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Agricultural Growth and Economic Development: a view through the globalization lens

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Agricultural Growth and Economic Development: a view through the globalization lens

Prabhu Pingali¹

This paper re-visits the age old proposition that agriculture growth contributes to overall economic development, and asks whether the relationship still holds in an increasingly globalized world. There is overwhelming empirical support for the above proposition, indeed, it is hard to find exceptions, barring a few city states, where sustained economic development has not been preceded by robust agricultural growth. However, there are a large number of countries that have witnessed neither agricultural growth nor economic development. Even in countries where agricultural growth has been significant, dramatic inter-regional differences persist.

This paper examines the factors that contribute to or constrain the process of agricultural transformation. Does the process of globalization, and the resultant changes in agrifood systems, offer new opportunities for agriculture led growth, or will it further marginalize excluded countries, regions and groups? The factors that cause exclusion are examined both in terms of globalization forces and in terms of domestic shortcomings in policies and governance. Policy interventions that attempt to reduce the costs of transition to a globalized agricultural system are explored, including safety nets for those left behind.

Agricultural Growth and Economic Development

Development economists in general and agricultural economists in particular have long focused on how agriculture can best contribute to overall economic growth and modernization. Many early analysts (Rosenstein-Rodan, 1943; Lewis, 1954; Scitovsky, 1954; Hirschman, 1958; Jorgenson, 1961; Fei and Ranis, 1961) highlighted agriculture because of its abundance of resources and its ability to transfer surpluses to the more important industrial

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sector. The conventional approach to the roles of agriculture in development concentrated on agriculture's important market-mediated linkages: (i) providing labour for an urbanized industrial work force; (ii) producing food for expanding populations with higher incomes; (iii) supplying savings for investment in industry; (iv) enlarging markets for industrial output; (v) providing export earnings to pay for imported capital goods; and (vi) producing primary materials for agro-processing industries (Johnston and Mellor, 1961; Ranis et al., 1990; Delgado et al., 1994; Timmer, 2002).

There are good reasons for why these early approaches focused on agriculture's economic roles as a one-way path involving the flow of resources towards the industrial sector and urban centers. In agrarian societies with few trading opportunities, most resources are devoted to the provision of food. As national incomes rise, the demand for food increases much more slowly than other goods and services. As a result, value added from the farm household's own labour, land and capital, as a share of the gross value of agricultural output falls over time. Farmers' increasing use of purchased intermediate inputs and off-farm services adds to the relative decline of the producing agriculture sector, per se, in terms of overall GDP and employment (Timmer, 1988, 1997; Pingali, 1997).

Rapid agricultural productivity growth is a pre-requisite for the market mediated linkages to be mutually beneficial. Productivity growth that resulted from agricultural R&D has had an enormous impact on food supplies and food prices, and consequent beneficial impacts on food security and poverty reduction (Hayami and Herdt, 1977; Pinstrip-Andersen et al., 1976; Binswanger, 1980; Hazell and Haggblade, 1993).

“Because a relatively high proportion of any income gain made by the poor is spent on food, the income effects of research-induced supply shifts can have major nutritional implications, particularly if those shifts result from technologies aimed at the poorest producers”. (Alston et al., 1995, p. 85)

Agricultural productivity growth also triggers the generation of non-market mediated linkages between the agricultural sector and the rest of the economy. These include the in-direct contributions of a vibrant agricultural sector to: food security and poverty alleviation; safety net and buffer role; and the supply of environmental services (FAO, 2004a). While agriculture's direct, private contributions to farm households are tangible, easy to understand and simple to quantify, its numerous in-direct benefits tend to be overlooked in assessing rates of returns. Ignoring the whole range of economic and social contributions of agriculture underestimates the returns to investment in the sector (Valdes and foster, 2005).

Substantial empirical evidence exists on the positive relationship between agricultural growth and economic development (see Valdes and Foster, 2005). The transformation of agriculture from its traditional subsistence roots, induced by technical change, to a modernizing and eventually industrialized agriculture sector is a phenomenon observed across the developing world. However, there are also a large number of countries that have stalled in the transformation process or have yet to "get agriculture moving". These are almost always countries that are classified as the "least developed". Even within countries that are well on the pathway towards agricultural transformation there are significant inter-regional differences (Eastern India, for example). Some of the reasons for the poor performance of their agriculture are as follows:

- i) low and inelastic demand for agricultural output due to low population density and poor market access conditions;
- ii) poor provision of public good investments in rural areas;
- iii) lack of technology R&D on commodities and environments important to the poor;
- iv) high share of agro-climatically constrained land resources; and
- v) institutional barriers to enhancing productivity growth.

Will globalization make a difference? Will trade integration and increased global inter-connectedness enhance or impede the process of agricultural transformation for countries that have successfully used agriculture as an “engine of growth”. What about countries at the low end of the transformation pathway? These questions are addressed in the rest of the paper.

