Chapter 1 IMPROVING AGRICULTURE'S CONTRIBUTION TO NUTRITION IN MALAWI: A CONCEPTUAL INTRODUCTION

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ABSTRACT: WITH MALAWIAN DIETS HEAVILY DOMINATED BY STAPLE FOODS—MAIZE FIRST and foremost, but also rice and cassava in some areas—food security in Malawi is often equated with having access to enough maize. What is missing in this traditional measure of food security in Malawi is the importance of the quality, in addition to the quantity, of dietary intake. This household-level scenario is reflected in, and exacerbated by, national development priorities; food security is a top-line agenda item for agriculture in Malawi, whereas nutrition is still considered primarily a health issue. To guide analysis and action in this complex environment, we present a conceptual framework to illuminate the multiple and complex linkages from agriculture to food security and nutrition. This framework reveals a number of ways in which the agriculture sector can help strengthen diet quality. These include: (1) promoting production of nutrient-dense foods via subsidies and other incentives; (2) promoting food processing, marketing, and consumption in ways that conserve nutrients, create demand, and decrease prices; and (3) supporting women farmers through, for example, targeted efforts to increase their productivity and bargaining power.

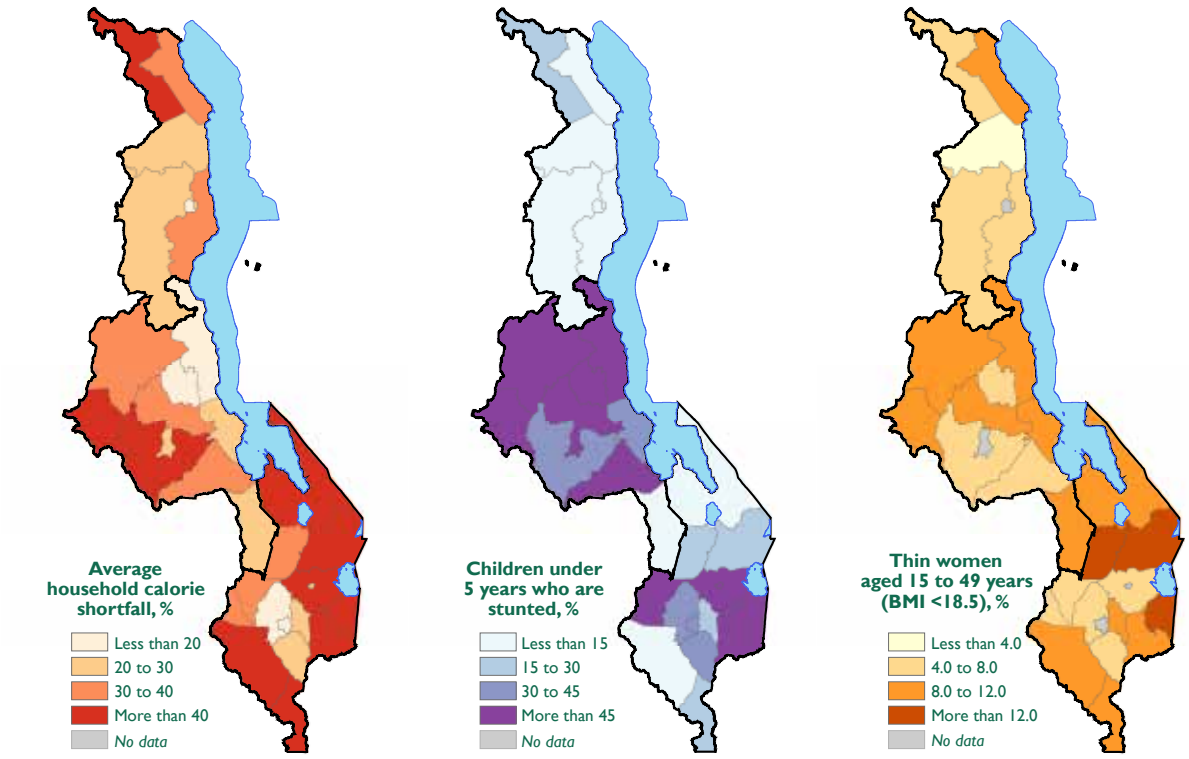
Smallholder agriculture is the mainstay of Malawi's economy. Its importance for livelihoods cannot be overstated. Ninety-four percent of rural residents and 38 percent of urban residents engage in agriculture to some extent (Jones, Shrinivas, and Bezner-Kerr 2014), the vast majority as smallholder farmers with landholdings of less than one hectare. Maize accounted for nearly half of smallholder-cultivated land between 2010/11 and 2014/15, followed by groundnut, bean, cassava, sweet potato, and other food crops (Benson and Edelman 2016). These foods are grown for household consumption and for sale at local and regional markets. The Malawian food supply, especially in rural areas where markets are thin with few buying or selling options, is shaped largely by trends in smallholder food crop production.

