

**THE ROLE PUBLIC AGRICULTURAL RESEARCH IN  
SECURING FUTURE HARVESTS**

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*Mr. Rector Magnificus, Ladies and Gentlemen,*

After more than a decade, globalization still remains a highly controversial issue.<sup>1</sup> Most researchers in the academic community and in the international development organizations have highly favorable views on this process. And their views are supported by strong empirical evidence showing that — during the past decade — globalization spurred growth and led to a reduction in poverty. Nevertheless, the backlash against globalization continues unabated, and large crowds of protesters gather for any meeting of the international economic organizations to vent their anger against policies and agreements aimed at creating an ever more interdependent world.

These protesters are a diverse lot, but relatively few claim to represent the poor of the world. So far, however, they have not managed to present a convincing case why globalization is detrimental to the developing countries. In the developing countries themselves, most complaints are against the structural adjustment programs that have been implemented under the stewardship of the International Monetary Fund (IMF), the World Bank, and the World Trade Organization (WTO). Many in the developing countries argue that the globalization process has led to a massive redistribution of income and wealth in favor of the rich countries and the rich people in their own countries, while many of the poor were actually impoverished.

The empirical evidence on the impact of globalization has been analyzed most thoroughly in several recent World Bank studies and summarized in two main reports: The first is the World Bank's *World Development Report of 2000/01* that focused on poverty and emphasized the

decline in the percentage of the world population living in extreme poverty from 29 percent in 1990 to 24 percent in 1998, although there were large differences between regions and most of the decline was in East Asia (Table 1). In the other regions the decline in percent was minimal and the number of the poor has actually increased.

**Table 1: Trends in World Poverty during the 1990s\***

	1990		1998	
	No. (million)	Poverty rate	No. (million)	Poverty rate
EA	450	27.6	280	15.6
LAC	74	16.8	78	15.6
SA	495	44.0	522	40.0
SSA	242	47.7	291	46.3
World**	1276	29.0	1200	24.0

\*Source: World Development Report 2000.

\*\* Includes also MENA and the Ex-Centrally Planned Economies

The second is a World Bank Policy Research Report entitled *Globalization, Growth and Poverty: Building an Inclusive World Economy*. This report highlights the fact that 24 developing countries with a population of some 3 billion people – particularly in East Asia, and including China and India – reformed their economies and were able to have large gains from globalization. These countries achieved unparalleled rates of growth and a sharp reduction in poverty. However, the report also emphasizes that many other countries – particularly in Sub-Saharan Africa, the Middle East, and the former Soviet Union – failed to restructure their economies and to be integrated into the global economy. The economies of these countries shrank by nearly 10 percent during the 1990s, and their poverty has increased.

The support of most economists for globalization is based on the neo-classical maxim that — with trade — resources

are allocated more efficiently to productive uses; the gains from trade and trade liberalization are further increased by the flows of foreign direct investments that have been stimulated by the globalization process, although most flows were directed to a relatively small number of countries that were perceived as 'good risk.' Economists also emphasize the gains that low-income countries — with abundance of unskilled labor and significantly lower wages — can have by expanding output and employment in labor-intensive industries in which they have a comparative advantage. The successful experience of most East Asian countries underscores these benefits and led to the conclusion that: "Growth is Good for the Poor;"<sup>1</sup> the reason being that globalization raised incomes and, since the income distribution in developing countries have not worsened, the poor participated in full.

The World Bank papers that review these developments recognize, however, that the benefits from the deepening global trade relations have so far been distributed very inequitably between and within nations:

- The rich industrial countries have reaped the larger share of the total gains;
- The countries in East Asia achieved the fastest growth rates due to rapid, export-led growth and large flows of foreign direct investment;<sup>2</sup>
- But most other developing countries remained stagnant, and the volume of foreign investment that reached their borders shrank to a trickle.<sup>3</sup>

As a result, global income inequalities have increased during the past decade and the gap between the nations with the poorest 20% of the world's population and the nations with the 20% of the most affluent people nearly doubled. On these grounds, opponents of globalization

argue that globalization benefits the few at the expense of the many.

