



RESEARCH BRIEF – DECEMBER 2014

FOOD SECURITY IN AFRICA SERIES: ASSESSING URBAN AND RURAL FOOD SECURITY

EXECUTIVE SUMMARY

The *CCAPS Food Security in Africa Series* is composed of four briefs that focus on combating food security vulnerability in Sub-Saharan Africa. This third brief in the series explores how persistent inequality threatens to undermine development strategies and magnifies exposure to risks for marginalized segments of rural and urban populations. As governments direct more attention to the agricultural sector, what strategies will ensure that increased investment will translate into increased food security? What is the effect of growing inequality, occurring in tandem with growing vulnerability, on the potential for countries to reduce hunger and poverty as their economies grow? This brief puts forth policy recommendations that promote inclusive growth with the ultimate goal of attaining stable food security for whole populations.

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Over the past decade, six of the ten fastest growing economies in the world were found in Sub-Saharan Africa.¹ This oft-cited statistic is remarkable for a continent that is often associated with widespread poverty and economic isolation. However, this growth has not been shared evenly. Increasing gross domestic products (GDPs) have been coupled with increases in inequality, where growth is concentrated in rapidly expanding urban centers and opportunities for marginalized communities are becoming increasingly limited. The poorest 20 percent of the population in Sub-Saharan Africa typically receive just six percent or less of national income, and the poorest 40 percent in most cases receive less than 15 percent.² This growing divide is explicitly reflected in issues of food insecurity. More than one in four Africans—over 200 million people—are chronically undernourished, stemming from uneven distribution of food resources, inadequate agricultural production, and underdeveloped markets.³

Adding complexity, this rising inequality is occurring simultaneously with increasing risk. Food prices are more volatile, civil conflict is a persistent threat, weather-related disasters are on the rise, and climate change is threatening landscapes and livelihoods. Like wealth, this vulnerability is shared unevenly. Marginalized communities, both rural and urban, often face disproportionate risk to short-term and long-term shocks and stresses that threaten their ability to satisfy the minimum requirements of food security.⁴

Vulnerability is often intimately tied to food security since a significant portion of the limited incomes of the poor is dedicated to the purchase of staple foods. Moreover, food-producing smallholder farmers are often net buyers, leaving them vulnerable to both production and market-related risks.⁵ Only households with strong and diversified assets are able to satisfy all four pillars of food security: availability, access, utilization, and stability.⁶ While food security is complex and multifaceted, vulnerability acts as a multiplier that magnifies the effects of negative shocks. Significantly, as income inequality increases, so does exposure to risk, ultimately undermining development opportunities.

THE 4 PILLARS OF FOOD SECURITY⁷

Availability – Having sufficient quantities of food available on a consistent basis

Access – Having sufficient resources to obtain appropriate foods for a nutritious diet

Utilization – Having an adequate diet based on knowledge of basic nutrition, as well as sufficient water, sanitation, and health care

Stability – Having access to adequate food at all times, irrespective of sudden shocks or cyclical events

MEASURING VULNERABILITY

Vulnerability is typically described as having three dimensions: exposure, magnitude, and sensitivity.⁸ Increased vulnerability occurs when high susceptibility is coupled with a lack of coping and adaptive capacities or, rather, when increased risk is paired with low resiliency.⁹ Household-level vulnerability is most often associated with threats to livelihoods—either livelihoods are inadequate because of resource constraints and low productivity, or livelihoods are risky and susceptible to collapse. Livelihood shocks can affect individuals through illness or accident; entire communities with floods, epidemics, or livestock disease; or entire economies with financial crises, natural disasters, conflict, or food price shocks. These shocks are most acute at times of cyclical vulnerabilities, such as between harvests or at times of low demand for casual labor.

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A recent report from Oxfam explores the different social and physical factors that shape vulnerability at the country level.¹⁰ Their analysis includes four indices that focus on different aspects of vulnerability, including natural hazards, socioeconomic status, vulnerability to climate change, and governance.¹¹ Not surprisingly, in all cases they found that vulnerability increases as income gaps widen.¹² This

suggests that economic growth is insufficient to reduce poverty without also addressing systems of inequality and how they affect resilience and exposure to risk.

