



# FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



INNOVATION LAB FOR  
**FOOD SECURITY  
POLICY**

# Synthesis Report III

## Rural and Agrifood Systems in Transforming Economies in Africa and Asia

Milu Muyanga, David Tschirley, Thomas Reardon, T.S. Jayne,  
Ferdinand Meyer, Saweda Liverpool-Tasie, and Tracy Davids

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MICHIGAN STATE  
UNIVERSITY



## P R E F A C E

Under the Global Component *Engagement in Global Policy Debates on Food and Nutrition Security*, the Food Security Policy Innovation Lab (FSP) conducted two streams of research organized around transforming agrifood systems in Africa and Asia. The “upstream team” focused on issues of structural change and transformation at farm level and moved downstream into selected assessments of the impacts of these changes on the trading sector and employment opportunities beyond the farm. The “downstream team” started downstream with a focus on diet change in Africa and Asia, moved upstream into implications for and empirical documentation of small and medium agribusiness growth and behavior in the midstream, and considered implications for nutrition. Though starting at different points, these two teams converged over the course of FSP on a highly complementary and largely consistent “story” about the promises and challenges facing smallholder farmers, small entrepreneurs, and consumers in this rapidly changing environment. This report tells that story and lays out a policy and programmatic agenda, including needed new research, based on what we have learned. In the few cases where conclusions may differ, we highlight this and suggest what needs to be done to resolve the empirical issues and identify effective policy and programmatic approaches.

# Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	5
<b>Background</b> .....	11
<b>Drivers of change</b> .....	11
<b>Conceptual approach</b> .....	13
<b>Opportunities and challenges from patterns of change</b> .....	16
Labor is shifting off the farm, but farming remains crucial to the welfare of rural areas and to broader economic growth .....	16
Rising incomes, together with urbanization and globalization, are transforming diets across the developing world in broadly similar directions .....	20
Dramatic changes in structure and behavior in the midstream and downstream are generating real benefits while creating new concerns .....	24
Farm structure change is fueling technical change and productivity growth at farm level, with multiplier effects throughout the economy.....	27
Smallholder farmers face major challenges competing in this new environment, making it hard for them to prosper.....	31
<b>Policy responses</b> .....	34
<b>References</b> .....	46

# List of Figures

<b>Figure 1.</b> Stages of agrifood system transformation relate to a country’s broader transformation and the connectedness of its geographic spaces .....	14
<b>Figure 2.</b> Employment in the post-farm agrifood system rises—and becomes an entry point for young workers—in more urban areas (FTE labor shares by age and sector in Africa, Asia, and Latin America) .....	18
<b>Figure 3.</b> Diet changes very rapidly among the poor (food budget shares by processing category and income in East and Southern Africa) .....	21
<b>Figure 4.</b> Rural Africans live predominantly in densely populated rural areas (population density in Africa and Zambia) .....	22
<b>Figure 5.</b> In every region, overweight is rising among youth more rapidly than underweight is falling (percentage point change in underweight and overweight/obesity for youth aged 12 to 24, by region, 1976–2016) .....	23
<b>Figure 6.</b> Medium-scale farms’ (5–100 hectares) share of national value marketed crop output .....	29
<b>Figure 7.</b> Tanzanian sunflower market outlook.....	40
<b>Figure 8.</b> Product flow in Tanzania sunflower market, 2017.....	41
<b>Figure 9.</b> Vegetable oil imports into Malawi and Zambia—total quantity (a) and average share between 2013 and 2017 (b).....	43
<b>Figure 10.</b> Soybean and soybean product trade in Zambia (a) and Malawi (b) .....	44

## List of Tables

<b>Table 1.</b> The post-farm agrifood system offers many employment opportunities for women (labor shares, FTE basis, in farm, post-farm agrifood system, and non-agrifood system).....	19
<b>Table 2.</b> Changes in farm structure in sub-Saharan Africa.....	29
<b>Table 3.</b> Alternative future scenarios for Zambia's soybean sector.....	44

## Acronyms

CAADP	Comprehensive Africa Agriculture Development Programme
FAO	Food and Agricultural Organization
FAOSTAT	FAO Statistical Databases (United Nations)
FDI	Foreign Direct Investment
FSP	Food Security Project
FSP-IL	Food Security Project Innovation Lab
FTEs	Full-Time Equivalents
GIS	Geographic Information System
HA	Hectare
IFAD	International Fund for Agricultural Development
LSMS	Living Standards Measurement Survey
MSME	Micro-, Small-, and Medium-Scale Enterprises
Mt	Metric Tons
NCDs	Noncommunicable diseases
NGOs	Nongovernmental Organizations
NPS	National Panel Surveys
ReNAPRI	Regional Network of National Agricultural Policy Research Institutes
SME	Small and Medium Enterprise
USAID	United States Agency for International Development

# Executive Summary

Over the five years of the implementation of the Food Security Policy Innovation Lab (FSP), the “upstream” and “downstream” teams under the global component *Engagement in Global Policy Debates on Food and Nutrition Security* developed a complementary and largely consistent “story” about the promises and challenges facing smallholder farmers, small entrepreneurs, and consumers in rapidly changing agrifood systems. This report tells that story and lays out a policy and programmatic agenda, including needed new research, based on what we have learned.