In the last decade, Malawi has experienced rapid smallholder-led growth in the agricultural sector, largely attributed to the Farm Input Subsidy Program (FISP), a major government program that annually provides about half of all smallholder farming households with heavily subsidized fertilizer and seed (Arndt, Pauw, and Thurlow 2016). Despite this progress, the country still faces significant challenges in terms of food security and nutrition outcomes (Figure 1). Analysis of data from the Third Integrated Household Survey (IHS3) of 2010–2011 suggests that 36.7 percent of rural Malawian households fail to access sufficient calories (NSO 2012). Estimates from the 2010 Malawi Demographic and Health Survey (DHS) indicate that 47 percent of children under the age of five in Malawi are stunted (height-for-age index scores below minus two standard deviations from the median of an international reference population) (NSO and ICF Macro 2011).[1] Thus Malawian diets are lacking in terms of the quantity of food—total calories consumed—and more so in terms of the quantities of nutrient-rich foods, such as meat, fish, eggs, dairy, legumes, fruits, and vegetables.

Good nutrition requires both—that is, enough total calories (quantity) and enough total vitamins and minerals per calorie (quality). Without a high-quality diet, even children who can fill their bellies on most days will suffer from chronic undernutrition. The most obvious sign of chronic undernutrition is stunted growth, or low height-for-age, where children are significantly shorter than well-fed and healthy children of the same age (WHO and UNICEF 2009).

In addition to suboptimal physical growth, there are invisible, insidious effects of chronic undernutrition. Children under two who consistently consume poor-quality diets are known to have impaired cognitive development that can lead to economic underperformance and other adverse outcomes in adulthood (Hoddinott et al. 2008). Poor educational attainment, low per capita income, low wage rates, and an increased likelihood of falling below a designated poverty line in adulthood are some of the indicators associated with chronic undernutrition in childhood (Martorell et al. 2010). And while it is individuals and families who bear the heaviest burden in terms of lives lost and potential wasted, the ripple effects of undernutrition reach all the way up to national and regional economies. Stunting is associated with GNP losses of up to 11 percent across Africa and Asia, where prevalence rates are highest (Haddad 2013). In Malawi, where stunting prevalence is very high according to global standards (NSO and ICF Macro 2011), child undernutrition is a huge drain on the human and physical capital of the country, constraining national economic growth.

FIGURE 1 AVERAGE HOUSEHOLD CALORIE INTAKE SHORTFALLS, PREVALENCE OF STUNTED CHILDREN UNDER 5, AND PREVALENCE OF THIN WOMEN AGED 15 TO 49, BY DISTRICT, MALAWI, 2010



Source: Maps by M. Kedir Jemal, IFPRI, of IHS3 and DHS results and IHS3 calorie intake deficiency from the analytical results of Verduzco-Gallo, Ecker, and Pauw (2014).

As such, reducing stunting rates in young children in order to improve human capital for future health and productivity is good policy. Examples of health-based programming to improve nutrition are deworming, micronutrient supplementation, improved antenatal care, and therapeutic treatment of acute malnutrition. These direct nutrition actions target women of childbearing age and young children, primarily during the key window of opportunity between pre-pregnancy and two years of age. They are typically delivered via clinics, hospitals, and community health workers.