RURAL LIVELIHOODS

Despite rapid economic growth, agriculture remains the main source of livelihoods for more than two-thirds of the population. Small farms—farms with fewer than five acres of land—provide over 80 percent of the food consumed in the developing world.¹³ These smallholder farmers, with little access to seed, fertilizer, financing, training, and markets, face a number of complex and intersecting challenges such as “increasing competition for land and water, increased influence of and changing markets, rising fuel and fertilizer prices, and climate change.”¹⁴ These farmers are often the least capable of adapting to or coping with shocks and stresses due to these challenges and are thus highly dependent on sustainable ecosystems and stable markets.

The High Level Task Force on the Global Food Security Crisis, established in response to the dramatic increase in global food prices in 2007-08, has recently promoted a focus on rural smallholder farmers in poverty reduction strategies. The group’s Comprehensive Framework for Action emphasizes social protection systems and support for rural smallholder agricultural production.¹⁵ This rural emphasis aimed to address the clear geographic distribution of poverty. The UN Food and Agriculture Organization’s Committee on World Food Security (CFS) maintains that “as 75% of the people who suffer from hunger are rural-dwellers, increased rural production is the key to food security.”¹⁶ Thus, priority has been awarded to promoting rural livelihoods and financing smallholder agricultural in most development agendas.

Prior to this sense of urgency about the global food system, however, international attention to agricultural investment was lacking. This lack of donor financing led to a steady decrease in agriculture's share of official development assistance from the mid-1990s until 2003, from over ten percent to below five.¹⁷ National governments have also historically favored urban development over investment in rural sectors.¹⁸ A recent study of 19 signatories to the Maputo Declaration¹⁹ revealed that only four had met the target of allocating ten percent of budgets to agriculture and seven countries had actually lowered their agricultural expenditures.²⁰

In addition, existing agricultural financing is largely geared towards the expansion of farmland and the modernization of large-scale farms rather than increasing the productive capacity of small farms. National agricultural policies are created under the assumption that large farms drive growth and provide employment for rural populations sufficient to replace smallholder farming as a livelihood strategy. Smallholder farmers are seen as inadequate to achieve the drastic agricultural transformation that is demanded in traditional development models, because of their lack of some required "skills and technology, finance and access to capital, and the organization and logistics of trading, marketing, and storage."²¹

With the absence of dedicated policies to ensure the security of livelihoods, smallholder farmers are subject to certain increased vulnerabilities. First, farmers suffer from decreasing plot sizes as economic growth and demand for biofuels drive up demand for arable land, often leading to relegation to infertile soils. Second, labor created on large farms rarely compensates for lost livelihoods. Third, integrated markets bring unpredictable price fluctuations, depending on the types of crops grown and level of specialization. And lastly, smallholders often have limited control over land and natural resources in the absence of formal land tenure rights.²²

This vulnerability is compounded with the presence of climate change that brings about short-term and long-term uncertainties in the viability of land and ecosystems, reinforcing rural poverty and undermining food systems.

THE URBAN POOR

Literature that discusses food security and poverty tends to focus on this apparent rural-urban divide, leading many analysts to claim the presence of a persistent "rural

bias" in food security policy and advocacy.²³ However, shifting demographic trends in developing nations have revealed expanding wealth gaps within urban centers as well, which complicates the discussion of necessary tools to address food insecurity.

In fact, reports show that the gap between urban and rural malnutrition is closing, with malnutrition in the poorest areas of cities already rivaling that of marginal rural areas.²⁴ Unfortunately, this is primarily due to *increasing* urban poverty rather than the betterment of rural livelihoods. Although cities generally offer better access to opportunity, infrastructure, and education, growing segments of urban populations are excluded from these benefits as inequality persists and widens.

The UN predicts that, between 2000 and 2030, Africa's urban population will increase by 367 million, ultimately exceeding the rural population by 2030.²⁵ This rate of urbanization is twice the global average in an environment where vulnerability is already acute and where poverty and food insecurity are intensifying.²⁶ Causing this rapid increase is the dual phenomena of high birth rates in cities as well as high levels of migration from rural areas.

