Why Look at Public Spending for Agriculture in Africa?

Extreme poverty in the world is becoming increasingly concentrated in Sub-Saharan Africa, which accounted for 43 percent of global poverty in 2012, and its breadth and depth remain a dominant challenge (World Bank, WDI database). While gross domestic product (GDP) growth has picked up in recent years, it is driven mostly by higher production of mineral and hydrocarbon resources. This growth model has not rapidly reduced poverty or boosted shared prosperity, the World Bank’s twin goals. Even after experiencing nearly two decades of economic growth, most Africans continue to earn their livelihoods in the traditional economy. Much more than in any other region, agriculture dominates African economies, accounting for a third of the GDP regionwide and employing two-thirds of the labor force, with the poorest countries most heavily reliant on it.

Further underscoring the need to encourage growth in rural areas, evidence shows that growth in agriculture is one of the most effective ways to reduce poverty, with growth in the sector reducing poverty by around three times as much as growth in other productive sectors. A 1 percent improvement in agricultural productivity translates into about a 0.9 percentage point reduction in poverty in developing countries, compared with a reduction of 0.3–0.4 percentage point from a 1 percent increase in productivity in other sectors (Ivanic and Martin 2014). Agriculture is also critical for managing Africa’s urban transition. To date, this process has been driven largely by populations being pushed out of rural areas, rather than by cities attracting a larger workforce. The urban transition would be a more positive process if it were driven by improving economic opportunities in the cities that gradually pull rural residents in, rather than by declining conditions and periodic disasters in rural areas that push residents out. A key element of a transition strategy, therefore, is to enhance living standards and increase resilience in rural areas.
Conditions Are in Place for Transforming African Agriculture

The Green Revolution that boosted yields in other countries largely bypassed Africa. A comparison of Africa’s performance in total factor productivity growth (TFP, a comprehensive measure of overall efficiency in using all inputs) with that in other developing regions over two decades shows that Sub-Saharan Africa was lagging in the 1990s and fell even farther behind in the 2000s (figure 1.1) (Fuglie 2015). In other regions, production increases were mainly associated with yield growth due to the better use of inputs and adoption of improved production technologies. But in Sub-Saharan Africa, the increases in production were largely the result of expanding the area under cultivation. In fact, it is the only developing region in the world where the contribution of area expansion exceeded the contribution of growth in yields (figure 1.2) (Deininger et al. 2011). And growth in cereal yields in Sub-Saharan Africa has consistently lagged that in all other regions (figure 1.3). Over four decades, yields in Sub-Saharan Africa remained much lower than those in other regions (figure 1.4). This is despite the fact that the adoption of new production technologies increased faster in Sub-Saharan Africa than in other regions (figure 1.5).

Figure 1.1 Total Factor Productivity Growth in Africa Lags behind Other Regions—and the Gap Is Widening

Source: USDA Economic Research Service data.
Note: TFP = total factor productivity.
**Figure 1.2** Production Increases in Africa Came Largely from Expanding the Area under Cultivation Rather Than Input Intensification or Total Factor Productivity Growth

Source: USDA Economic Research Service data.

Note: TFP = total factor productivity growth.

**Figure 1.3** Cereal Yields in Africa Have Barely Increased in Four Decades

Source: World Development Indicators database.
Sub-Saharan Africa have barely doubled, while tripling in South Asia and increasing around sixfold in East Asia and the Pacific.

Even so, the potential for increasing production and productivity in African agriculture is enormous. With an abundance of land and water, Africa has the resources for agricultural prosperity. Of the world’s surface area suitable for sustainable expansion of production—that is, unprotected, unforested land, with low population density—Africa has the largest share by far, accounting for roughly 45 percent of the global total. Although some large areas of the continent are arid or semiarid, the available water resources in Africa are, on average, greatly underused. Only 2–3 percent of renewable water resources in Africa are being used, compared with 5 percent worldwide.

On the supply side, the prospects are encouraging for increasing capital and labor devoted to agriculture. If the investment climate can be improved, there is much potential to attract a higher share of global resources. The inward foreign direct investment (FDI) stock in agriculture in Africa is only 7 percent of the total stock in developing countries compared with 78 percent in Asia and 15 percent in Latin America.

