



Africa Growth
Initiative
at BROOKINGS

AFRICA GROWTH FORUM

ENHANCING AGRICULTURAL PRODUCTIVITY FOR
SHARED GROWTH IN AFRICA



JANUARY 19-20, 2011

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Cover Photo: Lucia Boki fetches water at a borehole the village of Bilinyang, near Juba, South Sudan. © Arne Hoel / World Bank

INTRODUCTION

The Africa Growth Initiative (AGI) at Brookings convened the Africa Growth Forum that engaged researchers, policymakers and stakeholders in both the United States and Africa. The forum organized under the auspices of AGI was held January 19–20, 2011 in Washington, D.C. with the theme “*Enhancing Agricultural Productivity for Shared Growth in Africa.*” The theme was chosen to highlight the centrality of agriculture to the growth of African economies.

According to the World Bank’s World Development Indicators, in 2009 agriculture contributed to 13 percent of sub-Saharan Africa’s GDP and to 3.45 percent of annual growth. Additionally, according to the 2010 World Bank Agriculture Factsheet, the agricultural sector in north and sub-Saharan Africa employs an estimated 65 percent of persons in the region. Effective agriculture policies for Africa are imperative due to the precarious food security situation in the continent. Africa’s population is expected to increase from 770 million in 2005 to 1.2 to 2 billion by 2050, thus increasing the demand for food significantly. Data on the Millennium Development Goals show that 26 percent of sub-Saharan Africa’s population was estimated to suffer from chronic malnutrition and hunger in 2005–2007. These statistics demonstrate that the next four decades will require major improvements in the productivity of Africa’s agricultural output and expansion of agribusinesses. Expansion of agriculture is also important to the overall growth of African economies, as evidence shows that growth in the agricultural sector is associated with a larger multiplier effect than in other sectors.

To improve agricultural productivity in order to meet growing demand, Africa must invest heavily in research and development. However, spending on agricultural research only grew by 0.6 percent from 1980 until 2000, and use of new technologies to improve agricultural production in Africa remains dismally low. Specifically, cereal yields remain low

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compared to the rest of the world, fertilizer use is minimal, and only 4 percent of land is irrigated in sub-Saharan Africa compared with Asia’s 38 percent and a global average of 20 percent. Nearly 80 percent of farms in sub-Saharan Africa are small—less than 2 hectares. Thus, many of the challenges for improving African agriculture must focus on enabling small farmers to use advanced production methods.¹

AGI’s Africa Growth Forum provided a platform to address issues that have a direct bearing on agricultural production. The following topics were covered in the presentations: fertilizer adoption, adoption of improved seed varieties, climate change, insurance, contract farming, land certification/tenure, and financial innovation. The presentations and discussions identified viable policy options to unlock Africa’s agricultural potential.

BACKGROUND ON THE CONFERENCE PAPERS

Papers presented at the forum dealt with the aforementioned issues from a wide array of methodological approaches. Most were quantitative analyses, relying heavily on econometrics models. Others were qualitative and largely based on the analysis of responses to in-depth interviews. The majority of the papers dealt with issues from a microeconomic perspective such as the analysis of adoption behavior by different farmers or the impact of some specific programs on farm productivity.

A common methodological approach implemented for many of the studies was the use of randomized experiments where units of analysis are randomly designated to either a group that receives a particular treatment or one that does not—the “control”. As was expounded in the presentations, the advantages of such approaches lie in the fact that randomization systematically reduces sampling bias: an error caused by one group having characteristics which are different in some way than the other. Without a randomization process to ensure that the two groups are similar *ex ante*, the conclusions drawn from results are suspect because such randomization findings might simply reflect preexisting differences in the subject pool itself and not the effects of the treatment, *per se*. The unit of measurement applied to the treatment and control group varied across the papers. They included individuals, households, communities, vocational associations, and villages. The variables that the papers examined also ranged widely, from the biophysical characteristics of a plot of land to a farmer’s level of risk aversion to his/her ability to access credit.

FERTILIZER ADOPTION

In order to keep pace with rising food demands caused by escalating population levels and urbanization, world food production will need to increase by 70 percent.² However, many African nations are net importers of staple agricultural products despite having adequate arable land. African nations continue to use very low amounts of fertilizer per hectare—Africa averages only 8 kg/hectare compared with an average of 96 kg/hectare in East and Southeast Asia.³ New agricultural technologies—fertilizer use in particular—have been identified as having a high impact on productivity levels. Understandably so, governments and donors have both pushed for increased fertilizer usage—yet use rates across sub-Saharan Africa remain negligible.



Preparing fertilizer for the cultivation of aloe plants, Kenya.
© Dana Smillie / World Bank

The forum explored the following questions pertaining to fertilizer use in Africa:

- Generally, what hinders agricultural technology adoption in Africa?
- What increases uptake by farmers?
- What are the roles for governments to promote improved productivity in agriculture?

Focusing on the underutilization of fertilizers in sub-Saharan Africa, one of the studies featured at the forum examined the demand for fertilizer in a sample population of cocoa farmers in Côte d'Ivoire, while another study explored fertilizer adoption in Western Kenya. Malawi's Farm Input Supply Program (FISP) was exemplified as a successful policy implementation that increased agricultural technology adoption through fertilizer usage. The study measured the impact of the FISP and determined the benefits to farmers as well as whether these benefits provided any spillover effects or consequential results.