## II. The Impact on the Agricultural Sector

The countries that have so far failed to be integrated into the global economy remain predominantly agricultural, and the majority of their population lives in rural areas. Moreover, even in countries that gained from globalization, the agricultural sector and many rural areas often trailed behind. *The design of policies to assist the poor must therefore start with and focus on the agricultural sector.*

The main reason for the slow pace of adjustments in the agricultural sector is the far-reaching transition that farmers must undergo as an effect of the reforms. These reforms included the removal of trade controls and tariffs, elimination of most internal price controls, and sharp cutbacks in most subsidies and price supports, and they have led to large changes in the prices of all agricultural inputs and outputs. As a result, many farmers were forced to change their farming and marketing practices and switch to different methods of production, and many were compelled to abandon agriculture altogether. Although these reforms are an essential part of the structural adjustment program and are needed to spur growth, the adjustments are bound to take time and — in the short run — they impose a heavy burden on large segments of the agricultural sector and the rural population.<sup>4</sup>

Several specific factors contributed to increase the difficulties of agricultural producers:

- First, many producers of traditional export crops suffered heavy income losses with the sharp fall in commodity prices in the world markets.

- Second, trade liberalization opened the markets of the developing countries to cheap imports of maize, wheat and other field crops from the developed countries, and many local farmers that produce these staples were not able to compete because their yields are much lower.<sup>5</sup>
- At the same time, however, the markets of the *developed* countries remain protected by high tariffs and subsidies, and agricultural producers from developing countries face very high barriers when they export their products to the lucrative markets in Europe and the US.

Clearly, the global trading system that emerged from the multinational and regional trade agreements is not, in fact, a system of entirely free and entirely fair trade — as envisioned by the neoclassical economists.

- On the one hand, it is a system in which trade is subject to a wide range of rules and regulations and it is therefore not free.
- On the other hand, the majority of these rules that form the foundation of the WTO are part of the General Agreement on Tariff and Trade of 1994, and that agreement was clearly biased by the priorities of the developed countries that dominated the negotiations.

To evaluate the main characteristics of the transition process in the agricultural sector of the developing countries as an effect of globalization and the impact on their rural population, ISNAR conducted a large research that included an analysis of these trends in 15 developing countries during the 1990s. Local research teams prepared thorough surveys of the developments in these countries, and a subsequent comparative analysis drew common lessons from their experience that can be relevant to other developing

countries as well.<sup>6</sup> In addition, a more general analysis was conducted to evaluate the impact of several key changes in the global trading system that were driven by the multinational agreements, including:

- the rules on food safety standards and intellectual property rights,
- the increasing domination of multinational corporations in international trade,
- the growing share of the private sector in agricultural research.

The country — surveys emphasized the negative impact of the sharp drop in commodity prices and the flood of cheap imports of field crops that inflicted heavy income losses on local farmers. Moreover, in the absence of reliable information on prices and current market conditions, it took farmers a season or two to realize that, with the new prices, they may not be able to recover even their input costs. In the remote rural areas, the adjustments were prolonged by the geographical distance to the market and by the lack of timely information on prices and market conditions. As a result, after the reforms the first step of many farmers was to withdraw to production for their own consumption; many others abandoned farming altogether.

The main alternative that farmers had was to diversify their farming system by expanding the production of non-traditional crops for the domestic market or for niche markets in the developed countries. This transition is, however, a complex logistic process that may be beyond the capacity of small-scale farmers:

- First, the *diversification* of their farming systems and the introduction of new, particularly non-traditional crops requires local farmers to have access to the necessary inputs and technologies, as well

as information and instructions how to grow these crops and how to meet the market standards.

