

AGRICULTURAL RESEARCH IN AFRICA

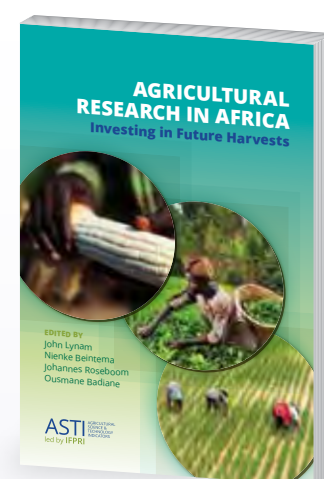
Investing in Future Harvests

Edited by John Lynam, Nienke Beintema, Johannes Roseboom, and Ousmane Badiane

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Africa south of the Sahara (SSA) has seen unprecedented economic growth since the turn of the millennium: poverty rates have steadily declined, and rural livelihoods have improved in many of the region's countries. Nevertheless, numerous countries face serious challenges—such as rising and volatile food prices and the adverse impacts of climate change—that require an immediate acceleration of agricultural productivity. Agriculture is the economic mainstay of many African countries and provides a significant source of employment and staple food requirements. The need to increase agricultural productivity makes agricultural science and technology a key priority for the region's policymakers and donors.

In *Agricultural Research in Africa: Investing in Future Harvests*, researchers and other development specialists examine the state of agricultural research and development (R&D) in the region and how such R&D can be improved. The research is an output of Agricultural Science and Technology Indicators (ASTI), led by the International Food Policy Research Institute within the portfolio of the CGIAR Research Program on Policies, Institutions, and Markets. ASTI is recognized as the authoritative source for information on the structure, financing, and capacity of agricultural R&D in low- and middle-income countries.



OVERVIEW OF AGRICULTURAL RESEARCH AND DEVELOPMENT IN AFRICA SOUTH OF THE SAHARA

Despite substantial growth in agricultural research capacity across Africa over the past 50 years, most countries still appear to be underinvesting in agricultural R&D and have limited human resource capacity (Figure 1). This combination of low investment and limited capacity hinders their ability to generate the technological innovations needed for agricultural productivity growth. Investments in agricultural research need to be drastically increased, but the effective use of these resources is equally important. Weak

organization and management continue to be widespread among African agricultural research organizations, and further capacity building is warranted. A promising opportunity for agricultural research is stronger collaboration among African national agricultural research systems (NARSs) in the form of joint research programs and regional centers of excellence.

The accumulation of new knowledge and improved agricultural technologies and farming practices from research has significantly contributed to improving agricultural productivity. Studies on SSA confirm that agricultural total factor productivity—a comprehensive measure of how efficiently a country’s agricultural inputs generate agricultural outputs—either stagnated or declined during the 1960s and 1970s in most countries but turned positive during the mid-1980s. While not all countries achieved productivity improvement, the ones with a rising stock of knowledge capital from agricultural research were more likely to be in the growth category. A critical strategy for all SSA countries is maintaining collaborative relationships with regional and international agricultural research networks, as well as maintaining a policy environment that enables countries to take advantage of technologies developed elsewhere.

FINANCIAL INVESTMENT

SSA has benefited less from agricultural R&D than other regions of the world because both investment in the development of new technologies and the potential for technology spillovers from elsewhere are low. Overall, agricultural R&D investment levels in most countries still fall well below the minimum target of 1 percent of agricultural gross domestic product recommended by the African Union. Further, agricultural R&D agencies in SSA are more dependent than their counterparts in other developing regions on funding from donors and development banks. Such donor funding has shown greater volatility over the past decade compared with government funding. Halting this volatility requires a long-term commitment from national governments, donors and development banks, and the private sector.

Policy prescriptions to address underinvestment in agricultural R&D should create incentives for nonstate actors to raise their investments. At the same time, one way to create political incentives for agricultural R&D investments is to improve information symmetry between citizens and politicians on the relative costs and benefits of different types of agricultural (and nonagricultural) investments. More in-depth research and diagnostic analysis can also inform development interventions and policy dialogue.

Moving forward, greater transparency of donor contributions is needed to ensure accurate and constructive

analysis of development assistance levels, trends, priorities, destinations, and uses, especially for new funding sources. Greater ownership of the development assistance agenda in support of agricultural R&D by leaders, agricultural ministries, research organizations, farmers’ associations, and other constituencies in SSA is necessary.

SSA has entered a phase of rapid commercialization of its food and agricultural system, which provides major new opportunities for privately conducted R&D. Private R&D is currently constrained by small markets, weak public-sector research programs, a shortage of scientists and technicians, and a difficult business environment, including competition with government corporations and weak intellectual property rights. Nevertheless, a more open policy environment in the 2000s is stimulating strong private investor interest in Africa that could spur private R&D. Governments are working to create a better business environment and reduce barriers to trade and foreign investment.