However, it is now widely accepted that in addition to the health sector, agriculture and other sectors also have roles to play in reducing undernutrition (World Bank 2013, Ruel et al. 2013, WFP 2016). Given this approach, what expanded role might the agricultural sector—particularly the dominant smallholder farming systems of the country and the food supply chains they influence—play to significantly improve Malawi's nutrition statistics? And more broadly, what options exist for agriculture-based strategies to improve these statistics? While other factors besides agriculture policy—such as high population growth, limited land resources, and climatic shocks—are seen as playing a strong role in various dimensions of the nutrition challenge, we theorize that agriculture has a strong role to play in improving diets in particular. Some perspectives on these questions are offered below—first, via consideration of the food security concept, which along with health and care is considered a key driver of nutrition outcomes,[2] and second, by presenting a conceptual framework describing causal pathways through which agriculture affects nutrition.

FOOD SECURITY IN MALAWI: WHERE DOES NUTRITION FIT?

Food security is commonly defined as "when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO 1996). This definition includes four dimensions that must be fulfilled simultaneously:

- Physical food *availability* at a national or community level determined by food production, stock levels, and net trade.
- Households' and individuals' economic and physical *access* to food.
- Food *utilization*, commonly understood as energy and nutrient intake by individuals as a result of care and feeding practices, food preparation, diversity of the diet, and intrahousehold distribution of food. Food utilization can be considered the most explicitly nutrition-oriented aspect of food security. It is important to note that utilization of food is a biological process that is affected not only by food intake but also by the presence of infection or disease, since a sick individual will absorb or utilize the nutrients in food less effectively than someone who is healthy.
- *Stability* of the other three dimensions over time.

In general, Malawian diets are heavily dominated by staple foods, maize first and foremost, but also rice and cassava in some areas. As such, food security in Malawi is often equated with having access to enough maize—whether through own production or from other sources, especially local markets—for a household to meet the caloric needs of its members. What is missing in this traditional measure of food security in Malawi is the importance of the quality, in addition to the quantity, of dietary intake. While maize and most other popular staple crops are high in carbohydrates, they are low in proteins, vitamins, and minerals. Because most Malawian meals rely heavily on maize, other nutrient-rich foods, such as fruits, vegetables, fish, beans, and meat, are often consumed in small amounts or not at all. Thus, meals are often adequate in terms of total calories or quantity, but likely to be inadequate in terms of quality.

This household-level scenario is reflected in—and exacerbated by—national development priorities; food security is a top-line agenda item for agriculture in Malawi, whereas nutrition is still considered primarily a health issue. This conceptual division

facilitates conflation of food security with staple crop production alone, as opposed to encouraging a comprehensive perspective that systematically considers the importance of non-cereal crops and pays greater attention to the utilization dimension of food security. This perspective also results in adopting approaches to addressing nutrition needs exclusively through health-based delivery platforms, where the primary focus is on women's and children's health as described above, as opposed to seeing nutrition as a multisectoral issue for which diverse food is a key component and agriculture and food systems are important drivers.

