CLASSIFICATION OF FOOD AND AGRICULTURAL POLICIES: OBJECTIVES, INSTRUMENTS, AND PERFORMANCE INDICATORS

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November 1975 WP-75-151

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This paper attempts to clarify the meaning of "policy" in the context of food and agriculture through a simple classification with examples. It is hoped that such a classification will facilitate comparisons of methodology and results of the various efforts to use formal systems analytic methods to evaluate policy.

It is not likely that any specific systems analytic model will be sufficiently general to embrace the range of food and agriculture policies discussed. Nevertheless, in model construction it may be prudent to anticipate the need to evaluate policies other than the specific ones for which the model is intended. A classification may thus also assist in anticipating subsequent modification of a specific policy-evaluation model by taking into account common elements of a larger set of policies at the time of initial model construction.

A policy for food and agriculture may be viewed as having three components: general objectives or goals, a more specific set of objectives which may be called performance indicators, and a set of instruments or means of achieving policy goals [13]. The general relationships among these elements are sketched in Figure 1. This paper deals with the inputs to and outputs from a national or regional agricultural policy analysis model (center of Figure 1). A few examples of such models using the simulation approach are listed in the Reference section of this paper. [3, 5, 7, 8, 11, 12, and 14]. Macro-applications of the simulation of agricultural systems are reviewed in a state-of-the-art article by Anderson [1,pp.29-30]. The applications of mathematical programming, chiefly linear programming, to national agricultural policy analysis are too numerous to recount in this paper.

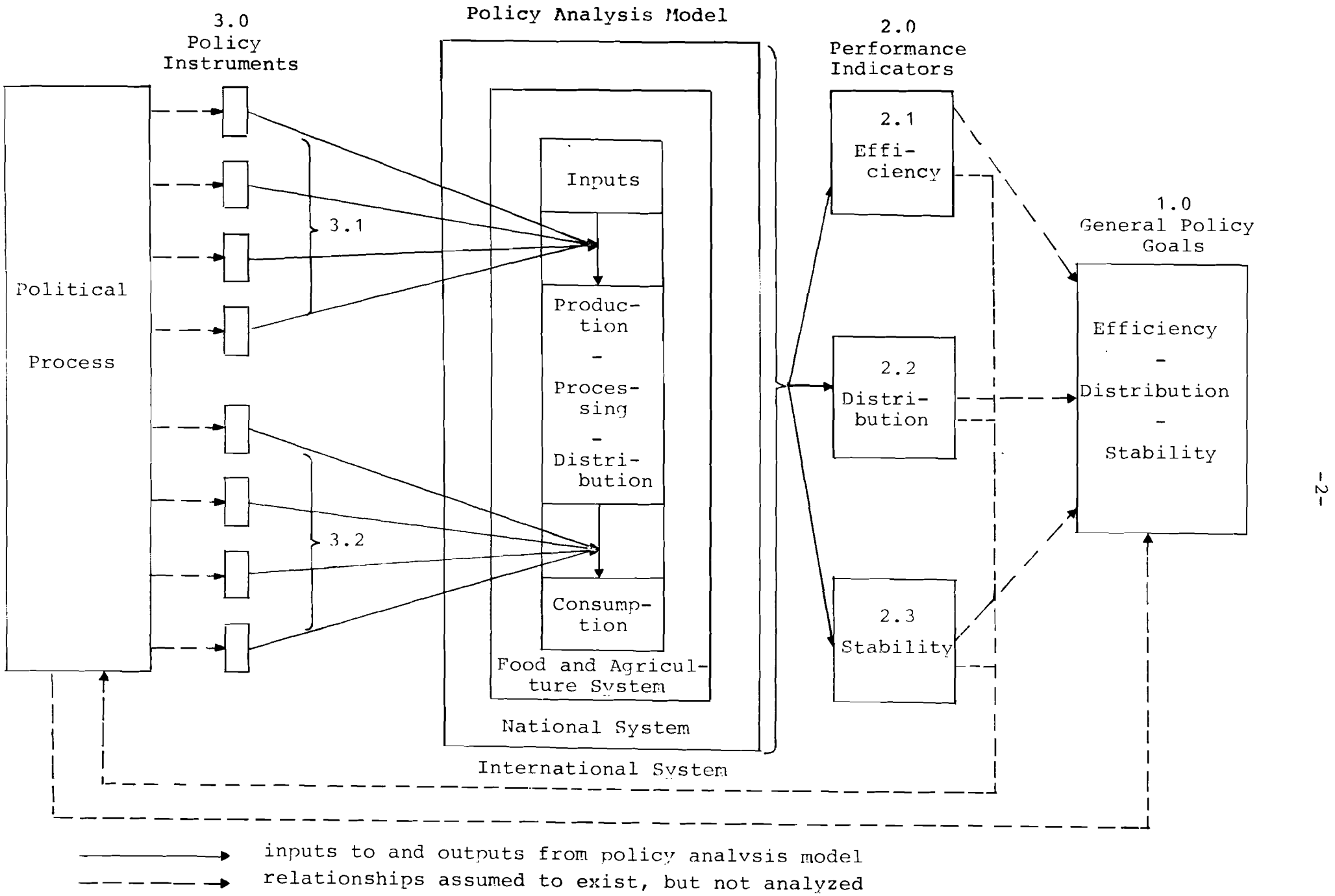

Figure 1. Classification of food and agriculture policies.