Globalization and the transformation of food systems

Globalization has resulted in the rapid growth of world trade, internationalization of production by multinational corporations and declining information and communications costs. The potential trade benefits for agriculture arise from three aspects. The first stems from the possibility of direct increased exposure of agriculture to international competition. The ability to access global markets and specialize in areas of comparative advantage could yield high gains for this sector. The second stems from the indirect effects of increased international trade on the growth of non-agricultural sectors changing the domestic demand for agricultural goods both quantitatively and qualitatively (Pingali and Khwaja, 2004).

Third, an often unrecognized consequence of globalization is lifestyle changes including diets, particularly among the urban middle class, as a result of increased global inter-connectedness through travel and communications. The diet transition is characterized by diversity, convenience, and a break from tradition. Consumers in large, urban centres are more exposed to non-traditional foods as a result of their access to food retail outlets and marketing campaigns (Reardon, Timmer, et al., 2003). Large urban markets create the scope for the establishment of large supermarket chains, and they attract foreign investments and advertising from global corporations. Non-traditional foods are more accessible as a result of trade liberalization and declining costs of transportation and communication (Chopra, Galbraith and Darnton-Hill, 2002). Moreover as more women enter the labour force, we

expect to see an increase in the consumption of processed food, ready-made meals, or meals that cut the long preparation time of traditional dishes (Regmi and Dyck, 2001).

Food markets in developing countries are undergoing profound changes that are fuelled by rapid urbanization, diet diversification, trade integration, and the liberalization of foreign direct investment in the food sector. The most commonly observed changes are: i) rising food imports; ii) vertical integration of the food supply chain; and iii) commercialisation and diversification of domestic production systems.

Rising food imports

FAO' study on Agriculture towards the year 2015/2030 indicates that the trends in international trade of foodstuffs, which have seen developing countries turn from net exporters to net importers of food commodities, are expected to continue in the future (FAO, 2002). In 1961/63 developing countries as a whole had an overall agricultural trade surplus of US\$6.7 billion, but this gradually disappeared so that by the end of the 1990s trade was broadly in balance, with periodic minor surpluses and deficits. In the case of the least developed countries (LDCs) the deficit is much more pronounced, by end of the 1990s, agricultural imports were more than double their exports (FAO, 2004b). The outlook to 2030 suggests that the agricultural trade deficit of developing countries will widen markedly, reaching an overall net import level of US\$31 billion (FAO, 2002).

The net imports of the main commodities in which the developing countries as a group are deficient (mainly cereals and livestock products) will continue their rapid rise. At the same time, the net trade surplus in traditional agricultural exports (for example, tropical beverages, bananas, sugar and vegetable oils and oilseeds) is expected to rise less rapidly or to decline (FAO, 2002). Over the past three decades the share of gross food imports in GDP more than doubled for an average developing country. The increase was most pronounced for the LDCs,

where the value of food imports rose from 1% of GDP to over 4% (FAO, 2004b). Over the past thirty years the countries most vulnerable to food insecurity (the LDCs) have spent, on average, an increasing share of their limited foreign exchange earnings on commercial food imports (FAO, 2004b).

Increased developing country imports of cereals and livestock products are due to increased demand combined with the low competitiveness of their domestic agriculture, though the relative weight of these factors varies across countries. Low competitiveness is often the result of insufficient resource mobilisation for the enhanced competitiveness of poor rural communities, the sustainable use of natural resources, the provision of market infrastructure and research. Growing food imports are also the result of inflows of lower priced food from subsidised agriculture in developed countries. Rapid urbanisation, especially the growth of mega-cities on the coast, has added to the competitiveness of food imports relative to transporting it from the hinterlands.

With regard to agricultural exports, markets for traditional exports are generally saturated, but there is potential for significant gains by developing countries if the processing and marketing of value-added tropical products is moved from consumer to producer countries (FAO 2004b). However, lack of capacity on the part of the exporters and the presence of tariff escalation in the importing countries both contribute to the loss of potential export revenue. Capacity limitations are particularly felt in markets where access depends on increasingly strict sanitary and phyto-sanitary standards. Much is said about the developing countries responding to niche markets, but they will always be just that –niche markets, small, highly variable and subject to the vagaries of changing consumer demand.

The vertical integration of the food supply chain

The change in urban food demand is almost simultaneously accompanied by consolidation in the retail sector. The result is an impressive increase in the volume of food marketing handled by supermarkets, but also substantial organisational and institutional changes throughout the food marketing chain (Dolan and Humphrey, 2001). Such changes include the setting of private grades and standards for food quality and safety, and the adoption of contracts between buyers and sellers at various points along the food marketing chain.²

Sub-contracting for products of specified quality and traits is likely to proliferate as a form of interaction between retail food chains and producers. If regions where supermarket retailing is more developed (for example, Latin America) are a precursor of what will follow elsewhere, then supermarkets and large-scale distribution will progressively dominate the food marketing chain in urban areas. Vertically integrated supply chains have also been focussing on the export market. There are numerous examples of successfully integrated food supply systems that are managed from the farm to the consumers plate (Reardon and Berdegúé, 2002a; Reardon et al., 2002, 2003).

