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Agricultural economics and distributional effects

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Abstract

The paper examines the main issues surrounding distributional effects in the domains of natural resource management and land policies, agricultural technology and research policies, agricultural market and trade policies, and consumer-oriented policies, including standards, subsidies, and labeling. Agriculture is drifting into an ever more drastic bifurcation at a global level and within many countries. Correcting that bifurcation will require large investments in rural areas and rural people, in institutions, and in information and biological technologies accessible by the poor in the world's smallholder sector. Large and growing national and international inequalities related to agriculture and rural areas threaten peace, growth, and sustainable development.

JEL classification: Q18

Keywords: income distribution; economic development; agricultural technology; agricultural markets; natural resource management; land ownership and tenure; agriculture in international trade; agricultural policy; food policy; bifurcation

1. Why revisit distributional effects?

Agricultural economists have always been concerned with enhancing the productivity and efficiency of agriculture, and rightly so, as these are essential for increased wealth and human welfare. Efficient allocation of resources drives the spatial distribution of economic activity and the rents earned by factors of production, including labor (von Thünen, 1826, 1850). But the founders of our association were also concerned about the effects of agricultural change on income distribution (Ashby, 1930), because then much of world poverty was concentrated in rural areas as is the case now. Over the past seven decades, however, the representation of distributional effects at our conferences has been rather uneven and may be more a product of zeitgeist—the spirit of the times—than of the actual nature and scope of the issues.[1]

The approach toward achieving equity through agricultural policies during the twentieth century has been largely to allow growth and markets to generate an (Pareto-) efficient equilibrium, and to rely on redistribution policies to take care of adverse distributional consequences. Kuznet's curve thinking reinforced the neoclassical concept that economic growth would eventually (after rising initial inequality) result in more equal income distribution. To a large extent, the issue of income distribution was "out in the cold"—as more of an adjunct to economics than a research priority in its own right (Atkinson, 1997). After decades of economic growth in much of the world, it is witnessing a dramatic splintering of income equality, both internationally, and intranationally, and a declining progress in the reduction of poverty and hunger (Kanbur and Lustig, 1999; Pinstrup-Andersen and Pandya-Lorch, 2001). Globally, the incomes of the world's richest 1% of earners are equivalent to those of the poorest 57%, and international inequality, which had remained rather stable with the Gini coefficient of world income distribution of about 0.46 between 1950 and 1985, has increased dramatically by 17%

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[1] An account of distribution-related themes, including poverty and development themes, in IAAE conference volumes shows the following years as most prominent: 1947—47%; 1955—43%; 1982—65%. Since 1985, there has been a low level of papers covering distributional effects: 1985—14%; 1988—9%; 1994—22%; 1997—18%; 2000—13%. (These figures are drawn from the papers published in the IAAE proceedings volumes.)

(to 0.54) over the past decade (Milanovic, 2002, 2003). The average per capita income in the industrialized nations was 9 times the sub-Saharan African average in 1960; the disparity has since doubled to 18-fold (UNDP, 2001). In addition, with rapidly expanding communications networks, the recognized standards of comparison relative to other world citizens changed for billions of people—especially in rural areas—and rendered relative deprivation increasingly relevant for welfare perceptions.

Economic growth is necessary to reduce poverty and inequality, but it is not sufficient (Chen and Ravallion, 2000; Ravallion, 2003).[2] In the absence of appropriate policies, institutions, and public investments, the highest income earners capture the lion's share of the benefits of economic growth. Agricultural growth reaches the poor hardly better than nonagricultural growth does when income distributions are highly skewed (Gardner, 2000; Timmer, 2002). These facts, combined with a rapid regional and global change in the characteristics of agriculture, particularly in the past two decades, collectively demand a reexamination of the interaction between agricultural policy and distributional effects, as well as a fresh look at agricultural economics' potential contributions to this field. This paper argues that:

- We ought to rethink the nature of the relationships between growth and distribution in agriculture and the rural space, because of fundamental changes in structures and dynamics of agriculture and food systems, driven by new technologies and institutions;
- We are confronted with large and growing national and international inequalities that are related to agriculture and rural areas, which threaten peace, growth, and sustainable development; and in view of these observations;
- Our profession is probably underresearching distributional effects.

Three categories of distributional effects are relevant for this discussion: (1) variance (distributional equality or inequality, typically measured by Gini coefficients); (2) absolute deprivation (i.e., poverty, including consideration of how far below an accepted cut-off point a subset of population may fall),[3] and (3) relative deprivation (the patterns of distances within the distributions that may affect people's aspirations and perceptions).[4] All three categories are subjects for economic study in their own right, and they will selectively be referred to throughout the paper.

Examining the major domains of agricultural policy making provides an instructive overview of the main issues surrounding distributional effects and agricultural economics. These include:

1. Natural resource management and land policies;
2. Agricultural technology and research policies;
3. Agricultural market and trade policies; and
4. Consumer-oriented policies, including standards, subsidies, and labeling.

Policies related to public goods cut across these four domains. The vector of the relationship between growth and distributional outcomes—subject to initial conditions and context—can be depicted in their interaction with these policy domains, as shown in Figure 1.

I will selectively discuss these domains from global, regional, and household perspectives; explore the scope for new areas of research; and consider the interactions of agricultural policies and their distributional effects, as these domains are interlinked and partly reinforce and partly counterbalance each other.

2. Transformation of world agriculture with bifurcations

The institutional and political context within which agriculture operates has changed rapidly in the past two decades. The bipolar global political system has come to an end, as have the devastating experiences with

[2] Chen and Ravallion (2000), drawing on 265 national sample surveys spanning 83 countries, found that although there was a net decrease in the overall incidence of consumption poverty over 1987–98, it was not enough to reduce the total number of poor by various definitions.

[3] See the important contributions by Amartya Sen (1997) to this category.

[4] See Stark and Wang (2000). The idea is that a comparison of the income of i (an individual, a household, a family) with the incomes of others who are richer in i's reference group results in i's feeling of relative deprivation. The associated negative utility impinges, for instance, on migration behavior. Stark shows that the relative deprivation of an individual (or, for that matter, of a household or a family), whose income is y, is where $F(x)$ is the cumulative distribution of income in y's reference group.

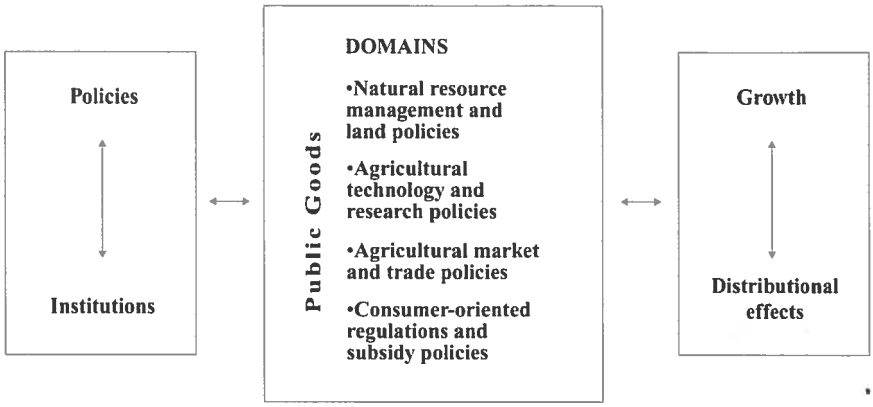

Figure 1. The conditioning of agricultural growth and distributional effects.

central planning of economies and societies (which often included disastrous experimentation with agriculture). Other political changes include the introduction of democratic systems, the strengthening of the rule of law, and—very relevant for rural areas—moves toward decentralization, devolution, and privatization (von Braun and Grote, 2002). In many countries, national governments are devolving authority to subnational and local governments or ceding roles to the private sector, civil society, or—especially in the case of natural resource management—user groups (Meinzen-Dick et al., 2002; Birner, 2003). As national governments in developing countries have reduced their economic and social roles, nongovernmental organizations (NGOs) have helped sustain vital social safety net programs and played an important role in local development activities. However, NGOs are limited in their ability to take on the task of complete public goods provision (Paarlberg, 2002).