HUMAN RESOURCES

Many low-income countries have not been able to keep pace with rapid developments in science and technology because of a lack of appropriate human resource capacity. This is especially the case in the field of agricultural science in SSA countries. Major challenges include lack of staff training and experience, inequitable salary levels and benefits, and resulting high rates of staff attrition. Although the absolute number of agricultural researchers employed in SSA has grown continuously in recent decades, researcher numbers and qualification levels are among the more serious constraints facing NARSs.

Fundamental to building strong human resource capacity in agricultural research is the development of comprehensive recruitment, training, and succession plans to fill existing and anticipated medium- to long-term staffing gaps. Such plans should assess gaps in specific skills and disciplines, the distribution of staffing by age and gender, and degree-level and short-term training needs. An implementation plan is also required for the management and provision of training and mentoring.

Investment in faculties of agriculture, and in particular in postgraduate programs in agricultural sciences, is critical to enhancing agricultural research and innovation and hence agricultural development across Africa. Growth in funding of higher-education institutions (including faculties of agriculture) should be increased considerably, at least to match growth in undergraduate student enrollments. Collaboration between national and regional faculties of agriculture is warranted to streamline, through clustering and specialization, the range of postgraduate programs offered. Such cross-institutional and cross-border

collaboration has the potential to facilitate emergence of centers of leadership.

One way to build a strong human capital development infrastructure and to harness gains from innovation in the research process is investment in networks. These types of networks are critical mechanisms for building the next generation of innovation-minded agricultural scientists in Africa. In the long term, a successful professional network needs to provide the incentives to keep researchers employed and actively engaged in Africa and provide the necessary environment for them to succeed in making measurable contributions to the broader system of agricultural innovation.

MEASURING EFFECTIVENESS

Over time, research evaluations have increasingly focused on identifying a causal relationship between agricultural research and outcomes. Policymakers, funding agencies, and implementers of agricultural research need tools to monitor and evaluate aid effectiveness in order to (1) reduce the risk of decisionmaking; (2) provide accountability to government and funding agencies by demonstrating that their investments had impact; and (3) enable implementers to identify problems, flexibly adjust activities, and readjust goals in real time. The “institutional architecture” for such monitoring and evaluation is largely in place. Many countries, however, lack strong articulation of a national agricultural innovation system to bring research,

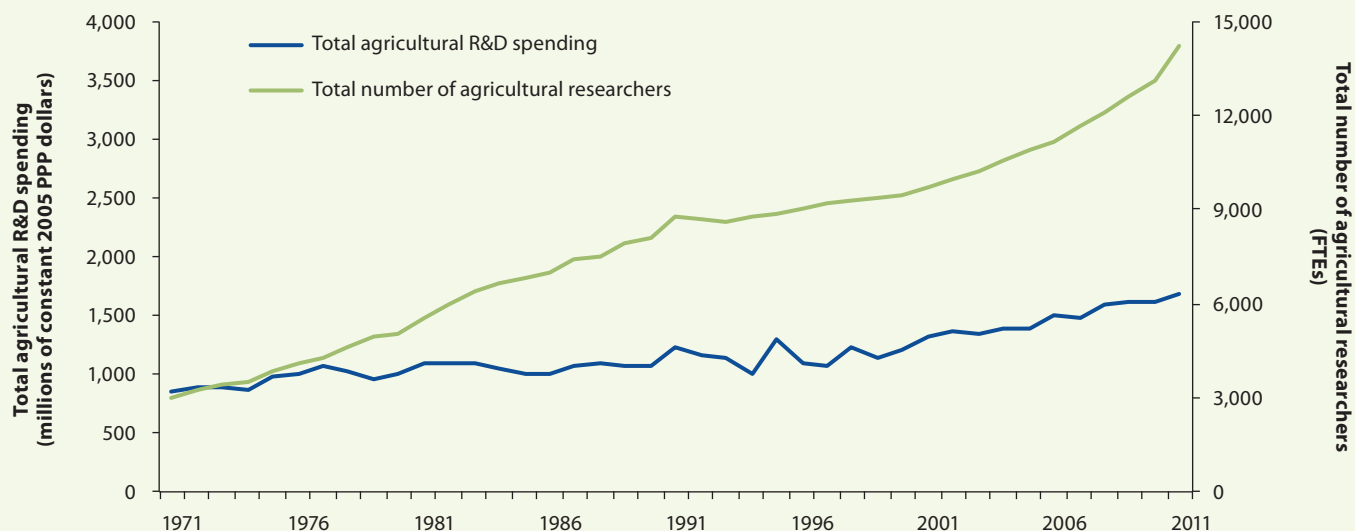
higher education, extension, and the private sector together. Compacts facilitated by the Comprehensive Africa Agriculture Development Programme (CAADP) seek to close these gaps while committing governments to a meaningful funding target to support the system. The adoption of the Science Agenda for Agriculture in Africa (S3A) in Malabo by the African heads of state is encouraging. These heads of state should address the inadequacy of data for planning and monitoring Africa’s agricultural growth and development.