Challenges for Agricultural Technology Adoption

Côte d'Ivoire is one of the world's leading cocoa producers, yet cocoa yields per hectare are low in Côte d'Ivoire compared to Asian countries. These low yields can be attributed to low fertilizer use. The study in Côte d'Ivoire surveyed 362 cocoa farmers to investigate the determinants of fertilizer demand. The study found that education, access to credit, membership in a farmer's organization, farm size, soil fertility, and risk aversion are key variables that affect demand for fertilizer.



THE MALAWI FARM INPUT SUPPLY PROGRAM: A POLICY IN ACTION

Malawi has provided an example of a government policy intended to promote the usage of fertilizer in a sub-Saharan African context. In 2005, after one of the worst harvests in 10 years, maize yields only amounted to 57 percent of the estimated national food requirement. President Bingu Wa Mutharika implemented FISP to supply subsidized fertilizer to Malawian farmers.⁴ At the time of FISP implementation, the prevailing donor sentiment on agricultural subsidies in Africa was that they were costly, inefficient, and likely to have an adverse effect in reducing fertilizer usage in some cases. Despite these criticisms, in 2006–2007 Malawi maize production was approximately 3.44 million tons, 1.34 million tons over the estimated national requirement. Malawi also sold surpluses to neighboring Zimbabwe and Kenya; therefore, what began as a poverty alleviation policy has shown potential to bring in export revenue. Former critics of the subsidies are now implementing similar strategies. For example, the European Union has pledged \$100 million for an input support scheme for communal farmers in Zimbabwe.⁵

While the Malawi program has exhibited positive results, its impact on poverty alleviation and intended use as a social support mechanism requires further examination. The program has not been free of challenges. In 2007–2008 the Malawian government exceeded the purchasing limit agreed upon with its largest international donor, the U.K.'s Department of International Development (DFID). Mutharika's administration purchased extra fertilizer at peak prices that remained unused. The government also blocked private sector involvement by banning the private retail of subsidy fertilizer. This move prevented DFID from supporting a private sector grain storage program intended to mitigate future crop failure due to low rainfalls.⁶ While the FISP experienced challenges in delivery, it was considered a good value for DFID's money and increased maize yields and met national requirements for grain supplies. In this sense, the program demonstrates effective policy implementation as well as lessons learned for policymakers that can inform decision making in the future.

Photo Above: Picking tea leaves in Malawi.

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The other case study focused on the adoption of fertilizer in Western Kenya, which has typically been a low use country despite availability of products; in fact, only 17–20 percent of farmers use fertilizer. The data from Western Kenya tested the hypothesis that farmers have low adoption rates due to lack of information on the returns on fertilizer investment. The study found that on-farm demonstrations increased fertilizer usage, and usage lasted longer than farmers who were only presented with “start-up kits” (materials required for using fertilizer and instructions) and no on-farm demonstration. Another finding of this study was a lack of information-sharing among farmers about farming techniques within the sample population in Western Kenya. The study demonstrated that low usage of fertilizer in Africa stems from a combination of factors: misleading information about fertilizer products, low capacity to purchase inputs due to cash flow and credit constraints, varying quality of available fertilizers, and absence of crop insurance mechanisms.

One data set presented at the forum—collected in central and southern Malawi from 2002–2009—investigated whether fertilizer use had increased among smallholder farmers in Malawi. The analysis of this data revealed that smallholder, poorer, and female farmers were not the primary beneficiaries, but that the program did increase fertilizer use among recipient households. A similar study using a national data set confirmed the findings that smallholder, poorer, and female farmers were not the primary recipients of the FISP program. Both studies at the forum that addressed FISP found the subsidies had a positive and significant impact on maize production, and increased the area of land used for production at the household level. The study measuring the impact of the subsidy on income noted a significant positive impact on rainy-season crop income at the household level.

Typically, income benefits to farmers are contingent on the cost of fertilizer. However, the Malawian government has internalized a bulk of the cost to the farmers through the FISP, and the program provides a clear increase in income for recipient farmers. It was estimated that the FISP was attributed to an average income increase of \$1.50/kg of fertilizer received and only \$.10-.15/kg of fertilizer in costs.

Policy Implications

Having looked at the key determinants of fertilizer use, risk aversion, level of education, credit availability and farmer organization membership, research suggests that policymakers should prioritize alleviating the price risks of purchasing expensive agricultural inputs. Increasing access to education and credit are strategies that governments should also consider to increase adoption of agricultural technology. A more specific directive stemming from the forum encouraged policymakers to focus on the type of education that farmers need to increase individual adoption of technology. Research results suggested that intensive extension education and multiple farm visits and demonstrations are more effective than the more passive approach of providing “starter kits” with accompanying information packets. Forum presenters agreed that promoting increased membership in farmer cooperatives and other farmer organizations could spark increased farmer knowledge and potential incorporation of technology.