A common set of drivers is generating broadly similar patterns of agrifood system transformation across the developing world and generating a rapidly changing mix of risks and rewards, for farmers, entrepreneurs, consumers, and policy makers. There is much good news in these developments. Yet smallholder farmers and small and medium enterprises (SMEs) need to learn new skills and behaviors if they are to prosper, consumers need new knowledge and understanding to make choices that result in safe and healthy diets, and policymakers need to decide how to deal with big new challenges even as old ones continue to demand their attention. This synthesis paper brings together the lessons learned from FSP “upstream” and “downstream” research over the past five years to help guide these decisions. It presents a conceptual framework and characteristics of key changes taking place in agrifood systems in developing countries, their implications for income and employment opportunities throughout the system, and the policy responses needed to effectively promote the interests of smallholder farmers, small and medium enterprises, and consumers in these transforming systems.

## Conceptual framework for understanding agrifood system transformation

Agrifood system transformation needs to be understood as a subset of the structural and rural transformation of economies. Once agrifood system transformation starts, it can become self-reinforcing if public policy and investments remain conducive to private investment, being *pulled* by downstream demand from urbanization and diet change, *facilitated* by behavioral change and investment in the midstream and downstream, and *fed* by the upstream through intensification, commercialization, and diversification at farm level.

We can think of a transformation from a traditional stage through a transitional stage and finally to a modern stage. This transformation can be seen at one place over time as incomes and urbanization rise. It can also be seen at one time over different places, for example in cities versus rural hinterlands. Included in this idea is that transformation varies over products, with the general pattern that staple foods can be marketed all over a country through traditional and early transitional value chains, while perishable products cannot. Associated with these stages is the empirical regularity of the J-curve of firm consolidation. This starts with moderate consolidation in the dualistic systems that prevailed prior to the structural adjustment of the 1980s. With reform, the transitional stage of transformation generates a highly competitive structure (the bottom of the J) as many thousands of micro, small, and medium firms enter following reform. Over time, as economies of scale force smaller players out, the modern stage is characterized by much greater firm consolidation.

## Opportunities and challenges from patterns of change

### *The transitional stage is the boom time for off-farm employment*

Most of Africa, South Asia, and some of Southeast Asia lies in the transitional stage of transformation. Diets during this phase shift from grains and other staples to more perishable and processed foods, unleashing a wave of structural change. Rural-to-urban food value chains emerge. The urban share in the food market (by value) is high, at 50 to 70 percent. Production of nongrains grows rapidly. Input use rises, along with demand for farm services. Traders invest in more storage, including cold storage, making supply to the market less seasonal.

Consumers during this phase purchase staples primarily in processed form, and entirely new ultra-processed foods and beverages begin to be widely available and heavily promoted by food companies. Expenditure on food prepared and consumed away from home skyrockets, and concerns about food safety begin to emerge. Off-farm labor in marketing and processing and food preparation rises rapidly, especially among women. Supermarkets spread fast, though their share of total food retail remains small. Small- and medium-sized firms still dominate, but larger firms start emerging.

This is the boom stage for employment opportunities in small and medium enterprises and to a lesser extent in wage employment in the agrifood system (the bottom of the J-curve) and in more remunerative and commercially oriented farming. Yet it is also during this stage that the competitive landscape begins to change in important ways for farms and firms. Overall, the number of opportunities is falling at farm level (even as new and much more attractive opportunities arise for some) and rising rapidly after the farm. At both levels, new skills need to be learned and old ways of doing business need to change if smallholder farmers and micro-, small-, and medium-scale enterprises (SMEs) are to take advantage of these opportunities and grow their incomes.