Agricultural economics research must address changes in political systems, as well as the greater diversity of actors, the more complex context in which food systems and food policy operate, and the capacity of local organizations to take up new roles. Such research must engage stakeholders as active participants and not simply as objects of study. Hedley (2001) pointed out these important issues in his International Association of Agricultural Economics presidential address.

The agriculture and food system is increasingly changing from a relatively large and distinct sector of the economy into a more pervasive, integrated system, in which resource use and ecosystems functions are linked to consumers via extended food and service chains with multiple market and nonmarket institutions shaping the system. Essentially, a development is underway from a linear relationship between farmers, markets, agro industry, and consumers toward systems of interaction between and among these four, with policy making and institutional innovations cutting across the system in more complex fashions. These developments proceed to a different extent and at different speeds in different parts of the world; and when technology and education investments are low, the transformation of agriculture proceeds slowly at best (Schultz, 1964), which is one reason for bifurcations.

Viewing the domain of agricultural economics as defined by a narrowly delineated agricultural sector puts an unnecessary constraint on the scope and relevance of the profession. Even the economics of traditional and subsistence agriculture must be studied beyond the farm level, or much of the value-added of household processing and ecosystem functions would simply not be accounted for. The economics of small- and large-scale modern agriculture, in which much of the value-added is created farther down in the value chain, artificially reduces itself when defining "agriculture" as isolated from that chain. Thus, our profession should not define its scope by a narrow statistical concept of agricultural sector production but embrace the whole food and agriculture system.

The increased challenge confronting agricultural economics is the bifurcation of fundamental agricultural developments:

- At the farm level around the world, the distinction between large and small farms is ever more stark.
- The sustainability of agricultural ecologies, including water management, appears to be on the decline in many parts of the world. Sustainable and nonsustainable systems exist in parallel.
- In food industries, global competitive and noncompetitive industries move farther and farther apart, as exemplified by the technologies and institutions used in local and global food industries.
- Markets that are nationally and globally integrated coexist much longer than expected with nonintegrated (subsistence) and local exchange systems.
- The share of consumers who are poor remains high and is increasing in some regions of the world.

The number of people operating at a marginal level (the third column of Table 1) is larger than the number operating at a dominant level (the second column). Yet the economic weight of global agricultural systems depends much more on the small number of dominant actors. Agricultural economics may be driven unduly by economic weight rather than by relevant population shares. The bulk of our profession's research efforts focus on the structures and actors in the second column—the small subset made up of large farms, sustainable agro-ecologies, users of advanced science, integrated markets, competitive industries, and rich consumers—and much less on the large subset made up of small farms, nonsustainable agro-ecologies, users disconnected from science, fragmented markets, noncompetitive industries, and poor consumers.

The distributional effects of agricultural change cut across these bifurcations in new ways. Agricultural policy at a global, national, and local level is confronted with new, far-reaching distributional effects both in terms of regional and intertemporal distribution effects of policies. Institutional change is an important element of this. Understanding and predicting distributional effects and providing guidance for efficient and equitable policies will require agricultural economists to expand their toolbox. New approaches to modeling these effects are needed and are already being actively pursued.

Table 1
Stylized bifurcations of world agriculture

Agricultural domains	Dominant	Marginal
Farms	Large	Small
Agro-ecologies	Sustainable	Nonsustainable
Technologies	Using advanced science	Little connected to science
Markets	Integrated	Fragmented
Agro-industry	Competitive	Noncompetitive
Consumers	Rich	Poor
People directly affected	Few	Many

The remainder of this paper will assess changes in the four major domains of agricultural policy making and their distributional effects, and will describe the research implications for our profession. At the outset it must be stated, however, that analyses of distributional effects in agriculture are impaired by lack of sound and comparable statistical information, which may be a consequence of the lack of demand for such data by policy makers and researchers.

3. Distributional effects of natural resource management and land policies

Access to land and natural resources, it could be argued, is of decreasing importance for agricultural distribution effects because of the growing technology and knowledge content of agricultural production and processing. The flipside of this hypothesis suggests that access to land and natural resources remains of great relevance to poor farmers who have little access to technology to date. In low-income countries, the distribution of land still matters greatly for income distribution and for poverty reduction (Binswanger et al., 1996; Carter, 2000; de Janvry et al., 2001).[5] The world now contains about 460 million farms. Table 2 depicts their estimated size distribution (not controlled for quality of land). Eighty-five percent of the world's farms are smaller than 2 hectares, and of these farms smaller than 2 hectares, 90 percent are in low-income countries and 10 percent are in middle and high-income countries. These small farms require special attention by agricultural and rural development policies to facilitate pro-poor growth.

Changes in *farm size inequality* reveal that bifurcation is increasing. In developing countries average farm

[5] In India landlessness is the best predictor of poverty: 68% of landless laborers are poor, compared with 51% of scheduled castes and tribes and 45% of illiterate households (World Bank, 1997).

Table 2
An approximation of world farm size distribution, late 1990s

Farm size (hectares)	% of all farms	Number of farms (millions)
<1	73.2	333.95
1–2	11.7	53.29
2–5	8.9	40.28
5–10	3.0	13.77
10–20	1.5	7.12
20–50	0.8	3.72
50–100	0.4	1.67
100–1,000	0.4	1.98
>1,000	0.1	0.30
Total	100.0	456.07

Sources: Estimates based on FAO World Agricultural Census, 1990; Supplement to FAO World Agricultural Census (various years) and various country statistics.

Table 3
Gini coefficients of income distribution and land distribution for selected countries (different years in the 1990s)

Country	Index of Gini coefficient of land concentration	Index of Gini coefficient of income
Nepal	45.0	37.0
Ethiopia	47.0	44.0
Thailand	47.0	41.0
Philippines	55.0	46.0
India	58.0	38.0
Turkey	61.0	41.5
Peru	86.0	46.0
Paraguay	93.0	58.0
Japan	59.0	25.0
United Kingdom	67.0	37.0
Germany	68.0	30.0

Sources: World Bank (2002); Lipton (2001); IFAD (2002).

size is generally shrinking, whereas in high-income countries it is increasing. The changes in average size come with a mixed pattern of inequality: in a sample of 32 developing countries with information over time, only 11 countries show decreasing inequality. Furthermore, in many countries a relatively small proportion of large and growing farm units coexist with a large number of small farm units, which often provide important shares of household income and are managed by households whose members hold multiple jobs.[6]

Land reforms have long been major mechanisms to redistribute assets. Some weak positive correlation between land distribution and income distribution remains in low-income countries, but the relationship has become less relevant in middle- and high-income countries (Table 3). Land reforms remain dependent on the distribution of political power and typically happen in politically volatile circumstances. The past two decades have seen large policy changes in relation to land distribution and landownership as elements of larger societal transformations in many parts of the world—for instance, in China, Vietnam, the former Soviet Union and Eastern Europe, Southern and East Africa, and parts of Latin America. Many of these processes are far from complete, and agricultural economics research could deliver large benefits by providing guidance on productive and sustainable land use, land market, and land tenure systems.

