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Volume Title: The Role of Agriculture in Economic Development

Volume Author/Editor: Erik Thorbecke, ed.

Volume Publisher: NBER

Volume ISBN: 0-87014-203-8

Volume URL: <http://www.nber.org/books/thor70-1>

Publication Date: 1970

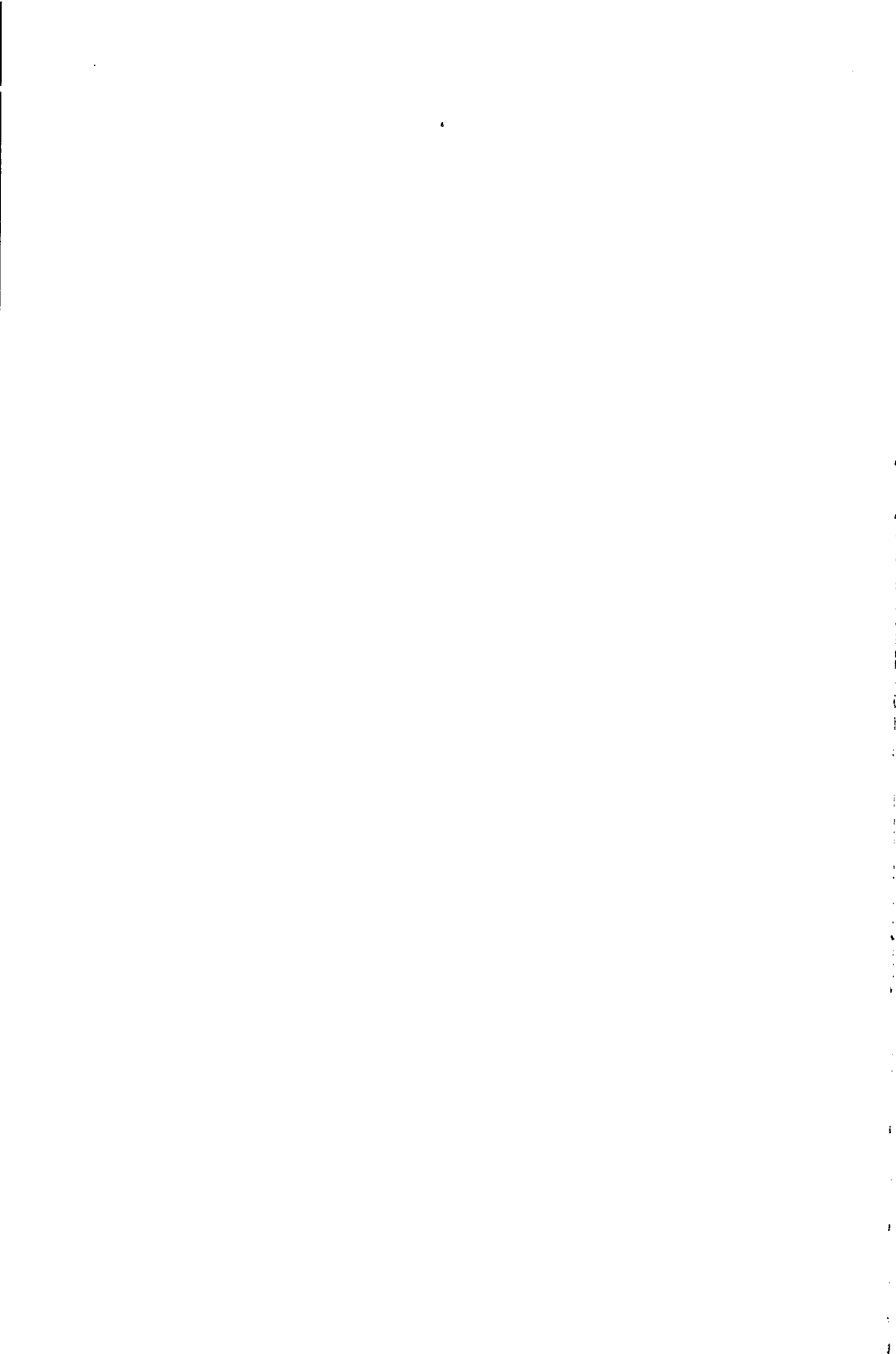
Chapter Title: Introduction to "The Role of Agriculture in Economic Development"