- Second, farmers may also encounter difficulties to *market* their produce since there is no functioning supply chain for these crops from their villages to the urban centers.

In the more developed countries, where the private sector is competitive and efficient, the 'market' provides all the necessary information, and the prices in that market are the most effective signals that guide farmers in selecting new crops and adjusting their farming system. In countries where markets are undeveloped and public institutions in charge of supervising their competitiveness are still at their infancy, reforms that strive to "let the market forces work," may not be able to fly.<sup>7</sup>

Even in India and China — two countries that have gained heftily from globalisation — the gains did not reach all areas and population groups:

- In India, the reforms started already in the late 1980s and a key element of the reforms was a reduction in all government support to the agricultural sector. Many farmers are still struggling, however, to make the adjustments due to their very limited substitution possibilities. Resource and credit-constrained small farmers suffered the greatest losses, because they lack the resources needed to make the adjustments.
- In China, the authorities are having grave concerns over the potential impact of trade liberalization on their rural population as China now joins the WTO. With the transition to free trade, the prices of most field crops (with the exception of rice) are likely to decline due a the flood of cheap imports, whereas the prices and exports of horti-

culture and most animal products are likely to rise. From the macroeconomic perspective, the resulting increase in the exports of labour-intensive agricultural products and the imports of land-intensive products is consistent with China's domestic resource endowments – and therefore seems desirable. However, farmers in many Western and Central provinces, who produce primarily field crops, have very limited substitution possibilities, and they may not be able to prevent the decline in their income.<sup>8</sup> These farmers and provinces may become increasingly depended on public support during the transition period, both in direct transfer payments to prevent their impoverishment, and in the selection of substitute crops.

In the countries that have lost from globalization, farmers may *need even more* the support of the public sector to help them in make the proper choices and the necessary changes in their farming system; in these countries, the public sector still has an important role in alleviating the difficulties of the adjustments, accelerating the transition, and reducing the social costs. Toward that end, the reforms should be planned from the outset so that the pertinent public institutions remain actively involved in the entire transition process, help farmers make the proper decisions, provide them resources to make the necessary adjustments and assist them in marketing their produce.

Another lesson from the experience of the countries that were included in ISNAR's research was that factors specific to each country ultimately determined the impact of the somewhat generic reform policies that these countries implemented. All too often, however, the reforms in the

agricultural sector were complicated by a multitude of hurdles and challenges that were dealt with by centrally prescribed policies — although it became obvious very rapidly that the success of the reforms would be determined primarily by how sensitive they are to local conditions and constraints — including the strength and effectiveness of local public institutions. The implementation of these policies and their modification to the local conditions proved to be quite complex, however, and the transition period — until local farmers could make the adjustments — was therefore much longer and fraught with more problems than initially envisioned.

Perhaps the most important lesson that emerged from this comparative analysis is that the common premise underlying the reforms — namely, that the removal of all government controls will unleash market forces that can eliminate price distortions and inefficiencies rather rapidly — is often far too optimistic. In the long run, a competitive market system is indeed the most effective means of correcting the highly flawed and misleading signals that are currently given by the maze of government intervention measures. But it takes time for the markets to become competitive and efficient and for the market prices to converge to their correct levels, and it takes time for local producers and traders to make the transition to new crops and a new mode of operation.

Indeed, the decidedly mixed experience of these and many other developing countries following the measures that they have taken to liberalize their markets ‘in the strike of a pen,’ based on the strong advice of the IMF and the World Bank, has led to growing recognition that healthy and competitive market systems cannot emerge overnight following

these measures.<sup>9</sup> Countries that have liberalized their food and commodity markets, in particular, have encountered considerable difficulties.<sup>10</sup> Markets require supporting infrastructure and public institutions, and it will take time to develop this support in countries that were dominated by local monopolies or semi-public marketing boards.<sup>11</sup> These difficulties during the transition are the main reason for the sharp decline in agricultural production that many developing countries have experienced following the rapid liberalization of their internal price systems and their trade.

