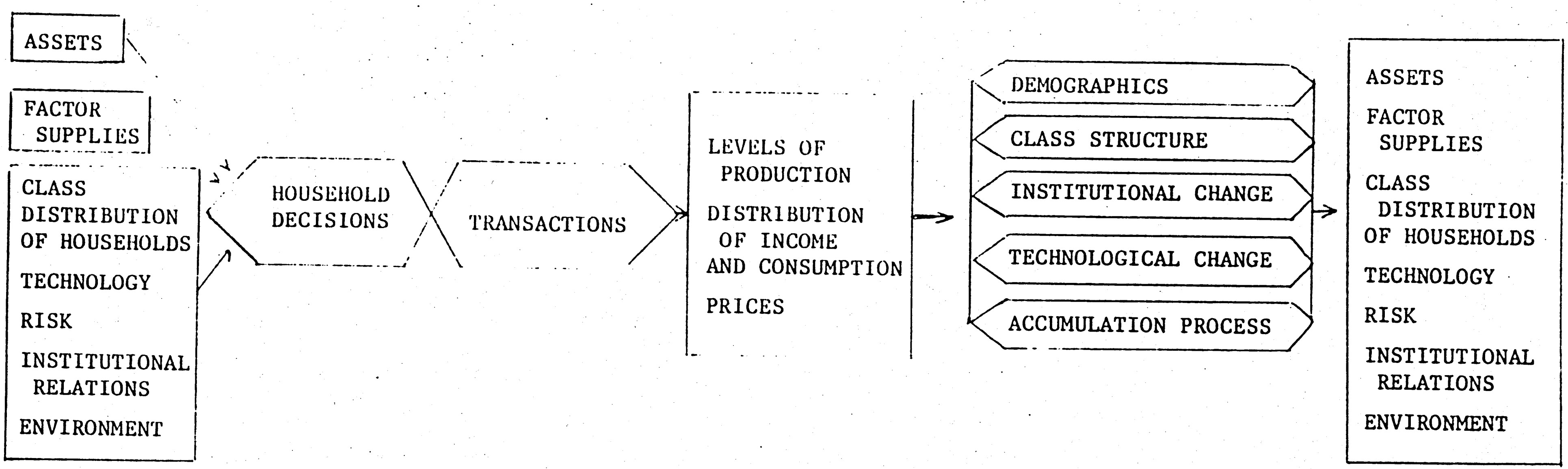
The static village model consists of a household submodel and a transaction submodel. The inputs of the static model are the level of assets, factor supplies, class distribution of households, and technological, institutional, behavioral and environmental parameters. The outputs are the levels of production, prices, and the distribution of income and consumption. The purpose of the household submodel is to determine the appropriate behavioral functions for the different classes of households. The transactions submodel will describe the modes of transaction. This will incorporate legal market, government marketing board, black market, and non-market transactions.

The dynamic model consists of four main sub-models which determine the demographics, class structure of households, accumulation processes, and the extent of institutional and technological change. The outputs of the static model are the inputs of the dynamic model, and the inputs of the static model are the outputs of the dynamic model. It should be noted that only the endogenous elements of the dynamic model are displayed in Figure 1.

The demographic submodel will predict births, deaths, marriages and migration. The technological change submodel will be based on the calculation of the benefits and costs of adopting a new technique in the face of government regulations. The endogenous component of the institutional change submodel will assume that institutional relations are determined in a bargain theoretic framework. The household class distribution submodel will measure changes in the number of households in each category resulting from existing social processes, institutional change and the demographics.

FIGURE 1

VILLAGE ECONOMY MODEL



Sections IV, V, and VI discuss background material relevant to modelling village institutions, households, and decision processes. Sections VII and VIII, respectively, outline the elements of the static and dynamic models.

IV. Institutions

Although the term "institution" has been defined in numerous ways, a focus on human relationships is common to all its meanings. Most authors have chosen to define institutions as the "rules of the game" or systems of contracts and rights (Demsetz and Alchian [1973], Prejovich [1972], Hayami [1980], Roumasset [1978], Ruttan [1975], and Schmid [1978]). However, institutions can also be defined as structures of information flows, incentives, and transfers. Definitions based on information flows and incentives are more consonant with economic theories of uncertainty, information and market failure, while definitions based on contracts and rights lead directly to empirical analogs as demonstrated by the work of Bardhan (1977). In the present study, institutions will be defined as "the behavioral rules that govern patterns of action and relationships" (Ruttan [1975]).