Chapter Author: Erik Thorbecke

Chapter URL: <http://www.nber.org/chapters/c3360>

Chapter pages in book: (p. 3 - 12)

**THE ROLE OF AGRICULTURE  
IN ECONOMIC DEVELOPMENT**



# Introduction

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ERIK THORBECKE

IT HAS BECOME INCREASINGLY EVIDENT in the last few years that the conception of both economists and policy-makers regarding the role of agriculture in economic development has undergone an important evolution. Whereas in the past, agriculture was often viewed as the passive partner in the development process, it is now typically regarded as an active and co-equal partner with the industrial sector.

During the 1940's and 1950's there was a resurgence of interest in analyzing the determinants of economic growth. The economics profession turned its attention to the study of economic development to better understand the anatomy and physiology of the growth process and to formulate prescriptions for appropriate development policies and strategies. It was widely believed during this period that industrialization was the unique key to development and that the industrial sector, as the advanced sector, would pull with it the backward agricultural sector. More specifically, industry, as the leading sector, would be a source of alternative employment opportunities to the rural population, would provide a growing demand for foodstuffs and agricultural raw materials which it would process for domestic consumption or export, and would begin to supply industrial inputs (e.g., fertilizer) to agriculture.

It became fashionable to use as an analytical and planning framework one-sector models of the Harrod-Domar types which, because of their completely aggregative and simple production functions, with only investment as an element, emphasized at least implicitly investment in infrastructure and industry. The one-sector, one-input nature of these models obviously precluded any measurement of the sectoral production effects of alternative investment allocations and of different combinations of factors (since it was implicitly assumed that factors could only be

combined in fixed proportions with investment). In the absence of either theoretical constructs or empirical information on the determinants of agricultural output, the tendency was to equate the modern sector with high productivity of investment (and vice versa for the backward agricultural sector) and thus direct the bulk of investment to industry and industrial infrastructure.

With the advent of two-sector models economists continued to assign to subsistence agriculture an essentially passive role as a potential source of "unlimited labor" and "agricultural surplus" for the rest of the economy. Not only was it assumed that the farmers could be released from subsistence agriculture in large numbers without a consequent reduction in agricultural output, but also that they could do so while carrying their own bundles of food (i.e., capital) on their backs. One popular policy prescription to encourage the above transfer of labor and of the agricultural "surplus" was to turn the terms of trade against agriculture. The trouble with this approach was that the backward agricultural "goose" would be starved before it could lay the golden egg.

As the dual-economy models became more sophisticated and realistic it was increasingly recognized that the functions which the agricultural and industrial sectors must perform in order for growth to occur are totally interdependent. On the one hand, the agricultural sector had to release resources for the industrial sector, which in turn had to be capable of absorbing them. On the other hand, the release of resources, by and of itself, and the absorption of resources, by and of itself, were not sufficient for economic development to take place. It was felt that growth could result only if these conditions occurred simultaneously and that this release-cum-absorption of labor and capital resources was, in fact, the key to development. Recognition of this active interdependence was a large step forward from the naive industrialization-first prescription, because the above conceptual framework no longer identified either sector as leading or lagging.

Even though two-sector models did provide important insights into the interaction between the agricultural (backward) and industrial (advanced) sectors, there were at least two fundamental points that they did not address explicitly: foreign trade and the determinants of agricultural output. The foreign trade sector was eliminated—a closed economy being selected as the frame of reference rather than the open economy. A better understanding of the determinants of agricultural output—both in micro- and macroeconomic terms—is essential if agriculture is to play an active role as a supplier of resources.