Clearly, the public sector is by no means a paragon of efficiency, and the existing distortions are obviously due to ineffective and politically biased government interventions in the economy. In the short run, therefore, a choice must be made between two options – namely, reliance on market forces or on public institutions – and both options are well below the optimum optimum. In many developing countries, the markets are already quite developed and the institutions of governance already function quite effectively; in these countries the reforms could establish greater efficiency in the organization of production and trade and greater competitiveness in the markets. In most of the least developed countries, however, the existing markets are far too fragmented and dominated by local monopolies, and the current organization of production and trade are far too rudimentary and inefficient; in these countries the reforms cannot rapidly restructure production more efficiently and streamline the markets — as the planners of the reforms envisaged.

In the latter group of countries, continued involvement of the pertinent public institutions may be necessary, at least during a transition period until the markets start to operate

more effectively and competitively. The public sector may also have to take active measures in assisting the poor and the more vulnerable segments of society who may be particularly at risk during the transition period, either by designing effective and affordable social safety nets or by strengthening the economic sectors that are particularly susceptible to income gyrations during the transition.

For these reasons, the set of policies advanced by the 'Washington Consensus' — and summarized somewhat schematically as "Liberalize as much as you can, privatize as fast as you can, and be tough on monetary and fiscal matters,"<sup>12</sup> — failed to achieve the intended goals in most developing countries. Their experience makes clear that — although free markets and less government intervention in the economy are the long-term goals of the reforms — the sequence and pace at which they are introduced must be constrained by the existing effectiveness and competitiveness of the local markets. On these grounds, Joseph Stiglitz — formerly the World Bank's Chief Economist — questioned the priority given by the 'Washington Consensus' to rapid privatization, and criticized the lack of attention to establishing competition or building social or organizational capital.<sup>13</sup>

### **III. The Role of the National Agricultural Research Organizations**

The main characteristic of the transition is the transformation of the country's agricultural sector — from a *supply-oriented* structure of production — based on traditional *export crops* and *staple foods* for domestic consumption, to a *demand-oriented* structure, open markets and specialization in production in line with the country's comparative advantage as well as the demand conditions in the domestic

and the global markets. A public institution that can have a pivotal role in assisting farmers to make this transition is the national agricultural research organization (NARO) — with its research, development and extension services.

- On the one hand, the main activities that this task requires — namely, the development of suitable technologies that will facilitate the adoption of new crops, and the dissemination of these technologies in the rural areas — complement the current activities of the NARO.
- On the other hand, the *additional* activities that this task requires — including the development of production practices in line with the market demand and the food safety standards — will contribute also to improve the NARO's current operations.

The success of the transition depends on the capacity of local producers to generate enough income with the new structure of production and trade. The key to that success is an appropriate *choice of crops*, availability and affordability of the necessary production inputs and technologies, and access to markets. The choice of appropriate crops is the first and most critical step, and the main criteria to evaluate this choice are the profitability and the marketability of the alternative crops.

This evaluation requires, in turn, timely information on prices and market conditions, knowledge and experience in evaluating the different alternatives, and an effective organization to transfer that information and disseminate that knowledge to the farmers.

Most farmers in developing countries — particularly the

small-scale farmers – do not have that knowledge, and at the present they depend on the local traders, the large corporations, or the semi-public marketing board. But these entities often have a monopolistic power in the local markets, and they may therefore restrict even further the farmers' capacity to make an effective adjustment.