The papers presented at the forum suggest that the Malawi FISP was successful in increasing fertilizer usage and maize production at the household level for subsidy recipients. However, the program had major challenges in reaching the intended target beneficiaries to complete its poverty alleviation goals. In particular, research on the FISP has stressed the need to make the criteria for beneficiaries clear and explicit. The following guidelines for future policies to target “vulnerable” groups are suggested:

- Set the recipient criteria to match country-specific indicators of poverty.
- Specify the minimum and maximum farm sizes for the subsidy.
- Make guidelines more accessible by providing them in local language.

The newly independent nation of South Sudan was singled out by participants as a key beneficiary from the insights of this panel discussion. At present, South Sudan is a net importer of agriculture products and is categorized as being food insecure. Yet the majority (80 percent) of its land is arable with vast agricultural potential. With effective policies to increase yields, the nation could become a breadbasket for the east African region. The country’s nascent leadership has shown a commitment to agriculture development, recently announcing a target to purchase fertilizer. South Sudan should clearly outline its priorities and carefully match beneficiaries of the subsidies to individual farm characteristics to meet intended targets. In general, African nations as a whole should consider pairing subsidy programs with strategies for increasing agricultural technologies aimed at alleviating risk, providing more credit, and expanding effective agricultural education.

ADOPTION OF IMPROVED SEED VARIETIES

Improved-seed varieties are an effective tool for increasing agricultural production in Africa. Their benefits include higher yields, a shorter growing cycle and stronger resistance to disease. Yet, despite these advantages, they remain underutilized across Africa. The region has the lowest levels of improved seed utilization in the world. Improved

Previous research found that only 18.5 percent of agricultural land in sub-Saharan Africa was planted with high-yielding seed varieties in 2000, compared with 50.2 percent in Asia and 41 percent in Latin America.

seed varieties in combination with other technologies such as irrigation and fertilizer have been critical to the Green Revolution in Asia and elsewhere. Previous research found that only 18.5 percent of agricultural land in sub-Saharan Africa was planted with high-yielding seed varieties in 2000, compared with 50.2 percent in Asia and 41 percent in Latin America. Improved varieties of many of the staple crops in the region continue to be underutilized including cassava, sweet potato, yams, sorghum, millet and rice. Improved cassava seeds have been found to increase farm yields by 40 to 50 percent; however, despite these findings the region has yet to reach its potential utilization of this crop.

The seed industry in Africa continues to be underdeveloped. By some estimates, only 10 percent of seeds in the region are supplied by the formal sector. The remaining supply is recycled or exchanged among farmers, which leaves little room for the introduction of improved varieties. It is clear that an innovative approach is required to increase the use of improved seeds in the region. Some of the primary challenges to increasing their use in Africa are a lack of access to good quality improved seeds, a lack of finances to purchase seeds and obstacles in convincing farmers of improved seed utility.

During the forum, researchers examined several causes for underutilization of improved seed varieties. One study analyzed the impact of a “small push” on improved seed use and fertilizer adoption by subsistence farmers in the eastern, central, and western regions of Uganda. Researchers conducted a randomized controlled experiment to determine whether farmers would have a higher demand for inputs (improved seeds and fertilizer) if they were provided access to credit and were part of a one-time intervention that provided an orientation to effectively using these inputs.

The study found that output could more than double if farmers switched from local variety seeds to hybrid seeds and utilized fertilizers. Farmers in the treatment group had a much higher lasting demand for inputs after learning and experiencing firsthand the benefits of such inputs. The study also found evidence of information spillover effects as neighbors of the households in the treatment group demonstrated higher demand for improved seeds and fertilizers after the intervention. Researchers also identified a lack of access to credit as a major obstacle to input demand in Uganda. Farmers’ demand for both improved seeds and fertilizer increased significantly when they were given access to credit before the planting season compared to when credit was not offered. Furthermore, once farmers experienced increased output from improved seeds, they were more likely to invest in the inputs during the following season.

The findings suggest that the strategy to increase the adoption of both improved seed varieties and fertilizer should also provide access to credit, teach farmers how to use these inputs, and demonstrate to farmers through experimentation that these inputs can boost their yields.

Another study examined how public-private partnerships can help to increase the utilization of improved seeds. Farmers surveyed in several districts in Uganda indicated fake or counterfeit seeds in the market are a key obstacle to the utilization of improved seeds. The sale of counterfeit seeds not only discourages the purchase of improved seeds, but it also undermines consumer confidence in the market as a whole. In a recent court case in Uganda, farmers sued their seed-provider, Mukwano Group of Companies, for the sale of allegedly dead seeds. Researchers recommended the Ugandan government work with private sector seed distributors to maintain high quality standards/grades as well as to ensure that counterfeit seeds do not continue to infiltrate local markets. Access to production credit was also found to play a key role in the decision to utilize improved seeds for many resource-constrained farmers.

The study also identified a lack of information about the benefits of improved seeds as a reason for their underutilization. Participation in farmer’s associations is a possible solution to increase information sharing among communities. Researchers found that participation in farmers groups and associations led to higher adoption of improved seeds

among farmers especially when compared with farmers who did not belong to such associations. Through these groups, farmers are able to share information about how to use improved seeds as well as let others know about unscrupulous distributors selling counterfeit seeds.