There is also the prospect of a growing labor force for agriculture, if Africa can create the jobs to absorb this “youth dividend.” With the creation of jobs in upstream or downstream agribusinesses, this youth dividend could drive growth in the sector. However, failing to create these job openings in agriculture would mean rising unemployment, with the adverse effects that entails.

On the demand side, African regional markets are growing rapidly, driven by population and income growth and urbanization, and forecast to reach US$1 trillion by 2030 (figure 1.4) (World Bank 2013). The rising demand for food to nourish rapidly growing urban populations in the region has mostly been filled with imports. From the 1990s to the 2000s, the balance of trade in food staples was moving from deficit (imports exceeding exports) to surplus in Europe and Central Asia, South Asia, and East Asia and the Pacific; in Sub-Saharan Africa, however, this gap greatly expanded.

Food trade deficits are understandable in a region such as the Middle East and North Africa, which has limited comparative advantage in food production. But in Sub-Saharan Africa, with all the natural ingredients for efficient production, deficits of this nature signal that something fundamental is amiss. If not reversed, the consequences of the missed opportunity to capture regional markets will grow over time as that market expands. But as African agriculture becomes more competitive and regional producers can capture more of these markets, the benefits would be enormous.
Enhancing Agricultural Growth Requires Improving Public Spending in Agriculture

African policy makers are refocusing their attention on improving agricultural performance, and one essential ingredient in the strategy is to improve public spending in agriculture. Over the past few years, ministries of agriculture and finance have intensified efforts to improve the volume and effectiveness of public spending. The African Union’s Maputo Declaration (2003) recognized that agriculture in most African countries was neglected in the public budget and set a notional target for countries to increase public agricultural spending to 10 percent of total public expenditure—a target recently reiterated in its 2014 Malabo Declaration.

Increasing the volume of public spending in agriculture will be important, but will not by itself be enough to kindle growth. Actions will also be needed to improve the efficiency and effectiveness of public spending. To address this, the Comprehensive Africa Agriculture Development Programme (CAADP) has led the charge in supporting national teams working on agricultural sector expenditure programming to conduct basic agriculture sector public expenditure reviews and to carry out related specialized analyses. Assisting countries to develop national agricultural investment plans (NAIPs) that make progress
toward the quantitative goal and improve the quality of expenditures has become a cornerstone of CAADP’s work with that of its development partners, including the World Bank.

**Why Governments Spend on Agriculture**

Much of this book is concerned with “how” governments should spend public funds, but before getting to that point, it is useful to briefly consider the “why.” Why should governments be involved in spending on agriculture at all? The rationale for public investments derives from two fundamental sources: economic inefficiencies resulting from market failures and inequality in the distribution of goods and services.

Agricultural production is quintessentially a private enterprise. Yet production requires a number of goods and services that, on both theoretical and empirical grounds, the private sector is unable to provide efficiently. The non-excludable (if the good is provided to one consumer, other potential beneficiaries cannot be kept from enjoying it) and nonrivalrous (consumption by one does not reduce the availability of consumption by another) characteristics of these goods create a divergence between social and private returns leading to investments that are below the social optimum. Nonexcludability implies that potential beneficiaries cannot be charged for the good, so the producer cannot capture its full social value. Nonrivalry implies that it is inefficient to charge anything for the good, since the cost of supplying an additional unit (that is, letting another consumer enjoy the benefits) is zero. These are classic characteristics of a “public good” and a good that has one or both would be under-provided to some extent by the private sector.