In these countries, the NARO is the public institution that is, in my view, in the best position to assist farmers in making the proper choices and an effective transition to a new structure of production. This role of the NARO may have to include additional tasks and activities — beyond those that are traditionally included under the generic definition of 'R&D' — and a different mode of operation to perform these tasks:

- First, the emphasis on the profitability and marketability of the alternative crops requires the NARO to give much greater emphasis to economic considerations in selecting its research projects and disseminating new technologies.
- Second, the introduction of new and mostly non-traditional crops will require different research priorities and more resources to research on these crops.
- Third, the commercial prospects of the new crops depend on whether the farmers will be able to deliver them to the market. That, in turn, depends not only on the quality of the access road and the distance to the urban center, but also on the organization of the entire 'supply chain,' — namely the organization of procurement, transport, storage, processing, and delivery of the products. Presently these supply-chains are often very rudimentary and inadequate in many rural areas. To secure the commercial prospects of the

new crops the NARO may therefore have to assist the development of the supply chain, particularly to remote areas.

In the more developed countries, 'market forces' take up these tasks and provide these services rapidly and effectively. In developing countries, where markets are often inefficient and dominated by monopolistic forces, the public sector must step in and either directly provide these services, particularly during the initial period, or assist the relevant private enterprises to develop that capacity. In many of these countries, the NARO may be the most suitable public institution to perform these tasks, but the "division of labor" between the various public and semi-public institutions that operate in the rural areas must be determined by the specific conditions in each country and the strength of these institutions. These new tasks will require the NARO to change its guiding principles as outlined in Table 2.

**Table 2**

<i>Present</i>	<i>Future</i>
<b>What cultivars to develop</b>	<b>What crops to select</b>
<b>How to maximize the expected yields/output</b>	<b>How to maximize the expected profits/income</b>
<b>What are the production methods</b>	<b>What are the production costs</b>
..	<b>Where to deliver the produce</b>

Another task of the NARO is to secure the availability of advanced technologies and the access of local farmers to these technologies. With the globalization of agricultural research, spurred by the TRIPS agreement on intellectual property rights and by the massive investments of private

corporations in research, access to advanced technologies becomes more expensive and more limited.

At the same time, policy reforms aimed at scaling down the role of State enterprises in production and distribution opened the door to private companies, both national and multinational. The entry of the private sector is a double-edged sword, however:

- On the one hand, it can increase private investments in agricultural research and accelerate the development of new technologies;
- On the other hand, private companies are motivated by profit considerations and therefore tend to concentrate on the more lucrative segments of the market, cater to the demands of large-scale commercial farmers, and leave out the small-scale farmers or the farmers in remote areas.

Private seed companies, for example, sell almost exclusively hybrids in which they have very effective 'technical' protection over their intellectual property rights, whereas research in areas where intellectual property rights are not protected is trailing behind. Moreover, economies of scale in seed research and distribution, and growing concentration of seed trading in large supply chains following a series of vertical integrations, increase the share of the large private seed companies and give many of them a monopolistic power that they use to raise seed prices.

The protection of intellectual property rights may create difficulties for the public agricultural research organizations by restricting their access to proprietary technologies, — but they may also offer many opportunities. These opportunities present the public research organizations with multiple dilemmas:

- Should they continue to make their technologies available to all at no cost and insist on defensive patenting only?
- Should they concentrate on the development of new technologies that are needed mostly by the poorer farmers and leave to the private sector the development of more commercial technologies?
- Should they use the new system to mobilize private investments for their research, establish collaboration with private research companies, and commercialize part of their own research? <sup>14</sup>

The prospects are great, and there is a lot on the line. In the final part of my presentation, I would like to examine how well prepared the public agricultural research organizations are to face the new challenges.

#### IV. Are the NAROs Ready?

To examine the impact of all these changes on the mode of operation of the NAROs in developing countries, another part of ISNAR's research included an extensive survey that inquired about: <sup>15</sup>

- The NAROs' new research priorities and their methods of selecting new research projects;
- the participation of farmers' cooperatives and others in determining these priorities,
- their collaboration with other public and private research institutes,
- the impact of intellectual property rights on the selection of their research projects.