The relationship between agriculture and foreign trade can be scru-

tinized at the national level or at the global level. The majority of the developing countries are largely dependent on primary exports as their major source of foreign exchange. The import capacity of the typical developing country is based, to a large extent, on the flow of agricultural and mineral exports that it can sell to the rest of the world. Since the balance of payments is generally the binding constraint to further growth, the role of the agricultural sector as a provider of foreign exchange through exports or as a saver of foreign exchange through import substitution (particularly through increased domestic production of foodstuffs) is a crucial one. In many less developed countries, the agricultural subsector producing for exports tends to be highly commercialized in contrast to the subsector producing foodstuffs for domestic consumption. In such cases, the backward linkages of agricultural exports may be quite small. In other countries, particularly in Africa, the distinction between the commercialized (export) and the subsistence sectors is much more difficult to draw.

At the global level the dependence of the developing world on agricultural exports creates many problems. World demand for these products tends to be both income and price inelastic. As a result, for many crops, of which the supply is also inelastic in the short-run, the growth rate of export earnings is held to a relatively low level and prices fluctuate. Efforts at diversification and commodity stabilization can be successful only if undertaken under viable international agreements. Empirical evidence on the terms of trade of the developing vis-à-vis the developed countries leaves at least a presumption that they are not improving. In most developing countries the level of receipts from traditional exports—determined as it is by exogenous forces—is largely outside of the control of the country; large output and efficiency gains are often negated by perverse price effects. Under these circumstances, the planning of agriculture and over-all development cannot be done through the simple aggregation of independently prepared national plans and projections that are likely to be mutually inconsistent. What is required is that the prospects for agricultural exports and their contribution to development be evaluated through the projection of supply and demand by regions and by commodities within a general and spatial equilibrium setting. National projections need to be aggregated, and differences in planned global and regional output and demand reconciled, before a rational (efficient) production and trade pattern can be established.

The possibility, or even (in the light of very high rates of population growth) the necessity of concentrating directly on increasing agricultural productivity and output tended to be somewhat overlooked during the

period of infatuation with industrialization. Once the key role of agriculture was recognized, the knowledge gained from years of experimentation with seeds, fertilizer, and other inputs by foundations, universities, and the private sector began to be applied on a larger scale and more systematically. In the last few years a much better understanding was obtained of the function of industrial inputs as almost the *sine qua non* of agricultural development. Specific and detailed quantitative information became available on production functions—at both the farm and aggregate levels—revealing the complementary relationships between various inputs and the desirability of following a “package-approach.” As the effects of the interaction between technical, economic, and social factors on agricultural development became clearer, the last tended to be conceived of increasingly as a system within which analytical questions and policy recommendations could be examined and resolved.

The question as to the form of the production function and the choice of technique within agriculture is fundamental. Because of the limited capacity of the industrial sector to absorb labor productively and because of the very low efficiency and residual nature of employment opportunities in services, a labor-using technique to alleviate the unemployment problem appears called for in a majority of the developing countries. With respect to land, the question is less clear-cut. In Africa land is still abundant and output can continue to increase through land expansion. In parts of Latin America and Asia, the bringing under cultivation of new land areas entails very large capital resources in infrastructure (e.g., irrigation) and thus yield-increasing techniques may be more efficient. In any case, the macroeconomic implications, in terms of employment creation and income distribution, of different techniques and combinations of inputs should be analyzed carefully to determine the possibility of conflicts that might arise in the pursuit of static economic efficiency, on one hand, and long-run economic and social development, on the other. This comparison is further complicated by the discrepancies that exist between the shadow and market prices in the factor market.