### *Labor is moving off the farm, but farming remains crucial*

FSP made two major contributions to analysis of the structure of employment in low-income countries. First, it pioneered the use of employment data from the World Bank's Living Standards Measurement Surveys (LSMS) to quantify labor in full-time equivalents (FTEs). This enabled a much more accurate description of where households allocate their labor effort and showed that farming's labor share was substantially lower than had been previously thought. Second, FSP disaggregated the distribution of nonfarm labor into labor off the farm but within the agrifood system, and labor that took place entirely outside the agrifood system, then into segments of the post-farm agrifood system. This approach provided the first window on the role of the full agrifood system, farm and post-farm, in employment. Various analyses using these methods showed that farming had a high starting share in employment but would see its share fall steadily, that employment in the post-farm agrifood system would grow rapidly but from a small base, and that employment outside the agrifood system would capture the largest single share of new employment. It also showed that female employment was especially high in the post-farm agrifood system and confirmed this sector's very rapid growth during the transitional stage of transformation.

As transformation proceeds, farming, food, and the agrifood system slowly cede their primacy in the economy to activities with little or no connection to agriculture. A focus on the agrifood system is nonetheless important for two reasons. First, it continues to be a major employer of people in developing countries and will remain so for several decades; and the productivity of farming and the broader agrifood system is a key driver of real incomes and productivity in the rest of the economy. Finding ways to spur productivity growth in the agrifood system and to promote adequate supplies of diverse, safe, and nutritious foods for consumers is thus a central task in ensuring strong and healthy overall economic growth.

### *Do food imports pose a threat to job growth in Africa's agrifood system?*

FSP pursued two strands of inquiry on this issue: (1) trends in net cereal imports, and (2) trends in food imports as a share of total food expenditure. While both found that per capita imports were rising, they differed in their assessment of the threat this posed. Here, we suggest that whether or not food imports are "too high," Africa needs increased productivity and targeted public- and private-sector investments in its agrifood systems from farm to retail. Moreover, few if any would argue that trade barriers should be used to minimize imports.

### *Changing diets bring great benefits along with new and serious challenges*

Income growth, facilitated by the drivers discussed above, is combining with urbanization and globalization to transform diets across the developing world in similar directions. Another contributor is increased rural population densification, which has led to increasingly urban characteristics in rural consumption. The change is unfolding broadly across and within countries and is penetrating all income levels, driving rapid change among African households that are still below the international poverty line (Figure 3; see also Tschirley et al. 2015a). This means that enormous pressure is being brought to bear on food systems to respond to these dynamics now, not at some point in the future.

Diets are changing in four ways. First, they are becoming more *purchased*. For example, in rural areas of East and Southern Africa, 40 to 50 percent of the value of all food consumed by rural households was purchased in 2010. In rural Nigeria and Bangladesh, this share is around 70 and 80 percent, respectively. Second, diets are becoming more *perishable*, as predicted by Bennett's Law, which states that as incomes rise, people begin to eat more nutrient-rich, animal-sourced foods. Animal-sourced foods and fresh produce now make up about half of all food consumption (by value) in rural Africa, two-thirds in urban Africa, and three-quarters in urban Asia. Third, diets are becoming more *processed*. This can simply involve a change

in the form in which a traditional final product (e.g., maize meal in Eastern and Southern Africa or *chapatis* in India) is acquired rather than a change in diet per se. Purchasing in processed form saves time and hard labor for women. But as transformation advances, consumption of *ultra-processed foods* also rises. These foods are entirely distinct from traditional staples, and are created using multiple ingredients, food additives, and often chemical rather than just physical processing. Fourth, more foods are being *prepared and consumed away from home*. This category consistently shows an income elasticity of demand well above 1.0 and is experiencing vertiginous growth in all countries studied.

This diet change has two broad implications: (1) dramatic growth in agribusiness opportunities, discussed further below, and (2) a rapidly changing mix of nutritional challenges. The early stage of transformation brings improvements in nutrition, with rapid falls in child underweight and stunting. This stage also greatly reduces the burden of food preparation on women by making basic processed staples far more available. However, overweight and obesity tend to rise rapidly as a country moves from the traditional into the transitional stage. Changes in the food environment can promote unhealthy dietary behaviors, especially among youth. The unhealthy foods driving this dynamic include locally produced “junk foods” and some traditional foods prepared away from home—like fried meats and carbohydrate-heavy dishes. Recent research, including by FSP, links these consumption trends to negative nutritional outcomes in Kenya and Tanzania.

These changes in diet are rapidly shifting the mix of nutritional challenges that countries face. For example, in Tanzania between 2009 and 2015, for every 100 households that had problems of underweight or stunting, the number with problems of overweight or obesity rose from 40 to 80. At the same time, micronutrient deficiencies persist, even among those who are overweight, due to the poor nutritional quality of many processed foods and beverages. The result is a “triple burden” of malnutrition.

***Change in structure and behavior in the midstream and downstream generates real benefits while creating new concerns***

Supply chain configurations change in three ways during transformation. First, they lengthen spatially and temporally, allowing food to be sourced from increasingly distant locations and stored for longer periods. Second, rural–rural supply chains emerge and become more complex and longer due to rising reliance on markets in rural areas. Third, urban–rural and rural–urban–rural supply chains emerge. Urban–rural chains arise to distribute imported foods (or locally produced foods such as bread made from imported wheat) to rural towns and villages.

