NEW TECHNOLOGY IN CROP PRODUCTION: THE CASE OF SMALL FARMERS

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ABSTRACT

The following discussion relates how Latin America's small farmers were left behind its economic mainstream. The region has substantial parts of its population living in the agricultural sector as small farmers. It is indicated that technological, educational and organizational problems are causing high urban/rural migration rates. Urban areas, on the other hand, are not able to provide jobs to those families in the short run. Therefore, housing, health, and mainly, urban safety problems are aggravated. The paper closes with comments on the strategic actions suggested to help small farmers' economic and social development.

INTRODUCTION

New technology in crop production raises several types of concerns about environment, food safety, consumer driven orientation, vertical integration of production, and consumer resistance to biotechnologically modified plants, among others. Phillips and Walsh (1992) of the U.S. Office of Technology Assessment have an interesting discussion about the possible impacts of these trends. They result from advances in new technological tools, changing demographics and lifestyles, and new distribution of income. I shall not discuss this any further. I want to move the subject of my speech to a different focus.

I will be talking about small farmers' production and their corresponding technological and economic problems. For obvious reasons my emphasis will be on Latin America. I will divide my speech into two parts. First I will discuss how Latin America's small farmers were left behind its economic mainstream. This was due to the kind of technology utilized by their agricultural sectors and the emphasis on using inputs not available to small farmers. There are serious educational problems that hinder their ability to attain higher income. They also have problems of organizing themselves into associations in order to gain political power. The overall result is high rates of rural/urban migration. I conclude with some comments on the strategic actions suggested to help farmers' economic and social development.

LATIN AMERICAN AGRICULTURAL DEVELOPMENT AND RURAL POVERTY

Contrary to Australia and New Zealand's type of development strategy, which increased the strength of their agricultural sectors, most countries of Latin America have chosen urbanization and industrialization as leading tactics to promote economic development. Based on the UN's CEPAL rationale, industrialization was the preferred strategy because it would reduce the distortions caused by perverted terms of exchange with industrialized countries and because agriculture was not thought to be a sector that responded to economic stimulus. Furthermore, because they were agriculturally-based economies the necessary income to support heavy governmental structures and services had to come mainly from the rural sector. These economies relied on governmental actions (decree) and on direct governmental intervention to build the transformation industry sector. Direct governmental interventions tend to produce perverse income distribution that favors the politically stronger groups of society. The overall result has been a relative impoverishment of an important part of Latin American populations especially a part of the rural population.

The mainstream of economic development in Latin America has left part of the rural population out of the benefits of the modernization process. Its agricultural sectors were penalized via direct transfer of resources to finance the building of urban economic sectors and to support governmental bureaucratic structures. This transfer of income from the agricultural sector has lasted for several decades. In more or less democratic societies long term penalization of a sector is allowed only if society develops "values" against that sector. CEPAL's government followers justified penalization of the agricultural sectors in favor of urban sectors in order to spread the view that farmers attitudes were conservative and against progress; that they were labor exploiters, therefore against changes in the "status quo" of the sector; that they wanted the rural population uneducated to better exploit it; that they did not respond to economic stimulus, as urban entrepreneurs do; and that urban activities required higher levels of education while farming was a business that rough uneducated people could do as well and, consequently, they should earn lower income than urban populations.

Another result of the prejudice created against agriculture was the increasing flow of migration to urban centers. The income differential that one can earn in urban areas, when compared to rural income, plus societies' values against the rural way of living, reducing their members' self-esteem, has an enormous appeal to rural youth migration. Therefore, the best from rural populations tended to migrate to the cities.

Migration driven by a lack of economic opportunities and by societal values that create low self-esteem in part of the population perversely penalizes the origin sector. Young people and the most prepared part of the population tend to migrate first.

They are the ones who are willing to accept the risks associated with the adoption of new technologies. An example of the importance of migrant population characteristics is given by the practice of the personnel departments of large corporations. The personnel department of large corporations look first for general knowledge, youth, and willingness to run risks in new workers. Those characteristics are definitely more important than specific professional abilities in recruiting labor.

Latin American and Caribbean countries have substantial parts of their population living in the agricultural sector as small farmers. In these regions they represent more than 13.5 million units (FAO, 1993). They comprise the major part of the region's rural poverty. Given their technological knowledge and natural resources endowment they lack both the physical and the human capital required to provide their families with an yearly income comparable to urban incomes. Increased rural-urban migration rates result from this prevailing situation. Urban areas, on the other hand, are not able to provide jobs to those families in the short run. Therefore, housing, health, and mainly urban safety problems are aggravated.

Wealthy countries like the members of the European Economic Community (E.E.C.) or Japan, among others, are willing to spend the necessary resources, that market forces would otherwise stimulate, to maintain a larger part of their population, working in the agricultural sector. They are accomplishing it either through subsidizing or through transfer of income to their farmers. Recent trends in international trade arrangements, on the other hand, are requiring the opening of underdeveloped economies to foreign competition. An unfair system is, therefore, created against these countries' agricultural sectors. Small farmers are particularly harmed by this unfair competition which adds to the migration forces expelling people from rural areas. It is sad to see small farmers of Panama, Ecuador, or Brazil displaced in their attempt to try to sell in markets depressed by cheap subsidized wheat, corn, milk, beef, or other products imported from developed countries.