Since the purpose of the project is to analyze an Egyptian village economy, only institutions which directly affect the allocation of resources will be considered. Recent work by economists has emphasized land tenure relations as quasi-markets (Bell and Zusman [1976], Braverman and Stiglitz [1980]) and the use of institutions as insurance mechanisms

(Scott [1976]and Popkin [1979]). The analysis of the non-market allocation of resources (i.e., work sharing, gift swapping) has remained the territory of anthropologists and sociologists except for the work of Polanyi and Darlton (1968). Both market and non-market institutions will be incorporated in the model. Examples of institutional relations to be incorporated in this study are land tenure, rural credit, existing government regulations, implicit and explicit rules for labor usage and the buying, selling and distribution of commodities, insurance and disaster relief, family structure, and class structure.

The view taken here is that institutions are not stagnant and rigid but dynamic and adaptable. Also, while institutional change may occur as a series of catastrophic leaps (Marx), it is assumed that the usual process of institutional change is gradual (Davis and North [1971]). Institutions change for numerous reasons, and some changes are predictable while others are arbitrary. The economic determinants of change are especially relevant factors for analyzing the institutional structure of a village or community. Hayami and Ruttan (1971) summarize the important causal link in their indirect innovation hypothesis, which states that:

> ...institutional innovations occur because it appears profitable for individuals or groups in society to undertake the costs. It is unlikely that institutional change will prove viable unless the benefits to society exceed the cost. Changes in market prices and technological opportunities introduce disequilibrium in existing institutional arrangements by creating profitable new opportunities for the institutional innovations.

In summary, the village simulation project will incorporate institutions that have direct effects on the allocation of resources within the village. These institutions will be endogenous in that individuals will reformulate relationships in order to increase their welfare (i.e., increase economic return, reduce risk).

V. Typology of Households

The view taken here is that the appropriate objective function is different for different classes of households. As a result, it is necessary to define a typology of village households (i.e., a class structure of the village) that allows one to specify the appropriate behavioral functions.

With respect to modelling, the behavior of households can differ for three basic reasons: (1) Objective functions are identical, however, the opportunity sets are very different. For example, some groups have extensive assets while other groups have very few. (2) The objective functions are the same but the parameters are different. For example, some groups may be significantly more risk-adverse than other groups. (3) Lastly, the objective functions can be completely different.

At this point it is not clear what typology of households is appropriate for the institutional setting of an Egyptian village. The typology presented below is based on our reading of the village economy literature. It will be adapted as appropriate when the Egyptian team has been formed.