Consumers see three main benefits from these changes. First, seasonality of food supply declines as food (including imports) is sourced from broader geographic areas. Second, consumers see lower real prices as firms throughout the agrifood system increase their scale of operations, driving down costs of production, while competition typically remains strong enough to transmit these cost reductions to consumers. Third, the diversity and convenience of foods increases greatly, as firms experiment with products to meet consumer demand and generate profit.

For entrepreneurs, the major benefit of these transformations is the rapid growth in demand for value added products, which drives a comparable increase in the number of micro, small, and medium enterprises in logistics, processing, and packaging and distribution. Farmers also benefit from a general improvement in market access due to improved public infrastructure and private investment in input supply and in output trading at scale that reduces costs to farmers.

These changes also bring new challenges. Beyond the nutritional changes discussed above, two main concerns arise. The first is food safety, driven by supply-side and demand-side factors. The second concern relates to the rate of consolidation at different levels of the system, which we refer to as the J-curve. Larger firms employ much less labor per unit output, so a too-rapid rate of consolidation (that is, the exit of micro, small, and medium firms) will decrease the contribution that the agrifood system can make to employment growth.

***Farm structure change poses big challenges for smallholder farmers, but also fuels technical change and productivity growth***

Policy changes, urbanization, growing incomes, and the continuing effects of the commodity price surge of 2007/2008 have made farming a more attractive commercial opportunity in Africa. At the same time, the record on investor-owned

large farms in Africa is exceedingly poor. The result has been a dramatic increase in the number of medium-scale farms, defined as farms of between 5 and 100 hectares. Nearly all such farmers are nationals of the countries they are farming in. The share of national cultivated farmland under medium-scale farms has risen since 2000 in most but not all of the countries where nationally representative farm data are available. This investment appears to be most common in countries with relatively abundant land, and evidence suggests grains and oilseeds are the major focus of these farms.

Agricultural policy reforms facilitated the emergence of this group of farmers. Key policy reforms in the 1990s removed restrictions on private movement of food commodities across district borders and ended government grain marketing parastatals, which encouraged major investment in commercialized farms, marketing, processing, and retailing. When world food prices suddenly skyrocketed, these reforms enabled thousands of small, medium, and large farms and private firms to respond rapidly to profitable incentives.

Closely associated with agricultural policy reform is the development of agricultural land markets in Africa. Unlike 20 years ago, land sales and rental transactions are now legal, even in most areas of customary tenure. Agricultural policies have also become more favorable to the interests of medium- and large-scale farms. Most national farmers' unions and lobbies support policies that raise food prices, encourage the conversion of customary land tenure to statutory tenure (to promote access to land through market transactions), and promote input and credit subsidy programs that are open to bigger farms.

We identify three channels through which these farms are likely to bring new sources of capital and know-how to African agriculture. First, medium-scale farms have drawn investment from large-scale grain wholesalers, injecting needed capital into the system and increasing the number of assembly traders sourcing farm commodities deep in rural areas. By attracting private investment in grain trading around them, these medium-scale farmers have improved input and output market access conditions for surrounding smallholder farmers. Second, smallholders in areas with a high concentration of medium-scale farms are significantly more likely to rent mechanization equipment for land preparation than smallholders in other areas. Third, rural areas with a high concentration of medium-scale farms have significantly higher farm and nonfarm incomes. Medium-scale farm households tend to spend more money in the local economy, creating off-farm employment opportunities for rural people formerly dependent on subsistence farming.

At the same time, the rise of medium-scale farms probably led to the increasingly unequal distribution of agricultural land in Kenya, Ghana, and Zambia over the past 10 to 20 years. FSP research finds that current Gini coefficients of land ownership far exceed those of most Asian countries in the 1980s, raising real questions about the prospects for smallholder-inclusive agricultural growth in countries where this is happening.

***Smallholder farmers face major challenges competing in this new environment; well under half are likely to prosper as farmers over the next two decades***

Considering the dynamics of transformation that we see, and based on several attempts to categorize African smallholder farmers by level of and capacity for further commercialization, we suggest that well under half will be able to prosper *as farmers* over the next decade or two. Among those who fail to do well, some will leave farming for more attractive off-farm opportunities. Others will remain in low-productivity farming with minimal off-farm engagement and will need safety nets to ensure their food security and help the next generation escape from poverty. Those who do prosper are much more likely to produce nongrains (that is, products with high-value and less land-intensive value chains, such as dairy and fresh fruits and vegetables) rather than grains, since the latter show economies of scale in production; the rising medium-scale farm sector is already moving into the grain sector with some force. In order to thrive, smallholders will have to adopt new attitudes and learn new skills to engage with farming as a business.