Another factor that tends to increase agrarian rural/urban migration is the kind of technology utilized in the agricultural sectors of Latin America. Modern technologies involve the purchasing of inputs such as fertilizers, pesticides, herbicides, machine services, wrapping and bagging, efficient transportation, and other commercialization services. In general, small farmers have neither the cash nor the credit availability to allow them to have access to these inputs. Furthermore, cultivating small tracks of land and purchasing small amounts of each input add to their costs, making their products more expensive than those produced by larger technologically developed commercial farms. On the other hand, most Latin American countries import technologies developed for different realities than theirs that tend to favor the more capitalized farms. Small farmers' income are, consequently, lower and they tend to leave the sector in search of better ways to make a living.

There is an overwhelming availability of data to show how small farmers of certain regions of Latin America are less competitive than the generally larger commercial farms. One example occurs in a Brazilian region where small farms prevail: the Northeast's production of cotton in the "sertao" and "agreste". While cotton yields are growing in most regions of the country, especially in commercial farms, yields in the Northeast states are constant or even decreasing over time. Table 1 depicts yields for the five regions of the country. The perennial cotton crop is cultivated almost exclusively by small farmers (small landowners or sharecroppers) in the Northeast region. Commercial farms cultivate annual cotton.

Table 1. Production of Two Kinds of Cotton (Annual and Perennial) in the Five Regions of Brazil, 1970 to 1990. (in kg/ha)

Type/Region	1970(a)	1975	1980	1985	1990
Annual Cotton					
North	226	(b)	679	400	781
Northeast	175	349	264	449	458
Southeast	1,013	1,203	1,580	1,692	1,334
South	1,175	1,415	1,671	1,918	1,740
Central West	1,046	1,192	1,704	1,653	1,547
Perennial cotton					
Northeast	175	179	101	141	75

(a) Data for 1970 cluster the annual and perennial cotton.
(b) Data unavailable.
Source: IBGE's (Brazilian Geography and Statistic Institute) General Annual Report, several numbers.

Latin America's small farmers are, in general, poorly organized and consequently less able to transform their technological needs into effective demand for research by public institutions. As suggested by Hayami and Ruttan (1971), small farmers' inability to exercise political power results in underfinancing of research destined to solve their specific problems. Since they are not important suppliers of food or fibers to urban consumers governments are less concerned about their performance than they are about commercial farmers' yields. It suggest that they face organizational problems if their needs are to be addressed by public research institutions.

One interesting example can be used to show the importance of certain groups'ability to mobilize political support destined to gain governmental financing for specific research problems. Textile industry and cotton croppers used to have strong economical and political powers in the first half of this century in Brazil. As shown by Ayer and Schuh (1974), the State of Sao Paulo alone was able to invest more in cotton crop research by governmental institutions than all public research financed by public funds in

the development of hybrid corn in the United States during the decade of the thirties. This heavy investment in research explain why commercial production of cotton boomed in the southern states while the production and yields of perennial cotton decreased in the Northeast.

The case of edible beans is another interesting example of insufficient funding for research for non-concentrated groups. The problem is aggravated by public policy mismanagement. Edible beans are one of the major sources of protein for low income families in Brazil. The international market is very limited for the product. Government's perverted interventions in the market, through price ceilings or subsidizing imports, are common, due to the product consumption social impact. Furthermore, crop requirements in labor, especially for harvesting, is very large. Therefore, commercial farms are not interested in cropping edible beans and small farmers are the major producers. The general trend in crop yields has been to decrease. Table 2 shows the yields for the crop in the countries' regions. A new phenomena is happening in the Southeast region that deserves mentioning.

Starting in the 1980's some larger commercial farms from the Southeast and Central West regions of Brazil invested in sophisticated irrigation systems and are producing with up-to- date technologies. One of their production opportunities was cropping of edible beans in periods of low supply and, consequently, higher prices. Edible bean quality deteriorates rapidly and storing the product under special conditions would be very expensive. Although not yet reflected in the aggregated data of Table 2, the two regions have dicotomized bean productions: small farmers' production continues with decreasing yields and larger farmers' production are taking place at increasing yields. Small farmers' competitiveness will be in jeopardy when public research institutions sell seed varieties that allow mechanical harvesting. Those institutions are announcing that it will not take long before they are able to produce these varieties. Although society in general will probably be better off, because consumers will have a basic staple at a lower price, a new increase in the flow of migration to urban centers is expected. Being a non-concentrated group small farmers cannot exercise political pressure and public research institutions are not allocating enough funds to solve their problems even though those institutions are responsive to the commercial farms' needs.