There is significant debate surrounding motivations for migration but common theory suggests that there are two main causal drivers: environmental security, which considers migration as a reaction to rural stresses; and modernization and economic opportunities, which explains movement into urban centers.²⁷ There is little indication that the pace of migration will slow in the near future and substantial evidence that climate change will accelerate the process.²⁸

This will pose a significant challenge for the future of food security in cities. The UN Food and Agriculture Organization (FAO) states that urbanization will "bring severe challenges to household food security in the context of high rates of unemployment, increasing development of the informal sector, deteriorating infrastructure, overcrowding and environmental degradation."³³ These complex and interrelated challenges will make it

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USING AGRICULTURE TO ENSURE SHARED PROSPERITY IN MOZAMBIQUE

Since the ending of a devastating civil war in 1994, Mozambique has emerged as one of the fastest growing economies in Africa, with annual GDP growth averaging above seven percent since 2010.²⁹ Yet, despite this rapid growth, poverty rates remain high and hunger is persistent, “mainly due to the poor performance of the agricultural sector and the effects of the 2008 food price crisis on urban households.”³⁰

A recent study by IFPRI concludes that the poor performance in the agricultural sector is primarily due to: “(1) an immense development deficit caused by civil war; (2) a growth strategy focused on heavy industry “megaprojects”; and (3) generally weak public sector engagement in the agricultural sector.”³¹ The latter problem is reflected in constraints facing smallholder farmers, including “the absence of an effective national research and extension system; inadequate infrastructure, particularly rural roads; and low provision and adoption of modern inputs, such as fertilizer and improved seeds.”³² As a result, Mozambique has some of the lowest crop yields in Africa.

In recent years, Mozambique has renewed its commitment to the agricultural sector and has focused attention on community land registration to ensure the rights of smallholders. While Mozambique still faces many challenges, including high rates of poverty and vulnerability to droughts and flooding, the country has made respectable progress on food security indicators and is on track to meet Millennium Development Goal 1c of halving the proportion of people who suffer from hunger by 2015.

exceedingly difficult to provide enough nutritious and affordable food in the face of reduced inputs like water, land, and labor.³⁴

In urban areas, food availability is rarely a major constraint on food security. The main source of insecurity is limited access to food due to a lack of economic means, exacerbated by the fact that food represents 60 percent or more of total expenditures for the urban poor.³⁵ Therefore, the primary driver behind food insecurity in urban areas is that rapid urbanization has outpaced employment creation in the formal sector, which has grown at a rate far below the level required to absorb new market entrants. Even with a dedicated focus on stimulating the private sector in urban centers, a structural transformation of the labor market, similar to the rural labor market, would likely take decades and any short-term progress would be insufficient to integrate the rising tide of migration. This has created an environment where slums are expanding and many people are left without access to basic services as urban infrastructure is unable to meet the new demand.

This heightened vulnerability of the urban poor was notably evident during the food price shocks in 2007-2008 in Africa, which primarily affected urban residents who were unable to afford basic food staples. As

populations continue to grow, urban food systems will become increasingly dependent on improved agricultural productivity to sustain a stable food supply and keep prices low.

RECOMMENDATIONS

Policies to combat food insecurity must recognize the competing demands of poverty reduction in rural and urban areas, working to integrate complementary solutions that will not undermine investment in either environment. Focus must be placed on reducing structural inequalities that limit market access and productive capacity of rural smallholder farmers, while also ensuring that prices remain low for urban consumers. As governments allocate more resources to the agricultural sector, the following policies could contribute to the wider goal of poverty reduction.

Strengthen value chains between rural producers and urban markets. Rural and urban markets cannot function efficiently as singular, detached communities. For rural farmers, direct access to markets is essential for sustained livelihoods, the most formal of which are located in cities. Moreover, better access to markets can encourage shifts to higher-value crops—non-traditional food crops such

as vegetables, fruits, or flowers that have higher monetary value than traditional cereal grains—which could increase incomes. Correspondingly, urban consumers benefit from increased supply and quality of food that could lower prices and bolster diets.