[6] This applies, for instance, to large parts of Eastern Europe, especially Russia (von Braun and Qaim, 1999).

Gini coefficients of landownership are typically higher than the Gini coefficients of income distribution.[7] This difference occurs because people with little or no land have other income sources, and (especially in middle- and high-income countries) these sources are more significant than the distribution of land.[8] Moreover, even where land is not a major source of income, land reforms that provide at least some landownership—even homestead sites—can be important for improving the security, status, and bargaining power of asset-poor households (Hanstad et al., 2002). Even in generally land-rich sub-Saharan Africa, the relationship between land distribution per capita and consumption levels remains very close, and this relationship is also found in parts of South Asia.[9] However, many poor rural households are unable to gain sufficient access to land when such access could be their best option for escaping poverty (Bardhanet al., 1998; de Janvry et al., 2001; Binswanger et al., 1995).

Levels of *initial* land distribution have proved to have a significant impact on economic growth. Deininger (2003) finds a strong relationship between initial land equality in developing countries and economic

[7] In a sample of comparable landownership Gini coefficients and income Gini coefficients of countries, the former are on average 0.60 and the latter are 0.40.

[8] See Gardner (2002) for the United States.

[9] In East Africa off-farm income of farm households is lower than farm income even in farms smaller than 0.2 hectare per person (Jayne, 2001).

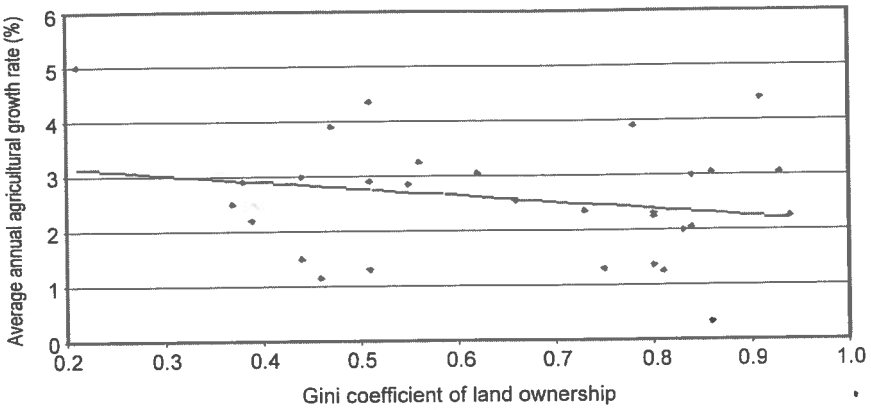

Figure 2. Inequality of landownership (1980s) and average annual agricultural growth rate for selected countries, 1989–2000.

growth—especially in Asia—between 1960 and 2000. However, in this more recent sample, changes in farm size inequality, as measured in Gini coefficients of farm size, and growth show at best a weak negative relationship (Figure 2). Furthermore, there is no apparent relationship between *changes* in Gini coefficients of land and *changes* in Gini coefficients of per capita income (Figure 3). This may be explained by a reduced relevance of land distribution for income distribution in many countries (but certainly not everywhere) in recent decades.

The *institutions* accompanying land (and other resources) seem to matter more for distributional outcomes than the mere distribution of the resources themselves. The distribution of land and other assets matters not only regionally and between households, but also within the household (Haddad, 1999). Research has shown that women's lack of landownership reduces their productivity as farmers by restricting their access to credit, extension advice, and decision making opportunity. Moreover, where women have independent rights to land or are recognized as co-owners with

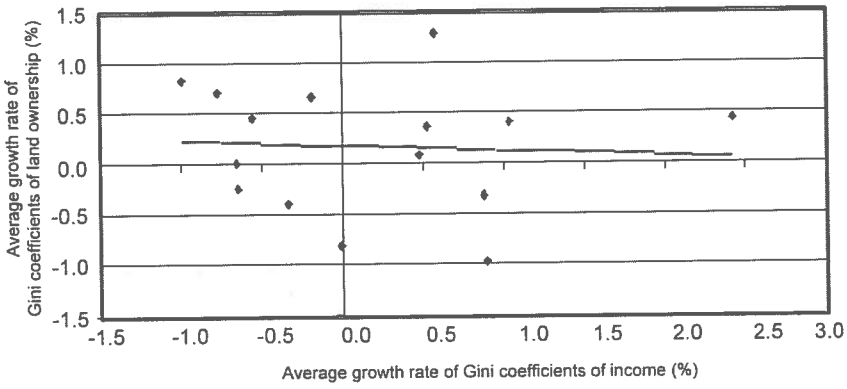

Figure 3. Rates of change in inequality of land ownership and income for selected countries, 1970s–90s.
Note: Selected countries: Argentina, Brazil, Egypt, Ethiopia, India, Indonesia, Korea, Lesotho, Mexico, Nepal, Pakistan, Peru, Philippines, Thailand; countries were selected such that time periods covering land Gini changes overlapped substantially with income Gini changes, but often not identical periods between 1970 and 2000.
Sources: Lipton (2001); IFAD (2002); Deininger and Squire (1998); WDI (2002); and Adams (2002).

their husbands of land they also have more bargaining power within the household, which has been shown to increase the proportion of household income spent on food, education, and the welfare of children (Quisumbing et al., 1995; Meinzen-Dick et al., 1997).

Quality of land is, of course, not homogeneous or constant over time. Soil degradation reduces agricultural productivity and affects about 25% of the world's agricultural land. Between 5 and 12 million hectares of arable land are lost each year as a result of salinization, flood-induced erosion, or nutrient mining. These factors also reduce productivity on an estimated additional 20 million hectares annually. Water and wind account for 80% of all erosion. Slow-onset disasters caused by soil fertility destruction are possible in some regions. Research is needed on policies for landscapes and land use that protect the world's soil fertility, promote integrated nutrient management, assure that poor farmers have information about plant nutrient use in various production systems, and foster efficient and effective plant nutrient markets (Scherr, 1999).

Access to water at low private cost in irrigated agriculture remains a major factor in the distributional outcomes of agricultural policies in the domain of natural resources. Initial distribution in irrigation settings tends to be rather equal because of the key role of public institutions in providing irrigation and distributing irrigated land. As land changes hands over time, this situation can change. Yet the rather equal distribution of irrigated agriculture implies also fairly equal distribution of access to irrigation water in these settings. Increasingly, however, water resources in developing countries are being privatized, which may reduce the equal distribution. In addition, a growing urban/rural bifurcation with regard to water usage has profound implications for the distributional effects of water policy. Increasing urbanization in developing countries has dramatically increased the demand for water and may jeopardize rural communities' access to water for agricultural purposes and thus undermine income-generating opportunities for the rural poor (IFAD, 2001).