Samples may be found in a book of readings edited by Judge and Takayama [6] and in the proceedings of an East-West conference on the use of quantitative methods in agricultural planning [4].

A comprehensive analysis of food and agricultural policy should take into account the process of policy formation (Figure 1, left-hand side), and also the links between the performance indicators and general policy goals (Figure 1, right-hand side). However, this paper abstracts from these aspects and focuses on policy instruments and indicators of accomplishment. A successful policy-analysis model (center of Figure 1) must, at the minimum, be able to assess the impact of the choice and level of intensity of the selected set of policy instruments on the performance indicators.

The institutional arrangements by which policy objectives are determined and the instruments selected may have substantial intrinsic value, that is, the way in which policy is formed may be of equal importance to its consequences. We do not analyze the important feature of the formation of policy in food and agriculture but merely indicate (Figure 1) that the political process is the source of the goal-setting and that feed-back to the political process from the set of performance indicators is one element in the process of policy formation. Even though we abstract from the political process, the examples of policy objectives and instruments given below could, in principle, be generated from a diversity of political processes [2 and 10].

In a very general way, policy objectives may be viewed in terms of their emphasis on levels and rates of growth in (a) efficiency in resource use in agricultural production and processing, (b) equity considerations relating to distribution among individuals or groups of the resources used in agriculture, the products generated by agriculture, and the rewards received by the various participants in the system. In the broader context of a total society including the economic, social, and political institutions, Okun [9] has noted the tensions that arise when rights and privileges are distributed more equally than economic goods.

Since the general objectives relating to efficiency and distribution must be viewed in a temporal framework, the concept of the planning horizon and estimation of the rates of movement toward specific goals are important aspects of policy evaluation. Along with the consideration of the time paths of variables in the food and agricultural system, a third general policy objective (c) emerges, that of stability. These three objectives will be discussed in somewhat more detail in Section 1.0 below.

Two examples will serve to show the importance of considering the time dimension in policy evaluation. Whether an agricultural development policy should first emphasize redistribution of assets used in production and then turn attention to production-increasing activities or vice versa or some combination of both is an important development policy question which, in principle, could be investigated by the use of an appropriately designed systems analysis model.

A second example deals with a problem frequently found in a developed country. The choice of policy instruments which attempt to achieve, in some sense, an equality between per-capita farm income and per-capita non-farm income will depend, in part, on the speed with which the adjustment is desired. Policy instruments designed to stimulate the out-flow of labor from agriculture require a longer period for their results to be perceived than, for example, provision of direct income supplements to farmers.

The scope of the analysis of food and agriculture policy will depend on the specific nature of the policy considered. One might generally expect a correspondence between the administrative unit (national, provincial, regional, etc.) and the unit of analysis. The discussion in this paper assumes agricultural policy analysis at the national level. For most national agricultural policy evaluations it is essential to place the agricultural sector in the context of the total national economy and for many evaluations also in the world economy (Figure 1). For other policies, analysis at a regional level is adequate.

1.0 General Policy Objectives

The goal-setting performed in the political process will, in effect, establish relative weights for the importance of each of these three general objectives. This is a dynamic process which will be affected not only by the feedback from performance indicators, but also by factors exogenous to the food and agriculture sector. It is likely that information on the trade-offs among performance indicators gained by experience with different policy instruments will affect the weights assigned to the "preferred" combination of the goals dealing with efficiency, distribution, and stability. That is, improved knowledge of what is achievable will condition the goal structure generated by the political process.

1.1 Efficiency or Production-increasing Objectives

Policies in this class are aimed primarily at (a) the use of the resources presently allocated to the food and agriculture sector in a more efficient manner and (b) investment of additional resources, including new techniques of production, into the food and agriculture sector. Again, the time shape of achievement of these objectives is an important component of their content.

1.2 Distributive Objectives

These policy objectives deal with the way in which resources used in agricultural production and processing, goods and services, and income to the factors of production are distributed among nations, groups within nations, and individuals within groups. Performance indicators related to this general objective may cover a range (see 2.2 below), but one might expect distributive objectives to call, in general, for less inequality in the distribution of the item under consideration. Exceptions are, for example, the protectionist or self-sufficiency policies of individual nations or groups of nations. As another example, it has been argued that to induce additional investment, tax rates on high-income individuals need to be lowered. This

represents the use of a policy instrument to increase the inequality of income distribution in order to achieve an efficiency objective.

