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TECHNOLOGICAL CHANGE AND SMALL FARMS: A REVISED ANALYTICAL FRAMEWORK

James Chapman
Martín Piñeiro
Eduardo Trigo

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TECHNOLOGICAL CHANGE AND SMALL FARMS [1]: A REVISED ANALYTICAL FRAMEWORK

Recent trends in the development of new agricultural technologies for small farmers have focused almost exclusively on the micro issue of understanding and changing small-scale farming systems within the current socioeconomic environment. This attitude is typified in the relatively recent farming systems research (FSR) approach which pays very little attention to broader social factors and thus offers no practical framework for incorporating them into the overall FSR strategy.

The extreme difficulties invloved in identifying and developing new technologies appropriate to small farm systems are well known. Taking the socioeconomic environment as given, it seems possible that progress can be made in obtaining at least marginal improvements in agricultural productivity. There is, however, no guarantee that the benefits from any change would reach small farmers or other disadvantaged social classes. This fact is especially important when technological change is being considered as a key component of rural development programs designed to enhance the standard of living of the rural poor.

The purpose of this note is to present an analytical framework for research, emphasizing the endogenous nature of technological change to the process of small farm growth, which in turn is influenced by forms of social articulation by which public policies define the economic environment. We propose that an explanation of technological changes occuring on small farms be interpreted in light of recent hypotheses regarding the economic stagnation of peasant economies, although such theories have not yet been incorporated into currently accepted knowledge. These hypotheses

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assert that the small farm sector is, in general, politically dominated or passive. For this reason, major determinants of technological backwardness and output stagnation will be refected in the nature of the interactions taking place between peasants and other social sectors (Stavenhagen; Frank; de Janvry). Due to the dependent nature of small farm economies, the possibilities for technological change and small farm growth to occur are influenced by the prevailing forms of social and economic linkages with the dominant sectors. Stagnation occurs whenever the dominant social forces either usurp any surplus produced or are indifferent to small farm development. Conversely, growth-oriented technological change is possible whenever the nature of social and economic relationships enables the leading social sectors to benefit from small farm progress.

Recent research efforts suggest that there are many different types of small farms, each developing in different historical environments which determine their specific and unique relationships with the overall economy. Consequently, small farm problems must be analyzed from a broader perspective that allows for an adequate characterization of different production situations and the social context within which production takes place. With such a description, it should be easier to understand the process of technological change in greater depth and detail. The processes of reproduction and economic growth or stagnation are directly influenced by the type of commodity produced and its role in the market (i.e. export vs. internal consumption), the nature of the input and product markets (concentrated or disperse) and the complex of social relations of production inherent in the specific small farm situation (e.g. individual

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vs. communal). Similarly, these factors also condition the process of technological change.

The analytical framework

The analytical model depicted in Figure 1 is an expansion of a model recently presented in this journal by Deere and de Janvry. Modifications include the addition of a non-agricultural family production process, explicit consideration of technology (supply and use), a detailed description of the differentiation process, and the identification of several regional and macro-level variables (actors and states of the political and social environment) which influence the organization and behavior of the small farm economy.

The organization of the peasant farm household is characterized by four key processes: the agricultural/non-agricultural production process, the wage labor production process, the circulation (market) process, and the reproduction/differentiation process. In the left-hand column of Figure 1, the total available means of production at a particular point in time are identified. These include raw materials (land and water), means of work (seeds, animals, tools, chemicals and fuels) and family labor (number, age and sex). The right-hand column gives the monetary variables that characterize the circulation process on both the supply and demand sides: gross cash income from sales, wages, net income formation, and the acquisition of the means of work and consumption. The center colum highlights the two fundamental production