Of course, enhanced public spending in agriculture is only one ingredient in a strategy for agricultural transformation. Investments in health, education, and rural infrastructure matter as well, and wise investments must be complemented by a host of other policies. Indeed, in a poor policy environment, even spending in areas generally considered high return will be unproductive or counterproductive. But smart use of public funds—not only by agriculture ministries but also by other ministries dealing with hard and soft infrastructure in rural areas—has laid the foundation for transformation in other parts of the world. A key question for policy makers and development practitioners is what kinds of spending decisions can yield the highest returns in achieving public policy objectives. What are the options to rebalance public agricultural spending and improve the budgeting process to increase the efficiency of limited resources for inclusive growth? Answering this question is the main objective of this book, so that public expenditure can do for Africa what it has done elsewhere.
WHY LOOK AT PUBLIC SPENDING FOR AGRICULTURE IN AFRICA?

Considering Pathways to Benefits

To guide decisions on areas appropriate for government spending, it is useful to consider what kinds of goods and services are necessary to catalyze agricultural growth, and to what extent each is a “public good.” To do this, we conceptualize the beneficial effects of public spending in agriculture along four pathways: generating technology, disseminating technology, reducing transaction costs, and attracting private capital. Each can be identified with particular classes of spending to provide goods or services that have public good characteristics and that are crucial for fostering robust agriculture productivity growth and poverty reduction in rural contexts.

- **To generate knowledge.** Effects that advance technology are associated with public spending on agricultural research and development (R&D) to create basic knowledge, which is both nonexcludable and nonrivalrous. Sometimes the knowledge can be embodied in a commercial product (as with hybrid seeds and chemicals), with benefits that are excludable and rivalrous, but the basic knowledge itself is not. Investments in R&D are among the most important public goods and a critical component of public agricultural spending. Numerous studies show that investments in R&D have tremendously enhanced agricultural productivity around the world over the past five decades, reducing poverty and increasing food security (Alston, Pardey, and Piggott 2006; Evenson and Gollin 2003; Pardey et al. 2007). In Sub-Saharan Africa, economic analysis finds strong and consistent evidence that investment in agricultural research yields high returns per dollar spent. These returns include benefits not only to the farm sector but also to the food industry and consumers in more abundant food at lower prices. Studies using different methods and coverage give a range of estimates of returns to agricultural research, but there is a consensus that the payoff from government investment in agricultural research has been high in Africa (Alene and Coulibaly 2009; Fuglie and Rada 2013; Thirtle, Piesse, and Lin 2003). One area where investment in knowledge may give high returns in raising productivity is improving information on soils (such as soil mapping), which would lay the foundation for programs to enhance soil quality.

- **To disseminate knowledge and build human capital.** Effects that enhance human capital can be associated with public spending on extension, training, and information services that transfer knowledge and skills to those engaged in agricultural production. These investments create significant positive externalities through demonstration effects and peer-to-peer learning of benefits from the adoption of new productivity-enhancing technology. As agricultural production processes become increasingly knowledge intensive, with higher demand for precise and
timely information, such investments are becoming increasingly important. Studies find positive effects of public extension systems on agricultural productivity and the adoption of improved agriculture technologies (Evenson 2001; Fan and Zhang 2008). Evidence also points to significant research-extension linkages and shows that the returns to extension services tend to be higher when technological change is rapid (Anderson and Feder 2007). The transmission of technologies depends on how fast new technologies become available, and the overall productivity gain tends to be limited by the weakest link in this chain. The new technological improvements available on the shelf, for instance, require effective extension and adaptive research to prosper in local contexts.

- **To reduce transaction costs.** Similarly, effects that reduce transaction costs can derive from public spending on soft and hard infrastructure that might improve access to input and output markets. Transaction costs are an important determinant of market integration, and investments that lower the cost of searching and exchanging information and of bargaining, decision making, and enforcing contracts tend to enhance market participation (Sadoulet and de Janvry 1995). Investments in rural roads, market information dissemination, and development of land markets, for example, are important in reducing transaction costs. Rural roads are a critical element of public infrastructure for agricultural growth—reducing travel times, transport costs, and in-transit spoilage; raising the prices farmers receive for their products; and lowering the prices they pay for inputs (Calderón and Servén 2004; Dorosh, Dradri, and Haggblade 2009). However, the high costs of identifying and charging a multitude of small-scale beneficiaries may make it infeasible for a private investor. Similarly, institutional investments to overcome barriers to collective action and reduce transaction costs to improve collection, storage, processing, quality control, and price information can optimize supply chain management in remote areas (Aker and Mbili 2010; Deichmann, Goyal, and Mishra 2016; Torero 2015). Improving land governance is also a public good with special importance for agriculture. Securing land tenure and reducing costs of transferring land, important in their own right, can also give farmers an important source of collateral and pave the way for the development of rural credit markets.