Essential to facilitating access is increased knowledge and awareness of market prices and processes for smallholder farmers. In the absence of up-to-date market price information, farmers are vulnerable to unscrupulous traders offering prices at below market rates. As well, farmers are often reluctant to diversify into high-value crops without assured access to a profitable market for outputs. Promisingly, mobile technology has emerged as an easy and effective tool to correct these barriers to knowledge.

Developing nations require increased investment in infrastructure such as roads and storage facilities. Currently, the undue burden of building infrastructure to satisfy the growing needs of populations rests on public resources that are insufficient to bridge a yearly financing gap of nearly US\$50 billion.³⁶ This is especially true for water and transportation infrastructure, which continues to attract the least amount of private investment due to a high perception of risk.³⁷ As donor governments cut development budgets in the wake of the financial crisis, African governments must capitalize on public-private partnerships. To do so, governments must reduce the perception of risk by strengthening their role in the planning, security, safety, and regulation stages of large-scale infrastructure projects.

Share risk with targeted social insurance and safety nets. Social protection can take many forms, including insurance that offers protection against risk, social

assistance through payments or in-kind transfers during periods of stress, and inclusion efforts that enhance access to existing social programs. In addition to lessening the impact of shocks to the most vulnerable, insurance and social safety nets will encourage farmers to take on productivity-enhancing risks such as new technology and switching to high-value crops.

Moreover, the presence of reliable and durable insurance schemes decreases the perception of risk, which in turn reduces costs of investment. Currently, real interest rates on loans to agricultural producers exceeds 20 percent in many African countries, a burden well beyond what is reasonable for small or medium farms to shoulder.⁴¹ Without access to credit and financing, smallholder farmers are denied optimal inputs—such as fertilizers or hybrid seeds—to enhance productivity.

Targeting of these programs to include the most marginalized will ensure that risks are shared and inequalities reduced. Taking into account that a significant portion of urban residents are unregistered and migrate to and from cities throughout the year, programs must be flexible enough to absorb fluctuating demand.

Integrate food security and climate change policies. Policies designed to respond to climate change should be complementary to policies needed for sustainable food security. To accomplish this, research for adaptation and mitigation should be refocused to include objectives of food security. As well, governments must strengthen the management of information systems, including early warning systems, to disseminate knowledge and build resiliency and the capacity of populations to manage and anticipate climate change and natural disasters. Comprehensive resilience strategies recognize that

SMS-BASED FARMER SERVICES IN ZAMBIA

The Zambia National Farmers Union (ZNFU) operates an SMS-based information service that allows smallholder farmers to compare current market prices in their district, province, or nationwide. Farmers are able to send a message from their mobile phones with a commodity name and immediately receive a text message response with a list of buyers with the best prices, updated daily.³⁸ Over 1,000 hits per week have been recorded on the system and over 130 traders update their prices on the system weekly.³⁹

To ensure that farmers without mobile phones also have access to this information, ZNFU hires and trains a “contact farmer” to provide commodity price and trader information to an extension officer to display in local centers.⁴⁰

prevention is more effective and efficient than reliance on emergency aid.⁴² This goal will necessitate improved coordination between international organizations, NGOs, government agencies and civil society to merge the debate on climate change with issues of food security.

Address structural inequality through women's empowerment. Millions of women work as farm laborers and play a critical role in purchasing and preparing food. However, unequal rights and obligations within households limit women's agricultural potential. Women often lack secure tenure over land; access to credit, financing and markets; and access to necessary inputs to human capital such as education and health care. A conservative estimate suggests that women make up almost half of the agricultural labor force in Sub-Saharan Africa, yet men own, on average, 85 percent of agricultural land.⁴³ Tenure insecurity makes women less likely to invest time and resources into land, which is aggravated as more men migrate to cities.⁴⁴ Policies that shrink the gap between men and women in terms of land tenure will significantly increase productivity, with additional positive spillover effects for families and communities. Additionally, access to key resources, such as land, credit, and access to extension programs, will encourage the adoption of new technologies that could ease the labor burden of female farmers and similarly increase productivity.