However, concentration of food trade in the hands of a few retailers and large market intermediaries threatens the existence of small traders and small business, central ‘spot’ food markets and neighbourhood stores. On the production side, these trends may mean the gradual disappearance of those smallholders who are unable to meet the private standards on health and safety set by large retailers and wholesale buyers as well as neighbourhood stores and spot wholesale markets (Dolan and Humphrey, 2001; Reardon and Berdegúé, 2002b). The prospects for small holder agriculture are discussed in the next section.

Changing agricultural production systems

² See Reardon and Berdegúé (2002a) and Reardon et al. (2002, 2003) for a more comprehensive coverage of the issues related to the proliferation of supermarkets.

There are five issues at stake in this area. First, an increasing commercial orientation of production systems is expected due, *inter alia*, to rapidly rising urban food demand, changing consumption patterns and the increasing integration of domestic and international markets for agricultural products. Some of the resulting changes include: larger operational holdings; reduced reliance on non-traded inputs; and increased specialisation of farming systems. While the speed of these transformations differs substantially across countries, they are all moving in the same direction (Pingali, 1997).

As economies grow, the returns to intensive production systems that require high levels of family labour are generally lower than those from exclusive reliance on purchased inputs. With the expected rise in operational holding size, the ability of the household to supply adequate quantities of non-traded inputs declines. Power, soil fertility maintenance, and crop care are the primary activities for which non-traded inputs are used in subsistence societies. With the increased opportunity costs, family labour will be used less as a source of power and more as a source of knowledge (technical expertise), management and supervision.

Farm decisions become increasingly responsive to market signals, domestic as well as international, and less driven by traditional practice. While at a regional or sub-regional level, trends towards diversification out of cereal monoculture systems are being observed, at the individual farm level the trend is towards product specialization. In China, for example, while livestock production was traditionally a sideline activity for farm households, more farms are now specializing in livestock production. Chinese households that specialize in livestock production accounted for 15% of national livestock production in 2000 (Fuller, Tuan, and Wailes).

Second, in the process of commercialization, rapidly increasing scales of production are being observed particularly in the livestock sector, trying to supply rapidly growing markets for meat, milk and eggs. Both global analyses and country case studies (conducted by

FAO in Brazil, India, Thailand and the Philippines) confirm that advanced technology embodied in breeds and feeds appears to be critical to the success stories for poultry around the world, and the same is likely to become true for hogs over time. Much of this technology appears to be transferable, but only at relatively large-scales of operation, at least for poultry. Thus there is strong reason to believe that technology itself is a prime driver of the displacement of smallholders from the livestock sector. Small-scale producers obtain lower financial profits per unit of output than large-scale producers, other things equal. This suggests that, in the absence of deliberate action, small-scale producers will eventually be put out of business by competition from large-scale producers, especially since the better-off producers will scale up (De Haen et al., 2003).

Third, the observed negative relationship between farmsize and productivity may not hold as agricultural systems become more vertically integrated. There is a considerable literature that testifies to the productive efficiency of small farms (see Eastwood et al. (2005) for an extensive review of the literature). On the basis of this, it is argued that small farms, if they can overcome some constraints tend to be more productive than large farms. The major reason cited for higher levels of efficiency is the higher productivity of farm family labor and lower supervision costs compared to large farms. However, this efficiency is often rooted in traditional labor intensive cereal crop production where the opportunity cost of family labour is low. It is unlikely that small farms sustain this advantage in a vertically integrated food supply system because of the transactions costs involved in participation. Also, rising wages and the decreasing relevance of traditional knowledge systems further reduce the advantage for small farms.

Fourth, declining competitiveness of marginal lands could be expected with increased integration of global food markets. Marginality could be a consequence of remoteness to sources of demand, such as mega cities, or because of poor agro-climatic conditions, such as

drought prone environments. Global integration of food markets makes availability of food through imports, particularly for cities on the coast, cheaper than bringing food from the hinter lands. Moreover, low productivity and lack of technology for marginal lands make them harder to compete against better endowed environments.