- **To attract private capital.** The crowding-in effects of agricultural public spending on private capital comes about to the extent that public and private investments are complements in production. An example is public investment in large irrigation infrastructure such as dams and canals, which then make it profitable for farmers to make small on-farm investments in water
management and a wider range of production technologies. The large number of atomistic beneficiaries makes it difficult to collect payments by private investors of large infrastructure projects. It is also sometimes argued that spending on programs to subsidize greater use of inputs (fertilizers and improved seeds) have the objective of demonstrating to poor farmers the benefits of using improved inputs and break out of a low-productivity poverty trap, thereby encouraging them to continue to spend their own money after input subsidies end (Jayne et al. 2015). Well-designed subsidy programs can in principle address these constraints, although whether they do so in practice is another question to which we return in the book.

Reducing Inequality and Poverty
Public spending in agriculture is also often justified on equity grounds, especially salient for spending in agriculture, given the concentration of the poor in rural areas, most of whom rely primarily on agriculture (directly or indirectly) for their livelihoods. One argument for fertilizer subsidies, for example, is that they could potentially help poor farmers break out of a low-productivity poverty trap. The equity justification for spending, of course, is stronger for programs that can actually be targeted at the poor, rather than diffusing their benefits, and for programs that demonstrate a high income multiplier effect. For instance, impacts of spending on extension have been found to compare favorably to several kinds of social sector spending with respect to progressivity, and were far superior to spending on subsidies. Also to be recognized is that many programs aimed at rural poverty reduction—either directly (as with rural safety nets) or indirectly (as with programs to support structural transformation by helping the rural poor find jobs in urban areas)—fall outside the scope of this study.

Ensuring Productive Spending
Not all public spending is productive. This is a clear implication of the relatively low estimated net benefits from total agricultural spending compared with the high benefits of certain categories of agricultural spending (Benin et al. 2012; Fan and Zhang 2008; Mogues 2011). Apparently, where aggregate spending has no measurable impact, the negative effects of ineffective spending overwhelm the positive effects of more effective spending (Devarajan, Swaroop, and Zou 1996). Public spending may be unproductive or even reduce the productivity of other spending for two basic reasons. First, governments sometimes spend on things that are not public goods. Governments tend to be inefficient suppliers of private goods, and when they enter these markets, there is a serious risk of displacing the
private sector. Second, even when there are clear failures in particular markets, government spending will not necessarily improve the situation. Inherent characteristics of government interventions can sometimes lead to “government failures,” which may exacerbate the original problems caused by the market failures and produce unintended adverse ancillary effects. Empirically though, public spending on public goods has typically been much more productive than public spending on private goods (López and Galinato 2007).

How Much to Agriculture?

How much should governments spend on agriculture? There is no easy answer. But a conceptual and analytical framework provides guidance on some factors governments need to include in the decision calculus (box 1.1). In the next chapter, we turn to the empirical questions of how much African governments have historically allocated to agriculture, how this has trended over time, and how it compares to other regions.

**BOX 1.1**

**How Much of the Government Budget Should Be Devoted to Agriculture?**

How much of the government budget should be devoted to agriculture, and how much to other sectors? What is “too little” and what is “enough”? The answers are conceptually straightforward but difficult to put into practice. In principle, to maximize welfare on a given budget, spending should be distributed such that the marginal dollar in each activity yields the same increase in national welfare (however welfare is defined). If this were not true—if, for example, an additional dollar devoted to agriculture increased welfare more than the incremental dollar to health spending—overall welfare could be increased by taking a dollar from health and spending it on agriculture (Correa and Schmidt 2014).