Climate change and related policies could have a variety of important implications for agriculture, but the distributional effects of climate change, mediated through agricultural adaptation or the lack thereof, are barely understood today. It is likely, however, that climate change has had (and will continue to have) its most severe impact on the tropical and developing regions of the world, where its effects may include decreased water availability, increased risk of natural disasters such as flooding, and an increase in health hazards such as tropical and waterborne diseases (FAO, 2002). Complex multidisciplinary modeling might improve our understanding of the impacts of global and regional climate change, including its impacts on agricultural inequalities. Agricultural economists should engage more actively in these modeling activities to add innovation based on sound understanding of agriculture. Research is needed to better explain how technology, trade, and insurance can help facilitate global and local adaptation to climate change. The challenge is to provide the information needed to design effective insurance schemes and to offer policy options for ensuring that poor farmers have access to climate forecasting and other tools that can help manage risks.

Long-term food security depends on the availability and efficient use of diverse *plant genetic resources*. Although this is a global policy issue, policies on conserving and using plant genetic resources are partly national and partly local and involve interplay between public and private actors. Multidisciplinary research—with economic, legal, ecological, and technological expertise—is needed to devise sustainable and fair solutions. Researchers should examine appropriate governance options for these globally important resources and identify sustainable, efficient, and equitable outcomes for low-income countries, farmers, and consumers. The chronic underinvestment in these global public goods contributes to growing inequalities, because large farmers, who are linked to the growing private seed industry, are much less dependent upon public investments in seed improvement.

Policies concerning the *multifunctionality* of agriculture encompass land use, water use, genetic resources, and the management of forests and landscapes. The policies and regulations related to multifunctionality entail costs and benefits, but the distribution of net benefits today and for future generations is difficult to assess. Many of the direct costs of multifunctionality are paid by the general taxpayers. Implicit consumer taxation (through price protection) and shifting of the cost of regulations to farmers are also significant. On the other hand, the benefits of rural amenities, including long-term natural resource protection, biodiversity, and landscape beauty, are society-wide in nature and only are partly captured by the actual "users"

of multifunctionality, including ecosystems services. This remains a complex area where new agricultural economics approaches to natural resource valuation can make a contribution (Randall, 2002).

It is possible to interpret agriculture's contributions to growth and its distributional effects as part of multifunctionality. Whereas multifunctionality has been seen partly as a mechanism for protecting agriculture in the Organization of Economic Cooperation and Development (OECD) countries, in a different sense it is also relevant to poor people in developing countries. Much of its relevance hinges on protecting customary access and use rights to land, water, and other biological resources. Although individual property rights related to land and access to water are increasingly well defined in world agriculture, governments often do not recognize the property rights of communities. Community rights to regulate uses of private land or to manage common property require collective action in order to be established and managed. Because of the heavy dependence of the poor on common property resources and the environmental importance of such resources, agricultural economics and sociological research on the formation of such institutions, including those for managing biodiversity, watersheds, and variable landscapes, will continue to have high payoffs (Meinzen-Dick and Bakker, 2001; Otsuka and Place, 2001; Meinzen-Dick et al., 2002).

Agricultural economics research today is challenged by new developments in the domain of land and natural resource policy, and the distributional implications thereof. The efficiency and equity implications that result from the effects of agricultural and natural resource policy are increasingly complex, especially because land and natural resource policies have joint effects for private and public goods. Further, agricultural systems are less stable in developing countries, where agriculture has a precarious and complex relationship to the natural environment, and where institutional ability to manage the interface between environment and agriculture is often weakly enforced (Lopez, 2002). To assess and predict these effects is a challenge. By confronting this challenge with an expanded understanding of institutional economics approaches, as well as with multidisciplinary research that helps explain long-term returns and risks for the resource base, our discipline may be led into new methodological and empirical research of great relevance.

4. Distributional effects of agricultural technology and research policies

Extraordinary new technologies—in areas such as molecular biology (including genetic engineering, tissue culture, and marker-assisted breeding), information, communication, and energy technology—are revolutionizing global productivity. Many of these technologies have a direct bearing on agriculture and food systems. The development of new technology in food and agriculture can be a political matter, however, because of perceived risks and perceptions of nontransparent benefits, the scope for regulation, and a naturally incomplete knowledge base in the new and fast-changing sciences. Acceptance and adoption of new crop technologies, including genetically modified crops, will depend upon transparent and convincing advantages for consumers and producers. In many cases, including those involving genetic engineering, consumer organizations, the media, and retail industries—rather than farmers, agro industries, and food processors—are playing an increasingly important role in technology policy.

The impact of new technologies on distribution will depend largely on the existence of policies that ensure that technologies are developed and disseminated and can actually be adopted by poor producers. With the emergence of more vibrant public agricultural research institutions serving the smallholder sectors in many countries, the gap between those with much access to technology and those with little access may have narrowed for an intermediate period in the 1970s and 1980s. With the breakthroughs in information and communications technology and biotechnology in the 1990s, however, as well as the institutional innovations along the food chain, the gap has widened again. Although agriculture and the rural economy have the potential to "leap frog" over several generations of technological advances, they are currently on the wrong side of the digital divide. Agricultural economics is challenged to take a fresh look at the growth and distributional effects of the advanced technologies and their interaction in agriculture and agriculture-related industries.

In the past two decades, *information and communications technologies* (ICTs—i.e., the telephone and the Internet) have probably changed food and agricultural systems more than biotechnology has so far, even though the latter dominates the agricultural technology

debates. Access to information and the ability to use it efficiently are critical for allocating resources, whether labor, capital, or natural resources,[10] under market or nonmarket conditions, and for access to public goods. As tools to help access and use information more efficiently, ICTs impinge on all of the determinants of distribution, and by providing new channels of information at reduced costs they can be expected to reduce inequality. Unlike roads, ICTs generate network externalities, which means that their returns can increase over time. The concept of network externalities is critical for the distributional effects of ICTs in rural areas (Torero and von Braun, 2004). More specifically, ICTs contribute to

- Lowering the costs of market participation for farm households and small rural enterprises;
- Reducing costs and improving quality of public goods provision (such as research-extension linkages in agriculture, and education and health services);
- More effective use of existing social networks or their expansion; and
- New institutional arrangements and consequent strengthening of peoples' rights.