In this survey, NAROs researchers expressed concerns that they will be pressured to commercialize part of their research, possibly at the expense of projects targeted on small-scale farmers or on marginal areas. Researchers also expressed concerns that the rise in the price of agricultural inputs because they include patented technologies may exclude many poor farmers. Nevertheless, the expectations of most researchers and most managers of these research institutes were that the stimulating effects of the new rules on their own research and on the research of private companies, and the prospects of their institutes to earn income from their own proprietary technologies will generate benefits that far outweigh the costs.

The survey also shows that well over two-thirds of their current research projects are still on traditional crops and only few research projects are conducted on non-traditional and new crops (Table 3). The main reason seems to be the limited funds available for research on new crops: Most donor funding is for research on traditional staple foods or environmental issues; funding of multinational corporations or domestic private enterprises is for research on traditional export crops

**Table 3: Principal Research Categories**

Research Category:	Commodity/Factor Research Of which: Genetic Improvement	Environ. NRM	Pest/Disease Control <sup>1</sup>	Policy/Economics	Other or N/A	Total	
Projects	248 (57%)	95 (22%)	44 (11%)	101 (23%)	24 (6%)	13 (3%)	430 100%

1. Including research on specific pest/disease controls conducted within the framework of commodity programs.

Another part of the survey inquired about the impact of the new rules on intellectual property rights. One stark observation that emerged from the replies is that the vast major-

riety of the NAROs did not conduct so far any systematic analysis to determine their policy on this issue. In many countries, the decision is left, in fact, to the directors of the individual institutes, and their decisions are often motivated by the prospects to mobilize funds by developing patented technologies. In many cases, the research institute has clear guidelines how to divide the prospective royalties between the researcher and the institute, but no guidelines to determine whether the technology will be made available free to any group of local farmers.

The CGIAR centers are in a very similar state. There are no general rules to determine the policy for the entire organization with regard to intellectual property rights, and the decisions are left to the directors of the individual centers. Even rules to determine the access of public agricultural research institutes in the developing countries to the Centers' genetic material have not yet been established.

Another discouraging observation in the survey is the very limited resources allocated by the NAROs to research on policy and economic issues. Only 24 of the 430 research projects included in the survey were on these issues. Among these 24 projects, there was not a single one that evaluated the economic prospects of any new crop. In the CGIAR, the picture is again quite similar: The share of research on policy and economic issues is quite small, and most of this research is on rather general policy issues. Impact assessment of agricultural research is focused primarily on an evaluation of past experience, i.e., an evaluation of innovations that were already developed and disseminated some years ago. However, impact assessment of past research projects may have only a limited relevance for an evaluation of new projects that develop technologies

that will be used some years hence under very different conditions in global trade and research. Moreover, this retrospective impact assessment may be biased by "picking the cherries." Research aimed at evaluating the feasibility and desirability of prospective new research projects, particularly new export crops, is very limited.

**In conclusion:**

At the turn of the 21st century, most poor farmers in developing countries are still highly dependent on the production and export of primary commodities that lost much of their value in the past years, and on traditional staple foods that are produced mostly for their own consumption.

*Mr. Rector Magnificus, Ladies and Gentlemen,*

If I sounded too negative or too critical, it is not at all because I am pessimistic, but because I think that a call for a different course of action is necessary. In fact, I believe that the prospects are great not only for the large industrial farmers but also for the small-scale farmers. I also believe that with proper guidance of the public sector in general and the public agricultural research organizations in particular, these farmers will be able to adjust their production and adopt new technologies that will enable them to reap the huge benefits that the global trading system can offer.

*Mr. Rector Magnificus, dear colleagues, friends and family,*

I would like to conclude my presentation with few personal remarks.

It has been a great honor for me to be appointed professor to the endowed Chair of Global Food Security and International Trade at Wageningen University. I would like to express my gratitude to the Foundation of Wageningen University Fund, to Wageningen University and the Board of Governors for the trust they have placed in me with this appointment.