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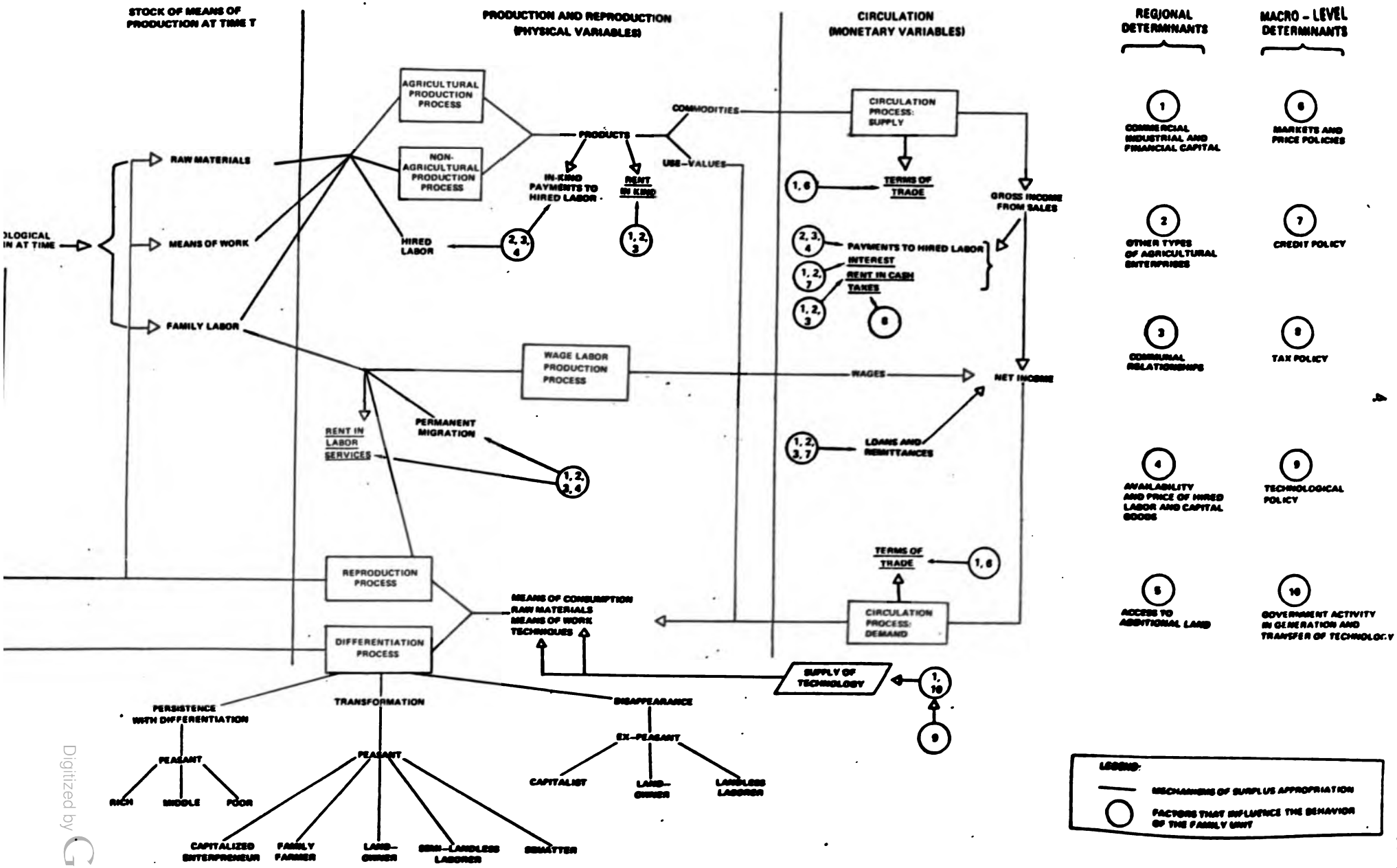

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FIGURE 1. A CONCEPTUAL MODEL FOR RESEARCH ON TECHNOLOGICAL CHANGE IN PEASANT ECONOMIES