It is important to keep in mind that access to information through ICTs is a question not only of *connectivity,* but also of the *capability* to use the new tools and of *content* or relevant information in accessible and useful forms. Although all these three "c"s are critical, it is connectivity that matters most for the poor, given that it is a precondition for the others. In terms of public access, the incidence of phone use by rural households is already substantial in rural areas of six developing countries studied, ranging from 33% in Laos to 69% in Peru (Torero and von Braun, 2003). Technological change in ICTs brings down unit prices and stimulates new products; this is partly facilitated by foreign and domestic research and development policies, as well as by the prevailing regulatory framework. Digital divides within a country—between poor and nonpoor, urban and rural, educated and uneducated—seem more prominent in developing countries. Whether rural households benefit from increased access to a telephone depends on whether the gain from having a telephone closer by is higher than the direct and indirect costs of the phone use. Based on household data analyses of rural phone programs in Bangladesh and Peru, Chowdhury (2002) finds that households in Bangladesh have a net benefit of US$0.11 to US$1.59 per call, and Peruvian households a net benefit US$1.45 to US$2.91 per call, depending on the applicable communication alternatives (such as sending a letter, travel to distant other phone, messenger). The poorest quartiles tend to benefit more. Moreover, participation in land and labor markets increases by at least 8% in the Bangladesh sample because of access to a phone, and high-value produce from small farms (eggs, milk, poultry) is channeled to markets at reduced transaction costs (Chowdhury, 2002).

Some observers have suspected that many *agricultural technological innovations* for farmers favor large-scale agriculture, but a closer look at the net distributional benefits suggests more scale-neutral distributions. This closer look requires a careful assessment of both the direct effects on agricultural incomes of farmers and workers and the indirect effects of technology on declining prices of food (Hazell and Ramasamy, 1991; Hazell and Haddad, 2001). The Green Revolution did, in fact, have positive distributional effects for small landowners in Asia. The initial and well-known lag in adoption by small farmers is not necessarily indicative of the sustained income distribution outcomes of technology. The conditions that facilitated the positive income distribution effects of green revolution technology were the relatively even distribution of land, the complementary roles played by research institutions, and investments in basic infrastructure. Negative distributional effects of green revolution technology occurred where poor agricultural smallholders shifted from tenant to nonagricultural rural households, unless there were accompanying increases in nonfarm employment. Moreover, the differences in irrigation resources often led to widening disparities between villages and subregions. An assessment of household- and community-level effects without interregional assessment gives a distorted picture of the distributional outcomes of the technologies.

Attempts to narrowly target agricultural technology to low-income and resource-poor farmers show mixed

[10] A large share of cell phone conversations among small farmers in Bangladesh are on land issues (Chowdhury, 2002).

results.[11] Technology and its benefits are often captured by those who have access to input and output markets and who can mobilize the investment resources required for technology use. This situation has, in many instances, led to less than proportional benefits for poor and women farmers. Again, the final outcome of these effects for distribution is a question of consumption and investment patterns resulting from the overall income streams. These patterns include human resource investments in, for example, education and health, and other expenses that may enhance the long-run, even intergenerational, distribution effects of the benefits of technology (Hazell and Ramasamy, 1991; Kerr and Kolavalli, 1999). Thus, it is necessary to look at the assets required to benefit from a technology. Beyond scale neutrality, it is necessary to consider whether water control, large labor or cash inputs, market access, and education are needed, as each of these requirements are likely to exclude some of the poor. People with fewer assets may have fewer options, but policies can help them overcome the barriers.[12]

The distributional impact of technological change ultimately depends on the particular context of policies, markets, and institutions and on interregional connectedness through infrastructure (de Janvry and Sadoulet, 2002). This leads to *diverse patterns by world regions*. In large parts of Africa, society-wide technological gains in agriculture remain limited because of a lack of interconnectedness, low efficiency, and inequity in taxation and public investment policies. Still, even minimal access to, for instance, irrigation technology can have a decisive effect for coping with drought and famine. In Latin America, many of the poorest rural hinterlands have remained poor because of a lack of access to markets and public services, such as education, health, and human capacity building that are needed complements of technology for pro-poor growth. A sizable share of the rural poor have remained excluded, and that exclusion may have even increased in the past two decades, despite many initiatives for administrative, fiscal, and political decentralization to foster progress in rural areas. In large parts of Asia, technological change has directly and indirectly led to rural growth combined with poverty reduction, including for landless rural people. In much of Eastern Europe and the former Soviet Union, after the economic transformation of the late 1980s and early 1990s, new technology only reached the large-scale sector. Agricultural technology and related services hardly reached the smallholder sector (where it existed, in countries such as Poland) and the sizable household agriculture sector.

A long-run view of technological change must also take into account the distributional effects of *agricultural research investments*. These research investments go beyond technology and include institutional innovations and the structure of the scientific system catering to agriculture. The benefits of agricultural research investments are large and undisputed, but their actual levels and distributional effects remain under discussion, as became very evident at the last IAAE conference in Berlin (Alston and Pardey, 2001). From a global perspective, it is important to recognize that there is an ever-greater disparity between private and public research and between developing and developed country agricultural research. Developed countries spend about 47% of the US$22 billion spent globally on public agricultural research, and spend more per farm and per unit of output than do developing countries, where spending is dominated by a few large countries including Brazil, China, and India (Pardey et al., 2002). Further, the growth of private investment in biotechnology has exacerbated the inequities in agricultural technology and research between developed and developing countries.

As biotechnological investments in agriculture have raised the private sector share in overall agricultural research expenditures over the past decade, the products from these investments have hardly reached smallholders. Most biotechnological research has yet to target cassava, sorghum, pearl millet, pigeon peas, or groundnuts, which are five of the most crucial crops in most of the developing world (Qaim et al., 2000). Transgenic crops are for the most part soybeans, corn, and cotton, which are found predominantly in the United States

[11] Attempts to target irrigation and rice crop technology to women farmers in West Africa did not succeed as well as expected because of the complexities of community and intra-household institutions of power, cost sharing, and lack of legal enforcement of contracts (von Braun et al., 1988). In Bangladesh, targeted agricultural technologies (such as improved vegetables) and ICTs (such as cell phones leased to low-income women) had an empowering and distribution-enhancing effect at the local level (Bayes et al., 1999; Hallman et al., 2002).

[12] Micro finance, for instance, can overcome barriers to credit for the poor (see Zeller and Meyer, 2002), and marginal lands can catch up if properly considered in research and investment strategies (Pender and Hazell, 2000).

(68%), Argentina (23%), Canada (7%), and China (1%) (Juma, 2001). The "fruits" of biotechnology thus tend to be contained within similar geographic areas, and exclude the subtropical and tropical regions of the world, which are also the poorest.

The growing private sector influence and the decline of the public sector in agricultural research investments underscores the bifurcation in world agriculture, and entails severe distributional consequences for much of the developing world. One of the challenges for agricultural economists is to identify institutional and incentive systems for transferring innovations from the private sector to the public sector, where these innovations can serve the poor. At the same time economists should develop institutional designs and economic incentives that would make it more attractive for the private sector to generate technologies for which effective demand could be forthcoming among the millions of smallholders. Currently, the private sector investments in technology, and biotechnology in particular, may be creating interesting innovations that never reach the public. They are discarded halfway through their testing and realization because of missing markets (i.e., lack of short-term commercialization potential) and deficient public–private partnerships. If this hypothesis is correct, the global knowledge system, especially in the private sector related to agriculture, is not functioning efficiently under a social cost perspective. The reasons are ill-designed intellectual property rights systems (especially concerning biotechnology) and codes of conduct in industry and in the public sector that are not sufficiently reliable to overcome these barriers.