Policy Implications

A number of policy recommendations emerged from the discussions. First, information about improved seeds should be better disseminated through farmers associations and/or local government offices, which are well placed to perform this function. Governments should support farmers associations because national endorsement has proven to be an effective mechanism to increase farmers' use of modern inputs such as improved seeds and even fertilizer. Second, governments should develop seed-certification programs to thwart counterfeit distributors and better regulate the market. Otherwise, such abuses will continue. It is also important to work with the private sector to increase the quantity of improved seed retailers. Retailers are often located far from rural farmers; the challenge for governments will be identifying how to incentivize retailers to invest in remote facilities where goods are most needed. Third, financial services should be extended to rural areas to ease farmers' monetary constraints and help them purchase needed inputs. Despite their effectiveness at increasing yields, the high cost of improved seeds prevents farmers from using them. To increase utilization, governments should work together with the private sector to provide production credit for farmers, especially those in rural areas.



Ethiopian woman shucking green beans. © Amanda Grandfield

In implementing these recommendations, information and communication technology—cell phones, SMS messages, the internet, etc.—will be instrumental. These cost-effective tools can quickly relay information regarding where to purchase improved seeds, seed pricing, and potential yield increase, etc. One successful example of this is Kenya Plant Health Inspectorate Services, which launched an SMS Maize Variety Service to inform farmers about a variety of maize seeds that are available in their area as well as to provide information about certified licensed dealers. Such tools help create a feedback loop between market participants and regulators so the buying and selling of seeds becomes more transparent, secure and lawful.

CLIMATE CHANGE

Forum papers also addressed the challenges presented by climate change and its impact on agriculture in Africa. Global warming will affect Africa in numerous ways, including changes to rainfall patterns, rising sea levels, decreases in water availability as well as increases in extreme weather such as droughts and

floods. Unless effectively managed, these changes will have devastating consequences on the continent's agricultural output. Adapting to and mitigating these effects will thus be essential for sustainable development on the continent.

One paper presented at the forum examined the impact of climate change on wealth dynamics of Boran pastoralists in southern Ethiopia. The livelihood and wellbeing of pastoralists in this region depends significantly on climatic conditions which impact herd mortality and reproduction. Researchers discovered herd dynamics in the region follow a “boom and bust” cycle that is influenced strongly by variations in rainfall. Low rainfall conditions resulted in negligible herd growth and often herd loss, while good rainfall led to herd growth and a return to initial herd conditions. One key impact of climate change in the region has been the growing frequency of severe droughts which reduces the capacity of pastoralists' herds to recover. Research indicated if the number of severe droughts in the region were to double—which is quite plausible by many estimates—then no herd growth will occur regardless of the initial herd size. Household herds may decline toward a new equilibrium of just a single animal per household.

Presenters highlighted the urgency for policies which include climate change adaptation and better rangeland management to help pastoralists. Weather indexed insurance as well as social protection programs will be needed to preserve the traditional livelihoods of these populations. Researchers also warned that inequalities stemming from increased herd size volatility as droughts become more frequent could ignite conflict over water and rangeland.

Increased climate volatility will require farmers to be able to better manage their existing resources. Another study examined how production risk exposure impacts the decision to adopt soil conservation techniques and fertilizer among farmers in semi-arid districts in Kenya. Farmers that began or increased methods of soil and water conservation, fertilizer, manure and terracing techniques enjoyed high productivity levels and relatively little soil deterioration. The study also found that in order to encourage the use of soil conservation techniques, it is important to hedge against risks associated with using these new techniques. Therefore, strategies to promote the use of new techniques should be coupled with policies to mitigate the potential production risk that comes with introducing new techniques. There was consensus that agricultural extension services are an effective mechanism for educating farmers about proper utilization of these techniques. Low-cost conservation techniques are becoming increasingly more important for the agricultural sector in Africa as volatile rain patterns, depleted soils, and the cost of fertilizer remains too high for many smallholder farmers.

Policy Implications

Presentations and discussions at the forum highlighted a number of policy options. The predicted increase in the frequency of droughts in much of Africa necessitates climate change adaptation strategies to protect vulnerable populations—especially pastoralists and smallholder farmers. National strategies to minimize the impact of climate change should include social protection programs as well as programs for better rangeland management and better management of existing soil and water resources. As part of these efforts, the

use of index-based insurance should be encouraged for both farmers and pastoralists to hedge against increasingly volatile rainfall.

Likewise, soil and water conservation techniques will be needed to help farmers cope with climate change. Recognizing that conservation/management strategies work best when they are localized, governments should place an emphasis on working with local agents (e.g. civil society) to provide information to farmers on region-specific production techniques.

Governments should also work more closely with pastoralists to best address their needs. In certain contexts, this might mean that governments enact policies allowing the systematic burning of rangeland to encourage grass growth. In other circumstances, the government might set-up accessible weather reporting systems via mobile phone technology, which transmit information regarding rainfall, grazing conditions, and water availability. One successful example is RANET (Radio and Internet for the Communication of Hydro-Meteorological Information)—a project launched by the Zambian government that collects rainfall data in remote areas and sends weather alerts via SMS and radio to rural farmers. Regional climate information is collected from satellites and translated into local languages to warn communities about floods, droughts and other extreme weather patterns.