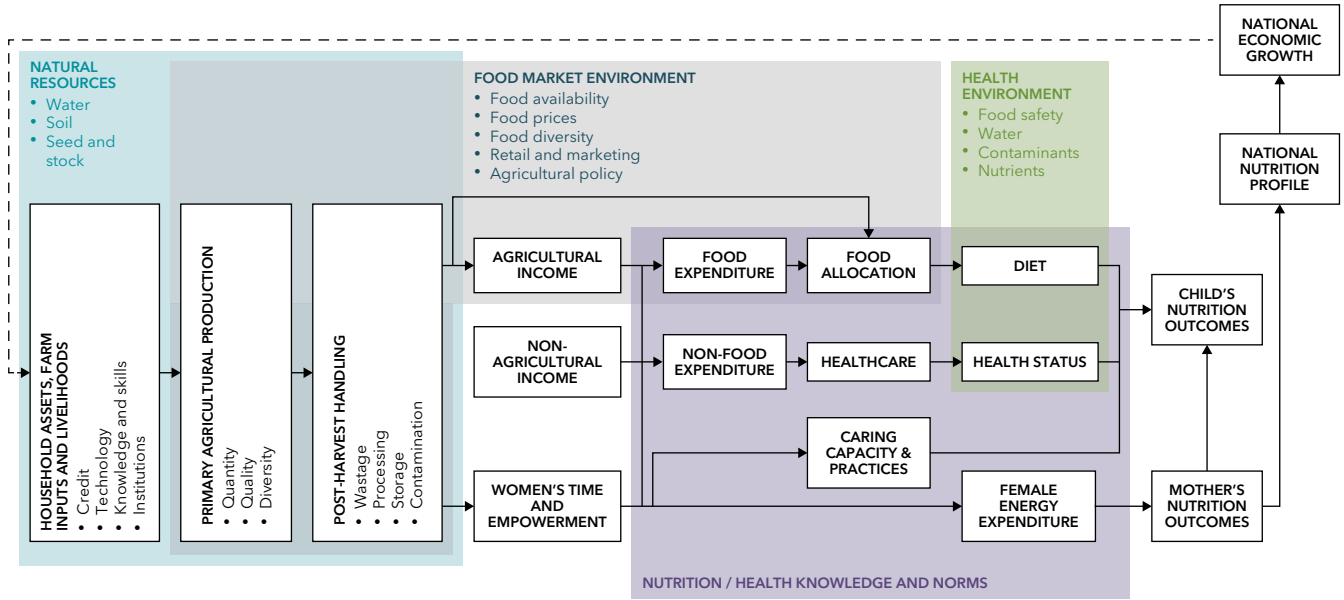
CONCEPTUAL PATHWAYS FROM AGRICULTURE TO NUTRITION

Applying a food and agriculture lens to nutrition requires a conceptual framework that clarifies the causal pathways through which agriculture affects nutritional outcomes. The framework in Figure 2—adapted to the Malawi context and referenced throughout this publication—does just this. Agricultural investments and activities are listed on the left of the diagram, while nutrition outcomes are listed on the right. While the trajectories from agriculture to nutrition are not always linear, in general, they can be divided into four main pathways, all of which apply to household- and individual-level outcomes.

(1) Agriculture as a source of food: Agriculture affects nutrition most directly when food grown by the household is consumed within that household. Farm households can improve nutrition of household members if

- their production practices and post-harvest practices improve the diversity, consistency over the year, and quantity of foods available to the household;
- the foods available to the household are allocated to individual household members, based on age and gender-specific nutrient requirements; and
- the health status of household members does not hinder absorption of nutrients from the healthy foods that they eat.

FIGURE 2 CONCEPTUAL PATHWAYS BETWEEN AGRICULTURE AND NUTRITION



Source: Herforth and Harris (2014), p. 3.

BOX 1 ENABLING ENVIRONMENT FOR NUTRITION: NATURAL RESOURCES, HEALTH, KNOWLEDGE, AND NORMS

Natural resources environment: Appropriate management of natural resources—water, land, and biodiversity—has direct consequences for the livelihoods and nutrition of farm families. Irrigation, for example, facilitates production diversity and increased yields with positive implications for food consumption and nutrition; however, it can also increase the risk of ill health due to waterborne disease and fertilizer runoff.

Climate change should be a routine consideration in management strategies. Early or late onset of rains, floods, droughts, shortened crop seasons, and premature harvests cause yield declines, which lead to decreased food availability and income for farming households. These challenges require farmers to continually adapt their agricultural livelihood strategies to maintain the viability of their natural resources base.

Health environment: Agricultural production interacts with health environments and related water and sanitation environments to influence nutrition for better or for worse. For example, livestock production schemes may increase exposure to zoonotic disease and impair good sanitation practices. Similarly, employment schemes in rural areas that target women may increase income, but may also reduce the amount of time that women can spend on childcare, cooking, fetching water and firewood, and home-based agricultural work, all of which are directly related to nutrition and health. Agriculture projects will have a higher likelihood of successfully impacting nutrition when these inherent tradeoffs are acknowledged as important considerations to be routinely addressed in project implementation via nutritional-risk reduction measures.

Knowledge and norms: Farming and nutrition knowledge held by family and community members has a major bearing on decisions related to agriculture and nutrition that are made within households. For example, activities that promote knowledge of nutrition and health may affect decisions around food production, purchase, and consumption. These decisions may enhance positive outcomes for both the agriculture and nutrition sectors while avoiding negative impacts. Conversely, knowledge and use of key agricultural practices and skills can include information that builds awareness and protects against harm to health and nutrition. For example, nutrition-sensitive livestock-raising practices may change how animals are kept in relation or proximity to the home, or nutrition-sensitive irrigation practices may help avoid household consumption of contaminated water. Social and behavioral change activities promoting nutritious diets and healthy practices—provided by an agricultural extension system or in collaboration with other sectors—can further enhance the impact of agricultural activities on nutrition.