Increase research and development for the agricultural sector and increase productivity with the adoption of new technologies. It is essential for agricultural productivity to increase to ensure both economic growth and poverty reduction. However, a singular focus on investment in large-scale commercial farms will be inadequate to ensure sufficient agricultural yields or employment for Africa's growing population.

Currently, roughly 80 percent of African farms are reliant on rain-fed agriculture in largely drought-prone areas.⁴⁵ Also, the vast majority of smallholder farmers work with substandard inputs: low-yield 'saved seed,' little or no fertilizer, and outdated farming methods. New technologies and processes, including "innovations in water management and irrigation, drought-resistant seed strains, soil conservation, and new tillage and climate-resilient cropping patterns,"⁴⁶ will enable farmers to intensify production and promote efficiency without increasing strains on limited land and water resources. Extension programs can ensure that these processes and

inputs are accessible and understandable to smallholder farmers, promoting the adoption and adaptation of unfamiliar systems.

EQUALITY AND GROWTH

According to the World Bank, growth in the agricultural sector is 2.9 times as effective at reducing poverty as growth in other sectors.⁴⁷ Moreover, a one percent increase in GDP driven by agriculture leads to a six percent expenditure growth for the poorest ten percent of the population.⁴⁸ This reveals the potential for investment in agricultural productivity as a strategy for poverty reduction overall and for closing the growing income gap.

In the long run, persistent inequalities could undermine increased investment and magnify vulnerability to food insecurity for the more marginalized segments of societies. Since shocks and stresses are not experienced singularly, they cannot be managed in isolation of other factors. The complexity of interacting challenges—poverty, climate change, slow job creation, food price volatility, and population growth—demands solutions that emphasize cooperation and coordination. 🌱