INSURANCE

Papers presented at the forum also focused on the important components of agricultural insurance. Among those included are crop-yield insurances—those designed to offset the various shocks that can affect crop production (i.e. hail or drought)—and crop-revenue related insurances, which use average annual output and price to determine the coverage amount. While the insurance schemes examined at the forum focused on crop-yield related insurance, all studies were interested in how such schemes could benefit smaller scale farmers in Africa. Revenue-based crop insurance is less ideal for this population due to the difficulty involved in measuring and estimating the required parameters or appraising the annual revenue and output of such small-scale farms.

Crop-yield insurance has proven to be an innovative solution to the problems that inclement weather can pose for many smallholder farmers. In this system, farmers pay a premium for financial coverage as a safeguard should the yield or value of their crops fall significantly, and insurers distribute an indemnity in such an event. Alternatively, “index-based” insurance products, which provide payouts to farmers based upon proxy measures of crop damage, have become increasingly popular. If, for instance, the level of rainfall in a region drops below a certain level, farmers are given compensation automatically rather than having to prove that their harvests have been damaged to a visiting insurance agent.

Papers presented at the forum focused on index-based insurance used for crops and livestock, which, as mentioned, are less expensive to administer and more objective than traditional forms of insurance

since assessments of crop damage are notoriously unreliable. One study explored index-based insurance for millet growers in Niger, another studied the use and uptake of index-based insurance with preexisting informal insurance groups in Ethiopia, and a final paper examined index-based insurance for livestock in northern Kenya.

The lessons learned from these studies varied. The Kenyan study found that index-based livestock insurance significantly increased the use of livestock as a productive asset, as opposed to a precautionary savings mechanism. The crop insurance experiment in Ethiopia found that using pre-existing social networks

can be a cost effective way of leveraging trust—a large factor in insurance uptake—in established informal groups. The Ethiopian study also found that training on the benefits and risks of insurance helped increase uptake dramatically, from 3 percent for those with only a minimal amount of experience to 42 percent uptake for those with intensive training. These studies also found that insurance usage can encourage farmers to take advantage of inputs; the notion that effort and resources would not be wasted on failed crops could account for increased input usage. This also showed a relationship to farmers' levels of risk aversion.

A number of challenges arise when implementing insurance schemes. In the case of millet in Niger, analysis demonstrated it is necessary to obtain data based on observations in order to properly parameterize insurance indexes, which makes previous knowledge of regional data essential. Difficulty was noted in effectively calibrating the index, stating that the imperfect coordination made this more of a gamble than an insurance scheme—one study found that in only 70 percent of instances did the insurance pay when merited. This fact stirred controversy as to whether index-based schemes insure for what they are intended, or if they merely require farmers to gamble.

Policy Implications

Index-based insurance has many implications for agricultural policy in Africa going forward. Before policymakers address these implications, they must acknowledge the apparent weakness presented by indexes, which are not always calibrated properly, and find a way to ensure that the insurance products being sold serve their purpose. Further study is needed to understand the conditions under which such insurance schemes thrive, as well as their effects on farmer behavior and welfare in both the present and long run. Policymakers should draw from studies which identify environments where these schemes have been successful and incorporate farmer behavior into considerations for policy writing.



Uganda. © Prill Mediendesign & Fotografie

If such insurance products can be effectively designed and shown to have positive effects on productivity and income smoothing, then the focus will shift to encouraging uptake of such insurance products. Traditional agricultural insurance products, as well as index-based ones, suffer from low utilization rates, especially among the poor and those who suffer the most from severe shocks to income. Often the complexity of such schemes and lack of farmer training are associated with the low uptake rates. As mentioned above, scaling-up training programs on the benefits of insurance have been shown to encourage product use. Such index-based insurance schemes have the potential, with further research, to be an effective tool for improving agricultural productivity and providing a safety net for small scale farmers. Therefore, policymakers can encourage the uptake of crop yield insurance schemes and support programs that orient farmers to their benefits as well as provide training on the intricacies of insurance policies.

CONTRACT FARMING

Although there are many approaches to contract farming, it is commonly defined as the “vertical coordination between growers of an agricultural products and buyers or processors of the product.” The practice of growing under contract is prevalent throughout sub-Saharan Africa. Ideally, contract farming provides African farmers with opportunities to take advantage of a firm’s scale and scope; in turn the firm benefits from having reliable suppliers with a standard quality. However, the impact of agricultural contracts on the productivity and welfare of African farmers, or firms for that matter, has been under-researched and under-examined.

Participants at the forum contributed to the broader knowledge of contract farming in sub-Saharan Africa. A valuable component of the contract farming session was an overview of survey data from Madagascar—where 36 percent of farmers work under contractual obligation to produce—that investigated the causal impacts of contract farming on household welfare. In addition to the Madagascar study, information from Nigerian focus group surveys was used to show the characteristics of farmers who enter contracts and to estimate the extent to which a contract improves farmers’ welfare. The Nigerian focus group study looked at differences in governance and impact on income from contract farming for different crops including cotton, ginger, and rice.