1.3 Stability Objectives

We need only to think of the impact of weather on crop yields or the consequences of drought on food supplies to recognize the importance of stability as a separate general policy goal. Adjusting to fluctuating levels of food supply may involve extensive loss of human life as well as damage from malnutrition for the survivors.

In the production sector, fluctuations in returns may have serious consequences for the viability of the individual production units, chiefly in terms of their capability to maintain control over the necessary resources to continue production. Consequently, a degree of stability in the major components of the food and agriculture system appears to be desirable.

2.0 Performance Indicators (Specific Policy Objectives)

The performance indicators may be used to gauge the success of the policy instrument (or collection of instruments) in achieving policy goals. These indicators are viewed as the output of the policy analysis model (Figure 1). It is not likely that any one of the policy indicators can, by itself, serve as a satisfactory proxy for any of the three general policy goals. Nevertheless, the indicators do serve as inputs, along with other elements, into the political process to generate adjustments in the instruments and/or the relative importance of the various policy objectives.

In systems analysis models used to evaluate policy alternatives, indicators of this type constitute the outcomes of interest and provision must be made during model construction for their inclusion and easy accessability in the output of the analysis. In the case of optimization models, the indicators may include variables in the criterion function and/or constraints on optimization.

2.1 Performance Indicators - Efficiency Objectives

2.1.1 Cost of food to consumers (fraction of total income, temporal comparisons, cross-sectional comparisons).

2.1.2 Value added in the agricultural sector.

2.1.3 Total agricultural output/total agricultural input.

2.1.4 Marginal conditions (i.e. marginal factor cost = marginal value product).

2.1.5 Agricultural production per worker in agriculture.

2.1.6 Number of persons fed by one agricultural worker.

2.1.7 Crop yields per acre.

2.1.8 Rate of return to investment in agriculture.

2.1.9 Livestock production per unit of feed.

2.1.10 Rates of generation of new technology.

2.1.11 Rates of adoption of new technology.

2.1.12 Total cost of processing and distribution.

2.1.13 Etc.

2.2 Performance Indicators - Distributive Objectives

2.2.1 Farm/non-farm income ratio.

2.2.2 Degree of fulfillment of minimum dietary standards for all persons (calories, protein, vitamins, etc.). Note: Achievement of improved diets in the agricultural labor force may also contribute to increased labor productivity.

2.2.3 Size distribution of land holdings in agriculture (e.g. measure with Gini coefficient or percent above [below] a given size believed to be "economic" or to provide an acceptable level of living). Note: This performance indicator may also have total production consequences reflected in, e.g. 2.1.3 above.

2.2.4 Size distribution of income among farmers or other groups.

2.2.5 Degree of self-sufficiency in food production for a region, country, or group of countries.

2.2.6 Index of unemployment in agricultural sector.

2.2.7 Index of unemployment in non-agricultural sector.

2.2.8 Cost of agricultural subsidies to taxpayers.

2.2.9 Etc.

2.3 Performance Indicators - Stability Objectives

Year-to-year fluctuations in:

2.3.1 Cereal grain production by regions, countries and total world.

2.3.2 Livestock production by regions, countries, and total world.

2.3.3 Supplies available for consumption by regions, countries and total world.

2.3.4 Supplies of livestock products available for consumption by regions, countries, and total world.

2.3.5 Prices for various agricultural commodities.

2.3.6 Incomes of agricultural producers.

2.3.7 Etc.

3.0 Policy Instruments

Methods of attempting to achieve policy objectives may take a wide variety of forms. It is very likely that a particular policy instrument, although designed to have primarily an efficiency, distributive, or stability effect, will also have some impact on the other objectives. Most of the examples of implementation methods given below affect the achievement of all three objectives, some in a complementary and others in a competetive fashion. Further, these relations may change over time; an initial competitive relationship may, at a later point in time, turn out to be a complementary one.

National agricultural policies may be expected to use a collection of instruments and systems analytic models should have the capacity to accommodate a reasonable range of such combinations. Because of the necessity of using a number of policy instruments simultaneously on a complex system, simple cause-effect

relationships (e.g. tax-incidence analysis) do not often provide an adequate analysis of policy alternatives. Again, we note the need for systems analytic procedures.

Although there may be a wide range among nations in dependence on the market mechanism in the organization of the food and agriculture sector [2 and 10], the separation of policy instruments into those that deal with (a) the factor market and (b) the product market appears to be a useful one (Figure 1). Prices and quantities of resources and prices and quantities of products are the four sets of important variables in such a system. Thus, we classify policy instruments first by whether government intervention into the system is directed toward manipulation of variables in the factor market or in the product market. (A more refined classification might distinguish among subcomponents of these markets.)