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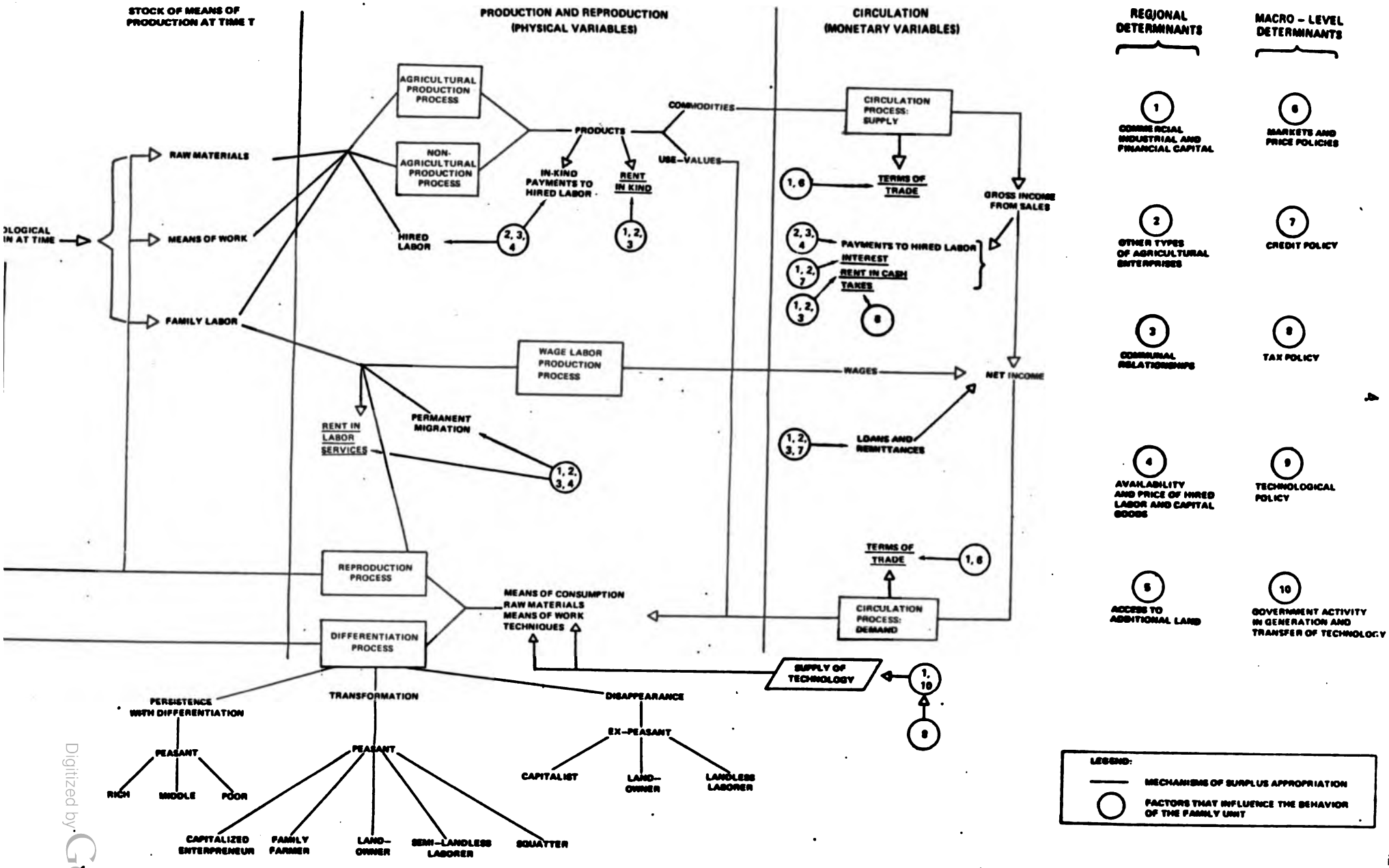

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processes (household and wage labor) and the process of reproduction of the family unit and the means of work. These two processes are related indirectly, through circulation in terms of formation and disposition of income, and directly, through production for home use.

The available supply of technology is included as an exogenously produced input. It may be acquired by the farm household, either through the circulation process (as a commodity), or as new knowledge from the state or other agents (e.g. extension).

In addition, Figure 1 includes a number of variables which define certain economic relationships occurring within the small farm sector and between the small farm sector and other social sectors. Intra-sectoral relationships include procurement and payment of hired labor, loans from neighboring farmers, and remittances from family members living and working outside the family production unit. Inter-sectoral relationships include rents in cash or in kind, labor services, interest rates on commercial loans, taxes and the terms of trade which define prices for the commodities sold relative to the commodities purchased by the small farm sector. The exact nature of these relationships plays an important role in determining small farm incomes, which in turn define the opportunities for growth of the peasant economy.

Listed to the right of the figure are several regional and macro-level actors and states of the socioeconomic environment which, to a large extent, determine the nature of the relationships mentioned above. The

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figure also shows which actors or states of the environment determine each specific economic relationship.

The differentiation [2] process is explicitly included as an evaluation mechanism which indicates the possible directions of small farm growth (or decline) over time, as a direct or indirect result of technological changes. The nature of the process as it occurs in the peasant sector is the economic equivalent of the process of capital accumulation (or loss) and growth typical of any other type of productive enterprise. In this sense, social differentiation contains the innovative process as one component. Similarly, when differentiation is used as a descriptor of the types of transformation that take place on production units, it becomes a definitive measure of the overall effects of inter and intra-sectoral relationships on each particular small farm situation.