The conclusions drawn from the evidence presented and the subsequent discussions were unambiguous: contract farming provides multiple welfare benefits for farmers in Africa. Perhaps most importantly, contract farming has a positive and significant impact

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on farmers’ income. The Madagascar study reported an increase in farmers’ income is as large as \$119 per household annually, equaling a substantial 10 percent jump in income among the important smallholder farmer demographic group. It was also estimated that contract farming raises productivity through promoting the usage

of modern inputs in agricultural production like high-yield seeds and fertilizer. These inputs help raise income levels. Contract holders in the Madagascar sample reported a shorter duration of the “hungry season”—the time when household members cannot satisfy their nutritional requirements—than households without contracts. Agricultural contracts were also correlated with increased access to financial instruments; contract farmers from the Madagascar sample are over 30 percent more likely to obtain a loan than farmers without contracts. This is to be expected as farm contacts typically provide a loan for inputs, such as seeds, that is deducted from profits at the time of harvest. Notably, a gender disparity was found in farmers that engage in contractual arrangements: women are 50 percent less likely to participate in contract farming. Some of the explanations offered for this finding include: discrimination among the agricultural processing firms and, more generally, disenfranchisement among females in the wider society.

The Nigerian focus group surveys found use of contracts in the production of all three survey crops (cotton, ginger and rice) to have a positive significant impact on farmers’ income as compared to farmers who do not hold contracts for these crops. Profitability and welfare indicators in the survey showed that farmers holding ginger contracts had better performance than rice and cotton.

Policy Implications

Given the indelible impact of contract farming on individual welfare, forum discussants focused on steps that governments and other organizations could use to promote contract farming. A number of policy implications were extrapolated from the discussion. First, depending on what explanation correctly accounts for gender disparity in obtaining contracts, market forces may or may not be able to correct the imbalance—an uncertainty that prompted some commentators to suggest areas for the public sector to engage more directly. Perhaps the gender disparity in contract farming stems from the inability of women to own land for any purpose, including agriculture. Thus, governments should build appropriate property rights legislation to promote land ownership by women. If already in place, governments should consider offering incentives to encourage firms to target poorer segments of the population and farmers who might not engage otherwise, especially women.

Second, governments can initiate activities to make contract farming opportunities more visible. A potential preexisting platform created by agricultural extension services already exists, which could also be used to disseminate information on the advantages of contract farming. Agribusiness firms and agricultural extension are complimentary and contract farming often stipulates the inputs a farmer must use and production methods, while extension services often offer similar advice in less compulsory terms. Governments may consider regulatory measures to limit the potential for rent-seeking behavior by firms. Judicial processes must also be strengthened to allow for grievances to be addressed legally. Partnerships with neighboring governments can be initiated to harmonize laws to facilitate cross-national contracting and enforcement.

Beyond government intervention, farmer and peasant associations may also play a role in encouraging contract farming. Cooperation serves two main purposes: to enhance the otherwise weak bargaining positions individual farmers have in such matters, and to cut costs of production by allowing farmers to take advantage of economies of scale.

Further research should focus on determining hindrances and best practices for contract farming in sub-Saharan Africa to maintain welfare benefits for farmers, and how best to create a favorable environment for recruiting agribusiness.

LAND CERTIFICATION/TENURE

Many economists agree that land security is a crucial element in the development of a thriving agricultural sector. In many parts of the world, the formal registering and titling of land has increased this security. To date, however, land certificates are rare in sub-Saharan Africa—in Uganda, for instance, more than 90 percent of the land is unregistered—and some economists wonder whether large-scale certification efforts are even relevant for an African context.

The nature of land property rights has a direct impact on agricultural productivity. It affects an individual's decision to invest in inputs as well as how they utilize the land. When farmers have well-secured rights to the land they farm, they are more likely to make long-term investments to optimally utilize the land. However, within land tenure systems in which individuals do not have secured rights, the incentive for farmers to make substantial investments or engage in sustainable farming practices is removed. Therefore, the structure of land tenure is a major determinant of agricultural productivity.

One study presented at the forum examined the different levels of productivity and land investment associated with various land tenure systems in Uganda. They analyzed the impact of weak individual land rights under customary law on food crop farming, tree planting, as well as whether farmers constructed permanent homes on the land. Researchers found that ownership of property rights did increase productivity. Most importantly, the study found that households with rights over the land they farmed invested more in productivity boosting inputs such as fertilizer, improved seeds and pesticides.

Another study analyzed the willingness of farming households to pay for land certificates in Uganda. In particular, researchers examined the willingness to pay for land certificates among poor farming households. Results indicated differences based on the economic status of the household, with wealthier households being more likely to pay for certificates compared with poor ones even though the subsequent security would benefit such households more significantly than wealthier households. The numerous administrative

fees associated with procuring a land certificate served as a major deterrent for poor households. The study concludes that land reform programs that charge fees, even if it is just on a cost recovery basis, would not be very beneficial to poor households engaged in the agricultural sector.

Policy Implications

These findings have many important policy implications for the government of Uganda as well as other African governments. First, land ownership matters for increasing land productivity. The majority of farmers in Uganda are subject to customary land ownership structures which discourage investment in the property. Therefore, to increase agricultural productivity it will be important for policymakers to encourage land certification. A push toward greater individual land ownership rights is likely to yield productivity gains. Based on study findings, support will also lead to greater utilization of productivity enhancing inputs such as fertilizer, improved seeds and pesticides—inputs that are all underutilized under customary land ownership structures.

