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THE POLITICAL ECONOMY OF AGRICULTURAL INCENTIVES AND PUBLIC EXPENDITURES, WITH SPECIAL REFERENCE TO AFRICA

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AGRICULTURAL R&D: INVESTING IN AFRICA'S FUTURE
Analyzing Trends, Challenges, and Opportunities

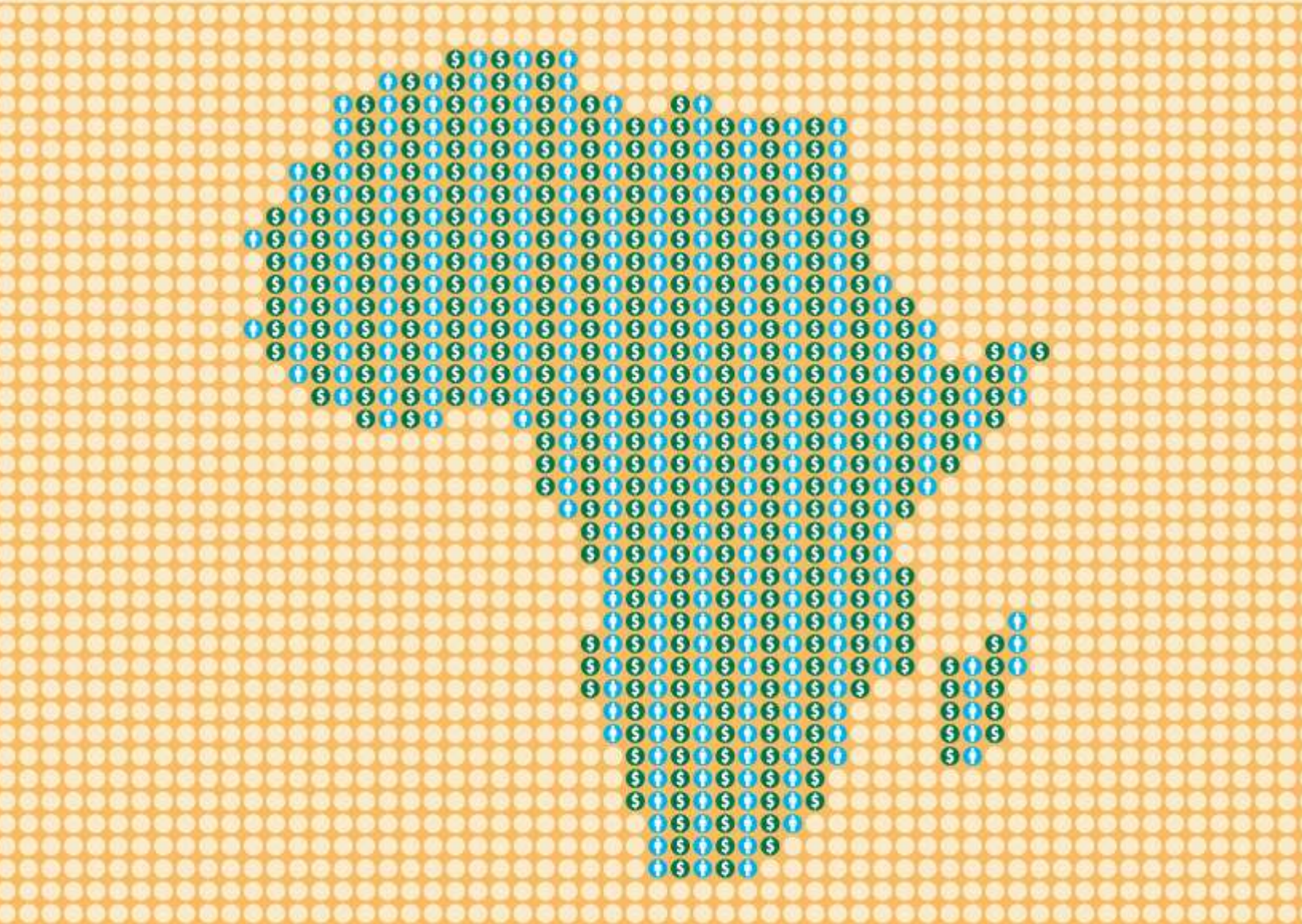

Table of Contents

List of Tables

List of Figures

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Acronyms and Abbreviations

ASTI	Agricultural Science and Technology Indicators
CAADP	Comprehensive Africa Agriculture Development Programme
CRS	Credit Reporting System
FTE	full-time equivalent
GDP	gross domestic product
ICRG	International Country Risk Guide
MDG(s)	Millennium Development Goal(s)
NEPAD	New Partnership for Africa's Development
ODA	official development assistance
OECD	Organisation for Economic Co-operation and Development
PPP	purchasing power parity
R&D	research and development
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
RRA	relative rate of assistance
SPEED	Statistics on Public Expenditure for Economic Development
WDI	World Development Indicators

Abstract

Accelerating economic growth has led to an improvement in agricultural incentives across Africa and to more rapid growth of public expenditures for agriculture in absolute, but not relative terms. However, the improvement in incentives was far faster in Asia and Latin America, so in relative terms Sub-Saharan Africa (SSA) has the worst agricultural incentives in the world. In most African countries considered, public agricultural expenditures represented only 5 to 10 percent of total national expenditures. Moreover, in most African countries these shares have actually declined rather than increased. Domestic funding for agriculture is the main funding source in only two of eight countries analyzed. The situation is unlikely to improve, as investment plans under the Comprehensive Africa Agriculture Development Programme show huge funding gaps, which are expected to be filled by official development assistance—a most unlikely trend given the current global economic slowdown. Spending on agricultural R&D increased over time, averaging 4 to 6 percent per year in many cases, with considerable variation within and across countries over time.

Under all political economy models reviewed, more rapid economic growth tends to move incentive policies toward protection rather than taxation, and leads to an expansion of public expenditures on agriculture and agricultural research. Urbanization and a relative decline in the agricultural population show similar results. Development of infrastructure, education, and communications make it easier for smallholder farmers to organize and make their weight felt in the political arena, which also tends to improve incentives under all models reviewed. However, rising international commodity prices and accelerating agricultural growth lead to higher incomes of farmers with an economic surplus and, under the political support function model, may lessen the need for policymakers to compensate them for relative income losses compared with other economic sectors. Improvements in property rights regimes, bureaucratic quality, and the rule of law also tend to increase public expenditures on agriculture and for research. Influencing incentive policies and public expenditures for agriculture could be achieved by improving the organizational capacity of smallholder farmers' groups, and cooperative and agricultural umbrella groups, thereby improving their ability to influence policy. Information and communications technology and rural transport infrastructure investments also improve the organizational potential of farmers' and related umbrella groups. The models also point to the importance of well-informed participation of all stakeholders in the policy process as an important condition for arriving at efficient policies and resource allocation.

On balance, the models reviewed tend to predict an improvement in the still, often, discriminatory incentive policies and additional public expenditures and research expenditures for agriculture. This review therefore supports a somewhat optimistic view that both incentives and underinvestment in agriculture and research in Africa can be ameliorated.

1. INTRODUCTION

Over the past 30 years, an enormous amount of literature has emerged on the political economy of agricultural policies, much of which has focused on explaining patterns of distortion in agricultural incentives around the world.[1] Determinants of public expenditures have also been analyzed extensively, but budget allocations and ultimate expenditures on agriculture and agricultural research have received little attention (Mogues and Petracco 2011). Much of the literature deals with agricultural policies in democratic, developed-market economies, although developing countries—irrespective of political regimes—are also covered, especially in Binswanger and Deininger (1997). It is important to note that governments intervene both to increase social welfare—for example, by financing agricultural research—and to redistribute incomes—for example, by shifting agricultural incentives. With this in mind, this paper explores the determinants of incentives and public expenditures in agriculture and agricultural research, particularly in Africa, by reviewing worldwide trends in agricultural incentives since the early 1960s together with trends in both public and agricultural expenditures and in agricultural research expenditures in Africa (based on available data).

In efforts to explain the trends identified, the discussion summarizes the topics and key conclusions of the theoretical and empirical literature, predominantly focusing on agricultural incentives because this area of the literature is much richer than agricultural expenditures. Incentives have significant relevance when it comes to allocating development budgets because countries that provide high levels of agricultural protection also tend to have high public agricultural expenditures. In addition, some of the incentive measures include product-specific public expenditures. The paper presents a closer look at trends in and patterns of agricultural and agricultural research expenditures for a set of African countries for which data are available, noting consistent features that can be explained by identified trends. These expenditure trends are also compared with commitments made by countries under the Comprehensive African Agricultural Development Program (CAADP) and are briefly analyzed in terms of their composition and funding sources. Finally, the discussion explores the implications of the findings on future prospects for Africa's agricultural incentives, public agricultural expenditures, and research expenditures.

2. CROSS-COUNTRY REGULARITIES IN AGRICULTURAL INCENTIVES AND EXPENDITURES

Agricultural Protection

Agricultural protection increases with per capita income—hence, "the development paradox." Figure 1, from Anderson (2009), shows the subsidy equivalents of agricultural policies from 1955 to 2007, compiled under a global project covering 75 countries that together account for more than 90 percent of the world's GDP, agricultural output, and population.[2] Subsidy equivalents include the impacts on agricultural incentives arising out of distorted exchange rates, trade policy, and commodity policies, such as tariffs, quotas, and export subsidies; other financial assistance to producers of specific commodities tied to outputs; and subsidies for major inputs, such as fertilizers and electricity. They do not, however, include public expenditures on growth-enhancing services, such as extension and research or rural infrastructure. Consequently, subsidy equivalents include significant budget expenditures, but by no means all of them.

[1] Much of this literature has been summarized in Binswanger and Deininger 1997; de Gorter and Swinnen 2002; Swinnen 2010; and Rausser, Swinnen, and Minhas 2011.

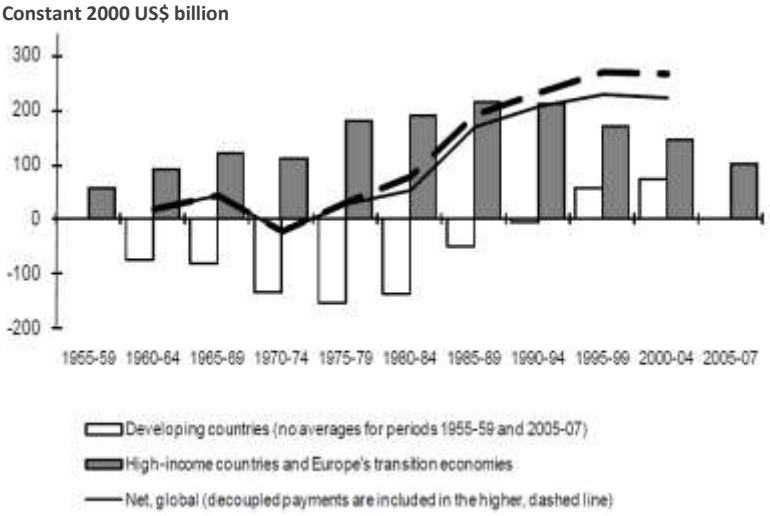
[2] For full details on African countries see Anderson and Masters, eds. 2009.

[2] For full details on African countries see Anderson and Masters, eds. 2009.

[3] Taxes and subsidies redistribute income between producers and consumers, but also lead to a net loss that does not

Gross subsidy equivalents for the developed world rose from around $50 billion in the late-1950s to over $200 billion in 1985–89, where they stayed for about a decade before falling to about $100 billion in 2005-07—all in constant 2000 U.S. dollars. Given the high global commodity prices since 2008, equivalents have undoubtedly declined further since then. In the developing world, the subsidy equivalents were initially around negative $50 billion in the early 1960s, rose to around negative $150 billion in the second half of the 1970s, turned positive between 1995 and1999, and reached around $50 billion between 2000 and 2004. These equivalents may also have declined due to high commodity prices since 2008. As a consequence of trends in both high-income and developing countries, total global support to agriculture increased until the second half of the 1990s, and thereafter slightly declined.