(2) Agriculture as a source of income: Income from wages earned through agricultural labor or the sale of agricultural products can be used to purchase food and other nutrition-relevant items, such as healthcare. As discussed in Chapter 5, income from crop specialization could be as beneficial to nutrition as crop diversification. Agricultural income can improve nutrition of household members if

- household income produced from agricultural activity is partly spent on diverse and nutritious foods;
- diverse and nutritious foods are available and affordable in local markets throughout the year for purchase by households;
- the foods available to the household are allocated to individual household members based on age and gender-specific nutrient requirements; and
- the health status of household members does not hinder absorption of nutrients from the foods eaten.

(3) Agriculture as moderator of women's time use and decision-making power: Women regularly work in agriculture and they make most nutrition-related decisions for the family, for young children in particular. When women have greater control over the use of household income, it is more frequently used on food and healthcare for family members (Smith et al. 2003). However, women often do not have control over household resources or power in household decision making. We examine issues of household decision making related to cropping and spending decisions in Chapter 3.

Thus, agricultural activities that increase women's income and decision-making power can have positive impacts on nutrition due to resultant increased household expenditures on nutrition-relevant goods and services. However, this assumes that these agricultural activities have a positive net effect on

- the amount of time a woman is occupied in them, as this will have consequences for the time she can focus on the food, health, and care of her family; and
- the amount of energy a woman expends on them, as this too has consequences for her own nutrition and health outcomes, as well as those of her children (and for fetal health if she is pregnant).

(4) Agriculture as a moderator of food markets: Agriculture and food-system policies affect a range of supply and demand factors that influence how well food markets perform in terms of the availability, price, and diversity of food. Food markets are a part of the environment in which farm households fulfill their food security and nutrition needs. Chapter 4 examines aspects of the food market environment, such as prices and availability and the implications for demand for nutritious foods. Food market performance can affect nutrition through

- the income of net seller households and the purchasing power of net buyers, and
- the availability and affordability of diverse and nutritious foods in local markets throughout the year.

Agriculture as a moderator of food markets is of particular importance in the Malawian context given the contribution of smallholder agriculture to domestic food supply. Only 5 percent of Malawi's farmers are exclusively commercial producers, while the remainder are largely subsistence-oriented, both buying and selling food to supplement food stocks and to address cash needs (Jayne, Zulu, and Nijhoff 2006). This pathway is captured in the gray-shaded box in Figure 2 on the food market environment. This environment affects the kinds of foods that are available locally and likely to be purchased, as well as those that are likely to be produced by farm households as a response to price signals and market incentives. Farm households determine what crops they will sell to markets and what crops will be consumed at home largely as a response to conditions in the food market environment.

Food market environments also are influenced by government policy and the actions of the private sector. In Malawi, input subsidies for maize, plans for investment in irrigation (the implications of which are covered in Chapter 6), and private-sector investment

in groundnut-based value chains are prime examples. In regard to value chains, it is important to note that labeling and social marketing are tools used by both the public and the private sectors to influence food purchase decisions and consumption habits. These tools send messages about the convenience of purchase and preparation of particular foods, their nutritional content, and related perceptions of quality and safety. Depending on the context, these messages can affect purchase decisions by households as much as the relative price of foods. This raises the issues of promoting the nutritional value of food chains, as is discussed in Chapter 3.

In addition to food markets, natural resources (in the blue box in Figure 2), the health environment (the green area), and nutrition and health knowledge and norms (the purple area) are often referred to collectively as the "enabling environment for nutrition" (see Box 1). Together, these contextual factors affect the trajectories of the causal pathways from agriculture to nutrition described.

UNPACKING THE FACTORS AND PATHWAYS: FROM AGRICULTURE TO FOOD SECURITY AND NUTRITION

Agriculture has the potential to affect nutrition through all these pathways, often through multiple pathways at once. For each pathway, increased access to and availability of nutrient-rich foods is a key step. However, achieving such increases in Malawi requires addressing major challenges in several areas, not least of which are strong cultural preferences for meals based heavily on maize and other starches, and the high cost of nutrient-rich foods relative to staples. National agricultural policy can contribute to overcoming these challenges by (1) promoting production of nutrient-dense foods via subsidies and other incentives; (2) promoting food processing, marketing, and consumption in ways that conserve nutrients, create demand, and decrease prices; and (3) supporting women farmers through, for example, targeted efforts to increase their productivity and bargaining power.