***Policy responses to assist smallholder farmers, small entrepreneurs, and consumers in transitioning agrifood systems***

This report focuses on a policy agenda for transitional agrifood systems, since most countries in Africa, South Asia, and some of Southeast Asia are in this stage. It emphasizes four overarching points. First, no policy or program will fundamentally alter the transformations taking place; however, they can nudge the changes toward more inclusive and



healthy directions. This amounts to a socially informed business approach that “goes with the flow,” while maximizing positive effects and managing negative ones.

Second, SMEs and smallholder farmers are natural partners. Though each will be declining over time, a gradual rather than abrupt transition is in the interest of both and is the only approach conducive to inclusive transformation.

Third, the foundations of any effective approach to helping smallholders, SMEs, and consumers, are policy and infrastructure. Getting these right is the only way to ensure a return on other, more targeted investments.

Finally, helping those on the margin who might be able to prosper to actually do so, and protecting those who are unable, requires targeting different elements from a portfolio of approaches to different kinds of people. New data tools, especially global GIS databases and georeferenced household datasets, are making this more feasible.

## **Infrastructure, policy, and targeted support for smallholders, small enterprises, and consumers**

**Infrastructure:** Beyond the standard recommendation for investment in roads, energy, and water and sanitation, this report makes two recommendations regarding infrastructure. The first is to prioritize secondary cities and towns. These urban centers are home to large shares of the total urban population and are closer and more accessible than large metropolises to rural residents. And in most transitioning countries, secondary cities have little food marketing infrastructure and thus provide an opportunity to “get it right” from the beginning. The second broad recommendation regarding infrastructure is to substantially improve urban wholesale markets, including with new ownership and management models to facilitate more efficient and equitable urban access to rural farmers.

**Transparent and predictable policy:** Broad policy recommendations focus on the need for transparency and predictability, and a far greater commitment to more open regional trade. Bureaucratic procedures for registering businesses and accessing public permits and services should be streamlined and transparent. Land law should be clear and take into account the special assistance smallholder farmers may need. Food safety and quality standards need to be clear and transparently enforced. Regulations on plant-protection chemicals, fertilizers, and seeds should be based on the latest science and uniformly enforced. Across the board, regulatory approaches need to recognize the continued informality of a considerable amount of economic activity and facilitate improved performance in both formal and informal systems.

**Targeted assistance at farm level:** Targeting programmatic assistance at farm level involves a spatial dimension combined with an ability to determine household-level capacity. There are data tools to help with this and they should be used. Because classification is never perfect, requiring some level of financial or in-kind buy-in from farmers as a condition of participation can help to increase a program’s effectiveness.

**Commercialized farmers need two kinds of assistance:** (1) in strengthening their ability to engage with private markets for inputs, farm services, finance, land, or outputs; and (2) in expanding productivity and scale of operation through intensification or extensification to drive down the cost of operation. Smallholders who show the potential to become commercialized need the same things, but perhaps more intensively and with a modest, limited-time subsidy. The question is how to move from a situation where input subsidy programs are the cornerstone of agricultural development to a holistic program of sustainable productivity growth. Doing so will include raising public investment in agronomic research and extension programs to enable farmers to use fertilizer more efficiently; reconsidering targeting guidelines to achieve more equitable development impacts; and greater political will for ensuring that the subsidies go to the intended beneficiaries. Smallholders trapped in unsustainable and low-productivity farming because of tiny, degraded farms and have minimal off-farm engagement need safety nets to ensure their food security and possible second-generation escape from farming.

**Targeted assistance for SMEs:** Despite their popularity, little is known about the effectiveness of programs for direct provision of micro- and small-scale credit or business development services to MSMEs. The risk of unproductive public

investment is thus high, leading to two recommendations. First, policy can be improved with collateral registries and secured-transaction laws that enable banks to lend to small entrepreneurs using movable assets as collateral. Tanzania is currently considering such legislation, in part due to efforts by FSP together with other programs financed by the United States Agency for International Development (USAID).

Second, targeting is as important for SMEs as it is for smallholder farmers. Spatial filtering can be done similarly to how it is done for farmers. The difference in targeting is that nonfarm SMEs are commercialized by definition, and predicting success on the basis of other characteristics is quite difficult. The best predictor is size: very few micro enterprises ever rise beyond the level of survival strategies for poor people. With a size cutoff and buy-in requirements in place, direct assistance such as training in technical and managerial skills, assistance in navigating regulatory requirements, credit guarantee funds and other measures to ease access to finance, and investment in agroprocessing clusters stand some chance of generating a positive payoff in terms of successful businesses, expanded efficient output, and increased employment. However, attention must always be paid to cost, as this can be high while the benefits are low. Providing these services to a cluster of similar firms is likely to be more effective and less costly than working with individual firms.