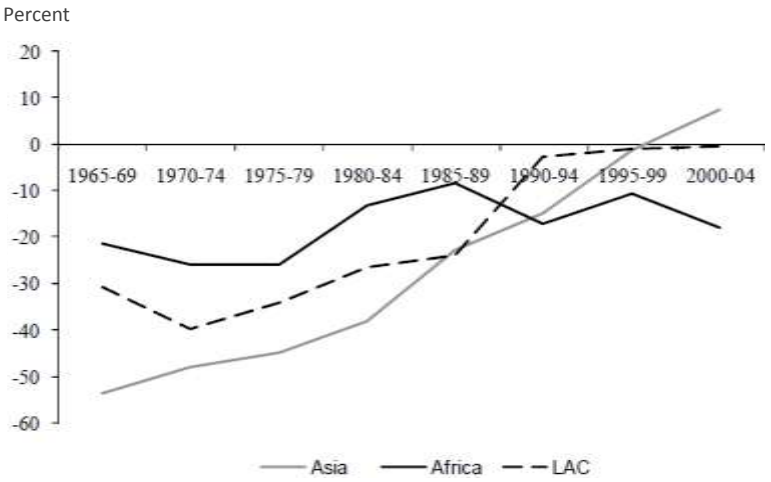
Figure 1. Gross subsidy equivalents of assistance to farmers, over time and by region, 1955 to 2007



Source: Figure 1.1 in Anderson (2009).

Relative rates of assistance to tradable agricultural and nonagricultural commodities summarize incentives, taking into account the protection provided to industry (Figure 2). In the second half of the 1960s, incentive policies were most adverse in Asia, followed by Latin America, and then Africa. Over time, however, Asia has sharply improved its agricultural incentive policies relative to nonagriculture, and now provides positive protection; Latin America has also improved its policy regime and now has neutral incentives; whereas—as of the early 2000s—Africa continued to disprotect its agriculture sector relative to nonagriculture, recording a relative rate of assistance (RRA) of –20 percent in 2000–04.

Figure 2. Relative rates of assistance to tradables in Africa, Asia, and Latin America, 1965–2004

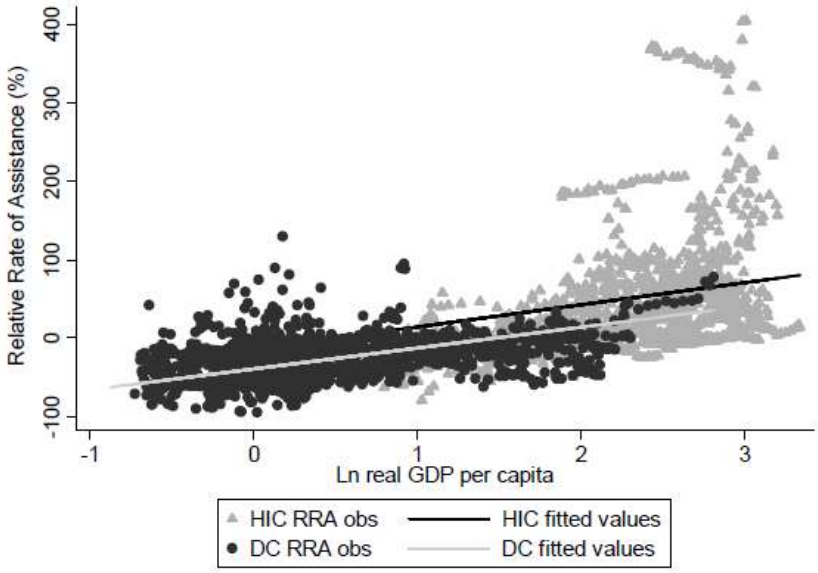


Source: Figure 1.6 in Anderson, ed. 2009.

Note: LAC indicates Latin America and the Caribbean.

RRAs are positively related to gross domestic product (GDP) per capita in developed or developing countries, given that the fitted slope is the same for both (Figure 3).

Figure 3. Relationships between real gross domestic product per capita and relative rate of assistance, 1955–2007



Source: Figure 1.9 in Anderson, ed. 2009.

Notes: RRA indicates relative rate of assistance; GDP, gross domestic product; HIC, high-income country; DC, developing-country; and obs, number of observations.

To date the discussion has focused on the "development pattern" of agricultural protection, which reflects the positive relationship between protection levels and economic development, and the associated shift from taxation to protection. A second regularity is the "anti-trade pattern," which refers

to the observation that import-competing sectors or commodities tend to be more assisted, or taxed less, than export-producing sectors. This pattern is common to both to high-income and developing countries. Consistent with this, sectors with a comparative advantage are taxed more heavily. A third regularity is the "relative income pattern," whereby the level of protection increases when farm incomes or incomes in a particular farm sector fall relative to the rest of the economy—for example, as a consequence of falling international prices, exchange rate fluctuations, or technical change in a particular commodity. Finally, governments everywhere tend to use inefficient policy instruments, such as international trade barriers, rather than efficient instruments, such as cash transfers, to achieve their policy objectives.

Trends in Public and Agricultural Expenditures

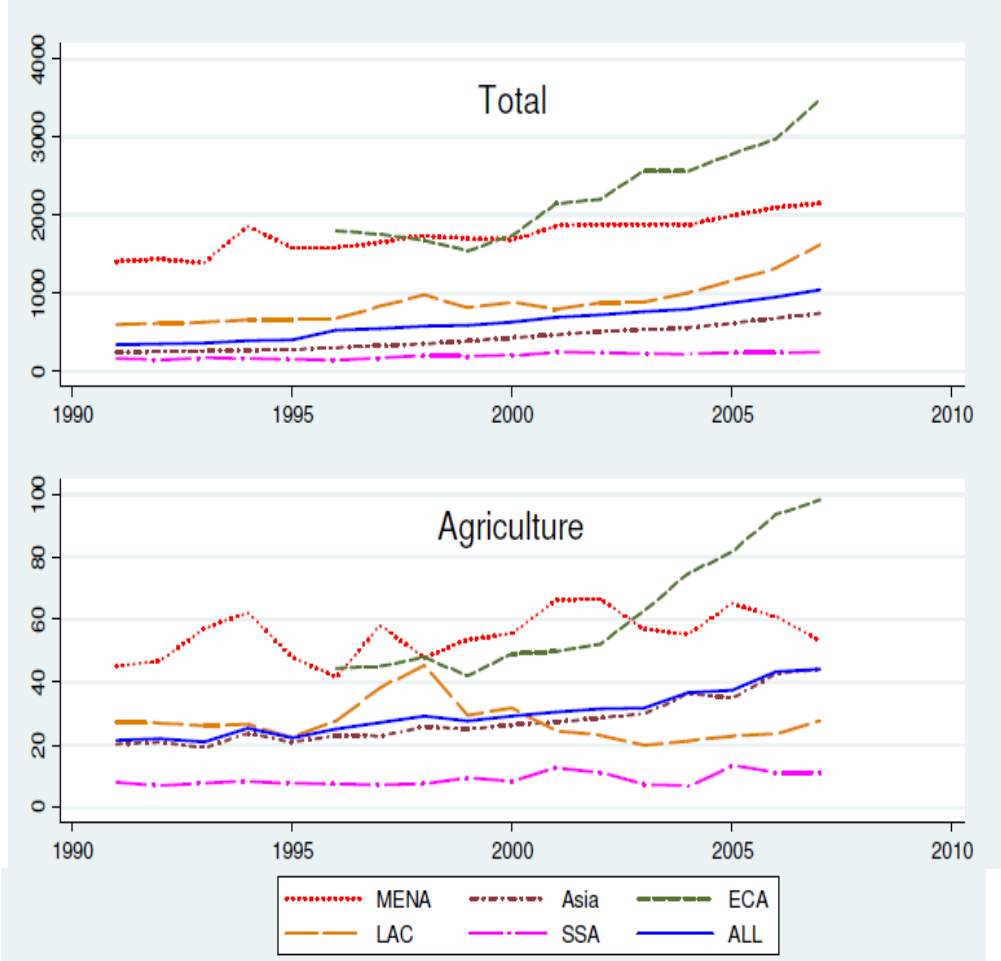
Mogues et al. (2011) analyze the volume, growth, and intensity of total and agricultural public expenditures for a global sample of 70 developing and transition countries from 1980 to 2007, including 10 Anglophone countries in Sub-Saharan Africa, plus Ethiopia and Mauritius (see Appendix Table A1.2 for the list of countries). Among developing-country groups, between 1991 and 2007 total per capita public expenditures and expenditures for agriculture were the lowest in Sub-Saharan Africa (Figure 4). In terms of shares of agriculture in public expenditures, however, Africa did slightly better than the average of all developing and transition countries, with a share of 4.4 percent in 2007 compared with the average of 4.2 percent for all the regions that year (Table 1). This is not as good as Asia (5.9 percent), but is considerably better than Latin America (1.7 percent). As a share of agricultural GDP, Sub-Saharan Africa also did slightly better than the average for all the regions in 2007 (8.4 compared with 8.2 percent). Once again, it did better than Latin America (4.7 percent) and only slightly worse than Asia (8.7 percent).

In Asia, both total and agricultural expenditures grew rapidly during 1991–2007, and agricultural expenditure growth accelerated after the turn of the century by 7.7 percent per year (Table 1). However in Africa, public expenditure growth and agricultural expenditure growth accelerated only slightly after the turn of the century, by 2.8 and 4.0 percent per year, respectively. This is probably a consequence of the difference in economic growth in the two regions, in that economic growth accelerated in Africa after 2000, but less so than in Asia. In Latin America overall public expenditure growth accelerated after the turn of the century based on a sharp expansion in 1997 and 1998, followed by a contraction in public agricultural expenditures of 2.0 percent per year between 2000 and 2007. Thus the improvements in incentives in Latin America during that time were accompanied by a withdrawal of public support to agriculture.

The overall impression from these data is that, in terms of overall public expenditure levels for agriculture, as of 2007 Sub-Saharan Africa had increased its expenditures and was doing comparatively well by the usual standards of comparison. This contrasts the more limited improvement in incentive policies discussed above.

Figure 4. Trends in per capita total government expenditures and expenditures for agriculture, 1991–2007

Constant 2005 purchasing power parity dollars



Source: Figure 3, panels 1 and 2 in Mogues et al. (2011).
Notes: MENA indicates Middle East and North Africa; Asia, South Asia, East Asia and the Pacific; ECA, Europe and Central Asia; LAC, Latin America and Caribbean; SSA, Sub-Saharan Africa; and "All," aggregate data of all the regions. See Appendix Table A1.2 for a list of the countries included in each region.

Table 1. Regional agricultural expenditure shares, 2007, and comparative growth rates, 2000–07

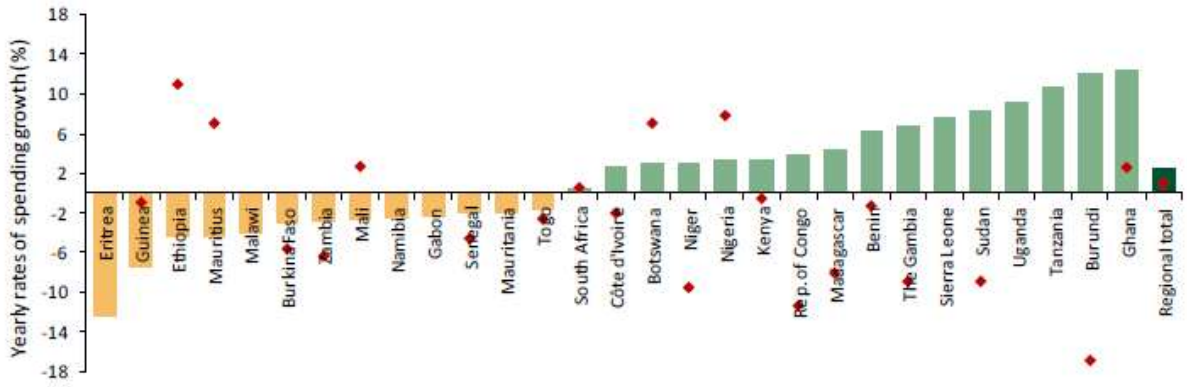
	Agricultural expenditures, 2007 (%):		Average annual growth, 2000–07 (%):		
Region	As a share of total public expenditures	As a share of agricultural GDP	Public expenditures	Agricultural expenditures	Gross domestic product
Asia	5.9	8.7	8.2	7.7	7.9
Latin America and the Caribbean	1.7	4.7	9.1	–2.0	1.9
Sub-Saharan Africa	4.4	8.4	2.8	4.0	3.3
All	4.2	8.2	7.6	6.1	5.3

Source: Adapted from Mogues et al. (2011, Table 3).
Notes: "All" indicates an aggregate of all the regions, including South Asia, East Asia, and the Pacific (Asia), Europe and Central Asia (ECA), and Middle East and North Africa (MENA). See Appendix Table A1.2 for a list of the countries included in each region.