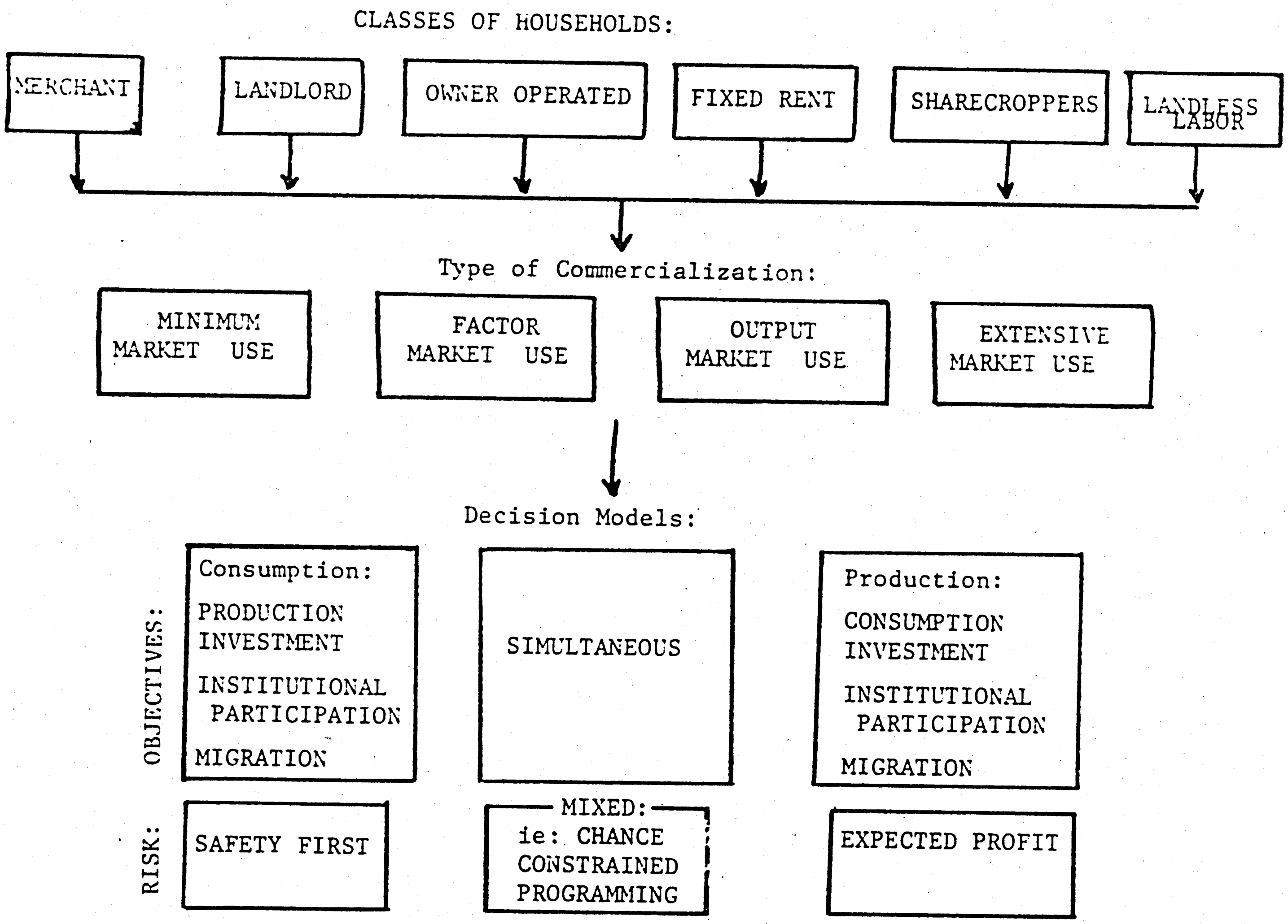
At present the typology of households is defined to directly reflect the different forms of land tenure. The categories are merchant, landlord, owner-operator, fixed-rent farmer, sharecropper, and landless laborer (see Figure 2). Each category is further distinguished by the extent to which a household is exposed to the market--little market use, factor market use, output market use, and intensive market use.

Several important points must be noted: (1) Some categories may be empty. For example, merchant households, being middlemen, must maintain extensive market contact. (2) The above typology creates 24 categories, which is much too complicated. It is expected that as a better understanding of the institutional setting of Egyptian villages is obtained this would be simplified to only the most important categories. (3) Under the present specification a household may be in several categories simultaneously. For example, a household with an owner-operated farm may also be sharecropping an additional piece of land. If the behavior functions of sharecroppers and owner-operated farms differ, then it will be assumed that a household behaves with the different appropriate objective functions.

Once the appropriate household objective function has been identified, then demand and supply curves for goods and services and inputs and outputs can be derived along with migration probabilities and institutional participation decisions. Demand and supply curves will be determined for consumption goods, investment goods, agricultural production,

FIGURE 2

THE SOCIAL STRUCTURE OF VILLAGE HOUSEHOLDS AND ECONOMIC DECISION PROCESSES



services and factor inputs in the context of the government marketing board, legal markets and black markets.

VI. Households and Decision Processes

The study will focus on households as consuming and income-generating units. The approach to be used recognizes that households possess a set of resources or assets which may be allocated over a wide range of activities. These assets consist of physical and financial capital, land, livestock, and labor time. Given the behavioral functions of different households, then the demand and supply of commodities and the extent of market and non-market exchange can be determined.