Fifth, preserving the natural resource base will be a formidable challenge. Policies for enhancing food security through the promotion of intensive agriculture production systems, such as irrigated rice systems in Asia, have had significant environmental costs which in turn limit productivity. The problem was not intensification, per se, but rather the limited incentives at the farm level for efficient and judicious use of inputs such as fertilizers, pesticides, and water (Pingali, 1998). Also, the costs associated with the loss of environmental goods and services were not reflected in agricultural input and output prices. Further intensification and yield growth are subject to limits for reasons of plant physiology, but also because of environmental stresses associated with crop choice, improper input use and poor management practices (Pingali et al., 1997; Murgai et al., 2001). Examples of intensification induced degradation of the land resource base can also be found in sub-Saharan Africa, particularly in intensive maize systems (Dixon et al., 2001). Rising opportunity cost of labor could lead to increasing herbicide use as a substitute for hand weeding in commercializing staple crop systems. Also, where property rights are not clearly established, high-value crop production in upland environments could lead to higher risks of soil erosion and land degradation.

Will increased trade liberalization result in improved incentives for sustainable resource use? Yes, to the extent that integration into international markets increases the pressure and capacity to consider environmental values in managing natural resources, and where domestic policy reform, especially the removal of input subsidies, encourages more efficient input use. Moreover, the need to reduce unit costs of production in order to enhance

the competitiveness of domestic agriculture contributes to the drive towards input use efficiency. The quest for sustaining competitiveness could contribute to environmental sustainability. However, efficiency enhancing technologies are knowledge and time intensive, and in rapidly growing economies, rising opportunity cost of labour could work against their adoption. Finally, where rapid overall economic growth draws populations out of the agricultural sector the release of marginal lands from low productivity agriculture can contribute to increased supply of eco-system services, such as carbon sequestration and biodiversity conservation (Lipper et al., 2006).

Globalization impacts on the agriculture sector

Whether particular countries, regions within countries and particular societies gain or lose in the process of globalization depends on where they are in the process of agricultural transformation and the extent to which they can adjust. Consider three categories of countries: i) those at the low end of the agricultural transformation process; ii) those in the process of agricultural modernization; and iii) those at high end of the transformation process.

Countries at the low end of the agricultural transformation process:

Countries in this category are invariably low income, least developed countries, a vast majority of them are in Sub-Saharan Africa. Most of them are in the bottom half of the UNDP's Human Development Index. They face low prospects for meeting the Millennium Development Goals of hunger and poverty reduction. These countries essentially lose out in

the process of globalization because their low productivity agricultural systems are uncompetitive in an increasingly integrated global food market. While some may benefit from exports to niche markets, the volumes tend to be small and variable and the long term prospects are for increasingly negative terms of trade in the primary food staples (FAO, 2004b). The prospects for “getting agriculture moving” are limited by perennial obstacles such as low demand conditions, unfavourable agro-climatic environments and poor institutions.

Moreover a history of urban bias in macroeconomic policies and public good investments tends to dampen incentives for enhancing agricultural productivity growth. Structural adjustment policies of the late 1980s and 1990s have to some extent corrected the macroeconomic disincentives, including over valued exchange rates, however, the bias against the rural sector created by a historical discrimination in public good investments has generally not been corrected. The easy availability of lower priced food on the global market makes it unlikely that massive rural investments will be forthcoming, especially where urban centers are located on the coast.

Countries in the process of agricultural modernization:

Countries in this category have successfully used agriculture as an engine of overall growth and are experiencing a steady decline in the share of agriculture in GDP and the share of agriculture in total labor force. Rapidly growing Asian and Latin American economies, mostly in the middle income level, are examples of countries that fall into this category. Small farm led staple food productivity growth, such as for rice and wheat, drove the process of agricultural transformation. Rising productivity in the agricultural sector has also stimulated growth in the non-agricultural sectors through forward and backward linkages.

This category of countries witness widespread impacts of globalization, both positive and negative.

Past investments in rural infrastructure, productivity enhancing technologies, as well as market institutions, make these societies more responsive to global market signals. Globalization and trade integration lead to both an improvement in the competitiveness of the staple food sector as well as a move towards diversification out of staples. Reducing unit production cost through efficiency improvements is the primary means by which the staple food systems sustain their competitiveness. For instance, the switch to conservation tillage reduced production costs by as much as 30% per ton of wheat and soybean in Argentina and Brazil (Ekboir 2003). At the same time, the staple food sector is re-orientated towards supplying the diversified urban diets and towards high value exports. The returns to diversification are, however, conditional on investments in post harvest technologies for processing, quality and food safety. The benefits from a global orientation of the agricultural sector can be pro-poor where the production and post-harvest activities continue to be labour intensive.

On the negative side, it ought to be noted that there can be significant inter-regional differences, even within countries well on the path towards agricultural transformation, in terms of agricultural productivity and responsiveness to urban and global market signals. Eastern India, Western China, and Northeast Brazil are examples of regions that get left behind even as these countries are making rapid economic progress. Relatively higher levels of poverty and food insecurity persist in these regions. As discussed earlier, marginal production environments face declining competitiveness. Migration to urban areas or to regions of higher agricultural productivity (such as the Indian Punjab) is one of the few viable options for small farm and landless labour populations in these areas.