In 1965 the Universities-National Bureau Committee decided that the time was ripe to organize a conference on the role of agriculture in economic development. Much had already been accomplished in the areas previously reviewed: the theoretical literature had extended the dual-economy approach to at least three sectors with the introduction of foreign trade; the FAO and other international agencies were analyzing the production, consumption, and trade patterns for the major agricultural commodities on a multiregional basis. In addition, significant new attitudes—both public and professional—were becoming apparent.

First, the public was increasingly concerned about the world food problem (i.e., the widening gap between projected desirable nutritional requirements in the light of the very high population growth rate in the developing world and the extrapolation of dismal historical food output trends); and second, optimism was spreading in knowledgeable circles as to the capacity of technology to cope with the world food problem through an attack on both the food-production and population-control fronts, a strategy which, it was believed, would ultimately solve the problem. Indeed, by the middle 1960's a few key countries such as Taiwan, Korea, Pakistan, and Turkey appeared to be either on the verge of or had already made an agricultural take-off, if sudden and sustained acceleration of growth in agricultural output are any indication. The promise of a "yield explosion" created by new "miracle seeds" combined with other inputs seemed to be capable of realization in the not-too-distant future. At least these countries provided evidence that food output in the developing world could be substantially increased given the appropriate set of policies and input combinations.

In retrospect, it appears that over the last four years many events have further vindicated the judgment of the Universities-National Bureau of Economic Research Committee. The pendulum has swung back in the last twenty-five years from a development strategy emphasizing industrialization at almost any cost to a much more balanced approach in which agricultural development is attacked directly from the supply side instead of indirectly through generation of increased effective demand in nonagriculture. The 1960's will not be remembered as the hoped-for "development decade" but conceivably this period may someday be recalled as the beginning of the "green revolution."

A planning committee consisting of Karl A. Fox, Bruce F. Johnston, Max Millikan, William H. Nicholls, and Gustav Ranis, in addition to myself, was asked to prepare the agenda for the conference. It was obvious from the start that it would be utopian to expect such a conference to cover all aspects of agriculture's role in economic development. We decided, therefore, to emphasize three main themes: agriculture in the world economy, the relationship between agriculture and other sectors, and national studies analyzing the transformation of traditional agriculture.

With respect to the first topic above, we felt that the work already initiated by the FAO on the Indicative World Plan would provide the skeleton of a conceptual framework within which both the over-all prospects for the agricultural exports of the developing countries as well as the internal national effects and linkages of a given level of agricultural



exports on the structure of output could be estimated. We asked Louis M. Goreux and J. A. C. Brown, two of the early architects of the methodology of the Indicative World Plan, to address themselves to the above two questions respectively. Goreux reviewed the various trade projections which UNCTAD and FAO had prepared. His analysis brings to light the desirability of increasing trade between developing countries and exports of nonagricultural commodities in view of the bleak outlook for traditional exports from the less developed to the developed world. Goreux discusses some of the implications of present urbanization trends in the less developed countries for the accuracy of projections. He also considers the increasing international inequality of export earnings that would follow for the developing world from a continuation of present export trends.

The Brown paper is an attempt at identifying, within a framework combining input-output and national-income accounting information, the relationship between agricultural and over-all growth and the impact of trade and aid on development. The approach suggested calls for the above data to be consolidated in terms of a number of relatively homogenous regions (e.g., West Africa), which could ultimately be incorporated into a world model. The design of such a model would make it possible, in turn, to investigate the effects of changes in such variables as capital movements and foreign exchange earnings on the whole system, and ultimately to ascertain the prospects for agricultural development in the developing world. In fact, the Brown paper provides an early blueprint for FAO's Indicative World Plan.