Another problem faced by Latin American small farmers is derived from the inadequacy of their formal educational system to help solving small farmers' problems. Formal education is an efficient way to allow youngsters to move to the urban sectors of the economy. The higher the degree received the better chance one has to make higher income in the cities. Given the tendency to leave agriculture by most adolescents, the general school system responded by adapting their curricula to favor urban education. The agricultural school system also responded to the demand for specialized knowledge useful to larger or capitalized farms. Like

the agricultural research system, the educational system did not try to put together a comprehensive body of knowledge to train managers for small tracts of land. In most of the systems, students are prepared to work for larger farm firmsin order to help those firms as extension workers, or to work for urban firms selling inputs to, or buying outputs from, farms.

Table 2. Edible Beans Yields in Brazil, by Regions. 1970 to 1990.
(in kg/ha)

Region	1970	1975	1980	1985	1990
North	824	(a)	578	549	588
Northeast	347	402	280	314	291
Southeast	547	492	550	543	647
South	924	818	526	712	599
Central West	742	572	310	427	598

(a) Data unavailable.
Source: IBGE's (Brazilian Geography and Statistic Institute) General Annual Report, several numbers.

The role of allowing rural youth to move to other sectors is not seen as a bad thing. On the contrary, a certain amount of adolescents living in overpopulated rural areas are supposed to move to other areas and/or activities and the educational system is responsible for helping them to do so, preparing them to be better citizens. The point is that small farmers are left without their best resource (the best human capital) and no specialists, either from extension or from research services, are trained to help them. As mentioned before, these populations of rural poor have small political power, and governmental policies will rarely be directed toward improving their quality of life. In some Latin American countries, they were not even allowed to vote until recently, under the legal umbrella that they were illiterates.

In summary, a large population of small farmers and their families were left behind the mainstream of economic development and they will move to urban areas unless their economic perspectives can be improved somehow. Metropolitan areas of Latin American countries are having serious problems of quality of life and it will get worse if this migration flow continues at present high rates. In the long run this part of the rural population will probably end up living in cities, where they will be employed by the transformation industry and/or the service sector. Because the cities currently cannot absorb this extra population, the problem is the transition period. It may last many years or decades and will likely cause a lot of unnecessary suffering.

STRATEGIC ACTIONS TO HELP SMALL FARMERS.

Three strategies are being proposed to help small farmers. The first is through government subsidy of their activities. The second is by changing formal education, research, and extension efforts toward the so-called agroecological farming system. The third is a mixture of both strategies. As a matter of fact we are not considering the alternative of large amounts of income subsidy being directed to small farmers like wealthier countries are doing with their farmers. Latin American countries are not willing, besides claiming that they are too poor, to give subsidy to their rural populations.

The strategy called agroecology is appealing. It is based on the substitution of chemical pesticides, on biological equilibrium among pests and predators or natural enemies, on crop diversification and rotation, on better management of soils' organic matter, and on larger genetic variability of plant varieties being cropped. Supporters of this new approach to agriculture claim that based on these "principles" it is possible to reach yields comparable to what modern agriculture is attaining. They further claim that it can be done in a sustainable way. The lack of empirical evidence to sustain this view plus the high costs associated with the so-called natural products will postpone its consideration as a possible general solution to small farms problems, at least in the short run. Furthermore, agroecology assumes the substitution of labor for capital in a reverse order from the experience in almost all successful cases of social development. Of course, if market niches for these products can be identified they should be used to improve small farmers' income.

I think the third strategy, giving small farmers some subsidy and using elements of agroecology, is the correct one. As the FAO (1992) publication states, three shortcomes are limiting small farmers' ability to overcome their problems: their lack of competence as farm managers; the absence of formal organizations to support their insertion on the market; and the lack of appropriate technologies. Formal education will play an important role in loosening the first limitation. The agricultural school system is, in general, not concerned with poor small farmers, except by giving their children a chance to go somewhere else for a better living. Agricultural school direction and staff know that the great majority of their students will not return to their parents' small farms. By giving small farmers competence to manage their small plot of land, the agricultural school system could improve peasants standard of living while preserving them from losing socially desirable values in big cities' slums. Adjustments in the school system are required if it is going to prepare students to become rural managers.

There is an urgent need to develop techniques for small farm management. New management technologies that include integration of different activities, techniques that use less purchased inputs,

and association development for commercialization of both inputs and products, may improve their income and consumption of goods and services. As already mentioned, it is unlikely that Latin American governments will be very concerned with small farmers' populations based on their importance as crop producers. In the macroeconomic aggregates their products have a relatively low weight. They are mainly subsistence farmers with only a small part of their products going into the markets. Small farmers are geographically disperse, therefore have little political power. They must be able to associate themselves into organizations capable of successfully convincing people that it is in the best interest of society to direct public policies toward viability of maintaining small farm production, at least in the short run.

Finally, a new approach to research is imposing. The classical separation between production and consumption decision-making violates basic realities faced by small farmers. At least in some phase of the research/diffusion process, small farmers must be incorporated to ensure that relevant results are generated for this distinct public. Research institutions will have to work much closer with small farmers than they have done until now. Through the development of small farmers' associations they ought to be able to express their demand to the research services.

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