Trends in African Agricultural Research Expenditures

None of the papers reviewed so far includes a comparative analysis of trends in agricultural research expenditures with overall public expenditure trends or with protection rates; however, Beintema and Stads (2011) summarize trends in African agricultural research expenditures. They show that, after stagnating in the 1990s, public agricultural research expenditures expanded by more than 20 percent on average, from 1.4 billion dollars in 2001 to 1.7 billion dollars in 2008 (in 2005 purchasing power parity [PPP] dollars). Together, the research institutions employed more than 12,000 full-time equivalent (FTE) agricultural researchers. The growth rates differed widely across African countries, and rapid growth was confined to just a handful of countries (Figure 5).

Figure 5. Yearly rates of growth in agricultural R&D spending, 1991–2001 and 2001–08



Source: Beintema and Stads (2011).
Notes: The bars depict the growth rate for 2001–08 and the red dots the growth rate for 1991–2001. The figure excludes Mozambique, Rwanda, Sierra Leone, and Zimbabwe because time-series data were not available. 1991–2001 growth rates are missing for Eritrea, Mauritania, Namibia, Tanzania, and Uganda due to lack of time-series data for the full period. Compound yearly growth rates are calculated using the least-squares regression method.

Reasons for the changes observed varied across countries, including rapid salary increases in Ghana, growth in expenditures on equipment and infrastructure in Sudan and Tanzania, and overall increases in expenditures (on salaries, infrastructure, and research programs) in Uganda. In contrast, research expenditures have fallen in francophone countries, which have fragile funding systems and remain excessively dependent on volatile external funding.

3. EXPLAINING THE REGULARITIES

De Gorter and Swinnen (2002) review the political economy literature that attempts to explain these patterns; the analysis presented here follows their exposition but introduces additional features, as needed, covered in other key political economy papers. De Gorter and Swinnen (2002) distinguish two main approaches to modeling the political process: lobby group models and political support function models.

Lobby Group Models

Under these models a passive government responds to interest groups who organize themselves to pursue collective action as lobby groups. The political outcomes, which influence agrarian relations and determine agricultural taxation, subsidization, and the provision of public goods, are the result of political bargaining between interest groups, which is usually constrained by an economywide budget

constraint. As Becker (1983) shows, the decisions reached through bargaining are more likely to be efficiency- and growth-enhancing when (a) there is participation of equally powerful interest groups that are aware of the aggregate government budget constraint and know the economic and distributional implications of different policy options; and (b) there are impartial institutions that facilitate participation of all groups in economic and political activities and that enforce decisions. Hence, the greater the deviation from these conditions, the greater will be the potential for efficiency-reducing outcomes. In addition, the costs will fall disproportionately on politically underrepresented or powerless groups.

Starting with Olson (1971) and verified by many studies (for example, Gardener 1987), small groups of farmers that produce high levels of output per farm and are regionally concentrated have been shown to be better able to organize and lobby for protection and fiscal program benefits than are smallholder farmers or those who produce low levels of output per farm. Urban consumers are numerous but difficult to organize, partly because their individual costs from distorted farm policies are small. Interest group models predict higher protection with rising per capita income as a consequence of declining numbers of farmers, associated lower organization costs, larger farm size, and more specialization in production (see Gardener 1987 for the United States, Bates 1987 for African countries, and Krueger 1996 for developing countries). Import sectors and sectors with inelastic demand have lower deadweight loss[3] and therefore receive more protection.

Collective action models explain the distortions of incentives against poor farmers, and their taxation by many other means over the course of history, in terms of the poor collective action potential of widely dispersed smallholder farmers. Binswanger and Deininger (1997) elaborate on the reasons for the differential collective action potential and degree of political articulation among groups involved in bargaining over agricultural and agrarian policies:

Low Potential for Collective Action by Smallholder Farmers

The agrarian structure leading to the greatest efficiency in production is one dominated by owner-operated family farms (Binswanger and Rosenzweig 1986). Paradoxically, these family farmers are highly unlikely to act collectively. The material conditions of agricultural production—spatial dispersion, seasonal work cycles, covariant risk, and the associate market imperfections under which family farmers operate—make it difficult for them to act collectively and to be aware of the implications of different policy options. The low collective action potential of poor peasants explains why many inefficient policy regimes persist. It also explains the striking inability of peasants to initiate revolts in the absence of a nonrural coalition partner, and to transform successful protests into lasting political change (Binswanger and Deininger 1997).

Members' human capital and financial endowments influence the ability of different groups to exert influence in favor of policies benefitting them. Greater educational endowments and access to information enable a group to more accurately assess the consequences and relative merits of different policies—for example, provision of fertilizer subsidies versus investments in rural roads—and, thus, makes them better equipped to push for policies of benefit to its members.

With development, however, many of the factors that inhibit organization on the part of smallholder farmers decline. Better roads and communication—especially the cell phone and the Internet—reduce the disadvantage of spatial dispersion; greater integration into markets for goods and labor reduce the impacts of covariant risks; and public education and health services improve human

[3] Taxes and subsidies redistribute income between producers and consumers, but also lead to a net loss that does not accrue to anyone. This is the deadweight loss of policies that intervene in markets; it is measured in terms of losses in consumer or producer surplus.

capital. These factors suggest why smallholder farmer interests might become better represented with economic development, reducing discrimination against them.

High Potential for Collective Action by the Rural Elite

On the other hand, large farmer interest groups (and other elite rural interests) have very high collective action potential, as experience in both developed and developing countries demonstrates. Such groups have often been able to secure privileges and avoid taxation through channels that are closed to small, family operators, which explains specific policies favoring very large farms. For example, elite rural interest groups were often able to steer policies and programs intended to increase rural productivity into investment programs for large farms, thus perpetuating inequality and inefficiency.

Where urban groups implemented low food-price policies, programs to compensate farmers almost exclusively benefited the rural elite to the detriment of rural growth and poverty reduction. In the countries of the Organisation for Economic Co-operation and Development (OECD), when policies shifted in favor of farmers, the policies and policy instruments chosen provided disproportionate benefits to large farmers: trade distortions provided rents that were proportional to output, credit subsidies favored large-scale over smallholder landowners and owners over tenants, and reductions in tax rates only provided relief to those with high tax liabilities.

Good Potential for Collective Action by Urban Dwellers

Urban dwellers benefit from spatial concentration, the relative unimportance of weather risks, and freedom from seasonal work cycles. Formal urban workers in particular have the opportunity of using the organizational structures of their firms for collective action, and they also enjoy steady incomes that make them less vulnerable to risk. They have a strong economic interest in low food prices and are able to organize highly visible manifestations of discontent, such as strikes. Informal urban workers, by contrast, generally have few assets, little education, and small and unreliable incomes. Because they are concentrated spatially, however, it is easier for them to mobilize than it is for peasants.

Urban Commercial and Industrial Elite

The urban elite enjoy all the advantages of the rural elite but without the disadvantages of spatial dispersion and covariant risk. Members of elite bureaucracies also share these advantages and may further benefit from social ties arising from common class origins and educational experiences. Sometimes they are formally organized into administrative groups (such as the Indian Administrative Service), which further lowers their cost of organization. In addition, they have privileged access to information and to the State's enforcement apparatus, such as the police.

Collective action models explain the historical shift of incentives and public expenditures in favor of agriculture as per capita income rises in terms of the impact of development on the potential for public action by farmers. As people migrate to urban areas in search of better jobs, the number of farmers declines, so it becomes easier to organize them. Improvements in road infrastructure, transport, and communication also reduce the disadvantage of dispersed smallholder farmers in organizing themselves. Higher per capita incomes reduce the risks they face from participating in political action. Similarly, higher education makes them better able to understand the implications of policies and to articulate their demands. At the same time the reduced shares of consumer expenditures in urban budgets make urban dwellers less sensitive to changes in food prices, so they may lobby less for lower food prices. As the size of the urban economy increases relative to the rural economy, the urban elite become more powerful than the rural elite. As a consequence the capacity of the rural elite to benefit from rural taxation—historically their major source of income—is eroded.

Political Support Function Approach

Collective action or lobby group models are consistent with major historical trends, but they fail to account for some important regularities: they offer no explanation for why relative or absolute income losses would result in support of farmers. The export crop sector in developing countries is often dominated by fewer large farms that should have high collective action potential, yet in developing countries the sector was or still is heavily taxed. Argentina and Brazil were both dominated by large farms, with low population density, huge spatial dispersion, and large urban sectors, yet they followed radically different agricultural policies.

The main alternative model strategy is the political support function approach. Under this model, fully informed politicians and voters interact, and politicians provide resource transfers to their constituencies in return for political support. Depending on the policy used to effect it, the transfer can take many forms, such as changed prices of goods produced or consumed, or special programs for relevant sectors such as research. Support is specified as a function of the change in income due to the policy change, and as a function of the relative income of each of the groups. The combination of these two influences results in a transfer of resources from the rich to the poor, but does not lead to an egalitarian outcome. The models provide an explanation for the negative correlation between agricultural protection and farm income: a decline in relative farmer income (prior to the policy change) will induce political support maximizing politicians' incentives to compensate farmers in some other way. But such support raises the political weight of the taxed group in the politicians' objective function, preventing an egalitarian outcome. Relative incomes also provide an explanation for why agriculture received increasing support in high-income countries from the late-1950s until the late-1980s, while protection declined in the manufacturing sector. It explains why farm policies began to support agriculture in the United States in the great depression, as agricultural incomes dropped by 50 percent more compared with urban incomes. It also shows why governments protect agriculture when conditions turn against it, and even more so when the vested interests of farmers are larger. As in the Becker (1983) interest group model, discussed above, farm protection declines as the deadweight costs of the transfer rise: the higher the deadweight cost, the higher the tax required for a given transfer, and the higher the political opposition.

A number of models combine the features of lobby groups with active politicians maximizing an objective function in which the public interest also plays an important role. These provide analytical underpinnings for revealed preference models in which governments maximize a weighted sum of interest group welfare measures. A transformation function reflects the economic structure facing policymakers and constrains their choices. Under certain conditions one can infer the marginal rates of transformation of one welfare measure into another and simulate the effect of changes in economic structure on policy choices. Most of the empirical work with these models is for the high-income countries, however.

Most of these models assume that governments are efficient in achieving their policy goals, but they also tend to agree that governments often use inefficient instruments to achieve policy objectives, rather than *Pareto* improvements with compensation, such as free trade with compensation of the losers. The political support function model can easily be augmented to include uncertainty and asymmetric information to predict inefficient policy choice. The same thing applies to the game theoretic formulations of the collective action models.[4]

[4] A significant amount of literature has emerged that applies to high-income countries and argues that the inclusion of all transaction costs, including the costs of implementation, administration, enforcement, and compliance of the private sector, would make apparently inefficient policy instruments into efficient ones. There is also some tendency for policies to become more efficient over time, as in the European Union, but many inefficiencies remain, even after accounting for all transaction costs. De Gorter and Swinnen (2002) review a number of models for high-income countries that attempt to do account for

The emergence of the new datasets on protection used in Figures 1 to 3, together with improvements in theory are spawning new research to improve our understanding of the relationship between political institutions and protection, as reviewed by Swinnen (2010). Olper et al. (2009) found that transition from an autocratic to a democratic regime has a significant positive impact on protection, but the opposite change has no impact. Olper and Raimondi (2010) find that within democratic regimes agriculture is significantly more protected under a regime of proportional electoral rules rather than majority rules. Olper (2001, 2007) finds that on average right-wing governments are more protectionist of agriculture than are left-wing governments. This does not exhaust the new results already derived, and undoubtedly the new datasets will allow for even greater insights.

From Taxation to Protection

The two broad classes of models make similar predictions about this shift associated with rising per capita incomes, but for different reasons. Under the lobby group models the rise in protection is explained by the higher lobbying power of smaller groups of farmers relative to wealthier taxpayers at large, while in the political support function approach it is explained by the relative loss of income of the farm population with economic development. While predictions are similar, in order to influence policy it is necessary to have the right model, so resolution of the observational equivalence of many of the predictions is important.