Karl Fox goes beyond the already ambitious approach followed by Brown, formulating, in an exploratory outline, a policy model of world economic development with special attention to the agricultural sector. World development is defined in a very broad sense as a function of material and nonmaterial factors. The identification of policies to achieve it requires the application of a comprehensive social science and "the integration of units of observation from psychology, sociology, and economics." Fox provides an analysis of the urbanization process and of its impact on individual and over-all welfare. Building upon the Brown model, he develops the broad outline of a multiregional model in which each region would be further broken down into a set of "functional economic areas." A bridge is thereby constructed between, first, the national and the subnational (regional) effects of agricultural development and, second, between the purely economic and the more general noneconomic effects of development on welfare. The major question with respect to both the Brown and Fox models is the extent to which they

can be made operational, in view of the almost insatiable appetite of these models for data, on the one hand, and the scarcity and dubious quality of existing statistics on the other.

The second set of papers is devoted to the relationship between agriculture and other sectors, taking the country as the unit of observation. Fei and Ranis build a rigorous theoretical model of development based on a historical sequence. Agricultural development is described as proceeding through four stages: (1) the agrarian society, (2) the open agrarian society, (3) the dualistic society, and (4) the industrially mature society. The transition is affected by the formation of the export sector and by consequent changes in the relationships between agriculture, services, export production, and the foreign sector. W. Arthur Lewis questions the realism of the assumptions underlying the above model, particularly the presumed relationships between (1) population and productivity; (2) the internal and external terms of trade, and (3) the neglect of the possibility of the capitalists' importing food and labor.

The Thorbecke-Field paper is an attempt at analyzing the relationships within and between the agricultural, industrial, services, and foreign-trade sectors in the development process. The major technological (e.g., input-output), income, and price relationships are identified and a general conceptual framework is formulated to analyze the growth process within the four-sector breakdown. This general model is applied for illustrative purposes to Argentina and in a more limited way to Peru. The behavioral relationships (e.g., the sectoral production and consumption functions) are statistically specified for Argentina, and the model is used to derive certain tentative policy implications with respect to the sectoral allocation of investment, sectoral pricing policies, and other measures. Clark Reynolds, while going along with the over-all conceptual framework and analyses on the national level, expressed reservations about the form of some of the quantitatively derived functions in the Argentine model and brings out some of the limitations inherent in using the model for policy purposes.

Sandee selected as his frame of reference a strictly dual economy, designing a hypothetical programming model. He shows that the introduction of "dual" targets and policy instruments increases realism and modifies conclusions reached with a "one sector" macromodel. The effects of changes in instrument variables on the system are clearly illustrated by means of simple quantitative manipulations. Jorgensen endorses the approach and describes some further uses for this type of programming model, while bringing out one real weakness, the model's failure to include the effects of monetary policy.

The third group of papers incorporates studies of four countries, highlighting the transformation of traditional agriculture in different parts of the world. Karcz undertakes a comparative study of this transformation in centrally planned economies, namely, the Soviet Union, Eastern Europe, and mainland China. He identifies three separate stages in the transformation process common to all these countries: the redistribution of land, the collection of farm surpluses under a "command farming" system to sustain an ambitious industrialization program, and finally the stage of decompression of command farming characterized by an increased flow of resources to agriculture and the substitution of incentives for coercion. Montias suggests that a case can be made for fitting Karcz's broad historical stages into a Fei-Ranis-type two-sector model. By imputing to the planners of a Soviet-type economy a welfare function calling for the maximization of some combination of industrial output and non-agricultural employment, a number of analogies between the theoretical Fei-Ranis phases and Karcz's historical stages are brought to light.

The Japanese pattern of modernizing traditional agriculture is the subject of the Ohkawa-Johnston study. There are three basic characteristics of the Japanese model: (1) agricultural output grew within an unchanged small-scale farming system; (2) the increased productivity was associated with the use of improved varieties, fertilizers, and other current inputs; and (3) agriculture and industry moved forward together in a process of "concurrent" growth. The major theme of the paper is that the Japanese model is transferable to other Asian countries in part, because of the similarities in a number of initial conditions prevailing in Asia today to those that existed in Japan at the beginning of its modernization process—with one major difference: the population explosion that Japan did not have to face. Lee argues strongly that there are serious limitations to the transferability of the Japanese experience to other Asian countries. Using Taiwan as a counter-example, he shows that its agricultural development proceeded successfully along different lines and in a different sequence. Thus, for example, heavy investment in irrigation took place at the beginning of the transformation process in contrast to Japan. Furthermore, the organizational changes required to adapt the Japanese model might be incompatible with the "heritage and basic convictions" of East Asian countries.