To assist poor households, the current system of land certification should be improved. The process by which certification occurs should be simplified and rationalized; its monetary and administrative costs, brought down; and efforts to increase certification, stepped up. In addition, policymakers should explore alternative land tenure systems including the creation and usage of land banks. It is likely that these two approaches are suitable for different contexts. In Ethiopia, large-scale certification efforts have been successful; the government has kept costs of certification low and the process relatively free of bias toward the country's wealthier constituents. Moreover, successful efforts have reduced conflict over land and empowered women in the society. In contrast, in certain parts of Madagascar—where there is a widespread and indigenous system of land tenure—certification has not been as effective. Researchers here have found that owning formal titles has relatively little impact on productivity and stakeholders have acknowledged that certification programs should not be instituted in this context. In such an environment, land banks may prove to be a more effective mechanism for securing rights and boosting agricultural productivity.

FINANCIAL INNOVATION

By changing the saving and spending habits of African farmers, innovative financial products are increasingly serving to improve agricultural productivity in Africa. Discussion at the forum took two main directions. The first was motivated by the results of a paper on microcredit and its impact on a community in western Ethiopia. A randomized control trial (RCT) was used to investigate the effects of microcredit on the targeted population and, consistent with a number of other studies on the subject, the paper found that microcredit was helpful, yet not a silver bullet. It did not have a large impact on levels of poverty, food availability or health indexes in the community.

Conversations also focused on the results of a commitment savings product and its effect on income levels of Malawian farmers over time. This research also utilized a randomized control trial and, similar to the first product, access did seem to have a sizable effect on its intended beneficiaries. It helped farmers save for future planting seasons, increase their level of inputs in the following harvest, and gave farmers access to funds in the subsequent “lean” period. These outcomes resulted from reduced social pressures on the farmer, which would have otherwise depleted his financial resources.



Kenyan coffee plantation. © Liz Leyden

Debate ensued, however, as to whether these effects were transferable to other communities. Notwithstanding, discussants agreed that more research is necessary on the savings habits of smallholder farmers.

Policy Implications

An important question arising from the studies is whether the lessons learned can be scaled up within specific countries and regions, or are applicable to other parts of Africa. This remains an important decision for policymakers. The financial products used in Malawi target the savings and consumption habits of specific communities of farmers. This type of field experiment could prove valuable if the supporting microfinance company scales up the use of this type of financial product to assist the financial needs of the community. Using field experiments that examine financial products as a type of market research for the private sector could initiate mutually beneficial banking in these regions. Overall, it is critical that policymakers ensure the sweeping trend of RCTs are applicable to wider communities or regions on a broader scale in Africa moving forward.

Ultimately, the use of RCTs could help further the development of the banking sector in Africa, scale up the usage of certain financial products, and benefit African farmers via enhanced agricultural productivity. To assist in the achievement of these ends, it is important for African governments to consider the important role they can play in disseminating results of this type of research to the private sector. Providing an encouraging environment for financial innovation, promoting the use of financial products that address the needs of people, and supporting the study of financial needs of their agricultural workers will be necessary steps for African policymakers to enhance agricultural productivity.

CONCLUSIONS

Cumulatively, the forum presentations covered a myriad of issues and presented case studies whose successes and weaknesses will be relevant to the improvement of agricultural yields in Africa. By exploring these findings, effective recommendations for policymakers and governments to promote growth of the agricultural sector in Africa are evident.

Lessons learned and shared challenges are applicable across regions and throughout the sector. For example, education and training programs for inputs such as fertilizers and improved seed varieties can increase the adoption of such farming practices. Farmers will be less apprehensive to take the risk of purchasing inputs that have no guaranteed return if they are effectively trained to avoid human error. This information has proven to be most effective when disseminated through localized mechanisms such as extension programs that make frequent visits to farms, as well as through farmers associations and local governments. Local-context specific programs facilitate a continuous exchange of knowledge and a sharing of best practices for the mutual benefit of farming communities. Farmer education has not only been successful in increasing the uptake of inputs, but also in the adoption of insurance programs which protect farmers against low-yield seasons. Crop-yield based insurance programs are underutilized, and farmer training in obtaining coverage and verifying correctly calibrated indexes will be important for securing the predictability of household welfare. Insurance programs have also proven effective in protecting particularly vulnerable populations such as pastoralists and smallholder farmers against increasing unpredictability caused by climate change.

As the effects of climate change continue to increase the number of droughts and natural disasters, governments will need to work closely with farmers associations and communities to balance conservation techniques with farmers' interests. The incorporation of new technologies has witnessed wide success through weather reporting systems and information sharing using new media, SMS messages, and mobile phones to report storms and prepare for fluctuations in advance. Technology utilization can also be widely effective in the provision of financial services to curb the high costs of inputs like fertilizer and improved seeds to farmers, offering simple credit systems in collaboration with the private sector.

The formal structuring of the agricultural sector is another important lesson for policymakers. Contract farming has proven widely successful in improving individual welfare, and policies should be enacted to utilize the platform of extension services to promote contract farming as well as protect smallholder farmers from rent-seeking firms. Moreover, the establishment of land tenure is another measure with notable successes because farmers are more likely to invest in sustainable land practices and inputs such as improved seeds and fertilizer when they own the land. Policymakers and governments can aid this process by cutting down on costly and timely administrative and bureaucratic hurdles to purchase and register land rights. Additional consideration is required for poor agricultural households for whom even the most minimal cost-recovery fees present

a major obstacle to purchasing land. Finally, certification programs to ensure the legitimacy of inputs like improved seeds and farming contracts are effective tools governments can enact to encourage the increase of agricultural yields in Africa.

