

## KEY POINTS

- Smallholder farmers in Sub-Saharan Africa face numerous agricultural obstacles such as climate change and the environment, corporate commodification of food and unpredictable political environments. Farmers are finding it difficult to sustain agricultural livelihoods and output.
- The international community approaches these obstacles through biotechnology, a temporary solution that contributes to the overarching issues of food security. Due to the intense privatization and monopoly surrounding intellectual property of biotechnology, international investment should be diverted toward an approach that addresses the root causes of food security in Sub-Saharan Africa.
- Taking into account the different geographic locations of farmers, the African Union (AU) should: encourage information sharing to focus on crop variety and system improvements, and knowledge diffusion through the use of mobile technology to surpass geographical, social and political barriers; and implement a pan-African approach in order to increase the initial knowledge base with unconventional methods of adaptation and to gather information from unique ecological conditions
- Reducing financial- and knowledge-based barriers for smallholder farmers will significantly improve crop output, growth and development — ultimately reducing food insecurity.

# IMPROVING ACCESS TO FOOD IN SUB-SAHARAN AFRICA: USING THE DIFFUSION OF AGROECOLOGICAL INFORMATION TO MITIGATE CLIMATE CHANGE EFFECTS

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## INTRODUCTION

By 2050, the world's population is expected to exceed nine billion people. Population growth is occurring most rapidly in Africa, which will see the population grow from one billion to 2.1 billion by 2050. Africa will see significant population growth; however, agricultural output is not growing at the same rate. Africa's abundant natural resources are being used ineffectively, and the country is unlikely to sustain current population growth. According to reGina Jane Jere (2014), "Barely a fraction of fertile agricultural land [in Africa] is being cultivated — just 10 percent of the 400 million hectares."

The AU created the Comprehensive Africa Agriculture Development Programme (CAADP), which is operated by the New Partnership for Africa's Development (NEPAD). CAADP is focused on creating development through innovative agricultural solutions. NEPAD is responsible for managing agriculture and food security projects with the purpose of helping smallholder farmers with access to markets, finance and technical support. It is through this channel that the AU should incorporate cellphone technology within the larger food security movement currently under development by the CAADP and NEPAD.

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In January 2014, the AU declared 2014 as the “Year of Agriculture and Food Security” at its annual summit (Jere 2014). Currently, Africa spends US\$40 billion on importing food, which is unsustainable and ineffective (ibid.). Enhanced agricultural performance is key to improving growth and reducing poverty through its direct impact on job creation and increasing opportunities, especially for women and youth (AU 2014). Most importantly, improved food security is necessary to reduce acute malnutrition and childhood stunting, which affects the development, prosperity and future growth of countries.

Presently, agriculture accounts for more than 33 percent of the continent of Africa's GDP (Jere 2014). More than two-thirds of Africans depend on agriculture for their income; 379 million people are responsible for producing 80 percent of Africa's food (ibid.). As Jere (2014) has stated, “Growth in the agriculture sector is 11 times more effective at reducing poverty in Sub-Saharan Africa compared to growth in other sectors.”

Agriculture is hugely important for Africa's current and future development. In 2003, African leaders signed the Maputo Declaration, committing to invest at least 10 percent of their annual budget expenditure to agriculture. Burkina Faso, Ethiopia, Guinea, Malawi, Niger, Senegal and Zimbabwe have consistently met this target, indicating that investment leads to concrete results (ibid.).

## CONTEXTUALIZING THE ISSUE

In addition to population growth and the predominance of poverty, Africa is threatened by the impacts of climate change. Although climate change is a natural phenomenon, human activities are accelerating the process through large emissions of green house gases and unsustainable farming or mining methods. Climate change has caused extreme weather events — such as

droughts, desertification, temperature and precipitation variations, floods and storms — that are extremely problematic for agriculturally dependent regions. Climate change will exacerbate displacement, migration and conflict over natural resources.

Smallholder farmers in Sub-Saharan Africa face numerous agricultural obstacles such as climate change and the environment, corporate commodification of food, and unpredictable political environments. With extreme weather conditions and the lack of sustainable farming knowledge, they are finding it more difficult to sustain agricultural livelihoods and output.

The international community currently addresses these obstacles through biotechnology, using genetically modified organisms to create hybrid seeds or fertilizers to increase crop yield or encompass a high tolerance to extreme weather patterns. Biotechnology can be viewed as a temporary solution, however, that contributes to the overarching issues of food security, and provides additional issues such as limited access to seeds, financial restrictions and the lack of appropriate complementary inputs.

The approach of knowledge-based agroecology has seen successes in its small-scale projects around Sub-Saharan Africa. Niger has engaged in many projects in local villages using agroecology to mitigate the effects of climate change. In the region of Maradi, the Farmer Managed Natural Regeneration project has been introduced to promote agroforestry. This promotes the practice of actively managing and protecting non-planted trees and shrubs with the goal of increasing the value or quantity of woody vegetation on farmland (Haglund 2011). The farms that have adopted this low-cost approach have seen an increase in income through the increased opportunity of crop diversity. Although this is a successful approach,

the adopting households or farmers are usually higher income, large farms with higher economic circumstances and larger stocks of assets. They also tend to have higher literacy rates and have received more schooling. This case demonstrates that although the technology and knowledge exists to create sustainable low-cost farming methods, it is not always a viable option for small farmers who tend to have barriers accessing innovative farming methods.