The Nicholls paper addresses itself to the transformation of agriculture in a semiindustrialized country, namely Brazil. The study embraces four parts: (1) a detailed long-range historical review of the Brazilian economy; (2) the rise of São Paulo since the turn of the twentieth century; (3) the role of the industrial-urban development in transforming

Brazilian agriculture in the 1940's and, finally, (4) a survey of Brazilian agricultural development since 1950. Industrialization, particularly in the state of São Paulo, is given credit for agricultural development. In a concluding parable, São Paulo is compared to a locomotive which in the past had pulled twenty freight cars (the other states). Unfortunately, half the cars came uncoupled (the north and northeast) "and their contents removed and used to fuel the industrial locomotive." Nicholls believes that another industrial locomotive should be found to pull along the depressed north and northeast freight cars. It is clear that in Brazil industrialization was associated with agricultural development. What is still in doubt is the direction of the causality. Schuh takes issue with Nicholls' view that agricultural growth resulted from progress in the industrial sector and suggests an opposite hypothesis: that the dynamic growth of agriculture contributed heavily to the development of the industrial complex of São Paulo through a large transfer of capital. (The case of Brazil illustrates well the importance of the interaction between these two sectors in the growth process.)

The final paper by Van de Wetering consists of a detailed description of the structure of Peruvian agriculture and of the agricultural planning process in that country. The structural and institutional bottlenecks are identified and the conflicts between policy objectives (e.g., efficiency and equity) are made explicit. The whole set of policy measures both direct (e.g., public investment) and indirect (e.g., price policies) is analyzed and the effects of these measures on the major policy goals estimated. Moving back and forth between a positive and a normative approach, Van de Wetering explains the factors that affected the planning decisions and attempts to estimate in terms of goal achievement the opportunity costs of certain policy decisions and public investment allocations. The author illustrates how difficult it is, first, to design a conceptual framework within which the transformation of traditional agriculture can be planned and, second, to implement the forthcoming policy recommendations given the prevailing institutional rigidities. Falcon expresses concern for the strong demand orientation in the agricultural planning process and the emphasis on national and even regional autarky in food production. It is suggested that instead of taking the relatively very low historical share of the national budget allocated to agriculture (about 3 per cent) as given, it would have been interesting to analyze what a 5 or 10 per cent allocation might have meant for agriculture and other macrovariables.

There were a number of areas on which a consensus seemed to emerge among the participants in the conference.

At the sectoral level, the desirability of attacking agricultural development directly from the supply side through the increasing use of improved inputs, appropriate price policies, and other measures, was recognized. At the same time it was generally agreed that a meaningful analysis of agricultural development can only be undertaken within a multisectoral framework bringing out explicitly the price, income, and technological relationships within and between the agricultural, industrial, services, and foreign-trade sectors. The very different conditions existing in developing countries preclude the formulation of a unique and universally applicable agricultural development strategy. The transferability of any given successful experience, such as Japan's, is bound to be relatively limited. Certain elements and policies may be transferable, but ultimately the planning and implementation of agricultural development must be tailored to the situation in each country.

Finally, it was clear to us that a worldwide framework, consisting of regional groupings further subdivided into countries, and even conceivably into "functional economic areas" within countries, was essential to an exploration of the mutual consistency of national agricultural and trade policies. The gap between the microanalysis of production functions in agriculture and the global approach of the Indicative-World-Plan-type is extremely broad. The conference, which was held at Princeton, N.J., on December 1-3, 1967, made a modest contribution to bridging this gap.