Developing policy and investment packages to promote the development of promising value chains involves stakeholder engagement, detailed policy proposals, and important tradeoffs.

**Consumer-focused policies:** Inclusive economic growth and programming help to reduce stunting and underweight. The challenge now is to maintain economic growth and programmatic commitment to drive these problems out of existence.

Much less is known about how to stem the tide of rising overweight and obesity. This is an applied research area that needs greater attention, with an emphasis on adequately describing rapidly changing food environments, linking them to consumer food behavior, and testing approaches to modifying that behavior.

# Background

A common set of drivers is generating broadly similar patterns—with national and subnational variations—of agrifood system transformation across the developing world. These transformations generate new opportunities and challenges, and a rapidly changing mix of risks and rewards for farmers, entrepreneurs, consumers, and policymakers. Overall, food security is improving, urban- and rural poverty are falling, and problems associated with insufficient food consumption, such as childhood stunting, are rapidly declining across the developing world. Many of the changes in agrifood systems—both at midstream and downstream<sup>2</sup>—are providing women with timesaving options for obtaining and preparing food and giving them greater control over their lives. Productivity in Africa’s farming sector is finally rising, driven by increasing use of external inputs and greater access to farm services and remunerative output markets (Jayne et al. 2018). And the digital revolution, including drone technology and the Internet of Things, is beginning to influence a set of rising entrepreneurial farmers. This is all good news.

Yet smallholder farmers and small and medium enterprises (SME) face a transforming competitive landscape and must therefore learn new skills, adopt different behaviors, and have policy support if they are to prosper in this new environment. At the same time, consumers face a rapidly changing mix of available foods, new channels for procuring them, and a rising tide of advertisements seeking to influence food choices. Consumers need new knowledge and understanding for making choices that result in safe and healthy diets. Finally, policymakers face daunting challenges related to the explosion of small and medium actors in the midstream, new and more pressing food safety and environmental concerns, and rising overweight and obesity. They must decide how to deal with these issues even as other longstanding challenges and policy priorities around smallholder productivity, food security, and undernutrition continue to demand attention. Policymakers need a clear understanding of the kinds and rates of change taking place, and what measures they can use to promote citizens’ welfare.

This paper brings together lessons learned from research conducted by the Food Security Policy Innovation Lab (FSP) over the past five years to help guide these decisions. The paper does four things. First, it briefly summarizes the forces of change that are driving these transformations and how they vary in different parts of the developing world. Second, it presents a conceptual framework for understanding the changes and taking policy action, based on overlapping stages of transformation and the typical characteristics of agrifood systems in each stage. Third, it characterizes the key changes taking place in agrifood systems in developing countries—from diet transformation and its implications in the downstream, to the quiet revolution in the midstream, to the profound change in farm structure and farm service sectors in the upstream. Finally, it considers possible policy responses that could effectively promote the interests of smallholder farmers, small and medium enterprises, and consumers in these transforming systems.

## Drivers of change

The rapidly unfolding changes in agrifood systems—and effective policies for promoting the welfare of small farmers, entrepreneurs, and consumers—need to be understood in the context of the structural and rural transformation of economies. Rural transformation is best thought of as the manifestation in rural areas of the economy’s structural transforma-

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<sup>1</sup> This paper is a grand synthesis of the Food Security Policy Innovation Lab C4a and C4b research work streams. The researchers under C4a are T.S. Jayne, Milu Muyanga, Kwame Yeboah, Ayala Wineman, Antony Chapoto, Xinshen Diao, Hiro Takeshima, Divan van der Westhuizen and Makhura Moraka. The C4b team consisted of David Tschirley, Thomas Reardon, Ferdi Meyer, Tracy Davids, Saweda Liverpool-Tasie, Christine Sauer, Jason Snyder, Brian Chisanga, Richard Kachule and Zena Mpenda.