New institutional research may help overcome these failures. From the perspective of seeking efficient and equitable solutions to allocating resources within and between the public and private research sectors, agricultural economists should devote more research attention to corporate governance related to technology and to the scientific innovation policies of the international agricultural companies. Complementary institutions, such as the Consultative Group on International Agricultural Research (CGIAR), must ensure that the benefits of agricultural technology and research extend widely around the world and especially to the rural poor (Pardey and Beintema, 2001; de Janvry and Sadoulet, 2002). To help provide distributional benefits, research is needed to identify—through stakeholder consultations and other means—appropriate policies in areas such as intellectual property rights, biosafety, and food safety regulations, seed systems, facilitation of access to new technologies, and the allocation of public and private research funds. The bifurcations in agriculture identified in Table 1 make it more and more difficult to facilitate technology and science transfers between the two branches of world agriculture. However, the private sector should find it in their interest to take a more long-term perspective toward market building and inclusion of the world smallholder sector, especially as smallholders are challenged to become more diversified and attempt to capture opportunities in high-value products in the fruit and vegetable sector and the meat and dairy sector.

5. Distributional effects of agricultural trade, market, and aid policy

Perhaps no other subject has commanded such controversy with regard to distributional effects as agricultural price and trade policy. Trade in goods and services and relatively open labor movement across borders could, in principle, be major driving forces for equality with growth. That they are not is largely a consequence of trade barriers in agriculture, such as domestic and regional market and trade policies, including the large subsidies connected to market intervention in OECD countries as well as hindered market access and export subsidies.

Although negotiating parties have made attempts in the Uruguay Round and in the current Doha Round of World Trade Organization (WTO) negotiations to move toward lower tariffs, quotas, export subsidies, and domestic support for agriculture between regions and between free-trade blocs (such as ASEAN, EU, MERCOSUR, and NAFTA), the world as a whole has yet to lower its barriers enough to bring about truly liberal agricultural trade. The failure to achieve this is heavily rooted in structural inequalities and in the political economy of agricultural protectionism.

It is likely that reducing barriers to agricultural trade, especially for developing countries, will deliver overall global benefits and thereby have a positive impact on global income equality. But while the international welfare effects of lowering subsidies, tariffs, and quotas in the global agricultural industry are positive, the magnitude of the potential gains remains the subject of much study and debate (Diaz-Bonilla et al., 2002;

Hertel et al. 2003; Martin et al. 2003; OECD, 2002b; Wobst, 2002). Several sticky issues and adverse trends make it difficult for developing countries to capture benefits from agricultural trade, including the failure of industrialized countries to open up their markets for agricultural goods from developing countries, the use of nontariff barriers such as nontransparent requirements regarding food safety and standards that poor countries cannot meet, and high tariffs for high value-added and processed commodities; and quota and market conduct play an important role for some products (Herrmann and Sexton, 2001). This is not only an issue of rich nations versus poor nations. Developing countries' trade restrictions on agriculture often offset the limited gains from international agricultural trade. These countries would also benefit from their own liberalization (Gulati, 2002). High-value and processed food exports from developing countries have expanded rapidly and are a major source of revenue, and for these exports developing countries stand to benefit as much from lowering their own agricultural trade barriers as from the lowering of OECD barriers (Rae and Josling, 2003). Focusing only on sectoral trade policy reforms does not give a complete picture, because in Latin America, for instance, real domestic prices of farm tradables fell after the initiation of reforms in several countries as a result of currency appreciation, reinforced by a fall in world prices (Valdes and Foster, 2003).

Despite the large potential gains for developing countries from agro-trade liberalization and thus improvements in distribution between nations, this is not necessarily indicative of reductions in *income inequality within countries*. An analysis of the distributional effects of agricultural policies within and among OECD countries shows that the distribution of support is similar to the distribution of output. The largest farms, and hence the most prosperous, are the main beneficiaries (OECD, 1999). Direct payments are more equally distributed than market price support. For instance, the Gini coefficients of direct payments are 0.56 in the EU and 0.61 in the United States, whereas the Gini coefficients for market price support are 0.74 in the EU and 0.98 in the United States (OECD, 1999). These policies of agricultural support are neither cost effective nor equitable.

For *middle- and low-income countries* a diverse pattern is observed. Chile, for example, dramatically reduced its incidence of poverty in the 1990s while its relative income distribution remained remarkably static (Animat et al., 1999). The distributional effects of agricultural liberalization, at least in the short run, can be either negative or positive, and tends to be more positive for net exporters than for net importers. Ultimately, understanding the broader effects of trade on income distribution implies a need for further research on the household-level impacts of these changes.[13] For instance, agro-trade liberalization would drive up food prices and probably labor costs, which would be adverse for low-income people, who already devote a high share of their earnings to food, and for their employment. In Brazil, Hertel et al. (2003) estimated that for agricultural households, the impact of liberalization by OECD countries would reduce poverty by 7.6%. Yet for nonagricultural households OECD liberalization would increase poverty by 2.5% (Hertel et al., 2003). In another computable general equilibrium (CGE) analysis of the distributional effects of trade liberalization in 14 Latin American countries, it was found that although poverty fell in 13 of the 14 countries, the impact on distribution was more ambiguous, in that inequality rose in 5 countries and fell in 9 (Morley and Piñeiro, 2003).

The story of the distributional effects of agricultural trade and market policy is complicated by an increased demand for quality and production process information and related standards. Rising *quality control and food safety standards* in the agro-food industry can pose problems for agricultural exporters in developing countries, thereby contributing to the widening gap in income distribution, especially on an international level. As Hazard Analysis and Critical Control Points (HACCP) and other food safety and quality control standards increasingly become the global norm, developing countries must meet this demand in order to compete in increasingly consolidated and competitive agro-food markets in wealthy countries. Yet compliance with standards imposes transaction costs, as well as significant risk, on developing-country producers. Further, the debate over genetically modified (GM)

[13] Comparative static assessment of trade liberalization effects provides limited insights for distributional outcomes. Economy wide modeling that increasingly includes distributional effects has progressed over the past decade and brings new insights (see Lofgren et al., 2003, for instance).

crops complicates the agenda for agricultural liberalization. The different labeling policies adopted or planned by the EU, Japan, and the United States hinder developing-country exporters from tapping trade opportunities, complicate the global food aid system, and thus have potential adverse distributional effects.

Agricultural trade and market development should also be viewed in relation to the rural nonfarm economy. *Commercialization and market integration* of the millions of smallholder farms remain a central task in overcoming rural poverty and the bifurcations in agriculture (von Braun and Kennedy, 1995; Kherallah et al., 2002). The substantial reduction in international transport costs, as a result of new transport and storage technologies and ICTs, over the past decade is an important advance. The urbanization of rural areas and the decreasing cost of capital relative to labor are transforming market institutions at a more micro level and changing the nature of farming in many countries. Explicit and implicit capital subsidies as well as infrastructure investments tend to be biased against small farmers and less-favored areas. Although many rural people depend on agriculture for their livelihoods, many more do so indirectly by working in small-scale rural enterprises providing goods and services for farm families or in agro industries that add value to primary agricultural produce.