The land reforms implemented in Japan, Taiwan, and Korea led to rapid growth in agricultural output and rural incomes. At the same time, rising urban productivity and incomes increased the opportunity cost of farming, encouraging workers to migrate from rural areas to cities. Reduced numbers and rising incomes increased the collective action potential of rural groups in general. Greater commercialization and specialization of farming increased the collective action potential of specific and narrowly focused commodity-based groups. Rural–urban migration reduced the number of farmers but did not diminish the political representation of rural areas because the voting rules were not adjusted to fully reflect changes in population distribution.

The broad trends in protection levels across regions are consistent with both modeling strategies: protection improved fastest in the fastest growing region, Asia, and slowest in the slowest growing region, Africa. And public expenditures for agriculture, while fairly high as shares of total agricultural expenditures and total agricultural output value, rose much faster in recent decades in Asia than in Africa. Latin America provides intermediate trends in all these variables.

The shift of OECD countries from taxing to protecting agriculture, which occurred during the second half of the 20th century, illustrates other elements that influence agricultural policies (as is discussed by Binswanger and Deininger 1997). At the conclusion of World War II, countries were left with a great number and variety of policies, programs, and organizational residues put in place to manage food and agricultural raw materials during the war. These could readily be put to different uses—such as agricultural protection and income support—which illustrates the impact of organizational residues on policymaking.

Binswanger and Deininger 1997 also noted the importance, in terms of policymaking, of the imperative of governments to ensure adequate national food supplies: the commodity price boom brought about by the Korean War strengthened the resolve of governments to maintain the security of national food supplies, further boosting the political power of farmers. The food shortages of the early

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transaction costs, concluding that reforms of existing political constraints—such as electoral rules, legislation governing political resource contribution, subsidization of information and organization costs of less influential groups, and so on—are needed to overcome credibility and time inconsistency problems of public decisionmaking.

1970s, and again of recent years, similarly spurred countries to adopt policies to ensure national food supplies. Many of the policies initiated during these years remain in place today.

In recent years, coordinated attempts to reduce the distortions of these farm policies in the OECD countries have led to adjustments to the Common Agricultural Policy of the European Union and the inclusion of agriculture in the framework of the World Trade Organization. As so often before, fiscal difficulties in OECD countries and rising competition among different interest groups for a portion of a constant or shrinking fiscal pie have forced governments to undertake these reforms. Knowledge and evolving ideas contributed to shaping the reforms, but not to initiating or accelerating them.

Explaining Patterns of Incentives in Africa

Bates and Block (2011) use the new long-term series of agricultural protection data to examine the political economy of agricultural trade policies in Sub-Saharan Africa. As discussed, African governments have discriminated against agricultural producers in general, and against producers of export agriculture in particular. While more moderate in recent years, these patterns of discrimination persist. They do so even though farmers comprise a political majority. Bates and Block (2011) explore the impact of three factors: institutions, regional inequality, and tax revenue generation. They find that, in the absence of electoral party competition, agricultural taxation increases with the rural population share, a finding that is in line with the models reviewed in this paper. The existence of party competition turns the lobbying disadvantage of the rural majority into a political advantage and reduces discrimination against the farm sector, a finding that is in line with the political support function approach. The authors also find that privileged cash-crop regions of countries are particular targets for taxation, which reduces their incentives to produce. This finding is also in line with the political support function approach because these regions have significantly higher incomes than other regions of the countries analyzed. However, if a country's leader comes from the region in question, the taxation is more moderate. In addition, governments of resource-rich countries, while continuing to tax export producers, reduce their taxation of food consumers. It is interesting to see that these countries use their higher incomes to favor the urban consumers rather than the more dispersed populations of farmers. This is in line with the earlier discussion of the relative bargaining potential of smallholders versus urban groups. All in all, the findings illustrate the applicability of the political economy models found in the literature in explaining agricultural trade policy in Africa.

Determinants of Public Expenditure Allocations

In terms of the broad regional patterns of public expenditures, the political support function model is consistent with the finding that—as shares of total public expenditures and of agricultural GDP indicate—Africa (and mainly the Anglophone countries) is doing quite well in relative terms, even though it has the lowest absolute expenditure levels, as well as low recent growth. The rural populations are still very large in Africa, representing a considerable voter population that politicians have to take into account.

Mogues and Petracco (2011) review the literature on the determinants of public expenditures and find that it contains much more on general expenditure allocation than on agricultural expenditure allocation. They (a) provide a description and theories of the budget process in an idealized and real world setting; (b) focus on the difference between budget allocation and budget implementation, and all the losses that can occur in between; (c) discuss the influence of bureaucrats stemming from their superior information and knowledge relative to politicians; and (d) cover the lobby group approach and the political support function approach discussed above. They also cover some special issues as enumerated below.

The Impact of Aid

The importance of aid varies widely and is very small in resource-rich or very large countries, such as China or India. Elsewhere it can be overwhelming, as in Afghanistan, Burundi, or Liberia. It is here that donor preferences could have a large impact on budget allocations. One way could be the impact of aid on the accountability of governments to its own citizens by reducing its incentive to generate its own revenues. Mogues and Petracco (2011) cite several studies that suggest a reduced accountability to citizens associated with foreign aid.

The influence of aid on expenditures is limited by fungibility of resources across sectors. The cross-country panel analysis in Feyzioglu, Swaroop and Zhu (1998) estimates a fungibility parameter for different sectors. The results show that agriculture is the only sector that is characterized by full fungibility—both considering total agricultural spending, as well as just agricultural capital spending. This suggests that in the long run, donor influence on agricultural expenditures is extremely limited because, under full fungibility, any change in donor expenditures is reflected in an opposite change in domestic expenditures to maintain overall expenditures in line with country preferences.

Nevertheless, Fan, Yu and Surkar (2008) suggest that conditionality associated with structural adjustment led to reductions in spending allocations to agriculture in countries in Africa, Asia, and Latin America. More recently, old conditionality has been transforming into more consensus-building conditionality, giving domestic preferences a greater role.

The Character of the Expenditures

The characteristics of expenditures affect the ease of attribution of impacts to the policymakers' actions. Such attribution is much easier for highly visible infrastructure investments rather than for efficiency-enhancing investments in agricultural extension or research. Under the political support function approach, these attributes would help explain the preference in national budgets for infrastructure investments relative to research investments. Correct attribution is made even more difficult if there are long time lags between the investments and impacts, such as in research. The problem is compounded by short tenures of politicians in office. This not only affects a politician's preferences for short-term investments, but also creates a commitment problem, as continued support to a particular investment may not be credible. Therefore more distortive subsidies may be preferred to efficiency-enhancing investments, such as agricultural research.

Economic and Political Governance

Corruption may enhance investment in large projects that give rise to more opportunities for corruption in the tender process. Capital intensive expenditures are preferred for the same reasons; however, such corruption also reduces the efficiency of the investments, as is common in large-scale irrigation schemes. The productivity of public investment is therefore compromised. Public agricultural research is less prone to rent seeking, as the benefits are not excludable and cannot be rationed and provided against a bribe payment. This explanation for a lower preference for research is not based on any of the models reviewed above, but is in line with the strong power of bureaucrats and politicians to influence public expenditures.

Beghin and Kherallah (1994) find that pluralistic government systems are associated with higher agricultural protection levels in a nonlinear fashion that is initially strongly positive, with further democratization dissipating protection to farmers. This finding is in line with Bates and Block's (2011) finding of better incentive policies, reviewed earlier. On the other hand, Swinnen et al. (2000) find that with an increase in a measure of political rights from low to medium, both protection and agricultural research spending actually decrease. A further improvement in political rights to even higher levels, however, has no additional effect on agricultural protection through subsidies, and leads to an increase in agricultural public good spending back to the levels of the lowest political rights regime.

Olper (2001) studies the impact on protection of the quality of bureaucracy of property rights measured via the International Country Risk Guide (ICRG) index. The results of his study suggest that as bureaucratic quality and rule of law improve from a low base, protection increases. This is explained by the fact that with improved bureaucratic quality and rule of law agricultural producers face a reduced transaction cost to undertaking activities to influence policy in favor of the agricultural sector. With even greater improvements in these institutions, however, there are no further gains in protection, as constraints on agricultural producer groups set in, through checks on their influence and increased competition from other interest groups).

Investment in Agricultural Research and Its Interaction with Incentive Policies

Despite the overwhelming evidence of high rates of return to agricultural research, significant underinvestment persists both in high-income and developing countries. "Explanations include imperfect information of governments, difficulties in overcoming the particular nature of the 'publicness' of research (transaction costs), free rider problems and spill-ins between countries (or states within a country). Others have claimed that underinvestment may be overstated because studies ignore deadweight costs of taxation, a country's trade position, terms of trade, the differences between intermediate and finished products, the effects on unemployment, private research effects, and the impact of public research on deadweight costs of commodity policies" (Swinnen et al. 2000, 112). While the first set of explanations involve economic inefficiencies, the rationalization for underinvestment in the second set of explanations reduces or eliminates these inefficiencies.

Using a political support function approach, de Gorter and Swinnen (1998) analyze the level of protection provided, as well as the investment in agricultural research, bringing the literature to a much higher level. Swinnen et al. (2000) test the model with a panel of country data from 37 high-income and developing economies. Commodity policies lead to deadweight losses, but other than that, there are no economic inefficiencies in the model, as the decisions on protection policies and research investments are optimal from the point of view of the politicians.

The model includes one agricultural and one industrial producer or producing sector, and a responsive politician who responds to the relative incomes in these two sectors. Developing countries are assumed to have an elastic demand for food and a relative inelastic supply, which means that benefits from research accrue primarily to agriculture. The political decisionmaker compensates the industrial sector by taxing agriculture. Since such taxation has a deadweight loss, the optimal amount of research decreases as a result. In high-income countries, demand for food is inelastic and the supply more elastic than in the developing countries. As a result, the agricultural treadmill operates, and the bulk of research benefits accrue to industry. Protection measures are used to compensate agriculture for the associated income loss. The deadweight loss of these policies again implies that optimal research investment is less than in the absence of these deadweight losses. If the structure of demand and supply were such that the agricultural and industrial sectors benefitted equally from research, no compensation policies would be needed, the deadweight loss would be zero, and the investment in agricultural research would be at the socially optimal level.

If, prior to the interlinked policy choices, there is a difference in endowment incomes in the sectors, these will provide additional impetus for compensation via commodity policies or for additional research if the research benefits are captured by the sector with relatively lower initial incomes. Conversely, if the sector that benefits from more research has higher relative initial incomes, research expenditures will be lower. The intuition behind this result is that when the research benefits are unequally distributed, and when income distribution via commodity policy have deadweight losses, the politicians will also use agricultural research for redistributive purposes. This gives rise to a complex interplay of relative incomes, the distribution of benefits from research, commodity policies, and

research investments, and therefore the responses of investments in research and protection to structural variables are likely to be nonlinear.

The model is implemented by Swinnen et al. (2000) with a panel of data from 37 countries from 1972 to 1985. Per capita GDP in 1985 dollars was chosen to determine the share of research benefits going to agriculture, which is an imperfect measure because it may reflect other variables. Pre policy endowment incomes were value-added in the sectors adjusted for protection induced incomes, measured by net protection. Agricultural land per person was included as a proxy for true agricultural endowment income. Other structural characteristics included the agricultural labor force; the share of agriculture in GDP, which figured prominently in the empirical literature as proxies for lobbying power; and agricultural exports in real terms, which is a proxy for the deadweight cost of protection policies and is therefore expected to have a negative value for protection policies and research. A measure of political liberties was included, as well as regional dummy variables. Protection was measured by average net protection and jointly estimated with research investment via full information maximum likelihood estimation. The signs of the key variables are in line with the predictions from the model. The following findings are of particular note.