The adoption of a technological innovation, or a change in intersectoral economic relationships, could provide the impetus for one of three types of differentiation to occur:

1. Strongly growth-oriented. The peasant family may become land owners, acquire agricultural capital in order to become family farmers, or incorporate hired labor and diversify into non-agricultural activities, thus becoming capitalist entrepreneurs.

2. Strongly debilitating. In this case, adverse changes gradually cause peasant farmers to lose control of productive resources, forcing them to sell increasing portions of available family

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labor and converting them into landless and semi-landless laborers or squatters.

3. Weakly growth-oriented or debilitating. Under such conditions, small farmers maintain their basic characteristics undergoing only slight socioeconomic changes.

What the model indicates

We begin with a small farm in an equilibrium which permits reproduction over time without differentiation. In order to initiate growth, some sort of shock to the system is required. Assume for a moment that a modification takes place, increasing the farm family's capacity to generate and/or obtain additional resources. Such a situation could arise due to an alteration in the terms of trade (e.g. a relative increase in farm product prices) or the adoption by the state of a policy which would permit an increased use of credit by small farmers.

Such an event could lead to an increase in the amount of income left over after paying the expenses of reproduction of the means of work and the family labor force. Part of this surplus income could be used to finance the adoption of new technology, which in turn would increase the productive capacity of the farm unit. If, social and economic conditions remained stable in the ensuing time period, sufficient excess income would be generated to permit the differentiation process to begin.

This preceeding scenario, however, has an undesirable mirror image.

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If the terms of trade were to undergo a change unfavorable to farmers (such as a "cheap food policy"), not only would technological change be inhibited or prevented, but would ultimately lead to the conversion of small farmers to the status of landless and semi-landless workers, as their income from agriculture continually fell short of their needs for covering the costs of reproduction. Eventually, the family may be forced to disinvest in agriculture (e.g. sell land) in order to survive.

A third possibility begins with an increase in disposable income and illustrates the "treadmill" effect sometimes accompanying the adoption of new technology. In this case, excess income makes it possible to incorporate new technology into the productive process, which in turn promotes increased farm productivity. However, in contrast to the first scenario presented, economic conditions change (e.g. product prices fall, new taxes are imposed, etc), and to a greater or lesser extent this offsets the potential benefits of new technology. Such a situation will, over time, hinder the growth and development of the small farm sector and, as a consequence, inhibit the process of rural development.

The discussion so far has outlined possible reactions to a stimulation of small farmer demand for already existent new technology. Another possibility is a shock to the system from the supply side as new technology appropriate to small farm conditions becomes available [3]. The technology is adopted and productivity increases. In a static political and economic environment, this increased productivity translates into increased disposable income, which can promote small farm growth and development.

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If however, changes in the prevalent inter-sectoral economic relationships prevent the rural sector from capturing the benefits, technological change becomes neutralized as a force for rural development.

Conclusion

We fully recognize the potential utility of farming systems research as a means generating technology appropriate to the current ecological and economic conditions faced by small farmers in developing countries. However, as the preceeding discussion of our proposed analytical framework indicates, there are no guarantees that once technology is adopted, increased benefits to small farmers and to rural communities will follow. The key factors to be considered, then, include not only the micro level ecological and socioeconomic environments prevalent within the small farm sector, but also the relationships occuring between the small farm sector and the dominant social sectors. If the nature of these relationships is exploitative, changes in the relationships will have to take place, perhaps spurred by favorable state policies, before technological change can become an effective tool for the development and maintenance of a viable small farm economy.

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FOOTNOTES

1. The economic unit to which we refer is a subset of what is commonly called a small farm in the U.S. agricultural economics literature, and which corresponds more closely to a campesino (peasant) farm in the Latin American literature. Since both terms are somewhat imprecise, we provide a definition here. The basic reference point of our unit of analysis is the agricultural production unit based upon a combination of land and family labor. The family has direct access to the land (either through ownership or rent) and devotes its labor force mainly to the farm.

   In accordance with this definition, the upper limit of the small farm category is the point at which permanent, non-family labor is utilized and/or significant capital accumulation has occurred. The lower limit is reached when all economically active family members sell the majority of their working capacity outside of the family production unit.

2. Differentiation is the process by which the organization of peasant production is modified either by incorporation of capital and wage labor into the productive process, or by the deterioration of its productive capacity and the consequent proletarization of the family labor force. The specific alternative differentiation paths depicted in Figure 1 were proposed by Murmis.

3. The development of such technology is, of course, the major objective of farming systems research as currently envisioned.

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