The prospects for smallholders depend on the extent to which staple food production can remain competitive and the extent to which they can participate in the market for high value products. Small holders, even in high potential environments, may lose out in the process of integration into the supply chains for high value products that serve domestic or export markets.

Small farmers find an increasingly skewed structure in the food system, facing on the one hand a small and reducing number of large food companies and food retailers. On the other hand, at the point of input supply to farmers, large chemical and seed companies are creating patented input supply systems controlled by a small number of companies (e.g. Monsanto and Dekalb Genetics Corporation/Delta & Pine Land, DuPont and Pioneer HiBred) (Napier, 2001). Facing this structure, small agricultural producers will find it increasingly difficult to negotiate favorable terms of the contract.

Thus, entering the food system on a competitive basis is problematic for small farmers because of physical investments needed to enter but also because of the transactions costs associated with the new agricultural market (Pingali et al., 2006). The increasing disconnect between the modern food system and the established social networks and traditional institutions tends to aggravate the costs of market participation. Farmers will not enter markets when the value of participating is outweighed by the costs of undertaking the transaction (Sadoulet and de Janvry, 1995).

Countries at the high end of the transformation process:

These are mainly high income countries with relatively small rural populations. Their agriculture sectors are highly commercialized, vertically integrated and globalized. For these countries the big challenge will be to create new opportunities for rural incomes while liberalizing trade. In this context the non-commodity roles of agriculture, such as biodiversity

conservation, agro-tourism, carbon sequestration, provide opportunities for the emergence of markets. Preserving rural societies and landscapes becomes important not only for political and nostalgic reasons, but also as a matter of economics. This could become an increasingly important trend in middle income countries as they reach the end of the transformation process. Public policy needs to create an enabling environment for the emergence of markets for environmental services. Direct public support for sustaining the non-commodity roles of agriculture would only be necessary under market failure conditions. Fortunately the OECD countries have the income to pay for this support, if necessary.

Public Policy for managing agricultural transition

Designing food and agriculture policy is substantially more complex in a globalized world than it was in a world of relatively closed food economies. While, chronic hunger and poverty continue to be daunting problems in much of the developing world, globalization brings about new policy challenges both for countries well into the process of agricultural transformation and for countries at the low end of the transformation process. The traditional policy agenda for promoting agricultural growth and economic development needs to be redesigned and adapted to the new realities of an increasingly inter-connected global economy. The following are some of the areas of policy focus and re-direction.

Continued emphasis on enhancing food security and reducing poverty

Substantial progress has been made over the last decades in hunger and poverty reduction. FAO (2006), projects that the MDG hunger goal, to half the proportion of undernourished by 2015, will be achieved at a global level and for all regions except Sub-Saharan Africa. The projections presume continued high levels of investment in and policy

commitment to enhancing food security. While the prospects for reducing the proportion of hungry are encouraging, the decline in the absolute number of hungry will be much slower and halving that number by 2015 is an unattainable goal in all regions of world, except East Asia³. While “trickle down” from globalization induced income growth can to some extent help alleviate poverty and food insecurity it will not be adequate without concerted efforts targeted at the neediest populations. For countries at the low end of the transformation process, concerted action towards enhancing food security especially through agricultural productivity growth is crucial in the quest for income growth and economic development. The same is true for low productivity regions in countries that are well into the process of agricultural modernization.

Hunger and poverty reduction requires a **twin-track approach** which combines, (a) direct interventions and social investments to address the immediate needs of poor and hungry (social safety nets, conditional or unconditional cash transfers, health interventions, food and nutrition programmes) with (b) long-term development programmes to enhance the performance of the productive sectors (especially to promote agriculture and rural development), create employment and increase the value of the assets held by the poor (physical, human, financial). Coherence between policies and investments to increase productivity and economic efficiency and those in the social sectors improves the effectiveness of both (Pingali et al., 2006). Coherence is also needed between agriculture and trade policies in order to achieve an appropriate balance between food imports and domestic productivity growth.

³ At FAO's 1996 World Food Summit (WFS), and again at the 2002 Millennium Summit, the international development community established an ambitious agenda for reducing hunger and poverty. The MDGs and WFS both set targets for 2015, using 1990 as a benchmark. The MDG 1 Goal includes two targets: (i) halving the proportion of population undernourished and (ii) halving the proportion of people living in poverty. The WFS target is to halve the *number* of undernourished people over this 25 year period. The latter is a more ambitious target given the rising populations in developing countries.

Some argue that the benefits of low food prices are as easily accessed by trade as by investing in domestic agriculture (Sachs, 1997). This argument ignores the strong historical connection between domestic food production and consumption because of the difficulty and expense of transporting and marketing food staples in rural areas, far from ports and efficient transport links (Timmer, 2002). “For both microeconomic and macroeconomic reasons, no country has ever sustained the process of rapid economic growth without first solving the problem of food security” (Timmer, 2002).