In peasant societies the modelling of behavior is complicated by the fact that households are not just consumers but also producers. As a result the standard neo-classical models of behavior are not always appropriate. Furthermore, the sequencing of decisions requires consideration. In the literature there appears to be a preference for either a simultaneous decision model or a hierarchical decision model such that consumption decisions are made first, then production/investment decisions, and finally any other decisions under consideration. This is in comparison to a neo-classical decision model which would have production decisions first, consumption/investment decisions second, and other choices last. Both simultaneous and hierarchical patterns will be considered in constructing the village simulation model.

Models of Behavior Under Uncertainty

A central preoccupation of the village simulation project is the specification of models which capture the nature of choices made by traditional peasantries. One critical requirement here is that the model include the element of uncertainty (especially with regard to the basic issue of survival).

The modelling of choice problems under uncertainty has received considerable attention both in the literature of economic theory (as the recent survey by Hirshleifer and Riley [1979] evidences) and in the applied fields of agricultural economics and business. This literature has focused primarily on decisions by individual households and firms, but the implications have been drawn for widespread existence of some institutions (notably sharecropping and insurance).

Despite the vastness of the uncertainty literature, it seems that relatively little work has been done which is directly applicable to peasantries. One notable exception is Roumasset (1976). One reason for this is that when attempting to express the essence of a complex phenomenon, simplicity is quite reasonably considered to be a prime virtue. Thus, in abstracting the decision-making processes of individuals, farms, or businesses, theorists have justifiably pursued simple models. Yet, the simple representations which are appropriate for analyzing the behavior of economic agents in relatively affluent countries usually do not include consideration of a key element which is of much more immediate concern in traditional societies--namely, survival. To incorporate extreme contingencies requires a more complex model.

Ignoring the central element of survival has led to inferences of peasant irrationality; yet those taking a closer look have argued that traditional societies are not as irrational as some people might believe. For example, despite the polarity of James Scott's (1976) and Samuel Popkin's (1979) views, both authors accept in general the idea that peasants operate with some awareness of their own preferences and constraints and attempt to make reasonable choices within that context. Thus the debate is elevated from one of rationality versus irrationality to one which focuses on finer points of modelling the choice process and accounting for the impact of uncertain forces which are totally or largely outside the control of the immediate society (e.g., natural hazards, variations in weather, political instabilities, technological innovations).

Threats to survival alter the behavioral context to such an extent that the conventional decision rule of expected utility maximization can inadequately represent the activity of choice in traditional societies. Expected utility maximization has the virtue of simplicity because it proceeds from the assumption that all wants or needs can be reduced to a common base so that all competing elements can be made fully compensatory. In situations where this assumption is reasonable (e.g., portfolio selection by a moderately well-to-do investor) the simplification is insightful and useful. But the simplification is too extreme when one considers what classical economists call irreducible wants (Georgescu-Roegen [1954]).

In situations where competing outcomes cannot be ordered into smooth, continuous trade-offs, an initial step in the decision process involves sorting potential arrangements into two basic sets: feasible and infeasible or permissible and not permissible. Whether or not an economic agent survives is an obvious criterion for this sorting, but other applications might involve the classes of legal and illegal, moral and immoral, etc. This is not to suggest that dividing lines are always clear or rigid, nor to claim that under all circumstances agents will select from the sets originally designated as feasible or permissible, but it is to suggest that in one extreme region of choice making, a fully compensatory rendering of choices does not appear applicable.

The alternative, then, is some sort of two-stage (or n-stage) sequential decision rule. Such rules are unpalatable to many economic theorists because of their incompatibility with the continuity assumption which enables neoclassical consumer theory to represent preferences with a real valued utility function (Debreu [1959]). Where the continuity assumption is valid, the convenient mathematical properties which follow are desirable and welcomed. But in the situations under consideration here, it seems unjustifiable to sacrifice treatment of an important element in the choice process (i.e., the impact of a survival constraint) for the sake of mathematical convenience.

Game theory offers a decision rule alternative which has the property of incorporating extreme risks and which is also generalizable to group choices (Adelman [1973]). In the face of such extremes possibilities as hunger and starvation, the guiding principle of conservative gamesmanship is a reasonable hypothesis.