INSTITUTIONAL STRUCTURES

In the 1970s and 1980s, national agricultural research institutes (NARIs) were created by consolidating disparate agricultural research units across various ministries into autonomous parastatals, which had the unintended side effect of isolating these new entities. This lack of organizational connectivity has continued to the present. To ensure the effectiveness of agricultural research, NARIs in SSA need to be more outwardly focused and develop better linkages with principal actors in the agricultural sector.

Encouraging innovation within the broader agricultural sector, primarily through improved communication, market integration, and institutional linkages across the different actors in the sector, has been formalized in what has become known as agricultural innovation systems (AIS). Organizing research within an AIS requires developing new capacities and skill sets, reviewing internal organization,

FIGURE 1 Agricultural R&D spending and staffing trends in Africa south of the Sahara, 1971–2011



Source: Based on ASTI database.

Note: FTEs = full-time equivalents; PPP = purchasing power parity; R&D = research and development.

and expanding field-level operating capacity. The challenge in moving this agenda forward will be in progressively demonstrating pilot-level impact to justify funding for expanded implementation. The most important factor in moving AIS approaches forward, however, will be testing and comparing implementation options in terms of innovation platforms, innovation brokers, and scale.

Although national governments hold the primary responsibility for the organization and funding of agricultural research, these issues have inherent international dimensions because most agricultural research challenges extend beyond national borders. A key concept in the discussion of these issues is what economists call “technology spillovers,” whereby the benefits of advances in knowledge and technology developed in (and paid for by) one jurisdiction spill over into another. Technology spillovers have great potential and can be purposefully created by constructing centers of excellence at the regional level.

The high dependence on donor funding makes the overall design of the African agricultural research system—and in particular its supranational component—quite vulnerable. Both stronger national governments and further political and economic integration at the supranational level are needed to create a local funding base for cross-border agricultural research.

Increasing agricultural productivity in SSA will require the involvement of a large range of actors, including CGIAR. The ongoing CAADP process, the implementation of the S3A, and the recent redesign of the CGIAR Research Program portfolio present important opportunities for CGIAR to collaborate closely with African R&D systems to support agricultural transformation in Africa. These partnerships and new scientific approaches will enable existing gaps to be addressed. The subregional organizations (SROs) and Forum for Agricultural Research in Africa are central coordinating mechanisms to rationalize joint planning and priority setting between CGIAR and NARSs; the CGIAR system needs to recognize the SROs’ role and empower them to fulfill it.

SYNTHESIS

Agriculture in SSA is at a prospective tipping point. Shifting to a growth path based on increased productivity is essential if Africa is to increase rural incomes and compete in both domestic and international markets. Such a growth trajectory depends on deepening rural innovation capacity, which requires a continuous supply of improved agricultural technologies and management practices stemming from an effective and efficient agricultural research system.

The design of the agricultural R&D system in Africa must take into account issues such as the wide scope of research needs and heterogeneity in agroecological and socioeconomic conditions. These factors affect the efficiency of agricultural research, especially in the context of limited government budgets and reliance on highly variable donor aid flows. The basic architecture of such an agricultural R&D system is essentially in place in SSA, but it has not yet coalesced into a fully interactive and integrated system with clear divisions of labor and effective subsidiarity. A significant reason for this is the underinvestment in national systems. Increasing national agricultural R&D investment remains a critical prerequisite for achieving balanced agricultural growth in Africa.

What SSA needs is rural capacity that incentivizes the delivery and uptake of new technologies and motivates the adaptation and innovation of these technologies across the extraordinary heterogeneity of African smallholder farming systems. Such an evolving rural innovation system will enable farmers, agribusiness firms, input and service suppliers, research institutes, and other public-sector institutions to continuously identify technology bottlenecks and to generate adequate solutions to overcome them. Improvements in education and training, better access to markets and information, and more fully developed links between farmers and service providers are also needed to increase productivity—in particular, to encourage the adoption of productivity-enhancing technologies.

John Lynam (johnklynam@gmail.com) is chair of the Board of Trustees at the World Agroforestry Centre, Nairobi. **Nienke Beintema** (n.beintema@cgiar.org) is head of Agricultural Science and Technology Indicators (ASTI), which is led by the International Food Policy Research Institute (IFPRI), Washington, DC. **Johannes Roseboom** (j.roseboom@planet.nl) is an innovation policy consultant and is located in The Hague, Netherlands. **Ousmane Badiane** (o.badiane@cgiar.org) is director for Africa at IFPRI, Washington, DC.

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A world free of hunger and malnutrition

2033 K Street, NW, Washington, DC 20006-1002 USA | T. +1-202-862-5600 | F. +1-202-467-4439 | Email: ifpri@cgiar.org | www.ifpri.org

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