Enhancing food security in the rural areas entails improvements in the productivity of smallholder agriculture. In the first instance, enhancing local food supplies contributes to improved household nutrition and thereby contributes to labour performance improvements. In the long term it broadens participation in market-led growth. Promoting sustainable use of natural resources, improving rural infrastructure, research and communications, facilitating the functioning of markets and enhancing rural institutions are integral parts of the strategy. Productivity-induced agricultural growth has a wider impact on rural areas through the strengthening of off-farm activities, rural employment and wages. Thus moving the society, region and country, onto the agricultural transformation trajectory.

Re-orienting agricultural research and development priorities:

Harnessing the best of scientific knowledge and technological breakthroughs is crucial as we attempt to “retool” agriculture to face the challenges of an increasingly commercialised and globalised agriculture sector. The primary objective of the research system remains to generate new technologies that sustainably improve productivity and farmers’ income.

Governments have a difficult task to perform: on one hand, continued food security needs to be assured for populations that are growing in absolute terms; on the other hand, research and infrastructural investments need to be made for diversification out of the primary staples. In

responding to diversification trends, the research should not abruptly shift from an exclusive focus on one set of commodities to another set of commodities. The focus of research should be to provide farmers the flexibility to make crop choice decisions and to move relatively freely between crops and other agricultural enterprises (Pingali and Rosegrant, 1995).

Both substantial crop-specific research and system level research effort will be required to provide farmers the flexibility of crop choice. Crop-specific research includes increases in yield potential, shorter duration cultivars, improved quality characteristics and greater tolerance to pest stresses. System-level research would include land management and tillage systems that allow for shifts of cropping patterns in response to changing incentives and farm level water management systems that can accommodate a variety of crops within a season. Also important at the system level is research on the carry over effect of inputs and management practices across crops, for instance, high insecticide and herbicide applications, or the effects of intensification in terms of prolonged water saturation, the build up and carryover across crops of pest populations, rapid depletion in soil micronutrients and changes in soil organic matter could lead to reduced productivity of rice monoculture systems over the long term (Pingali, et al, 1997). Modern science can thereby provide opportunities for enhancing input efficiencies and for developing more sustainable production systems.

Modern science and technology can also help provide new impetus for addressing the age-old problems of yield improvement, production variability and food insecurity of rural populations living in marginal production environments. Whilst the real and potential gains from science and technology are apparent, it is also necessary to take into consideration the fact that research and technology development are more and more in the private domain: biotechnology is a prime example.

Biotechnology holds great promise, but may involve new risks. In most countries, the scientific, political, economic or institutional basis is not yet in place to provide adequate

safeguards for biotechnology development and application, and to reap all the potential benefits (FAO, 2004c). Similarly, the evolution of food chains has been led by the private sector with obvious benefits in terms of food quality, safety and food price reductions. However, there have been casualties as some farmers and firms have been marginalised. Countries at the low end of the agricultural transformation process have gained the least from the above developments. In this case the question becomes one of whether there are technical solutions and business models that can enable engagement of such marginalised groups and countries.

Creating an enabling environment for smallholder transformation

The challenges faced by smallholder agriculture should be seen in the context of the general trends that will influence the structure of agricultural production. Namely, the transformation of diets and rising import competition will contribute to the increasing commercialization of the small farm sector. Governments ought to help create an enabling environment for smallholder commercialization through infrastructure investments and institutional reform.

Rural infrastructure investments play a crucial role in inducing farmers to move toward a commercial agricultural system. The emphasis for public investments should be on improving general transport, communications, and market infrastructure, while allowing the private sector to invest in commodity-specific processing, storage, and marketing facilities. Accessible and cost-effective communication systems such as mobile telephones can help generate information and other market-related services. The Internet explosion and related technologies have drastically reduced exchange and search costs in many Organisation for Economic Co-operation and Development countries and may be highly indicative of the potential benefits to developing countries (Bussolo and Whalley, 2002).

Efficient land markets and secure property rights are essential to capture

agricultural growth (Binswanger et. al., 1993). Where land rights are secure, farmers have the greater incentive needed to invest in land improvements. Moreover, land ownership is an important source of collateral that can improve the credit status of farmers, leading to easier access to funding for inputs and so forth (Feder et al., 1988). Individual farmers and households need to be assured “stable engagement” with other resources, such as water, water use rights that are flexible enough to promote comparative advantage in food staples and cash crops. Those rights must be matched by access to rural credit and finance and the dissemination of technology and good practices in water use (De Haen et al., 2003).