Since I have spent most of my professional career working on the issues of food security and poverty in developing countries, I may be biased in saying that these two subjects should have the highest priority in the list of global issues to which we should devote our resources. I know, however, that many of you share this view. My main argument in today's presentation was that we, the people in the developed and more affluent countries, can meet this challenge and that each one of us can make a difference in the lives of many people who are currently malnourished.

I greatly cherish the opportunity to be an active member of the Development Economics Group of the Department of Social Sciences at Wageningen University. Indeed, after more than a decade that I worked in the leading development organizations I did start to miss the kind of intellectual stimulation and open exchange that thrives best in the academia.

I therefore greatly welcome the opportunity to go back to teaching and academic research – two activities that I had cherished during the years I spent at the Hebrew University. This 'reunion' with the academia was made truly special due to the friendly and international spirit that I have found at Wageningen University, and, in no time, my colleagues at Development Economics Group became also good friends. I would like to take this opportunity to

express my deep gratitude to them. Very special thanks go to Professor Arie Kuyvenhoven, whose exceptional hospitality and kindness will always remain a most memorable part of my "Dutch experience".

Teaching at Wageningen is also a truly "Dutch experience;" in my class, the students came from all continents – a small but much more amicable representation of the United Nations. No wonder that the main subject in the course was *globalization*. I would like to express my appreciation to my students who challenged me and accepted my challenge to look at the pros and cons of every subject we discussed in class.

I came to the Netherlands three years ago to join ISNAR, and I have found there not only colleagues, but also many personal friends. Not all of them could be here today, because, following the call of duty, they are scattered all around the globe. To all my colleagues and friends at ISNAR I would like to extend my special thanks.

Finally, I would like to thank my wife Petra for being with me every step of the way. Petra and I share everything we have and we also share this Honorary Chair. Indeed, at least half of the honor should go to her.

I thank you all again for giving me the honor of your presence here today.

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<sup>1</sup> Dollar and Kraay, *World Bank Economic Review*, 2000.

<sup>2</sup> The East Asian countries were the main targets of these investments, but the perception of their riskiness has changed following the financial crisis of 1998.

<sup>3</sup> Rodriguez and Rodrik, (1999) emphasized, however, that the relationship between trade liberalization and growth is not straightforward. In particular, the effects of trade reforms on growth depend upon the implementation of other, complementary macroeconomic and structural policies and on the strength and efficiency of the institutions.

<sup>4</sup> Gardner and Brooks (1994) described these difficulties in Russia; similar difficulties were encountered by farmers in the other ex-centrally planned economies as well.

<sup>5</sup> See, for example, Alan Winters (2000).

<sup>6</sup> This research is presented in the book: *Globalization and the Developing Countries: Emerging Strategies for Agricultural Development and Poverty Alleviation*. (CAB International, forthcoming).

<sup>7</sup> See Jones (1995).

<sup>8</sup> See also Rozelle et al. (2000). During the initial period of the reforms internal trade barriers in China have, in fact, increased.

<sup>9</sup> McMillan (1995) and Brooks (1995) highlighted the lengthy process of the transition until the markets are stabilized and the political dimensions of the transition period.

<sup>10</sup> See, for example, Valdes and Muir-Leresche (1993).

<sup>11</sup> Park et al. (2002) assessed the market performance and the difficulties during the transition in China, based on a theoretical model and a rigorous empirical analysis.

<sup>12</sup> See G. Kolodko (1998).

<sup>13</sup> J. Stiglitz, (1999a). See also J. Stiglitz, (1999b).

- <sup>14</sup> The UNDP Human Development Report of 1999 noted that developed countries hold 97% of all patents worldwide and over 80% of patents granted in developing countries are owned by residents of the developed countries.
- <sup>15</sup> This survey was conducted in 105 national agricultural research institutes in 33 developing countries and provided details on 430 on-going research projects. Another survey was conducted in CGIAR institutes and in regional research institutes in Latin America by Joel Cohen, John Komen, Cesar Falconi, and Silvia Salazar.