The appropriate use of these linkages between agriculture and rural industrialization, as well as rural–urban linkages in an open trade context supported by public goods that facilitate smallholder productivity growth, have proven essential for pro-poor growth processes in, for instance, Japan, South Korea, and Taiwan (Hayami, 2000). These broader externalities of markets, together with public goods and nonmarket institutions, have important developmental and distributional effects that are not yet well understood under different rural conditions. Ultimately, the distributional impacts of agricultural trade policy depend primarily on the structure of the macro economy, the structure of markets, and the structure of poverty, employment, and income distribution within the economy. Initial conditions and change then determine the outcome, especially for small farmers. In Latin America small farmers were often excluded from reform benefits because of their difficulties adjusting to an open trade regime with higher price risks, oligopsonistic buyers in the food industry demanding increasingly larger volumes and higher standards, the trend toward greater capital intensity, and the reduction in agricultural subsidies (Valdes and Foster, 2003).

Official development assistance (ODA) directed toward agriculture could facilitate increases in global agricultural productivity and trade and add to global and national-level equality. Aid flows, however, are not well targeted at the poorest countries, and even less so at the rural poor. Moreover, development aid to agriculture and rural development has declined continuously in the past two decades. Agriculture and rural development aid totaled US$5.9 billion in 2001, compared with US$12.1 billion in 1979–1980 (OECD DAC, 2002a). A major impediment to agriculture and rural development is the limited public investment in infrastructure and research. The decline of aid for infrastructure is inhibiting the potential gains from market integration and trade, just at the time when countries with location advantages could benefit from reductions in international transport costs.

At an international level, food aid remains an important instrument for distribution, especially during crises. A comprehensive reassessment of food aid in its various types would be useful, given changed market and food security circumstances in many countries (Barrett, 1998). The distributional effects of food aid at a global level are significant, but the record of response in times of international price increases remained disappointing in the 1990s: when prices increased, food aid declined. The overall allocation of food aid across recipient countries has not changed much since the Uruguay Round. Only a small share of concessional food aid goes to low-income food-deficit countries. Results-based criteria for food aid are needed, including for emergency aid, and trade distortions should be minimized.

6. Distributional effects of consumer-oriented regulations and subsidy policies

The world food system is rapidly and fundamentally moving toward industrialized food processing, long-distance marketing, and retail business dominance (Peters and von Braun, 1999). The global food processing industry and the retail business sector both dwarf the agro industries that focus on inputs and crop technologies. Driven by new technologies (especially

in transport and information) and by the already mentioned changing demand patterns, this trend has far-reaching implications for consumers and governments. This trend partly bypasses small-scale food industries, low-income consumers, and smallholder farmers. Global food retailing with supermarket outlets is a well-known trend in high-income countries, a recent one in Latin America and the Caribbean, and a strongly emerging one in Asia and even Africa (Reardon and Berdegue, 2002). Research on institutional arrangements at global, national, and regional levels, such as antitrust standards, codes of conduct, and the means to enforce them, is increasingly called for.

At the same time, the demand for *food safety standards* is increasing and human and environmental health concerns are rising, posing a new challenge to our profession (Unnevehr, 2001). Issues of food safety, food security, and trade in agriculture are more than technical matters. They are a conflict over science, evidence, and values; over the future of agriculture and food cultures; over solutions to the hunger and malnutrition problems of the poor; and over trade, market shares, and competition. Research is needed on how to ensure that all links in the global food system function efficiently under this new more quality-demanding food system. Rising food safety standards have distributional implications that are not yet well understood.

Food safety policies, though targeted toward the export sector in developing countries, can have a positive impact on domestic food safety by facilitating spillovers of food safety policies to domestic markets and processing industries. To foster these spillovers, however, governments of low-income countries must invest in capacity strengthening. Without these investments, the spillovers will not come about and there will be a consolidation of the current bifurcation in the global food system in which one system with high standards caters to rich consumers and one with low standards caters to the poor.

Diet change is moving rapidly with urbanization, combined with rising prosperity in some regions, changing dietary preferences, and increasing time costs shifting the pattern of food demand toward processed food. Poor city dwellers' food security depends hardly on food production, but on income security. Research must provide solutions that can address rapid demographic shifts and assure sustainable livelihoods for people in urban and rural areas alike, as urban–rural linkages change (Virchow and von Braun, 2001). The media and information may influence patterns and trends of food demand today more than price changes, posing a challenge for traditional food demand analysis. Changing lifestyles in combination with diet change are creating new health problems, including the symptoms of obesity, a phenomenon that contributes to chronic diseases in growing segments of the population worldwide and imposes large health costs (World Health Organization, 2003). The World Health Organization (WHO) has emphasized the need for major international initiatives to address the diet problems of low-income countries, in particular because of the failed transition from hunger to health. Sixty percent of mortality in the developing world is now related not to infectious disease, but to chronic disease, much of which stems from bad diets. Further, more than 1 billion people in the world are chronically malnourished, and approximately 2 billion people have deficient diets, especially in micronutrients such as vitamin A, iron (especially in women and children), and zinc. This severe deficiency leads to deterioration of public health, shortens lives, and makes people less productive. Thus, to study the distributional effects of policies that impact on diets, research must include health and nutrition effects. Research needs to explain how food policy interacts with these health crises and the failed diet transitions. Agricultural economists are well positioned to address food-related health economics issues.

Studies on the potential contribution of income growth to overcoming absolute poverty, as represented by under-nutrition, are not encouraging. Even under optimistic scenarios of 2.5% per capita growth, undernutrition will not decline by more than about a quarter in a sample of developing countries until 2015 (Haddad et al., 2003). Other policy measures are needed. These measures include more or less targeted consumer-oriented subsidies and targeted investments in human capital.

Analyses of *consumer-oriented food subsidies* have shown mixed effects on income distribution and agriculture. Few of the programs have benefited the poor more than the nonpoor (Pinstrup-Andersen, 1988). Often—but not always—the interventions adversely affected agriculture through distorted prices and market interference (von Braun, 1988). A meta-analysis of

the efficacy of targeting interventions in 47 developing countries finds the median program transfers 25% more to the target group than would be the case with a universal allocation, but more than a quarter of targeted programs are regressive (Coady et al., 2002). Neither targeted nor untargeted programs on the consumption side seem to make up for the noted inequalities in a systematic way. A more encouraging alternative seems to be conditional transfer programs, such as food for education programs (Ahmed and del Ninno, 2001) or Mexico's PROGRESA (Skoufias and Parker, 2001), which build human capital while transferring benefits.

A further alternative is strengthening insurance and self-insurance mechanisms in rural areas, including crop, health, and old age insurance (pensions). Innovations in community-based health insurance are emerging in many rural areas of middle- and low-income countries and seem to be promising, even under harsh conditions, such as in Ethiopia (Asfaw, 2003). Building social security systems in rural areas from the bottom up may be an option.

Transfer and subsidy policies have not been able to redress the noted bifurcations. Despite much improved knowledge on who and where the poor are, and a much better understanding of the potentials of targeted interventions, inequality and relative deprivation have, in general, widened. Part of the reason may be that many countries simply discontinued compensating transfer programs in the 1980s and 1990s rather than reforming them to achieve improved efficiency and coverage. Agricultural economics research, in conjunction with human resources and health economics research, needs to address the scale and design issues of these programs to come closer to conclusion for policies.

7. Rural public goods and distributional effects

To a considerable extent, rural public goods policies that shape institutions, governance, and public investment cut across policies related to all four of the above discussed domains of agricultural policies. Policies on public goods can also stimulate positive externalities and optimal combinations of actions in the different policy domains.