The AU should promote mobile phone technology with the purpose of removing the geographical barriers that impede rural development through improvements to access to credit and the sharing of information to foster agricultural development as a means to sustain long-term development and productivity.

## CURRENT APPROACHES

Each region has approached these issues through a wide array of tactics. Some areas have ignored the anthropogenic causes of food insecurity, while others have encouraged the use of biotechnology, or have increased their capacity in offering micro credit. Neither option has provided a sustainable trajectory toward food security.

Without intervention on the part of the AU or individual action from its member states, the current agriculture regime will remain the same. Due to the multiple linkages of food security with other sectors, it can contribute to ecological degradation and environmental migration. Current farming practices will continue to accelerate desertification through poor cultivation, overgrazing, deforestation, poor irrigation mechanisms or any unsustainable use of the land and its resources (Darkoh 1998). This will reduce the amount of arable land available and create limited opportunities for the agricultural sector.

With the reduction of arable land, communities can no longer survive on their current economic and social infrastructures. They must find alternate sources for their livelihood or relocate for survival. This causes an abundance of displacement and these migrants are informally labelled as environmental refugees. Climate migration can be voluntary or forced, which creates disagreement on the appropriate channels they must go through for legality.

The growing dependency on corporate biotechnology as a solution to food insecurity will reduce access for small farmers entering the market commodity chain and does nothing to rectify the continuing disparity between smallholders and large farms. The increase in unemployment and consequent poverty creates a push for mass migration, as can already be seen throughout Sub-Saharan Africa. Due to the lack of consensus on the definition of what constitutes an environmental migrant, the number of affected persons ranges from 50 million to 250 million (Oliver-Smith 2012). The effects of environmental migration can increase the stresses of food security due to the effects on population density on the reduced available land for farming and agricultural purposes.

The option to increase access to credit has been a complementary approach to the available credit and subsidy programs initiated by governments and international organizations. The major criticisms surrounding credit programs have focused on the mismanagement of credit funds channelled toward large farms or politically powerful groups, rather than to smallholder farmers in remote rural areas in need of assistance (Bezner Kerr 2012). Credit and subsidy programs are viewed as temporary solutions to structural inefficiencies; however, they are a key part of the overarching solutions to be considered.

Enabling farmers to access and purchase necessary agricultural inputs, such as seeds and fertilizers, are necessary to increase yields. Microfinance provides farmers with the opportunity to be entrepreneurs, as credit enables farmers to purchase inputs that increase overall land productivity.

Microfinance is accessible to smallholder farmers or businesses, which are unable to access credit due to the high costs associate with banking institutions. According to the Food and Agriculture Organization (2000), "Many rural people need access to credit to allow investment in their farms and small businesses, to smooth consumption, and to reduce their vulnerability to weather and economic shocks."

In September 2004, the AU and the African Heads of States adopted the Declaration on Employment and Poverty Alleviation. In particular, the declaration recognizes the importance of making funds available for smallholder farmers to access microcredit to improve risk management and consumption strategies. Beyond the declaration's intentions to promote access to credit, the AU should begin to develop (with member states) a structure and system for implementing microcredit institutions.

Microcredit institutions can be set up and utilized with current mobile technology platforms, such as M-Pesa (a subsidiary of Vodafone) in Kenya. Improved access to financial services encourages savings and economic growth because it breaks down geographical barriers. For example, only 19 percent of adult Kenyans have access to formal bank accounts (African Development Bank 2013).

Africa has the highest rate of cellphone penetration, with over 650 million subscribers in Sub-Saharan Africa (Food Tank 2013). The increased use of mobile banking has created an opportunity for rural and low-income

consumers to access financial services at lower deposit rates than traditional financial institutions.

## RECOMMENDATIONS

The AU should encourage the development of African solutions to solve African problems through information sharing. It should diverge investment from corporate development and instead invest in improving local food infrastructures. In particular, the focus should be on improving access to local agroecological information that is conducive to food sovereignty and security. The AU is already dedicated to improving food security through their Department of Rural Economy and Agriculture, as their vision is, “A transformed sustainable agriculture that guarantees food and nutrition security and equitable economic growth for all citizens while ensuring sound environmental management and sustainable use of natural resources” (AU Commission 2014). Working within the institutions already in place will reduce the amount of overlap within the industry.

Access to appropriate information on sustainable agroecological practices will provide a positive shift in smallholder farmers’ agricultural output. By sharing local solutions to local problems, farmers can engage in the appropriate farming practices for their individual environments. For example, farmers can use Mobile Farm, which allows farmers to text a number and instantly receive current pricing information on their products; it also finds buyers for their produce (Global Citizen 2014). This service enables farmers to cut out the middlemen who eat into their profits.