Other sequential choice models which lend themselves to consideration of survival constraints have appeared in several forms under a variety of names: safety-first, safety-fixed, chance-constrained programming, lexicographic choice, ordered choice, etc. Such models, in contrast to game theory, involve subsequent steps only when the first step does not result in a feasible solution. In this sense, full optimality models such as expected utility maximization might be viewed as a subset of these sequential models. That is, sequential decisions which have the characteristic of all first-step choices being in the feasible space reduce to full optimality models because they do not require subsequent steps.

In the context of developing economies, ordered choice models have been applied to crop decisions by small farmers (Roumasset [1976, 1977]), response to natural hazards (Kunreuther [1972, 1974]), and selection of water sources (White, Bradley, and White [1972]). A similar approach was taken by Boussard and Petit (1967) in their modification of Schackle's "focus of loss" criterion (Schackle [1969]); Boussard and Petit assert that "farmers maximize their profits provided that the probability of ruin is negligible" (p. 869).

A simple, one-goal example from Kunreuther (1974, p. 209) has an individual economic agent allocating initial wealth, W_o, so as to

$$\max E(W_1)$$

$$\text{subject to probability } (W_1 < Z^*) \leq a^*$$

where Z* is a critical minimum (e.g., minimum wealth needed to physically sustain life) and a* is a maximum acceptable risk level associated with A*. The above maximization yields a feasible solution for a given value of A* only if

$$a' \equiv \min \text{ probability } (W, Z^*) < a^*$$

If a'> a*, Z* will have to be lowered and/or a* will have to be raised. If Z* cannot be lowered, as in the case of a minimum caloric intake to sustain life, then a* will be set equal to a' and the choice will be given by minimizing the probability that $W_1 < Z^*$. In this sequential choice pattern, the first stage constraint thus becomes the objective function when a second stage is necessary.

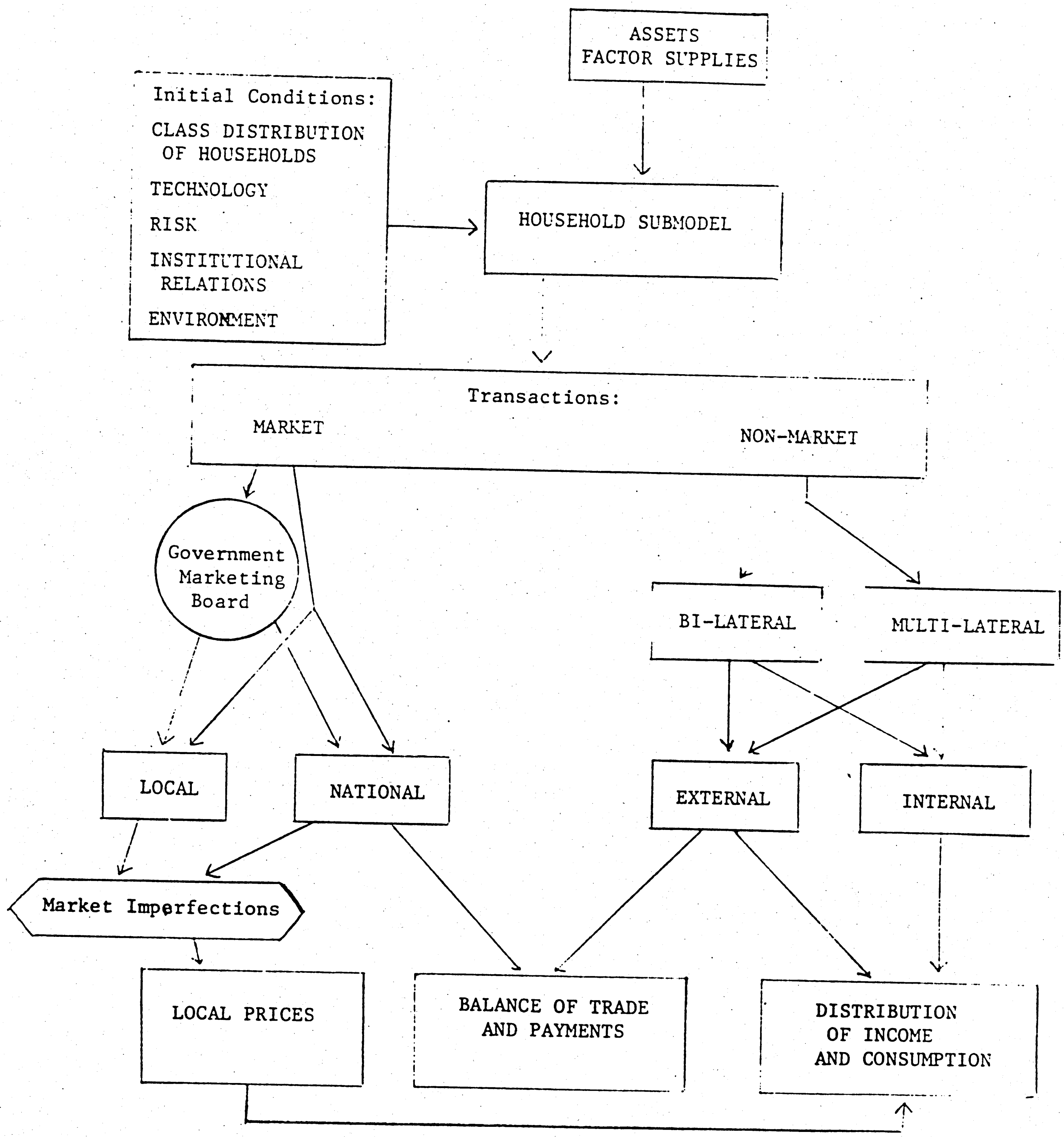
The lexicographic or ordered choice approach has been used in field studies (listed above) and in a laboratory experiment (Lichtenstein, Slovic, and Zink [1969]). It has the appeal of presenting a plausible but concise story of sequential choice where attainment must not fall below a critical minimum. Such models offer alternatives to the neoclassical approach and may be more fruitful for use in village studies.