ENDNOTES

- 1 Oliver August, "Africa Rising: A Hopeful Continent," *The Economist*, March 2, 2013.
- 2 Africa Progress Panel, "Jobs, Justice and Equity: Seizing Opportunities in Times of Global Change," *Africa Progress Report 2012* (Geneva: Africa Progress Panel, 2012), 16.
- 3 United Nations Development Programme (UNDP), *African Human Development Report 2012: Towards a Food Secure Future* (New York: UNDP, 2012), 48-50.
- 4 According to the most commonly used definition as put forth by the Food and Agriculture Association of the United Nations (FAO), food security exists "when all people, at all times have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life." See World Food Summit, *Rome Declaration of World Food Security* (Rome: FAO, 1996).
- 5 Shenggen Fan, Joanna Brzeska, Michiel Keyzer, and Alex Halsema, *From Subsistence to Profit: Transforming Smallholder Farms* 26 (Washington: International Food Policy Research Institute (IFPRI), 2013), 7.
- 6 FAO, *An Introduction to the Basic Concepts of Food Security* (Rome: EC-FAO Food Security Programme, 2008).
- 7 FAO Agriculture and Development Economics Division and FAO Netherlands Partnership, *Food Security*, Policy Brief Issue No. 2 (Rome: FAO, 2006), 1.
- 8 Debbie Hillier and Gina E. Castillo, *No Accident: Resilience and the Inequality of Risk*, Oxfam Briefing Paper No. 172 (Washington: Oxfam, 2013), 7.
- 9 Ibid.
- 10 Ibid., 16.
- 11 Ibid., 16.
- 12 Ibid., 16 (as measured by the GINI coefficient).
- 13 Kanayo F. Nwanze, *Smallholders Can Feed the World* (Rome: International Fund for Agricultural Development, n.d.).
- 14 International Fund for Agricultural Development (IFAD) and United Nations Environment Programme (UNEP), *Smallholders, Food Security, and the Environment* (Rome: International Fund for Agricultural Development, 2013), 9.
- 15 UN High Level Task Force on the Global Food Security Crisis, *Updated Comprehensive Framework for Action* (Rome: United Nations, 2010).
- 16 Jonathan Crush and Bruce Frayne, *The Invisible Crisis: Urban Food Security in Southern Africa*, Urban Food Security Series 1 (Cape Town: African Food Security Urban Network, 2010), 10.
- 17 UNDP, 53-54.
- 18 Ibid., 15.
- 19 The Maputo Declaration refers to an agreement made by governments during the 2003 African Union summit to commit 10 percent of national budgets to agriculture and seek 6 percent annual growth in the agricultural sector.
- 20 ONE, *Growing Opportunity: Measuring Investments in African Agriculture* (Washington: ONE.org, 2013), 10.
- 21 Paul Collier and Stefan Dercon, "African Agriculture in 50 Years: Smallholders in a Rapidly Changing World?" (Proceedings of the FAO Expert Meeting on How to Feed the World in 2050, Rome, Italy, 24-26 June 2009), 4.
- 22 IFAD and UNEP, *Smallholders, Food Security, and the Environment* (Rome: International Fund for Agricultural Development, 2013), 12.
- 23 Paul Collier and Stefan Dercon; Jonathan Crush and Bruce Frayne, *The Invisible Crisis: Urban Food Security in Southern Africa*, Urban Food Security Series 1 (Cape Town: African Food Security Urban Network, 2010); Clionadh Raleigh, *Migration, Urbanization, and Political Power in Africa*, CCAPS Research Brief No. 14 (Austin: Robert S. Strauss Center for International Security and Law, 2013).
- 24 UNDP, United Nations Population Fund (UNFPA), United Nations Children's Fund (UNICEF), and United Nations World Food Programme (WFP), "Agenda Item 1: Population Growth and Rapid Urbanization: Food Insecurity on the Rise in Urban Settings" (Joint Meeting of the Executive Boards of UNDP/UNFPA, UNICEF, and WFP, New York, NY, 23-26 January, 2009), 3.
- 25 UN Habitat, *The State of African Cities, 2008: A Framework for Addressing Urban Challenges in Africa* (Nairobi: UN, 2008), 4.
- 26 Bruce Frayne et al., *The State of Urban Food Insecurity in Southern Africa* (Cape Town: The Africa Food Security Network, 2010), 10.
- 27 Raleigh.
- 28 Paul Collier and Stefan Dercon, "African Agriculture in 50 Years: Smallholders in a Rapidly Changing World?" (Proceedings of the FAO Expert Meeting on How to Feed the World in 2050, Rome, Italy, 24-26 June 2009).
- 29 World Bank, *World Bank Development Indicators*, <http://data.worldbank.org>.
- 30 James Thurlow, *Strategies and Priorities for African Agriculture: Economywide Perspectives from Country Studies* (Washington: International Food Policy Research Institute, 2012).
- 31 Ibid.
- 32 Ibid.
- 33 Jonathan Crush and Bruce Frayne, 34.
- 34 Ibid.
- 35 UNDP, UNFPA, UNICEF, and WFP, 2.
- 36 Commonwealth Business Council, *Africa Infrastructure Investment Report 2013* (London: Commonwealth Business Communications Limited, 2013), 51.
- 37 Céline Kauffmann, "Engaging the Private Sector in African Infrastructure," (Paper prepared for the NEPAD-OECD Expert Roundtable on December 11, 2008 in Kampala, Uganda), 5.
- 38 Deloitte, *eTransform Africa: Agriculture Sector Study, Sector Assessment and Opportunities for ICT*, February 4, 2012.
- 39 Ibid.
- 40 Ibid.
- 41 Bob Geldof and Olusegun Obasanjo, "Africa's Green Revolution Is Ready to Go: Just Add Investment," *This Is Africa*, January 30, 2014.
- 42 UNDP, 101.
- 43 Ibid., 126.
- 44 Ibid., 49.
- 45 Africa Progress Panel, *Africa Needs a Green Revolution: Smallholder Farmers on the Front Line of the Global Food Crisis* (Geneva: Africa Progress Panel, 2012), 6.
- 46 Ibid., 7.
- 47 The World Bank, *World Development Report 2008: Agriculture for Development* (Washington: The World Bank, 2007), 30.
- 48 Ibid.

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This material is based upon work supported by, or in part by, the U. S. Army Research Office grant number W911NF-09-1-0077 under the Minerva Initiative of the U.S. Department of Defense.

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