<sup>2</sup> The midstream includes all actors and activities in the “middle” of a value chain, after the farm and before retail. It includes transport, wholesaling, third-party logistics, processing and packaging, and public-sector activities such as regulation and food safety inspection. The downstream is the end of the value chain, typically viewed as retailing and consumption, with actors being a wide array of retail sellers and consumers.

tion. Broadly speaking, this structural (and rural) transformation starts with some combination of factors, both internal and external, that raises productivity and incomes. These factors can vary across countries and over time but always include conducive public policy and public investment that facilitate productive private investment. In the upstream, as farming has become more profitable in response to a period of high world food prices and policy reforms, more capital is flowing into farming, and input, output, and land markets are developing. This has induced the growth of medium-scale farms, raised agricultural surplus production, and motivated stronger downstream responses to these farm production gains. In the downstream as incomes rise, consumer demand moves progressively away from food toward goods and services unrelated to food or farming. Within food expenditure, demand moves away from starchy staples (Bennett 1954) toward perishable products and, in today's industrializing food systems, processed food.

This change in the structure of demand drives two changes in employment. First, labor follows demand off the farm and into a wide range of nonfarm activities, many still linked to farming and based in rural space. This *sectoral shift* of labor allows rural areas to become more productive and diversified. As incomes rise and markets expand, more organized firms emerge that are capable of hiring people, putting them to work in combination with technology, and increasing productivity. The emergence of these more formal and larger firms drives the second kind of shift in labor—a *functional shift* from self-employment to wage employment. This *employment transformation* has historically been a fundamental characteristic of structural and rural transformation. In a conducive policy environment with strong public and private investment, all these dynamics contribute to continued rapid rises in productivity and incomes that further speed these transformations.

Agrifood system transformation is a subset of these structural and rural transformations. Indeed, a fundamental fact about economic transformation is that farming, food, and agrifood systems slowly cede their primacy in the economy to activities with little or no connection to agriculture. Nonetheless, we focus on agrifood systems for two reasons. First, in most of the developing world, the farming and food-related nonfarm activities that compose the agrifood system are still major employers of people and will continue to be for several decades. Second, the productivity of farming, and of the broader agrifood system, is a key driver of real incomes and productivity in the rest of the economy; if farming and other agrifood enterprises remain mired in low productivity, they undermine broader growth (Christiaensen and Martin 2018; Snyder et al. forthcoming). Finding ways to spur productivity growth in the agrifood system and to promote adequate supplies of diverse, safe, and nutritious foods for consumers is thus a central part of ensuring strong and healthy overall economic growth.

The fundamental driver of the rapid transformations happening in developing country economies and their food systems is rapid growth in per capita incomes and the policies and public and private investments that started and have sustained it. Over the past 20 years, real per capita incomes have risen by 7 percent per year in developing East Asia, 5 percent in South Asia, 3 percent in the least-developed countries as a group, and 2 percent in sub-Saharan Africa<sup>3</sup>. Of the 30 fastest growing economies in the world over that period, eight are in Africa and 12 are in developing East or South Asia.

This growth has been fueled by profound policy changes that swept the developing world starting in the mid-1980s and, during the past decade at least (longer in some East Asian countries), extensive investment in public infrastructure, including roads, communications, ports, energy, health, and water and sanitation. This policy openness and improved public infrastructure have fueled dramatic increases in local private investment and private foreign direct investment (FDI) in many countries, further contributing to growth and transformation (Jayne et al. 2018; Reardon and Timmer 2014).

The sharp rise in world food prices starting in 2007 intensified these growth dynamics for agrifood systems. Coming on the heels of the improved policy environment, better public infrastructure, and the rising local incomes that they made possible, these prices provided incentives for major new investment in African and Asian farm production and post-farm value added. Since 2007, world food prices have remained significantly higher than in the 1990s and early 2000s. This has provided an environment for continued investment, which has come largely from two sources. The first is large local, re-

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<sup>3</sup> Computed from API\_NY.GDP.PCAP.KD.ZG\_DS2\_en\_excel\_v2\_10399953.xls, found at <https://data.worldbank.org/indicator/NY.GDP.PCAP.KD?view=chart>.

gional, and international grain trading and processing companies that, in addition to importing, also invest in local supply sources to satisfy growing local demand (Burke et al. forthcoming; van der Westhuizen et al. 2018; Sitko et al. 2018). The second is local medium and large farms that invest primarily to satisfy local demand in growing cities with rapidly growing purchasing power (Neven et al. 2009; Jayne et al. 2016). Evidence is also now emerging that these medium- and large-scale investments at farm and post-farm levels can improve market access for surrounding smallholder farmers, allowing commercially oriented smallholder farmers to improve their own performance.

Once this transformation starts, it can become self-reinforcing if public policy and investments remain conducive to private investment. The transformation is

- *pulled* by downstream demand from urbanization and diet change in urban and rural areas that vastly increase and change the composition of food demand;
- *facilitated* by behavioral change and investment in the midstream and downstream, which lead to more efficient and diverse food processing, wholesaling, and logistics from a combination of large firms and SMEs, and changes in scale, behavior, and efficiency at the retail level, spurred by private investment in supermarkets; and
- *fed* by the upstream in the form of intensification, commercialization, and diversification at farm level (all associated with changing farm size distribution) and the rise of markets for feed, equipment, chemicals, and associated farm services, which increase marketed surplus and strengthen the ability of the farm sector to respond to changing demand in the midstream and downstream (Reardon et al. 2018).