The forum was an important opportunity for academics, policymakers, and other stakeholders to identify the areas in which education, training, improved technologies, and formalization practices can develop best practices and policies to aid growth and improve farmer welfare in Africa.

PRESENTED PAPERS

Adoption and Impact of Conservation Agriculture in Central Ethiopia. By Wondwossen Tsegayea, Dejene Aredob, Roberto La Roverec, Wilfred Mwangid, Girma T. Kassie and Germano Mwabuf.

Adoption and Levels of Demand of Fertilizer in Cocoa Farming in Côte d'Ivoire: Does Risk Aversion Matter? By Kouamé Euphrasie Ben-Houassa.

As You Sow, So Shall You Reap: The Welfare Impacts of Contract Farming. By Marc F. Bellemare.

Commitments to Save: A Field Experiment in Rural Malawi. By Lasse Brune, Xavier Giné, Jessica Goldberg and Dean Yang.

Cost as a barrier to land tenure security for poor agricultural households: Willingness to pay for land certification in Uganda. By Ibrahim Kasirye and Sarah Ssewanyana.

Dynamic Effects of Index Based Livestock Insurance on Household Intertemporal Behavior and Welfare. By Munenobu Ikegami and Christopher B. Barrett.

Health Shocks and Natural Resource Management: Evidence from Western Kenya. By Joshua Graff Zivin, Maria Damon and Harsha Thirumurthy.

Heterogeneous returns and the persistence of agricultural technology adoption. By Andrew Zeitlin, Stefano Caria, Richman Dzene, Petr Janský, Emmanuel Opoku and Francis Teal.

Innovation in African Agriculture: What Works Best, Where and How? Identifying and Rewarding Success with Proportional Prize Rewards. By William A. Masters.

Institutional Innovations for Agricultural Transformation and Pro-Poor Growth: The Case of Contract Farming in Nigeria. By Aderibigbe S. Olomola.

Knowledge Infrastructure and Agricultural Productivity in Ghana. By Olumide Taiwo and Emmanuel Asmah.

Land Rights, Agricultural Productivity, and Land investment in Uganda. By John Mutenyo, Mwangi Kimenyi, Edward Bbaale, Sandra Basemera and James Muwonge.

Learning by Doing but not Learning from Others: Experimental Evidence on Technology Adoption in Western Kenya. By Esther Duflo, Michael Kremer and Jonathan Robinson.

Measuring the Impacts of Malawi's Farm Input Subsidy Progra. By Christopher Chibwana, Monica Fisher, Charles Jumbe, William Masters, Gerald Shively.

On Climate Variability And Resource-Dependent Wealth Dynamics: The Case of Ethiopian Pastoralists. By Christopher B. Barrett and Paulo Santos.

On the Impact of Microcredit: Evidence from a Randomized Intervention in Ethiopia. By Alessandro Tarozzi, Kristin Johnson Jaikishan Desai.

Presented Papers continued

On the Origins of Gender Roles: Women and the Plough. By Nathan Nunn.

Policy Issues in Technology Adoption and Maize Productivity in Benue State Nigeria: An Endogenous Switching Regression Approach. By Goodness Chioma Aye.

Production Technology, Productivity and Gross Margin of Smallholder Commercial Food Crop Farmers in Ghana. By Akwasi Mensah-Bonsu, Daniel Bruce Sarpong, Ramatu Al-Hassan, Samuel Asuming-Brempong, Irene Egyir, John Kuwornu and Yaw Osei-Asare.

Rationalizing Public-Private Partnerships in the African Seed Industry: Insights from Uganda. By Barnabas A. Kiiza and Glenn Pederson.

Revisiting African Agriculture: Institutional Change and Productivity Growth. By Robert H. Bates and Steven A. Block.

Risk Aversion, Property Rights and Household Investment in Conservation Agricultural Technologies: Evidence from Agro-pastoral Regions of Kenya. By Maurice Juma, Wilfred Nyangena and Mahmud Yesuf.

Role of Information on the Adoption of Soil Enhancement Techniques: Evidence from Central Province in Kenya. By Jennifer Gathoni Njaramba.

Stages of Agricultural Commercialization in Uganda: The Role of the Markets. By Oleg Nivievskiy, Stephan von Cramon-Taubadel and Sergiy Zorya.

Technology Adoption in Agriculture: Evidence from Experimental Intervention in Maize Production in Uganda. By Tomoya Matsumoto, Takashi Yamano and Dick Sserunkuum.

Trade, Employment and Structural Transformation in Africa. By Margaret McMillan.

Understanding the complexities surrounding gender differences in agricultural productivity in Nigeria and Uganda. By Amber Peterman, Agnes Quisumbing, Julia Behrman and Ephraim Nkonya.

Weather-index drought insurance: an ex ante evaluation for millet growers in Niger. By Antoine Leblois and Philippe Quirion.

What are the Dynamic Effects of Fertilizer Subsidies on Household Production and Income? Evidence from Malawi. By J. Ricker-Gilbert and T.S. Jayne.

ENDNOTES

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