- Agricultural protection is used to offset lower endowment incomes in agriculture.
- Growth in per capita income, as a proxy for an increasing share of research benefits going to industry, leads to higher protection of agriculture, in a nonlinear fashion.
- Greater agricultural exports, as a proxy of deadweight loss for protection associated with the high-income elasticities of exports, leads to lower protection.
- A large agricultural labor force, as a proxy for greater organizational costs with more farmers, leads to less protection.
- A higher agricultural share in GDP leads to more protection, reflecting the positive impact of the size of the vested interest.
- In low-income countries, as expected, research expenditures first respond positively to increases in GDP, agricultural endowment incomes, land per capita, and the agricultural labor force, but the impact on research expenditures of further increases in these variables in high-income countries becomes negative.
- As previously discussed, Swinnen et al. (2000) find that, with an increase of political rights from low to medium, both protection and agricultural research spending actually decrease, but the effect disappears at even higher levels of political rights. Higher political rights, however, return agricultural public good spending to the levels seen under the lowest political rights regime.

The Impact of Inequality and External Shocks

The literature reviewed by Binswanger and Deininger (2007) indicates that in environments characterized by imperfections in inter-temporal markets, income inequality may help perpetuate poverty and dualistic development. Credit rationing, imperfect insurance and land markets, and the lumpiness (that is, indivisibility) of investments prevalent in rural areas limit the ability of poor people to acquire land, draft animals, machinery, and other equipment required to operate even small farms. The same conditions often force poor people to liquidate stocks of productive capital in times of distress.

Income inequality may also increase the likelihood that governments will adopt policies and programs that reduce efficiency. There are three main reasons for this. Inequality reduces poor people's direct participation and increases the impact of credit constraints on their ability to participate. Inequality may hinder the establishment of independent and impartial institutions and the enforcement of binding rules. Inequality makes it easier for the wealthy to hold out in political bargaining, either

directly of via capital flight (that is, withdrawal of investments). It therefore makes it more difficult for societies to respond quickly and optimally to external shocks rather than via the adoption of growth-reducing policies.

External Shocks, the Fiscal Position of the State, and Policy Change

The historical and institutional economics literature clearly shows how a State's fiscal crisis—often triggered or aggravated by some external shock—frequently brings about lasting changes in policies and institutions. Under certain conditions, fiscal crisis forces the State to devolve some of its power to independent institutions in exchange for financial assistance to meet its immediate needs. This may give rise to independent legal, political, and economic institutions that subsequently have positive impacts on policy choices and growth.

External shocks, such as changes in terms of trade, can have widely varied impacts depending on the material and political environment, and on the State's fiscal position. In the event of negative exogenous shocks (for example, an external or climate shock), the State may attempt to compensate influential coalition partners. If the State has sufficient cash reserves or access to credit, it is able to assist such partners through the use temporary and relatively nondistortionary transfers from fiscal resources or borrowing. If, on the other hand, the government is in financial difficulty, it may provide compensation by introducing distortions that have no fiscal cost, such as allocation of large tracts of frontier land or a restriction on competition favoring coalition members. Nonmembers of the coalition would pay the costs of the compensation. Positive external shocks can also have negative consequences. If a government has difficulty stabilizing the inflows, income inequality is likely to rise, which may increase the country's economic and political vulnerability to negative shocks.

Finally, under certain conditions, the political and economic reforms brought about in response to fiscal crisis may not be stable. Policy reversals are most likely when the State has insufficient means of financing growth-enhancing public goods, social safety nets, and transfers to politically articulated groups to reinforce the support for reform. Paradoxically, therefore, fiscal crisis—the main initiator of reform—may also hold the seeds for failure to sustain reforms. Rapid restoration of fiscal balance following the fiscal crisis, and the renewed access to foreign credit markets, are therefore likely to be key to producing lasting reform.

Summary of Factors Influencing Protection and Public Expenditure

The following factors have been shown theoretically and/or empirically to significantly influence protection and/or public expenditures in favor of farmers (+) or against them (–):

Economic Factors

- Increasing GDP (+), tapering off at high levels
- High land per capita and large rural labor force (+), tapering off
- High relative incomes (for example, privileged cash crop regions (–), or urban rural income differential (+) or negative income shocks (+)
- High deadweight loss of policies associated with high-income elasticities, such as for exports (–)
- Negative external shocks and a poor fiscal position (–/+)

Political and Institutional Factors

- Collective action potential and information of farmers and other societal groups (+)
- Rural population or number of farmers reduces collective action potential (–)
- Inequality (–), via several channels

- Political institutions: democracy and pluralism (+ initially, then tapering off; or – initially, then recovering), and electoral party competition in Africa (+)
- Bureaucratic quality and rule of law: (+), tapering off
- Right-wing governments (+)
- Regional origin of presidents (+)

Other Factors

- Organizational residues that can be put to new protectionist uses (+)
- Food shortages (+)
- Aid (+), sharply limited by fungibility of public expenditures
- Character of public expenditure: lumpiness, short-time horizon (+), works against research

4. PUBLIC AGRICULTURAL AND RESEARCH EXPENDITURES IN AFRICA

The purpose of this section is to take a closer look at public and agricultural research expenditures in the context of accelerating economic growth in Africa. This will also provide an opportunity to isolate further examples of some of the effects summarized in the previous section. This discussion also positions the data on agricultural research expenditures developed by Beintema and Stads (2011) within the broader context of total agricultural public expenditures.

The Data and Countries

The data used here were drawn from several sources, including the Statistics on Public Expenditure for Economic Development (SPEED) database (IFPRI 2011) for information on public agricultural and total expenditures; the Credit Reporting System (CRS) database (OECD 2011) for information on official development assistance (ODA); the Agricultural Science and Technology Indicators (ASTI) database (ASTI 2011) for information on agricultural research and development expenditures; the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) monitoring and evaluation database (ReSAKSS 2010) for information on the share of agricultural expenditures in total expenditures; and the World Bank's World Development Indicators (WDI) (World Bank 2011) for information on GDP. Using these data, values were calculated for different indicators associated with public expenditures and public research expenditures in the agriculture sector, then trends (levels and changes) in the values of the indicators were analyzed across indicators, time, and space. For agricultural research and development (R&D) spending in particular, trends were assessed over four- to five-year subperiods to more accurately reflect the duration of most governments' planning and program implementation horizons.

Agricultural research and public expenditure data were jointly available for only a subset of African countries (that is, 11 mostly Anglophone countries from Sub-Saharan Africa and 3 from North Africa). The sample significantly overlaps the sample of African countries included in the public expenditure analysis by Mogues et al. (2011) and includes five of the "big eight" spenders on agricultural research (Ghana, Ethiopia, Kenya, Nigeria and Uganda) analyzed in Beintema and Stads (2011). Nevertheless, for some indicators the discussion draws from a broader sample of countries.

As shown in Table 2, the countries included differ in many of the other variables that were shown to be influential in the political economy of agricultural policies and expenditures, including the size of the agriculture sector, and having alternative or nonagricultural sources of growth. For example, the countries differ significantly in terms of the relative size of their agricultural economies, ranging from 0.1 percent of Africa's total agricultural value-added in Botswana, Lesotho, and Swaziland to 16.1 percent in Egypt, and 22.4 percent in Nigeria. Together, however, the 14 countries account for 60.4 percent of Africa's total agriculture GDP, but because of the small number of countries it was not

possible to undertake an analysis of the different compositions of aggregations of countries. Of the 14 African countries in the sample, 9 are middle-income or lower middle-income countries, while five are low-income countries. The sample is therefore skewed in favor of Africa's better-off countries.

Table 2. Classification of sample countries

Country	Location by subregion	Share of Africa's total agricultural GDP (%)	Significant nonagricultural sources of growth	Status
Botswana	Eastern	0.1	Yes (diamond)	Middle-income
Egypt	Northern	16.1	Yes (oil)	Middle-income
Ethiopia	Eastern	3.9	No	Low-income
Ghana	Western	2.1	Yes (gold, oil)	Middle-income
Kenya	Eastern	3.9	No	Low-income
Lesotho	Southern	0.1	No	Middle-income
Malawi	Southern	0.6	No	Low-income
Mauritius	Eastern	0.3	No	Middle-income
Morocco	Northern	6.3	Yes (phosphate)	Middle-income
Nigeria	Western	22.4	Yes (oil)	Middle-income
Swaziland	Southern	0.1	Yes (coal, stone)	Middle-income
Tunisia	Northern	2.0	Yes (several minerals)	Middle-income
Uganda	Eastern	1.9	No	Low-income
Zambia	Southern	0.6	Yes (copper, others)	Low-income

Sources: Data on location by subregion are from AU 2011; data on the share of Africa's agricultural GDP are based on the annual average share in 2000–08 (World Bank 2011); income status is based on World Bank classifications (World Bank 2011).
Notes: For data on sources of growth, "yes" means rich in minerals (Mining INDABA 2012); the category "middle-income" includes countries classified as both lower middle-income and upper middle-income.

The Findings

Agricultural Expenditures

For the restricted sample, the annual average public expenditures for agriculture between 2003 and 2007 ranged from 2005 PPP$54.5 million in Lesotho to 2005 PPP$3.8 billion in Egypt (Table 3). In line with the trends already discussed, the absolute levels of agricultural spending in Africa (also measured in 2005 PPP dollars) increased substantially, particularly from 2003; eight of the African countries showed an increase, and for six of them, the level was more than 10 percent per year. On the other hand, in Botswana, Egypt, Morocco, and Tunisia, spending on agriculture declined, which is of concern given that, with the exception of Botswana, agriculture continues to play a significant role in these economies.[5]

A review of the data provided in Mogues et al. (2011) for a slightly smaller sample of African countries showed that, between 1991 and 2007 among developing-country groups, both public agricultural and total expenditures per capita were the lowest in SSA; in terms of the share of agriculture in public expenditures and the value of agricultural output, however, SSA was doing slightly better than the average of all developing and transition countries.

Most of the African countries considered in Table 3 spent between 5 and 10 percent on average per year, but several small, mineral-rich countries spent much more—ranging from 14.8 percent in

[5] Between 2003 and 2007, the annual average contribution of agriculture to GDP was 15, 16, and 11 percent in Egypt, Morocco, and Tunisia, respectively, compared with 17 percent for the SSA sample as a whole. These levels were slightly down from the average values observed in earlier years (18, 17, 14, and 18 for Egypt, Morocco, Tunisia, and SSA, respectively).

Mauritius to 59 percent in Botswana, which is not only small but has a tiny agriculture sector compared with its diamond sector. By comparison, China spent 11.5 percent of its agricultural output as agricultural expenditures, while the corresponding percentage for India was only 4.9 percent and for Brazil 1.9 percent.

Table 3. Annual average agricultural expenditure and official development assistance

	Agricultural expenditure					
	Million 2005 PPP$	Annual average growth rate (%)		Share of total expenditure (%)	Share of agricultural GDP (%)	Agricultural ODA as a share of total ODA (%)
	2003–07	1980–2007	2003–2007	2003–07	2003–07	2007–09
Botswana	252.7	3.4	–2.1	3.19	59.0	1.3[c]
Egypt	3,765.8	2.1	–6.9	4.20	7.1	11.1
Ethiopia	1,451.4	6.5	26.1	14.09	6.9	8.5
Ghana	859.6	11.5	29.9	8.59	8.9	8.6
Kenya	544.4	0.7	11.5	5.22	4.6	6.5
Lesotho	54.6	–0.6[a]	4.6	4.22	26.4	na
Malawi	172.9	–0.2	31.3	9.76	8.8	8.9
Mauritius	94.1	6.0[b]	6.0[b]	3.12	14.8	18.6[c]
Morocco	848.2	–0.1	–2.0	2.62	5.2	5.0[c]
Nigeria	929.4	–1.3	19.2	3.38	1.1	5.1
Swaziland	90.4	23.3[a]	26.0	4.54	26.7	26.4[c]
Tunisia	1,234.3	0.1	–6.1	7.42	15.9	5.1[c]
Uganda	134.0	3.0	11.0	2.48	2.1	8.7
Zambia	170.7	–6.4	28.1	5.28	6.2	5.1
Brazil	1,213.4	58.41	50.5	2.14	1.5	na
China	75,075.6	7.37	12.0	7.45	11.5	na
India	19,243.5	4.18	6.2	4.86	4.9	na

Source: Calculated by authors based on IFPRI (2011), OECD (2011), ReSAKSS (2010), and World Bank (2011).
Notes: Na indicates that data were not available; ODA indicates official development assistance.
a. Data are for 2002–07.
b. Data are for 2004–07.
c. Data are for 2006–08.