Reducing small farm transactions costs:

Smallholder participation in commercial and vertically integrated markets is becoming an issue of major concern, especially in countries with rapidly modernizing agricultural systems. Because transaction costs vary over households and enterprises, commodities and regions, there is no single innovation or intervention, public or private, which can reduce them. However, there are a number of ways in which market entry by small farmers can be developed. These include contract farming, the development of farmer organizations for marketing, development of the supply chain for high value exports produced by smallholders through an appropriate mix of *private* and *public* sector initiatives and facilitating private sector provision of market information via improved telecommunications (Kydd et al., 2000). The role of government is crucial in specifying property rights and enforcing contracts in order to promote specialization and reduce the costs of market exchange (North, 2000). Moreover, government policy needs to create incentives and send signals that encourage private sector participation in developing rural economies.

Before we target transactions costs as a remedy for increased small farmer participation we need to bear in mind two points. First, while a reduction in transaction costs should in principal allow for a greater number of farmers to trade, the ability to enter is not the same as the ability to stay (Pingali et al., 2006). This is as much a function of other factors as it is of transaction costs. Therefore, interventions need to be cost-effective. Public money should not be spent in declining and non-competitive sectors. Second, transaction costs are household, commodity and location specific and are subject to constant change. Interventions aimed at targeted reductions in specific costs should not be in the public domain. Public sector interventions are best left for public good provision and institutional reforms to correct incomplete or absent markets. The reduction of transaction costs associated with the specificities of the food system is best left in the hands of the private sector.

Seeking complementarity between trade and domestic policy

Trade liberalization can be a powerful tool to promote economic growth, however, low income countries, in order to benefit from trade reform, will need to enhance domestic competitiveness through policy and institutional reform (FAO 2005). Liberalization of domestic markets, through removal of quantitative restrictions on trade, and opening up of economies to internal trade opportunities is often a key step in starting or accelerating the process of commercialization. However, the opening up of markets also exposes producers to increased risk due to the greater short term volatility of world prices. Governments have historically intervened heavily in domestic markets to protect and stabilize the prices of agricultural commodities, with the result that domestic producer prices have varied substantially less than international prices. The relationship between diversification and risk is thus crucial in the context of trade and macroeconomic reform designed to align domestic prices more closely with international prices.

Many low-volume markets are associated with high-price volatility. Moreover, the diversification “start-up” phenomenon, of high prices for several seasons leading to over-supply and a consequent collapse of prices, is all too common. This can be countered by measures to expand the market by lowering transaction costs, improving external linkages or providing storage and processing technologies. Effective rural financial institutions will also assist in risk spreading and in the sharing of the benefits of commercialization more widely across the community and region.

Finally, in view of the continuing distortions on world markets, the least developed countries must be granted more “policy space” necessary to reduce poverty and hunger by developing their rural areas and agriculture. Trade liberalization should go hand in hand with public support for improving agriculture productivity.

Establishing safety standards and regulations

Globalization increasing the “effective demand ” for safe and healthy food. Government schemes to certify quality and safe food according to public regulations are required. This is important for domestic consumption and food safety, and even more so if a country wants to access foreign markets. If a country wants to export, it is necessary that an independent body will guarantee that the produce adheres to the required quality and safety standards⁴ (De haen, et al, 2003). However, public systems to ensure food quality and safety suffer from lack of organization and adequate funding. To the extent that developing country

⁴ The Codex Alimentarius Commission, jointly serviced by FAO and WHO, is charged with the responsibility of developing a food code. Its recommendations are based on the principle of sound scientific analysis and evidence, involving a thorough review of all relevant information. Codex international food standards are developed to protect the health of the consumers and ensure fair practices in the food trade. The SPS Agreement of the WTO cites Codex standards, guidelines and recommendations as the preferred international measures for facilitating international trade in food. The focus of the Codex is shifting to take account of the changing global food system.

governments do not impose international-level standards, private standards are being implemented by the leading players in retail and food processing (Reardon and Farina, 2002).

Enhancing incentives for sustainable resource use

Public policy can play an important role in encouraging the sustainable use of natural resources. First, by correcting incentive-distorting policies that encourage unsustainable use of the resource base. Second, by identifying market based instruments for promoting the supply of environmental services through appropriate changes in agricultural production systems and land use.

Government interventions in the cereals market, especially through output price support and input subsidies, long provided farmers incentives for increasing cereal crop productivity, particularly the rice monoculture system, and the rice-wheat system in Asia (Pingali, 2001). Input subsidies that keep input prices low directly affect crop management practices at the farm level; they reduce farmer incentives for improving input use efficiency, which often requires farmer investment in learning about the technology and how best to use it. These policies have contributed to significant degradation of the agricultural resource base by creating soil fertility imbalances; disruptions in pest-predator ecology; salinity and waterlogging problems, and higher incidence of soil erosion. The human health costs associated with pesticide use is also well documented (Rola and Pingali, 1993; Antle and Pingali, 1994).

With the progression towards global integration, the competitiveness of domestic cereal agriculture can only be maintained through dramatic reductions in the cost per unit of production. Technologies for more efficient use of fertilizers, pesticides, and water are available and could become worthwhile adopting as price distortions are removed. Increasing input use efficiency would also contribute significantly to the long-term sustainability of

intensive food-crop production and help arrest many of the degradation problems mentioned above.