The focus on alternate approaches has shifted toward agroecology, which is “knowledge intensive (rather than capital intensive), tends toward small, highly diversified farms, and emphasizes the ability of local communities

to generate and scale-up innovations through farmer-to-farmer research and extension approaches” (Holt-Gimenz and Altieri 2012). This approach addresses sustainable farming issues to mitigate climate change, as well as encourages a shift away from corporate biotech dependency.

**Due to the intense privatization and monopoly surrounding intellectual property of biotechnology, international investment should be diverted toward an approach that addresses the root causes of food security in Sub-Saharan Africa.** Currently, the majority of foreign investment provided by international organizations, philanthropic organizations and governments have focused on increasing access to biotechnology and the expansion of the hybridized seed industry beyond the private sector to include public actors. With the majority of attention and investment pouring into a short-term solution, major actors must refocus toward a long-term sustainable trajectory.

**Taking into account the different geographic locations of farmers, the AU should encourage information sharing to focus on crop variety and system improvements.** The geographic locations of farmers require unique projects that cannot be approached with a one-size-fits-all solution. The different environments require a focus on crop variety and system improvements, agroforestry and soil conservation, integrated pest management, livestock and fodder crops, regional and national policy partnerships, and aquaculture (Pretty, Toulmin and Williams 2011). Improving access to information on sustainable systems, current technologies available, business management advice, updated policies and regulation, and regular price updates can improve small farmers agricultural intensification (ibid.). This provides an alternate solution to biotechnology that farmers can informally adopt to approach their unique environment and circumstances.

The International Development Enterprises (iDE), a non-governmental organization, has implemented knowledge-sharing programs through their agents that sell farming supplies to local farmers in Cambodia. With the purchase of seed or fertilizer, iDE offers additional (free) information on weather patterns, soil care and current market pricing predictions (Mandell 2014). Organizations such as this in Sub-Saharan Africa have adopted an agroecological knowledge approach; however, further investment is required to reduce geographic barriers for access and encourage widespread diffusion of knowledge.

**The AU should encourage knowledge diffusion through the use of mobile technology to surpass geographical, social and political barriers.** Cellphone technology is able to connect remote communities with instant information about weather, accessing crop insurance, microcredit and banking. For example, there is an application that allows farmers to track the individual gestation period of each of their cows, which is important for expanding the size of their herd (Food Tank 2013). There are also mobile services to identify the appropriate seed varieties to use with the correct fertilizer so that farmers do not invest their limited capital incorrectly, resulting in unsuccessful cultivation.

Non-governmental programs have begun to introduce mobile technology as part of their overarching solutions. The start-up organization Farmerline has incorporated the use of mobile technology in agricultural development. In 2013, Farmerline ran a six-month pilot project in Ghana targeting fish farmers. They provided agriculture workers with aquaculture best-practice information, record-keeping services, and access to input suppliers and market access information through mobile technology. They share this information through SMS text messaging, mobile surveys and voice callback functions that are provided in several languages. This addresses the knowledge gap between farmers and basic

farming practices that can improve farming methods for sustainable fishing and increased returns. Having a callback function addresses the issue of literacy deficits as anyone can replay the message out loud for retention without having to read instructions. This also contributes to gender equality, as a large number of women are illiterate, yet are central actors in smallholder farms. The outcomes of this program were successful as there were increased farmer incomes by improving crop yields and reducing input costs, increased farmer autonomy through knowledge of the agriculture value chain and contributed to food security by sustainably producing more fish (Wood 2014). By providing a platform for knowledge in a technology that is already owned by a large number of small farmers, geographic and financial barriers are removed to increase the knowledge of agroecological practices. Mobile technology is not only efficient, but it can also ensure up-to-date information on market prices and weather patterns to increase accuracy in cultivation practices.

**The AU should implement a pan-African approach in order to increase the initial knowledge base with unconventional methods of adaptation, and to gather information from unique ecological conditions.** The creation of a pan-African approach with local integration requires investment and commitment from the knowledge bases across Sub-Saharan Africa. An overarching institution is necessary to oversee this program, which should be adopted by the AU. The shared knowledge base should stem from African universities across the continent to provide helpful research that can be adapted per unique ecological, social and political factors. This collaboration between African universities, the AU, aid agencies and farmers, will provide an effective alternative to biotech dependency and will address the structural inefficiencies of the food commodity chain

## CONCLUSION

Africa will experience large-scale population growth in the coming decades and agriculture will continue to be the primary source of income for many Africans. Climate change will continue to negatively affect Africa, which will ultimately impact crop yields. Action must be taken today, in order to avoid asking tomorrow, "How will we feed the world?" Food is necessary to prevent acute/chronic malnutrition and stunting, which negatively impacts a country's future growth and prosperity. The AU, collectively with its member states, needs to proactively develop programs and platforms to encourage knowledge dispersion through cellphone infrastructure. Access to credit is critical for improving output and crop yields because farmers require funds to purchase necessary inputs. Therefore, developing a cellphone platform to reduce food insecurity should be a priority for the AU. Reducing financial- and knowledge-based barriers for smallholder farmers will significantly improve crop output, growth and development — ultimately reducing food insecurity.

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