In relative terms, the picture of growth in agricultural spending looks a bit less favorable than in absolute terms. In recent years, as percent of agricultural GDP, Benin et al. (2010) shows that nearly half of all African countries reduced their spending on the sector between 2003 and 2009, reflecting a relative decline in agriculture's share of total expenditure. A relative decline in agricultural spending may not be strategic when a large share of the population still depends partially or fully on agriculture, rural poverty has increased in absolute numbers, and poverty has been increasing in absolute numbers.[6] Nevertheless, such a decline in relative spending could be consistent with the lobby group model and with the poor collective action potential of widely dispersed farmers. However, it is consistent neither with the political support function approach, under which the large rural population should have a strong political voice, nor with Africa's accelerating economic growth.

Also relevant for agriculture is that African governments have also devoted a low share of spending to infrastructure—particularly to transportation and communication—which gradually declined from 6.3 percent in 1980 to 3.7 percent in 2005 (Fan, Mogues, and Benin 2009). This pattern is discouraging because investments in transportation and telecommunications, especially road

[6] Africa as a whole has experienced a slow decline in its rural population share, from an average rate of 47.0 percent in 1990–95, to 46.5 percent in 1995–2003, and 44.3 percent in 2003–09; the absolute number of people living in poverty has increased because population growth has outpaced poverty reduction rates (Benin et al. 2010).

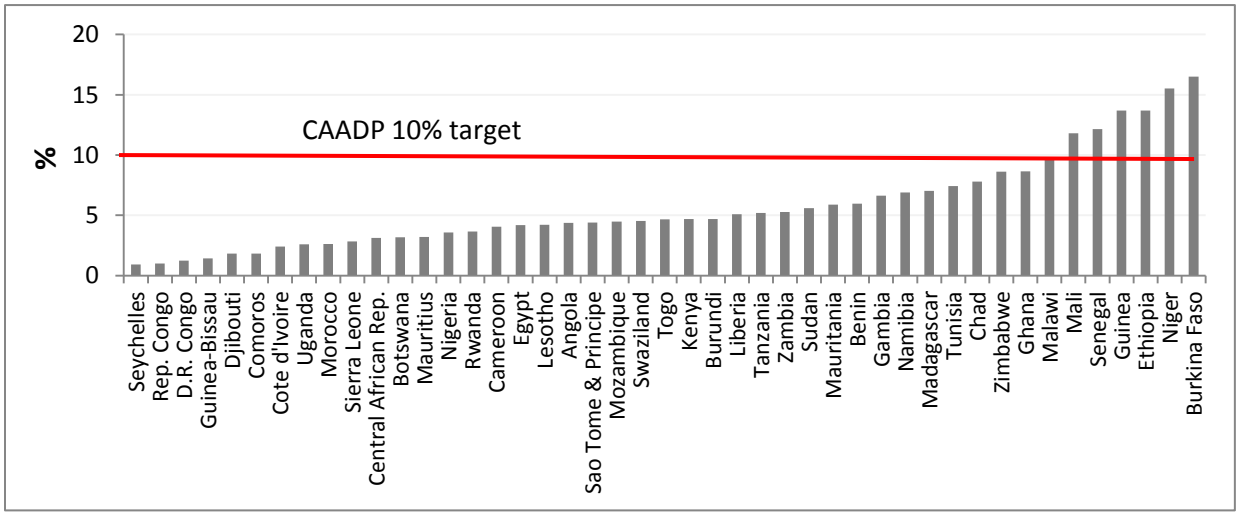
development, contribute strongly to growth and poverty reduction, yet road and infrastructure development remains poor in Africa. It is also inconsistent with a preference of politicians for highly visible infrastructure.

Agricultural Spending Relative to the CAADP Goal

The rapid increase in the absolute level of agricultural expenditures since 2003 is consistent with the African Union's resolve to designate agriculture-led growth as a main strategy to achieve the Millennium Development Goal (MDG) of halving the proportion of poor and hungry people. In 2003, under the Comprehensive Africa Agriculture Development Programme (CAADP), African heads of State pledged to increase the proportion of their annual national budget expenditures on the sector to about 10 percent (NEPAD 2003). This is a highly ambitious target because the average for low-income countries as a whole is only 4.2 percent (Table 1). Data for a much broader range of African countries show their progress in meeting this target between 2003 and 2009 (Figure 6). Such a high target is justified by the large size of the agriculture sector in African economies, its poor past growth performance, and the large rural populations who primarily depend on agriculture.

Only a few African countries—Burkina Faso, Ethiopia, Guinea, Mali, Niger, and Senegal—have surpassed CAADP's 10 percent threshold, although Ghana and Malawi have come close. Most other African countries, including the ones featured in this chapter, spent 3–6 percent of their total national budgets on agriculture. The corresponding numbers for Brazil, China, and India are 2.1, 7.5, and 4.9 percent, respectively, with China the clear frontrunner. Countries in Asia have recently reduced their commitments to agriculture in relative, not absolute terms, which may be largely due to the rapid economic and overall growth in public expenditure.

Figure 6. Annual average public agricultural expenditures as a percentage of total public expenditures in Africa, 2003–09



Source: ReSAKSS (2010).

Sources of Agricultural Expenditure

To a substantial extent, funding for agricultural expenditure in Africa is provided by development partners. In the 1980s and early 1990s, total ODA to agriculture trended downward in response to structural adjustment programs that favored industrial sectors. This declining trend was maintained until the end of the 1990s. Interestingly, even though total ODA increased, disbursements to agriculture declined by nearly 50 percent (Beye 2002). The start of the new millennium saw a trend reversal consistent with the recent commitments made by the donor community to increase aid to Africa and

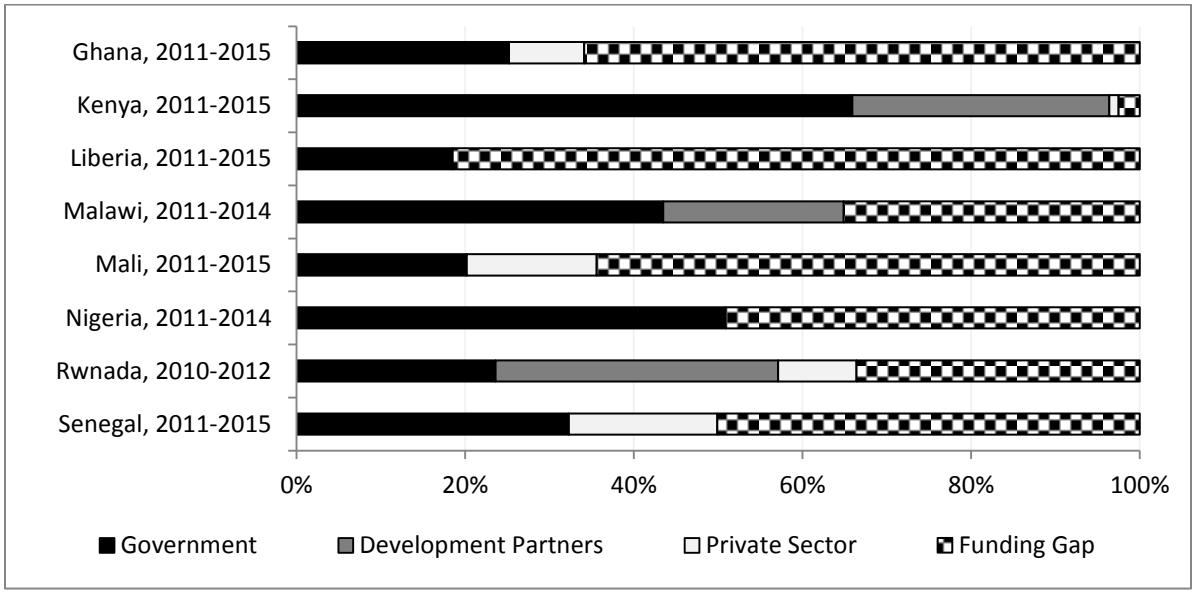
the agriculture sector. For Africa as a whole, annual average ODA per capita increased from $38.23 in 1995–2003 to $48.70 in 2003–09 (in 2009 constant prices), with an annual average of 4.1 percent being spent on the agriculture sector (authors' calculation based on OECD 2011). West African countries have shown high donor dependence on agriculture in recent years (Table 4). The national share of total expenditures ranges from a low of 2 percent in Niger to a moderate 16 and 23 percent in Burkina Faso and Mali, respectively, to a high of 67 percent in Ghana, the only country in the list with a significant commitment of domestic funding to agriculture. This donor dependency is unlikely to change in the near future. Of a sample of countries that have advanced in the CAADP process (including many of those listed in Table 4), only the Kenyan and Nigerian governments are expecting to finance over half of their total budgets, at 66 and 51 percent, respectively (Figure 7). Despite the expected ongoing dependency on external funding sources for agriculture, the upside is that, if these plans and budgets are implemented, many countries will raise the share of their total budgets allocated to the sector (for example, Uganda has allocated 5.1 percent per year for the 2011–15 period compared with 2.5 percent during 2003–07). In addition, certain countries are budgeted to outperform the 10 percent CAADP target (for example, Malawi has allocated 13.7 percent per year during 2011–14 compared with 9.8 percent in 2003–07), and others will just meet the target (Ghana, for example, has allocated 10.0 percent per year during 2011–15 compared with 8.6 percent in 2003–07). (See Benin et al. 2010 for the projected future budgets.)

Table 4. Share of domestic funding of agriculture expenditure in West Africa, and share of capital expenditures, 2003–07

	Share of domestic funding in total government agricultural expenditure (%)	Share of capital expenditure in total government agricultural expenditure
Benin	48.0	61.8
Burkina Faso	16.0	90.9
Cote d'Ivoire	56.8	27.2
Ghana	66.7	41.8
Mali	23.4	76.0
Niger	2.2	90.4
Nigeria	—	66.0
Senegal	49.8	71.0
Togo	42.3	20.1

Source: Calculated by authors based on ReSAKSS (2010).

Figure 7. National agricultural investment plans under CAADP: Funding sources and gaps



Source: Benin et al. (2010).
Notes: CAADP indicates the Comprehensive Africa Agriculture Development Programme.

It is discouraging that donor dependence is not expected to change significantly in the near future for the highly donor-dependent countries. Indeed, in many countries the gap between planned budgets and identified funding sources—the funding gap—is quite large (50 percent or more for Ghana, Liberia, Mali, Nigeria, and Senegal). With the exception of Kenya, these gaps are driven mostly by ambitious hopes and donor funding projections. Based on historical trends and the current budget problems in donor countries, these commitments are unlikely to materialize. From 2006 to 2009 for example, Africa received 69 percent of the total ODA commitments made; agriculture's performance was lower, at 64 percent (authors' calculation based on OECD 2011).

The cases of Niger, Burkina Faso, and Mali, where domestic financing covers only 2.2, 16.0, and 23.4 percent of total agricultural expenditure, respectively (Table 4), is particularly troubling, although Niger has received much higher disbursements of ODA as a percentage of commitments made, at about 81 percent on average from 2006 to 2009 (OECD 2011). This raises questions about the sustainability of the government to support the development of the sector in the event of a substantial reduction in donor funds, as was evident in Niger in 2009 when ODA disbursements as a percentage of commitments was only 39 percent. Such high donor dependence also suggests that the generous donor funding has crowded out domestic funding over time, which is in line with the high fungibility of donor funding and domestic funding previously discussed.

Although total aid to developing countries grew by about 5 percent per year, from US$7 billion in 1980 to US$27 billion in 2006 (in 2005 constant prices), the amounts spent on agriculture declined from 20 percent in 1980 to 15 percent in 1990 and to a paltry 4 percent in 2006 (Fan et al. 2009). In 2007–09, for example, most of the African countries featured in this analysis spent 5–8 percent of their aid budgets on agriculture (Table 4). Of all aid received, Egypt, Mauritius, and Swaziland spent much more on agriculture—11.1, 18.6 and 26.4 percent, respectively—whereas Botswana spent less than 2 percent.

How the agricultural budget is spent is also important. The bulk of agricultural expenditures in many West African countries was allocated to capital investments (Table 4). Burkina Faso and Niger invested over 90 percent of the budgets in capital improvements. These percentages—which compare

those reported for other countries (for example, 85 percent in Mozambique reported in Zavale et al. 2011)—seem high compared with other African countries (for example, 20 percent in Zambia reported in Akroyd and Smith 2007 and 32 percent in Uganda reported in OPM 2007). The high percentages may just reflect the high share of donor funding in total expenditures, since donor projects are usually classified as investment expenditures. The distinction between recurrent and development budgets has not always been clear-cut, and much of what is classified as development or investment expenditure equates to donor-funded activities that includes hidden recurrent funds (Akroyd and Smith 2007).