VII. Static Model

A flowchart illustrating the static model appears in Figure 2. The initial conditions of the static model consist of the class distribution of households, the applied technology,

FIGURE 3

STATIC MODEL FLOW CHART Stage 1



the nature of institutional relations, the environment and the distribution of risk. The set of potential technologies (from which the model will select those to be adopted) and the characteristics of the environment are exogenous to the whole model (Stages 1 and 2). The nature of the institutional relations and the class distribution of households are outputs of the dynamic model, and will be discussed in the next section.

The household submodel presented in Section VI asserts that, given the initial conditions and the appropriate objective functions, households make allocative decisions which result in a set of demands for and supplies of commodities and services. These will be aggregated to determine the village level demands and supplies. It is the interaction of these market and non-market transactions that the static model attempts to capture (See Figure 2).

Non-market transactions are reflected in institutional arrangements for work sharing and community welfare support. In an Egyptian village these are primarily centered around the abzia. Time and resources allocated to these activities remove resources that would otherwise be directed into markets or the government allocation board. In many countries these non-market transactions can be equivalent to half or more of the recorded gross national product. Accounting for this component of economic activity becomes especially important when modelling traditional, agrarian villages.

Another element of village economic structure which requires careful attention is the high incidence of quasi-markets. The principal distinction between markets and quasi-markets is that ordinary markets are characterized by a free multilateral exchange where one can search for the best deal, whereas quasi-markets are characterized by tied exchanges where one must buy from and/or sell to only certain economic agents. The interlinking of land, labor, and credit markets is commonly found in traditional agricultural economies. The tendency toward quasi-markets can be further increased by the impact of extensive government involvement in the economy.

In short, an adequate model of a village economy will consist not only of conventionally observed market phenomena but also the interrelationship presented by the existence of quasi-markets and the economic transfers which occur as a result of non-market phenomena.