Different *public investments* can have differential impacts on growth, distribution, and poverty reduction. These effects may also vary by region. Evidence has shown that in the past public investments have delivered greater benefits to farmers in more favorable areas, such as irrigated areas in India and coastal and central areas in China. Villagers in unfavorable areas, such as rain-fed areas in India and the western region in China, did gain important indirect benefits through increased employment, migration opportunities, and cheaper food (David and Otsuka, 1994), but these factors were rarely sufficient to prevent further widening of income differentials. In recent studies, Fan et al. (1999, 2002) have tried to quantify these differential effects of public spending in agricultural research, irrigation, infrastructure, education, and antipoverty programs, using time series and cross-regional data. In both China and India, investments in agricultural research have the largest returns in promoting agricultural production and productivity. Their effects on poverty, however, are often smaller. The largest poverty reduction effects come from improved rural roads in India and rural education in China.

Distributional effects also relate to *redistribution of power* through a change in institutions, governance, and decentralization. Governance affects the allocation as well as the efficacy of public spending. Both allocation and efficacy in turn have different effects on efficiency and income distribution. Many cross-country studies have attempted to link governance, returns to public investment, and economic growth (Isham et al., 1995; Kaufmann et al., 1999). In general, these studies found that good governance had a positive effect on economic growth.

Few studies have quantitatively examined the link between governance and public goods provision at the local (or community) level. Using a recent village survey conducted over a significant period of time, Zhang et al. (2002) compared two different modes of governance. They found that the presence of elections negligibly affects the level of a local community's revenue but significantly shifts taxation or levies from individuals to enterprises. Elections alone do not necessarily improve the allocation of public expenditures. Only when decision-making power is shared is the share of public investment higher. There are more questions to be answered. For example, does local governance affect not only the financing and allocation of public spending, but also the efficacy of public spending and final development outcomes such as growth, income distribution, and poverty?

In the 1990s, decentralization and local government reform became preferred development strategies. Decentralization involves transferring rights and responsibilities from higher to lower levels of government. These rights and responsibilities may be political, administrative, and fiscal. On the one hand, for public goods that have large spillover effects, such as agricultural research, a more centralized mode is probably more appropriate. But even within agricultural R&D, the types of research or technology development that are centralized or decentralized can have a large impact on growth as well as on poverty reduction. On the other hand, in a more decentralized mode, local needs and preferences can be reflected through local participation, and local accountability and efficiency can be improved thanks to a better understating of local knowledge and conditions. Therefore, for some public goods, such as health, education, local roads, and to some extent agricultural extension, a more decentralized mode may be more appropriate. Strong local capacity and participation, however, are a necessary condition for these investments to have high returns.

Estache and Sinha (1995) found a strong relationship between fiscal decentralization and government spending on infrastructure, which has a strong growth-promoting effect. Enikolopov and Zhuravskaya (2003) emphasized the preconditions for decentralization to have a positive impact on economic growth, quality of government, and public goods provision, including weakness or strength of the party system, and whether local- and provincial-level executives are appointed or elected. There is no clear-cut relationship, however, between decentralization and economic growth, and poverty reduction (von Braun and Grote, 2002), and cross-country analyses provide little policy guidance on how to improve current governance structures at community levels—the levels at which change can be implemented most feasibly and is most relevant for rural change. It depends on the nature of public investment. Few studies have quantified the effects of decentralization on the efficiency and distributional effects of public spending across different regions within a country. In particular, there is a lack of empirical evidence to analyze the conditions and types of rural public goods provision and public spending that should be decentralized. This type of research can be fruitfully related to agricultural economics issues.

8. Conclusions

1. World agriculture at the beginning of the twenty-first century is confronted with a *dilemma*: the global integration of agriculture and its potential benefits for poverty reduction and income distribution are not forthcoming to a satisfying degree. No comprehensive set of policies is emerging to address the matter. The contributions of expected growth will not correct the problem in the foreseeable future. The Millennium Development Goals, including the one to cut under-nutrition in half by 2015, challenges the situation in appropriate ways, but follow-up so far is not promising.
2. Agriculture is drifting into an ever more drastic *bifurcation* at a global level and within many countries. This bifurcation undermines growth potential and potentially fosters political conflicts. Correcting that bifurcation will require large investments in rural areas and rural people, in institutions, and in information and biological technologies accessible by the poor in the world's smallholder sector. The societal risks of perpetuated inequality must not be underestimated. Poverty—being largely rural—was until recently of little risk for world security. Today, virtually all of the poor know of potential lifestyles elsewhere on the globe. Relative deprivation can no longer be ignored.
3. *Land and natural resource policies* need further attention, but the institutions related to them may be more important than size distributions. Rights and access to land are ill defined in many countries and require reform. Inequalities induced by differences in access to agricultural land, resources, and technology can, in principle, be balanced by taxation, subsidies, public investments, and transfer policies, including consumer subsidies and investments in human resources (education), but that is not happening to a significant extent.
4. *Technology policies* remain central for distributional equity in agriculture. Information and communications technology and biological technologies have enormous potential to address scale economy problems in rural development and for growth in low-income farming communities. However, these potentials remain far from being tapped. Investment in public research that could foster these positive effects is lacking.

5. Market-oriented global redistribution through *open market and trade policy* is a potentially efficient and effective approach. Protectionism in OECD countries and market interference in developing countries prevents agricultural trade from playing its key role in ensuring favorable distributional effects. This calls for a coordinated and coherent correction.
6. In order to improve equity and efficiency, national governments must provide *public goods*, including internal peace, rule of law, and public investment in education, health, nutrition, and infrastructure. A massive scaling-up of investment in enhancing productivity in rural areas of developing countries is needed, accompanied by social services and innovative insurance institutions. Many of the key ingredients in agricultural growth in developing countries—research and related services that facilitate implementation—are in the public goods domain.
7. Taking these steps requires governments to make difficult choices. The capability to make these choices depends upon the quality of *governance of the food and agriculture system*. Providing these public goods can help accelerate private investment, since private investors generally avoid rural areas and countries characterized by weak justice systems and arbitrary and corrupt public administration.
8. *Important linkages* exist among the four domains discussed here (resources, technology, markets, consumer policies). These linkages are generating new distributional effects. Policy coherence and trade-offs need to be considered for stimulating positive aggregate distributional effects. But in view of the complex food and agriculture systems, the call for coherence among policy domains, such as land policies and technology policies or market and consumer subsidy policies, is becoming exceedingly difficult to respond to in the policy process. These choices cannot be made efficiently if only a top-down approach is adopted. Externalities of agricultural policies require more attention in research.
9. *Agricultural economics* is part of the solution, but only if our profession sufficiently directs itself to research-based problem solving. Agricultural economists have a fair degree of freedom in making choices regarding research priorities. Today more than ever before, the research agendas of agricultural economists are potentially more relevant for society, development, security, and peace. As a well-established global association, *the network of IAAE* is of tremendous value for agriculture-related decision making through its common spirit of professional ethics and its ambition to contribute to people's well-being with regard to agriculture, food, and rural areas. A *renewed focus on the distributional effects* of agricultural policy is part of such service to society.

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