Although we again stress that policies are implemented with collections of instruments, a subclassification of separate instruments within the factor and product markets appears appropriate in considering how instrumental variables are to be integrated into a policy evaluation model.

Within the factor market and the product market, instruments may take essentially two different forms depending on the reliance placed on responses of persons within the system to economic incentives. We shall term those instruments which rely primarily on economic incentives as "indirect". Instruments in this class include those which control or regulate prices in both the factor and product market. Price, wage, and rent controls (maxima and/or minima), as well as taxes, tariffs, duties, and subsidies are instruments of this type. Examples of specific agricultural policy instruments are given below.

A second class of instruments includes the "direct" ones which are oriented toward the quantities of factors or products in the system. Rationing of production factors and consumer goods, export embargoes, import quotas, and other types of quantity-oriented regulations fall into this class. Specific agricultural examples are given below.

Referring to these two types of instruments as "direct" and "indirect" by no means implies a corresponding nature of the relationship between the instrument and the performance indicators. These latter relationships are normally expected to be complex and indirect.

Again we emphasize that a policy will, in general, consist of a collection of instruments, often a combination of direct and indirect ones, in both the factor and the product markets.

3.1 Factor Market

3.1.1 Indirect Instruments

3.1.1.1 Tax incentives to increase investment in agricultural structures.

3.1.1.2 Subsidization of soil-conservation practices to decrease resources needed for production in some future time period.

3.1.1.3 Public sponsorship of programs that facilitate increased control over resources by producers through reducing the effective price of funds for investment (e.g. lower interest rates and longer repayment periods than in the market).

3.1.1.4 Pension plans for farmers to induce earlier retirement.

3.1.1.5 Payments to farmers to withdraw land from production (see 3.2.1.1).

3.1.1.6 Export or import tariffs or subsidies on inputs such as fertilizer, fuel, machinery.

3.1.1.7 Market for "rights" to use pollution-generating chemicals.(This also involves a direct instrument in the form of entitlements or certificates.)

3.1.1.8 Tax incentives to encourage location of agriculturally-related industries (input or product) in regions with "development" potential.

3.1.1.9 Property taxes on real estate, machinery, livestock, etc.

3.1.1.10 Refunds to farmers to reflect fuel cost increases.

3.1.1.11 Minimum wages for agricultural workers.

3.1.1.12 Government subsidy of agricultural cooperatives to supply inputs.

3.1.1.13 Etc.

3.1.2 Direct instruments

3.1.2.1 Collectivization of farms into larger units.

3.1.2.2 Expropriation of large estates and redistribution with upper limits on farm size.

3.1.2.3 Laws and customs regarding inter-generation transfer of land.

3.1.2.4 Public ownership and operation of institutions improving skills of producers.

3.1.2.5 Public ownership and operation of institutions generating new agricultural technology.

3.1.2.6 Government investment and ownership of irrigation projects, drainage projects, roads, etc.

3.1.2.7 Quantitative restrictions on use of agricultural chemicals to reduce environmental damage.

3.1.2.8 Export or import quotas on inputs such as fertilizer, fuel, machinery.

3.1.2.9 Direct government investment in development of land areas for crop production.

3.1.2.10 Government ownership and operation of seed production and distribution system.

3.1.2.11 Etc.

3.2 Product Market

3.2.1 Indirect instruments

3.2.1.1 Price-supports for farm products (may be combined with government purchases of farm commodities and/or quantitative restriction on input use, both of which are direct instruments.)

3.2.1.2 Crop-yield insurance sponsored by government.

3.2.1.3 Price subsidies for food products to lower prices to consumers.

3.2.1.4 Price ceilings for food products to control inflation.

3.2.1.5 Government operation of "fair-price" shops. (Also involves direct instrument of purchase of products.)

3.2.1.6 Export or import tariffs or subsidies on products.

3.2.1.7 Consumer income supplements to increase demand and/or improve diets.

3.2.1.8 Differential taxation of certain agricultural products (tobacco and alcoholic beverages).

3.2.1.9 Etc.

3.2.2 Direct instruments

3.2.2.1 Assignment of production quotas (obligatory deliveries) to production units.

3.2.2.2 Purchase of food by government for distribution to selected populations within or outside the nation.

3.2.2.3 Export or import quotas on agricultural commodities.

3.2.2.4 Government operations of buffer stocks of agricultural commodities.

3.2.2.5 Trade agreements for agricultural commodities emphasizing amounts, with prices determined on world market.

3.2.2.6 Etc.

4.0 Concluding Comment

The above classification scheme does not, of course, provide an assessment of the likely contribution of any of the policy instruments to the performance indicators. This is precisely the task of the policy analysis model and this paper has attempted only to systematize the instrumental variables and the desired output of such a model.

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