In a two-sector world (agriculture and nonagriculture), this condition for distributing spending so as to maximize welfare can be expressed as equation (1.1):

\[
\frac{dW}{dS_A} = \frac{dW}{dS_{NA}},
\]

(1.1)

where \( W \) is welfare and \( S_A \) and \( S_{NA} \) are spending on agriculture and nonagriculture.

Of course, how much welfare is increased by an incremental public dollar spent in agriculture depends on how much that dollar will increase agricultural production,
Box 1.1 (continued)

as well as how much the additional production will increase welfare. This optimal allocation condition can be expressed in a ratio of spending in each sector, such that:

\[
\frac{S_A}{S_{NA}} = \left( \frac{E_{WA}}{E_{W,NA}} \right) \times \left( \frac{E_{A,SA}}{E_{NA, S_{NA}}} \right),
\]

(1.2)

where \( E_{WA} \) is the elasticity of welfare to agricultural production (and likewise for non-agricultural production), and \( E_{A,SA} \) is the elasticity of agricultural production to public spending in agriculture (and likewise for nonagricultural production).

The optimality condition in equation (1.2) provides a useful framework for thinking about spending allocations whereby the optimal ratio of public spending in agriculture versus nonagriculture is equal to the ratio of the welfare elasticity of each sector's production times the ratio of each sector's elasticity of production with respect to public spending in the sector. The problem in operationalizing this to provide practical guidance to policy makers is that it would require empirical estimation of all these elasticities (in every sector) for a given country. There have been some attempts in cross-country samples to estimate the elasticity of welfare (measured by either national GDP or poverty reduction) with respect to agricultural production, and the elasticity of production with respect to public spending.\(^a\) But there is no strong reason to assume that for any given country, the elasticities would be equal to the global or regional average.

In the absence of a practical way to rigorously answer the question of how much public spending should be allocated to agriculture, there have been some efforts to provide rules of thumb, which may seem intuitive and reasonable. For example, De Ferranti et al. (2005) show that with some special (and quite restrictive) simplifying assumptions, the optimal allocation is such that each sector's share of spending is its share of national GDP. (For agriculture, this would mean that the Agriculture Orientation Index \([\text{AOI}]\), discussed below, is equal to 1.) This index—the share of spending on agriculture relative to agriculture's share in the economy—is calculated for a number of Latin American countries over time to analyze whether there has been a systematic underallocation or "anti-agricultural bias" in public spending, with the general conclusion of no such bias in that region.

An alternative approach is to examine the experiences of countries that have undergone successful agricultural transformations. Analysis of 12 East Asian and Pacific and South Asian countries during their periods of high agricultural growth—the Green Revolution—shows that, on average, these countries devoted around 10 percent of total public spending to agriculture.\(^b\) Many other factors certainly contributed to success, but public support was an important ingredient. Thus, the Maputo target is similar to what the Asian countries were spending on agriculture in this period. Likewise, the New Partnership for Africa's Development (NEPAD) target of spending 1 percent of agricultural GDP on research is quite similar to the level that Brazil devoted to its successful research agency, Embrapa, as well as the level of spending on research in some high-income countries.

(continued next page)
In applying such rules of thumb, it is also sensible to make adjustments based on economic reasoning using equation (1.2). For example, countries differ greatly in the contribution of agriculture to national GDP, and a 1 percent increase in agricultural production will generally result in a smaller percentage increase in overall GDP in a country in which agriculture is 10 percent of the economy than in a country in which it is 30 percent. That is, the value of $E_{WA}$ will be smaller in the latter than in the former, and so—all other things equal—the share of spending going to agriculture should be smaller as well. And the elasticity of production with respect to spending ($E_{A,SA}$) will be higher in countries with high agricultural potential (both because of favorable natural endowments and because the overall policy environment is conducive to a positive supply response)—and where the spending is “smarter.” In such countries with a higher value of $E_{A,SA}$, agriculture’s share of spending should be higher.

a. For example, see De Ferranti et al. (2005) with a focus on Latin America.
b. The figures were 15.4 percent (1972), 10.5 percent (1975), 12.4 percent (1980), 10.9 percent (1985), and 9.6 percent (1990).

References