In addition to policy corrections, governments can play an important role in promoting (through payments, if necessary) eco-system conservation through changes in agricultural production systems that complements food and fiber production. Conservation tillage, agro-forestry systems, and silvo-pastoral systems, are some of the many examples of agricultural production systems that can generate environmental benefits in the form of carbon sequestration, biodiversity conservation and watershed protection. The benefit of combining payments for the provision of public environmental goods such as soil carbon sequestration or watershed protection for the adoption of agricultural practices that can eventually lead to increased agricultural productivity is quite attractive. In some cases, however the adoption of the new agricultural practice could lead to a decrease in the returns to agriculture, in which case the payment for the public good component must be sufficient to compensate for such losses at a minimum (Lippert, et al, 2006).

Governments have a role to play in stimulating desirable land use change as well. In the process of economic development, as agricultural populations shrink and non-agricultural sectors grow, the potential for setting aside land for non-agricultural uses is high. Conversion of marginal agricultural lands to forests contributes to carbon sequestration, watershed protection and biodiversity conservation. OECD countries are going through this process of land use change supported by public policies such as the Conservation Reserve Program in the U.S. For developing countries with similar conditions in the agricultural sector, national and international public sector support for land use changes that generate global environmental goods and services can be an important means of attaining sustainable resource use. Public policy to stimulate land use change is also warranted where the environmental costs of agricultural production outweigh the benefits. For example, The Chinese government has a

goal of converting 14.6 million hectares of croplands on sloping lands to forest in order to reduce soil erosion that has serious economic impacts on land and water use efficiency (Lipper et. al. 2006). However, the successful incorporation of environmental services into the livelihoods of the poor via changes in either agricultural production systems or land use is dependent on the presence of enabling conditions such a property rights, food security and low transactions costs, as well as local and global recognition and willingness to pay for environmental goods and services.

Enabling income and livelihood diversification

It is important to start by recognizing that rural households, at all stages of development, rely on a diverse set of non-farm opportunities for earning incomes and sustaining food security and livelihoods. Higher agricultural productivity has contributed to the growth in rural non-farm and off-farm income earning opportunities through backward and forward linkages. Surveys of the rural non-farm literature indicate rural non-farm income represents on average 42% of rural income in Africa, 32% in Asia, 40% in Latin America and 44% in Eastern Europe and CIS countries (Davis, 2004; FAO 1998). The diversity of income generating activities in the rural areas calls for policies with wider impact as opposed to sector specific policies: education and rural infrastructure such as communications, roads and electrification will have beneficial effects to a wide spectrum of rural activities (Winters at al, 2006). Public investments ought to be accompanied by policies that induce complementary flows of private investment.

Does the vertical integration of the food sector have a negative impact on rural non-farm employment opportunities? While empirical evidence on this question is not yet available, one could postulate that there will certainly be a change in the mix of activities.

There could be a drop in small scale agro-processing and an increase in services and commerce. Finally, public investments made to create an enabling environment for non-farm employment will also be useful in preparing populations for exits from rural areas as economic development proceeds.

Conclusions

Agricultural growth has played a historically important role in the process of economic development. Evidence from industrialized countries as well as countries that are rapidly developing today indicate that agriculture was the engine that contributed to growth in the non-agricultural sectors and to overall economic well being. Economic growth originating in agriculture can have a particularly strong impact in reducing poverty and hunger. Increasing employment and incomes in agriculture stimulates demand for non-agricultural goods and services, providing a boost to non-farm rural incomes as well.

Trade liberalization and global inter-connectedness pose new opportunities and challenges for developing countries. Countries that are well into the process of agricultural transformation and modernization will find themselves benefiting from exposure to globalization trends. Past investments in rural infrastructure, productivity enhancing technologies, as well as market institutions, make them more responsive to global market signals. The transition will be pro-poor to the extent that production and post-harvest activities continue to be labor intensive and to the extent that there is an expansion in employment opportunities outside agriculture.

The transition process is by no means frictionless. Public policy needs to pay attention to inter-regional and intra-societal differences, particularly the prospects for small farm participation in commercialized markets. Also, the absorption of the rural poor in the

industrial and service sectors has significant costs in terms of learning new skills and family dislocations that need to be addressed.

Countries at the low end of the transformation process tend to lose out because their low productivity agricultural systems are uncompetitive in an increasingly integrated global food system. These societies, most of them food insecure, face daunting physical, infrastructural, and institutional obstacles to “getting agriculture moving”. Increasing and stabilising local food supplies continues to be the primary avenue for enhancing food security and thereby contributing to labor productivity and eventual market participation. For low income countries with a high share of rural populations and few opportunities outside the agriculture sector, if agriculture cannot be the “engine of growth”, then what can?

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