Spending on Agricultural R&D

Absolute levels of public agricultural R&D spending vary considerably across the African countries considered here (Table 5). Over the entire 1981–2008 period, Morocco and Nigeria invested in excess of 2005 PPP$100 million per year in agricultural R&D on average, whereas the others spent considerably less. With the exception of Malawi and Zambia—which recorded significant declining trends in research spending over the entire 1981–2008 period—spending on agricultural R&D increased over time, averaging 4–6 percent growth per year in many cases, but with considerable variation within subperiods (Table 6). For example, while Ghana and Uganda showed consistent growth in research spending, and further acceleration within the more recent subperiods, Nigeria experienced growth spurts in 1996–2001 and 2006–08, but declining investments between these periods. On the other hand, Botswana, Ethiopia, Kenya, and Mauritius experienced acceleration in agricultural R&D spending until 1996–2000, after which there was stagnation or deceleration. The trends for Malawi and Zambia are quite concerning, although in Zambia the declining trend slowed down in 2001–05, then spending climbed moderately in 2006–08, and hopefully has been sustained since. The declining trend in Malawi, particularly in more recent years, may have been exacerbated by the sharp expansion of agricultural subsidies at a time of budget scarcity, ultimately crowding out research expenditures. In 2007 the government spent about 6.5 percent of its total budgetary resources (about 50 percent of the agricultural budget expenditure) on subsidizing fertilizer packs to allow low-income farmers to purchase 50-kg sacks of fertilizer at Kw 950 rather than the market price of Kw 4,500 (Nolen 2007). In Zambia, too, subsidies have increased sharply: nearly 40 percent of the resources earmarked for the agriculture sector have been spent on the Fertilizer Support Program and the operations of the Food Reserve Agency, both of which directly support the maize subsector (Govereh et al. 2006).

Table 5. Average annual public expenditure on agricultural R&D 1981–85 to 2006–08 (million 2005 PPP$)

Country	1981–85	1986–90	1991–95	1996–2000	2001–05	2006–08
Botswana	9.68	9.84	11.76	15.64	18.86	23.23
Ethiopia	15.84	37.74	29.88	42.80	90.96	77.02
Ghana	14.01	36.29	34.17	39.27	48.62	78.68
Kenya	92.29	114.21	165.36	139.41	134.01	169.70
Malawi	31.82	38.16	30.37	29.75	26.92	22.98
Mauritius	11.94	12.00	15.05	21.31	28.72	22.59
Morocco	117.98	113.54	108.52	90.66	118.45	na
Nigeria	177.28	112.76	109.52	140.80	280.29	336.31
Tunisia	na	na	na	45.00	56.75	na
Uganda	na	na	22.47	34.77	61.81	78.53
Zambia	30.31	27.36	20.96	20.72	9.01	8.37
Brazil	1,007.28	1,162.55	1,349.99	1,309.72	1,233.97	1,349.23
China	na	na	1,390.96	1,600.31	2,290.65	3,011.96
India	na	na	na	1,226.45	1,508.53	1,896.43

Source: Calculated by authors based on ASTI (2011).
Notes: Na indicates that data were not available. The exact data ranges are 1981–2001 for Malawi, 1981–2002 for Morocco, 1996–2002 for Tunisia, 1995–2008 for Uganda, 1981–2006 for Brazil, 1991–2007 for China, and 1981–2003 for India.

Table 6. Average annual growth in public agricultural R&D expenditures (%)

Country	1981–86	1986–91	1991–96	1996–2001	2001–06	2006–09	1981–2008
Botswana	0.37	1.77	3.63	12.35	4.66	–14.46	4.54
Ethiopia	6.32	0.38	10.88	16.55	–4.18	-8.42	5.15
Ghana	18.40	0.46	1.59	2.67	10.19	20.57	4.07
Kenya	0.63	7.11	6.60	1.88	0.70	0.74	2.35
Malawi	–0.01	–1.10	–2.62	2.41	na	Na	0.40
Mauritius	4.61	1.28	5.04	7.64	–2.89	–3.08	3.68
Morocco	5.50	–0.33	–8.46	6.07	na	Na	–0.88
Nigeria	–12.44	1.80	–6.27	24.88	–1.15	17.72	0.97
Tunisia	na	na	na	5.11	na	Na	5.11
Uganda	–3.99	–1.95	4.96	4.39	11.09	12.45	10.48
Zambia	–1.22	3.67	–3.45	–19.43	–6.40	3.13	–4.12
Brazil	–0.31	4.90	1.19	–2.82	0.73	4.92	0.96
China	8.90	3.73	5.31	5.58	4.34	16.64	5.50
India	na	na	na	10.62	4.17	10.02	6.89

Source: Calculated by authors based on ASTI (2011).
Notes: Na indicates that data were not available. The exact data ranges are 1981–2001 for Malawi, 1981–2002 for Morocco, 1996–2002 for Tunisia, 1995–2008 for Uganda, 1981–2006 for Brazil, 1991–2007 for China, and 1981–2003 for India.

NEPAD's national R&D investment target is 1 percent of agricultural GDP. In each subperiod, Botswana, Kenya, and Mauritius consistently spent more than 1 percent on agricultural R&D (Table 7). Malawi, Morocco, and Zambia, which surpassed the target in the earlier years, fell short in later years. Ethiopia, Ghana, and Nigeria consistently spent less than the target, although the intensity of spending in Ghana has risen over the years, reaching an average of 0.8 in 2006–08.

Table 7. Public agricultural R&D expenditure as a percentage of Agricultural GDP (%)

Country	1981–85	1986–90	1991–95	1996–2000	2001–05	2006–08
Botswana	2.5	2.4	2.5	3.5	4.7	5.3
Ethiopia	0.1	0.3	0.2	0.3	0.5	0.3
Ghana	0.3	0.6	0.5	0.6	0.6	0.8
Kenya	1.3	1.4	1.8	1.3	1.2	1.4
Malawi	1.8	1.7	1.4	1.2	1.0	Na
Mauritius	2.2	1.7	2.1	3.0	4.3	3.8
Morocco	1.6	1.1	0.9	0.7	0.3	Na
Nigeria	0.3	0.1	0.1	0.1	0.3	0.4
Tunisia	na	na	na	0.7	0.9	Na
Uganda	na	na	0.4	0.6	1.1	1.1
Zambia	2.4	1.8	1.1	1.1	0.4	0.3
Brazil	1.2	1.2	1.8	2.1	1.5	1.6
China	0.4	0.3	0.4	0.3	0.4	0.6
India	na	na	na	0.3	0.4	0.4

Source: Calculated by authors based on ASTI (2011).
Notes: Na indicates that data were not available. The exact data ranges are 1981–2001 for Malawi, 1981–2002 for Morocco, 1996–2002 for Tunisia, 1995–2008 for Uganda, 1981–2006 for Brazil, 1991–2007 for China, and 1981–2003 for India.

Agricultural R&D spending as a percentage of total pubic agricultural expenditures reflects the commitment of the government toward research within its committed budget expenditure on the entire sector. Table 8 shows that the commitment varies considerably across countries. For example, although Kenya, Nigeria, and Uganda each spent less than 5 percent of total public expenditures on the entire sector (Table 3), they favored agricultural R&D, which accounted for more than a quarter of the agricultural expenditures in different subperiods (Table 8). Over time, Kenya and Uganda were the most consistent spenders on agricultural research. Ghana significantly increased its research expenditure share in the second half of the 1980s, at a time when the total budget for agriculture stagnated. Nigeria increased its research expenditure share sharply between the late-1980s and the early 1990s, and then remained committed to research. In Ethiopia, the share of R&D was rather volatile, declining from 10.3 to 4.0 percent between the first and second half of the 2000s, perhaps because of loss of World Bank support to research. Malawi experienced a similar collapse, probably resulting from a combination of the end of World Bank research support and crowding out by the fertilizer subsidy. In Zambia, support to research from the World Bank ended before 2000, again leading to a collapse of the research share in public expenditures. Both high donor support and subsidy expenditures may therefore be a significant threat to the stability of research spending.

Table 8. Agricultural R&D expenditure as a share of agricultural expenditure (%)

Country	1981–85	1986–90	1991–95	1996–2000	2001–05	2006–08
Botswana	7.9	4.3	5.5	5.3	6.9	8.8
Ethiopia	5.8	9.2	7.8	6.3	10.3	4.0
Ghana	16.9	50.5	10.3	5.9	8.7	6.7
Kenya	21.2	19.4	36.0	32.2	26.7	28.1
Malawi	17.4	18.4	13.9	9.0	13.5	Na
Mauritius	na	na	na	Na	28.0	19.8
Morocco	13.8	13.7	11.7	10.7	13.8	Na
Nigeria	16.3	9.1	31.3	36.8	25.7	30.2
Tunisia	na	na	na	4.7	4.4	Na
Uganda	na	na	54.1	71.2	54.6	46.4
Zambia	6.6	8.1	31.8	21.6	7.9	4.5

Sources: Calculated by authors based on ReSAKSS (2010), ASTI (2011), and IFPRI (2011).

Although the absolute levels spent on agricultural R&D in the African countries were much lower than those spent in Brazil, China, and India (Table 5), expenditure growth (Table 6) and spending intensity levels (that is, agricultural R&D spending as a percentage of agricultural GDP, Table 7) were similar in many of the African countries, some of which even outperformed Brazil, China, and India. For example, Ghana and Uganda experienced higher growth rates albeit from low spending bases, while Botswana and Mauritius had higher spending intensities. Brazil made a huge commitment to agricultural R&D in the 1970s and the second half of the 1980s, but decline and stagnation followed. China's spending intensity, at 0.4–0.6 percent, seems low (Table 7). China's agriculture expenditure budget for 2003 and 2004 indicates that only 1 percent was spent on promoting science and technology; the bulk went to rural production (69 percent), capital construction (27 percent), and rural relief (4 percent) (NBS China 2005). But these data are puzzling because China's growth in research expenditures has exceeded its agricultural growth rate since 1966.

The Impact of Economic Growth

To put the changes in agricultural and agricultural research spending into the context of economic growth, trends in economic growth and in agricultural and agricultural research expenditures are summarized in the last three columns of Table 9. Of the 11 African countries that experienced an acceleration of economic growth in the 2003–07 period, agricultural expenditures rose in 7. Of these 11 countries, data on the acceleration of research investment was available for only 8, and of these 8 countries, 7 also showed acceleration in research investment. In China, accelerating economic growth was accompanied by accelerating agricultural expenditure growth and agricultural research expenditure growth, while in India only agricultural expenditures, not agricultural research expenditures, accelerated. In Brazil, accelerating economic growth was associated with a decline in the rate of agricultural expenditure and agricultural research expenditure growth.

The main conclusion from this analysis is that the African countries conform relatively well with the global trends that accelerating economic growth leads to greater public expenditures on agriculture, and in case of the African countries, especially on agricultural research.

Table 9. Economic status and growth trends in GDP, agricultural expenditures and agricultural research expenditures

Country	Status	GDP growth (annual average %)		GDP growth per capita (annual average %)		Economic growth trend*	Agriculture expenditure trend*	Agriculture research expenditure trend*
		1980–2007	2003–07	1980–2007	2003–07			
Botswana	Middle-income	7.7	4.8	5.0	3.4	–	–	–
Egypt	Middle-income	5.0	5.1	2.9	3.2	+	–	na
Ethiopia	Low-income	4.1	9.1	1.1	6.5	+ +	++	– –
Ghana	Middle-income	3.7	5.9	1.0	3.4	+ +	++	++
Kenya	Low-income	3.5	5.4	0.3	2.8	+	++	++
Lesotho	Middle-income	3.3	3.6	1.4	3.0	+	0	++
Malawi	Low-income	3.0	5.4	0.1	2.5	+ +	++	na
Mauritius	Middle-income	4.6	4.1	3.6	3.2	–	0	– –
Morocco	Middle-income	3.7	4.9	1.9	3.8	+	–	na
Nigeria	Middle-income	3.2	7.8	0.7	5.1	+ +	+ +	+ +
Swaziland	Middle-income	5.4	3.0	3.0	2.0	-	+	na
Tunisia	Middle-income	4.5	5.5	2.6	4.5	+	–	+
Uganda	Low-income	5.8	7.8	2.4	4.3	+ +	+ +	+
Zambia	Low-income	2.1	5.6	–0.7	3.1	+ +	+ +	+
Brazil	Middle-income	2.7	4.0	1.0	2.8	+	+ +	–
China	Middle-income	10.1	11.7	8.9	11.0	+	+ +	+
India	Middle-income	6.1	9.0	4.2	7.5	+	+	0

Source: Calculated by authors based on World Bank (2011) for income status and GDP growth (see Table 2).
Notes: na indicates that data were not available. The last three table columns indicate whether growth rates increased (+); increased strongly (++), that is, by more than 2 percent for economic growth and by more than 10 percent for agricultural expenditures between 2003 and 2007); decreased (–); or remained more or less constant (0). For agricultural expenditures the growth rates were derived from Table 3, and for research expenditures they were derived from Table 6.