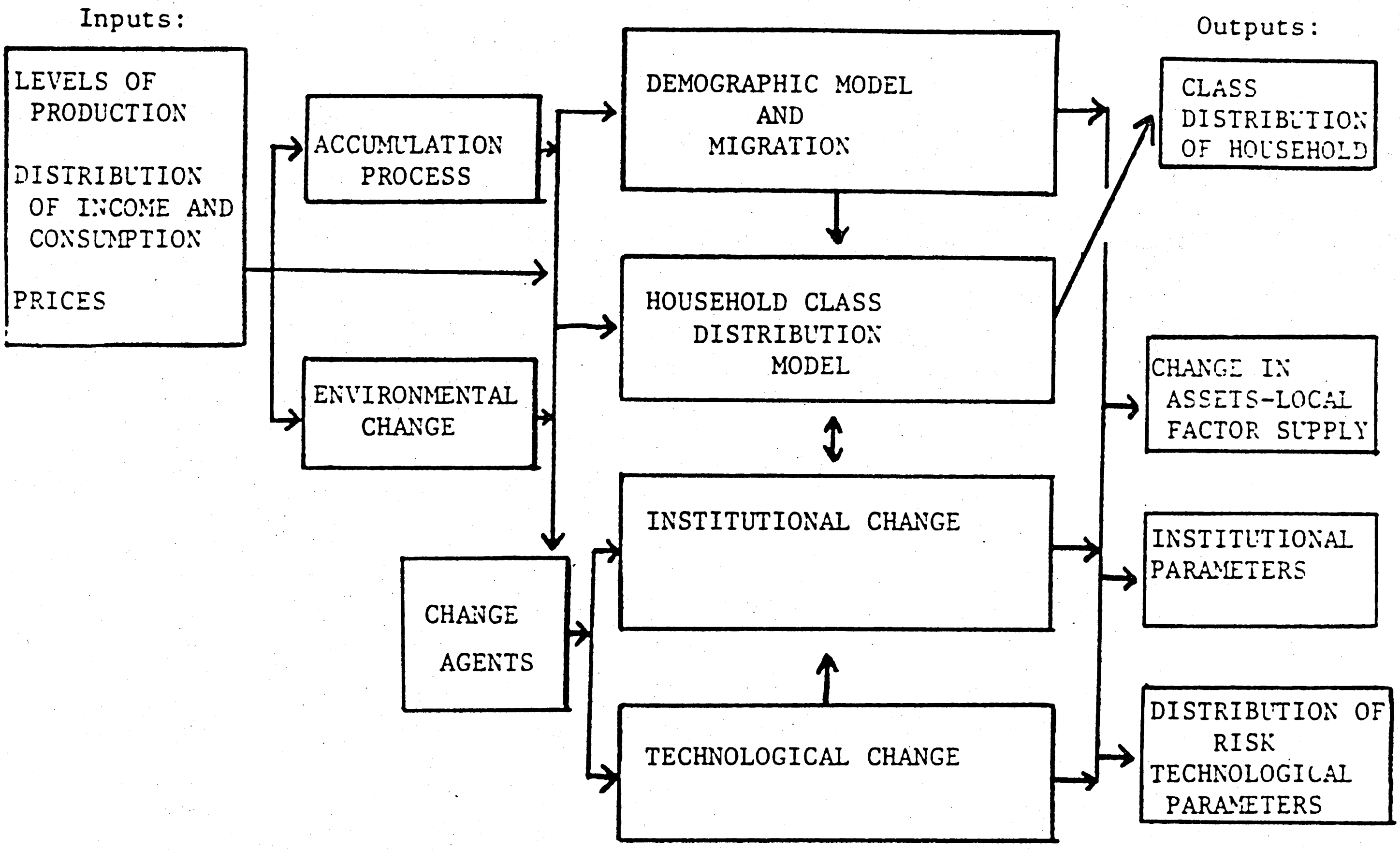
VIII. Dynamic Model

The components of the dynamic model are presented in Figure 4, where it can be easily perceived that the inputs of the dynamic model (levels of production, distribution of income and consumption, and price) are the outputs of the static model. The reverse is true for the outputs of the dynamic model.

The accumulation process will predict the growth of the capital stock, livestock, human capital and changes in land holdings. These will consist of fairly simple single-equation

FIGURE 4

DYNAMIC MODEL FLOW CHART Stage 2



models for each asset.