This publication provides a series of primary and secondary data analyses that are illustrative of these challenges and their potential mitigation. Subsequent chapters delve deeper into the issues raised in the conceptual framework above. The authors of these chapters examine a number of pathways through which agriculture can potentially impact diets and nutrition, including agricultural practices and technologies, food prices, crop sales, household income, poverty status, and women's decision-making power. However, it should be noted that this report is not explicitly concerned with poverty or with increased income as outcomes. Rather, increased income is seen as an important potential pathway for individuals and households to access a more diverse and nutritious food basket.

In Chapter 2, we discuss the common metrics and measures used to analyze or track agriculture, nutrition, and food security, as well as the data required. Working across sectors with complex pathways, it is important for policy makers, researchers, and practitioners to understand which indicators are appropriate for tracking progress along the pathways. While diets are the mediating factor between agriculture and nutrition, data limitations constrain our ability to directly measure diets in this report; thus most analysis of food consumption patterns takes place at the household rather than individual level. This is a critical data challenge faced both in Malawi and globally in determining how best agricultural activities and systems can contribute to better nutrition.

Chapter 3 explores agricultural production diversification and the relative importance of own-consumption, agricultural income, and women's time and empowerment pathways for diets. It undertakes a qualitative assessment of dietary preferences and patterns in the context of the promotion of nutritious and marketable crops among smallholder farmers.

Chapter 4 involves analysis of data from Malawi's Second and Third Integrated Household Surveys (IHS2 and IHS3) to examine the effects of the food market environment and the income pathway, including food prices and government interventions, on household access to food and micronutrients. Chapter 5 explores the effects of farm production choices on food consumption via income or own-consump-

tion pathways. Analysis includes assessing the determinants of farm production diversity and its impact on household dietary diversity, again with a focus on household access to micronutrients, using IHS3 data.

Chapter 6 examines lifting the constraint on natural resources (water) through agricultural technologies and how this affects first agricultural production and then food consumption. Specifically, the associations between irrigation and food security and nutrition outcomes are explored also using IHS3 data. Finally, Chapter 7 synthesizes a set of conclusions from the previous chapters on how agricultural systems and activities in those systems in Malawi might contribute significantly to achieving better diets in the country.

The authors of the chapters in this report largely rely on data from the IHS series of nationally representative surveys for their analyses. However, a significant concern in doing so arises from the potential challenges associated with the quality of the anthropometric data in the IHS3 dataset. There is a significant difference in the reported stunting prevalence for children under 5 years of age—30 percent versus 47 percent, respectively—in the estimates from the 2010–2011 IHS relative to those from the 2010 DHS. The Malawi DHS series is commonly considered the standard source of information on nutrition and health conditions for the country. However, the need for integrated data along the pathways from agriculture to diets to nutrition outcomes makes the IHS the most useful data source for cross-sectoral analysis, as discussed in Chapter 2.

As was noted earlier, the report on the 2015–2016 Malawi DHS (NSO and ICF Macro 2017), which was published as this document was being finalized, estimates a 10 percent decrease in stunting prevalence among children under five years of age nationwide since 2010. Likewise, improvements in underweight and wasting were also found. These improvements in nutrition outcomes could be the lagged positive nutritional outcomes resulting from a number of years of agriculture-led economic growth in Malawi due to favorable weather and input subsidies. However, this is not empirically tested in this publication.

While the official agricultural production estimates for Malawi are frequently discounted by users and other observers as being often subject to unwarranted adjustment for political reasons (Chirwa and Dorward 2013), the number of people requiring humanitarian food aid in Malawi was historically low between 2006 and 2012 (MVAC 2012), reflecting relatively improved food security due in part to the FISP. However, considering subsequent food shortages, culminating in the El Niño–driven food crisis Malawi faced in 2014/2015 and 2015/2016 planting seasons, there is a serious concern that these recently observed improvements in the prevalence of chronic malnutrition among young children will slow if not reverse. As such, understanding and leveraging the linkages between agriculture and nutrition in order to maintain progress—considering climatic variability, pervasive poverty, and vulnerability to shocks—is all the more salient in the face of these recent improvements.