Summary of Agricultural Spending and Research Spending in Africa

The discussion in this section complements the analysis of Beintema and Stads (2011) by analyzing agricultural research expenditures in the context of total agricultural expenditures of 14 countries in Africa. Consistent with the accelerating growth, as well as with the commitment of African countries to CAADP, public spending on agriculture has grown considerably since 2003, except in Botswana and North Africa. Although the amounts have increased, the shares in total public expenditures have tended to decline, and only 7 out of all the countries in Africa (mostly in West Africa plus Ethiopia) are meeting the CAADP goal of 10 percent of public expenditures for agriculture. It should be noted that the comparative countries, Brazil, China, and India, also spent considerably less than 10 percent of public expenditures on agriculture (with China reaching the highest percentage at 7.4 percent), but these countries have had better economywide and agricultural performance than Africa, and much smaller shares of agriculture in GDP.

As percentage of agricultural GDP, most African countries considered here spent between 5 and 10 percent in agricultural public expenditures (considerably less than Brazil, China, or India), and in most African countries these shares have declined rather than increased. Given the poor state of agricultural productivity in Africa, such a decline appears premature. In addition, the African countries also spent relatively little on infrastructure, with declining shares between 1980 and 2005, which is another disadvantage for their agriculture sectors.

After declining from a high of 20 percent of ODA in 1980 to 4 percent in 2006 for developing countries in general, foreign assistance for agriculture began an upward trend from 2.6 percent in 2003

but as of 2011 was still less than 5 percent. In only two of eight countries analyzed is domestic funding for agriculture the main funding source, with 57 percent in Côte d'Ivoire and 67 percent in Ghana. Extreme donor dependence characterized public expenditures for agriculture in Niger (98 percent), Burkina Faso (84 percent), and Mali (77 percent). The situation is unlikely to improve, as CAADP investment plans show huge funding gaps that are expected to be filled by ODA—a most unlikely trend given the current global economic slowdown and debt overhang in OECD countries. Given high rates of economic growth in Africa, and their satisfactory fiscal performance, greater reliance on domestic financing should not only be advocated, but also expected. The plans to continue to rely primarily on donors to fund agricultural development programs are quite disappointing and suggest that commitment to agriculture still is not very deep.

As previously stated, spending on agricultural R&D increased over time, averaging 4–6 percent per year in many cases, with considerable variation across countries and within countries for different subperiods. While Ghana and Uganda showed consistent growth in research spending, positive trends in Botswana, Ethiopia, Kenya, Mauritius, and Nigeria were spottier. Malawi and Zambia reduced their research commitments, partly because of loss of World Bank support, but were unable to make up the shortfall from domestic sources, perhaps because of crowding out from input subsidies. The longer trends over time suggest a somewhat different picture than the more recent positive trends analyzed by Beintema and Stads (2011).

Botswana, Kenya, and Mauritius spent consistently more than 1 percent of their agricultural GDP on research, while Malawi, Morocco, and Zambia only met that target in earlier periods. Ethiopia, Ghana, and Nigeria consistently spent less than the target.

5. PROSPECTS FOR INCENTIVES, AND PUBLIC EXPENDITURES IN AFRICAN AGRICULTURE

This section draws on the summary of the factors discussed on the political economy of agricultural protection and expenditures, as well as on the summary of spending and budget trends in Africa to look at the prospects for incentives, and agricultural and agricultural research spending in Africa. As discussed in Binswanger-Mkhize et al. (2011), there are several reasons to be optimistic about agriculture in Africa. International agricultural prices have improved significantly and are expected to persist. African economies are experiencing fairly rapid per capita income gains, caused by improved macroeconomic policies, which are also expected to continue. The investment climate is also improving, with positive impacts on agriculture. Finally, decentralization and participation in rural governance are improving, with positive impacts on agricultural and rural development.

Under all the political economy models reviewed, more rapid economic growth would tend to move incentives policies toward protection rather than taxation, and expand public expenditures on agriculture and on agricultural research. Urbanization and a relative decline in the agricultural population would have similar results. Development of infrastructure, education, and communications will make it easier for smallholder farmers to organize and make their weight felt in the political arena, which would also tend to improve incentives under all the models reviewed. However, rising international commodity prices and accelerating agricultural growth will lead to higher farmer incomes with an economic surplus, and under the political support function model, may lessen the need for policymakers to compensate them for relative income losses compared with other sectors of the economy. In addition, since they are operating in open trade regimes with fairly elastic consumer demand for food, farmers will reap a greater share of research benefits, similarly lessening the need for incentives policies to raise their incomes. The same factors, however, will tend to give them greater weight in demanding more public expenditures for agriculture in general, and for agricultural research in particular. Improvements in property rights regimes, bureaucratic quality, and the rule of law would also tend to increase public expenditures on agriculture and for research. On balance, therefore, the models

reviewed would tend to predict an improvement in the still, often, discriminatory incentive policies and additional public expenditures and research expenditures for agriculture. Therefore the review implies some optimism that both incentives and underinvestment in agriculture and in research can be ameliorated in Africa.

Nevertheless, these are at best overall tendencies. The models take account of many additional factors and complications, and predictions for individual countries or commodities would require application of the models to the specific cases, which is a task that goes beyond this chapter. Moreover the models show how material conditions and the structure of the economy and of its institutions determines both incentive and expenditure policies. Most of these factors are not amenable to direct influence of participants in the policy process, so they offer few direct handles on how to affect the policies.

One of the few actionable areas is the organizational capacity of smallholder farmer groups, co-operatives, and agricultural umbrella groups. Their strength determines their ability to influence policy in the lobby models, the policy preference models, or a combination of the two. While interventions to strengthen the capacity of these groups are usually undertaken for technical reasons, they also strengthen their influence in the policy process. The same holds true for other interventions, such as investments in information and communications technologies and rural transport infrastructure: "Certainly, one should be cautious not to oversell the potential political economy benefits of these kinds of interventions. To properly understand how far such indirect benefits may reach, a better grasp is required of the magnitude of change in political power that may result from an additional, incremental improvement in co-ordination capacity. Much of the canonical literature on agricultural interest groups derives the relationship between lobbying power and group characteristics from the observation of strongly varying groups: smallholders in poor agriculture-dominated countries versus farmers in industrialized economies; agricultural versus urban populations; family farms versus large commercial farms in developing countries. This discussion suggests scope both for deeper research bringing interest group models to the 'marginal change' level, and consideration of policy entry points to exploit the insights of these models." (Mogues and Petracco 2011, 26–27).

Many of the models also point to the importance of well-informed participation of all stakeholders in the policy process as an important condition for arriving at efficient policies and resource allocation. The CAADP framework for the development of agricultural strategies and investment programs aim to implement these principles. However, Zimmermann et al. (2009) find in the case of Ghana and Kenya that participation has been weaker in CAADP processes than is usual for the countries' own agricultural policy processes. Because use of experts and technical staff have featured more in the process than before, outcomes have tended to be more evidence based. Nontechnical and nongovernmental actors featured prominently only in the roundtables, and certainly improvements would be desirable.

All in all, the political economy models of incentives policies, agricultural budgets, and public research expenditures suggest that economic development will be a primary source of improvements in Africa, and that indirect interventions to strengthen farmers' groups and ensure their informed participation in policy processes are the most promising ways of accelerating these historic processes.

APPENDIX TABLES

Appendix Table A1.1. Countries included in the Dataset on Distortions in Agriculture with their per capita 2005 purchasing power parity incomes (US$ thousands)

Africa		**European transition economies**	
Benin	1.2	Bulgaria	9.3
Burkina Faso	1.1	Czech Republic	20.3
Cameroon	2.0	Estonia	16.5
Chad	1.5	Hungary	17.0
Côte d'Ivoire	1.6	Kazakhstan	8.7
Egypt	4.6	Latvia	13.2
Ethiopia	0.6	Lithuania	14.1
Ghana	1.2	Poland	13.5
Kenya	1.4	Romania	9.4
Madagascar	0.8	Russian Federation	11.9
Mali	1.0	Slovak Republic	15.9
Mozambique	0.7	Slovenia	22.5
Nigeria	1.5	Turkey	7.8
Senegal	1.5	Ukraine	5.6
South Africa	22.5	**High-income countries**	
Sudan	1.7	Australia	34.1
Tanzania	0.9	Austria	34.1
Togo	0.7	Canada	35.0
Uganda	0.8	Denmark	33.6
Zambia	1.2	Finland	30.5
Zimbabwe	0.2	France	30.6
Asia		Germany	30.4
Bangladesh	1.1	Iceland	35.5
China	4.1	Ireland	37.9
India	2.2	Italy	27.8
Indonesia	3.2	Japan	30.3
Korea, Republic of	21.3	The Netherlands	34.5
Malaysia	11.7	New Zealand	24.6
Pakistan	2.2	Norway	47.5
The Philippines	3.0	Portugal	20.0
Sri Lanka	3.4	Spain	27.1
Taiwan	26.1	Sweden	32.0
Thailand	7.1	Switzerland	35.2
Vietnam	2.1	United Kingdom	31.4
Latin America		United States	41.8
Argentina	10.8		
Brazil	8.5		
Chile	12.2		
Colombia	5.9		
Dominican Republic	na		
Ecuador	6.7		
Mexico	11.4		
Nicaragua	na		

Source: Table 1a in Anderson (2010).
Note: na indicates that data were not available.

Appendix Table A1.2. List of countries in the public expenditure dataset

Region	Country
Middle East and North Africa	Algeria, Bahrain, Djibouti, Egypt, Iran, Jordan, Kuwait, Lebanon, Morocco, Oman, Syria, Tunisia, Turkey, United Arab Emirates, Yemen
Asia	Bangladesh, Bhutan, China, Fiji, India, Indonesia, Korea, Maldives, Myanmar, Nepal, Pakistqan, Papua New Guinea, Philippines, Singapore, Sri Lanka, Thailand, Vanuatu
East and Central Asia	Azerbaijan, Belarus, Czech Republic, Estonia, Hungary, Israel, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Poland, Romania, Russian Federation
Latin America and the Caribbean	Argentina, Bahamas, Bolivia, Brazil, Costa Rica, Dominican Republic, El Salvado, Guatemala, Mexico, Panama, St. Vincent and the Grenadines, Uruguay
Sub-Saharan Africa	Botswana, Ethiopia, Ghana, Kenya, Lesotho, Malawi, Mauritius, Nigeria, Swaziland, Uganda, Zambia, Zimbabwe

Source: Mogues et al. (2011).

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The Agricultural Science and Technology Indicators (ASTI) initiative compiles, analyzes, and publishes data on levels and trends in agricultural R&D investments, capacities, and institutional arrangements in developing countries. ASTI is managed by the International Food Policy Research Institute (IFPRI) and involves collaborative alliances with many national and regional R&D agencies.

Jointly convened by ASTI/IFPRI and the Forum for Agricultural Research in Africa (FARA), the conference, "Agricultural R&D—Investing in Africa's Future: Analyzing Trends, Challenges, and Opportunities," brought together experts and stakeholders from the region to contribute their expertise for the purpose of distilling new insights and creating synergies to expand the current knowledge base. The themes under focus were (1) why African governments under invest in agricultural R&D; (2) how human resource capacity in agricultural R&D can be developed and sustained; (3) how institutional structures can be aligned and rationalized to support agricultural R&D; and (4) how the effectiveness of agricultural R&D systems can be measured and improved.

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