The demographic model will also consist of a set of simple equations that predict birth and death rates, marriage formation, and migration by household class. Migration will be a function of local and expected wage differentials (pull factor) and the uncertainty of income (push factor).

The environmental change and the change-agent components of the dynamic model are primarily exogenous factors in the model. The environmental change component captures changes in water availability, the construction or improvement of roads, and the effect of farming practices and other trends on soil fertility. The change-agent component would capture attempts of government agents to introduce new technologies and methods to the peasants. It could also include effects of a change in the educational system or in communication patterns.

The technological change component of the model contains exogenous and endogenous elements. The exogenous element will reflect the existing techniques that are available to the peasant. The different techniques will be categorized by whether they are labor saving, land saving, capital saving or risk altering. In the endogenous component of the technological change model it will be assumed that all individuals are aware of the existing technological possibilities and are capable of estimating the expected costs and benefits of a new technique. The costs and benefits will be a function of relative prices and risk.

All of the above processes enter the institutional sub-model. At this point a bargain theoretic framework is under consideration for modelling institutional change. In such a model the objectives of different households are allowed to differ, but all are functions of absolute and relative wealth positions. Possible outcomes are described by a payoff matrix and a Nash-contract is used to determine the solution. The existence of government constraints is also incorporated in the payoff.

An example of this process would be the introduction of a new technology which changes the expected profitability of different agricultural activities. Some members of the village may find that their income could be further increased by a change in the land tenure arrangements such as a shift from sharecropping to fixed rents. This would increase the expected variability of the tenant's income, but under certain conditions could also substantially increase their expected income. Those households which are risk minimizers would be against the change in land tenure, while those which are not would most likely be in favor of the change in land tenure. The resolution of this conflict depends upon the costs inflicted on the different groups and their relative bargaining strengths.

The last, and one of the most important, elements of the dynamic model is the household class distribution sub-model. The purpose of this sub-model is to determine how the class structure of the village will change over time.

This sub-model will describe the process of social differentiation. As mentioned earlier, it is relevant because of the assumption that there exist different objective functions for different types of households. The change in the class structure will be computed by the following rating equation:

$$\left[A_{t-1} + \Delta A_t + D_{t-1} + \Delta D_t\right] X_{t-1} = X_t$$

The matrix A_{t-1} is a transition probability matrix which specifies the transitions that occurred in the last time period due to the underlying social processes. For simplicity, it will be assumed that a household can only move one class in any one time period. The matrix ΔA is the change in the transition matrix (the social mobility, or social differentiation matrix) which, for example, would reflect whether it was becoming easier to move up or down the class structure. It will be a function of financial gains and losses, attempts to reduce risk, and institutional change. The matrix D_{t-1} is the demographic probability matrix, and specifies the probability of births, deaths, marriage formation and migration by household class. The matrix ΔD_t is the change in D_{t-1}. The vectors X_{t-1} and X_t are last periods and the updated household class distribution vector. The vector X_t includes the changes in the population as well as changes in the social processes.

IX. Conclusions

Historically, Egyptian Agriculture had been able to attain some of the highest yields in the Third World inspite of being heavily taxed to finance industrial development. However, in the last five years, crop yields have been constant and have even declined for many crops. This has created many stresses on the Egyptian economy because of rapid population growth and the government's orientation towards a more rapid economic development. For the Agricultural sector to be a boon and not a hinderance to the Egyptian People requires an increase in Egyptian Agricultural productivity.

Given the historical performance of the Egyptian Agricultural sector, it is clear that the key to understanding for recovery from the present stagnation in Egyptian Agriculture lies primarily with the system of incentives and the [illegible], and not with the behavior of the peasants. But the redesign of incentives and institutions cannot be successful without detailed knowledge of the Agricultural sector.

The required knowledge pertains to questions such as: How do villagers respond to various incentive structures? How are new technologies incorporated into existing modes of production? What institutional changes will emerge and prove effective in response to environmental and technological shifts? These questions are some of the many which need to be answered.

Detailed and accurate answers will require understanding of peasant decision-making in the context of their environment. The village simulation project is designed to provide such understanding and thus contribute to the improvement of Egyptian Agricultural performance.

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