Section 3 of this paper provides a framework for thinking about agrifood system transformation that relates it to structural and rural transformation. Sections 4 through 6 provide details on the changes we see unfolding at the upstream, midstream, and downstream levels. The final section provides the basis for thinking about different cost-effective policy approaches that can improve the welfare of farmers, entrepreneurs, and consumers.

## Conceptual approach

The level and speed of transformation of a country's agrifood system aligns in two ways with the level and speed of its structural and rural transformation. First, as overall transformation advances in a country, so too does the transformation of its agrifood system. Malawi's agrifood system therefore does not look the same as South Africa's, nor does Myanmar's look the same as Thailand's or Honduras's as Mexico's, because overall transformation is at different stages in these countries. Second, because the level and speed of economic transformation vary from place to place within a country, so does agrifood system transformation. Think of Lilongwe compared to a village in northern Malawi or Tegucigalpa compared to a small town in northeast Honduras.

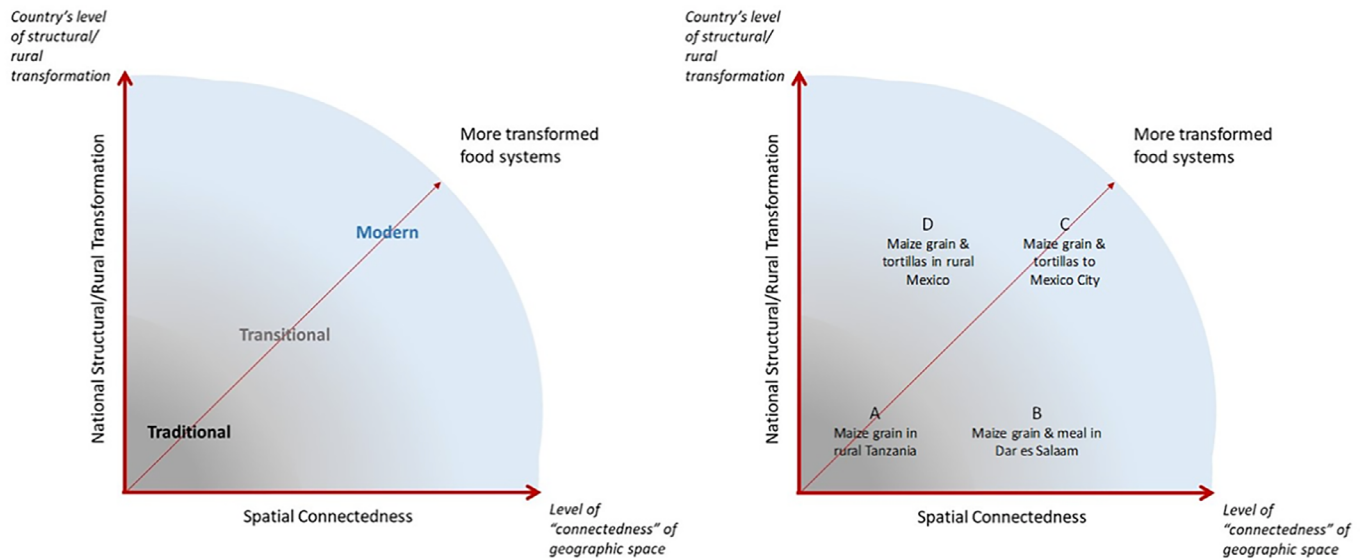
Broadly, transformation moves from a traditional stage through a transitional stage and finally to a modern stage (Reardon et al. 2012).<sup>4</sup> This transformation can be seen in one place over time—for example, in a rural area near a major city that grows and expands in a poor country as its income rises. It can also be seen at one time in different places—for example, in a maize value chain serving a small rural town versus one serving high-income areas of a major city. This means that the predominant stage of transformation in a country coexists with other stages in different parts of the country.

Similarly, transformation varies across products at a given time and in a given place. Therefore, maize grain or rice, for example, can be marketed all over a country through traditional and early transitional value chains, but milk cannot. To reach a national market, this perishable product must be pasteurized and transported through a cold chain or ultra-high-temperature pasteurized (UHT) and packaged using Tetrapak technology, both of which are features of mid-to-late transitional and modern systems.

<sup>4</sup> See International Food Policy Research Institute (2015) and HLPE (2017) for similar typologies.

Figure 1 illustrates these ideas. The graph on the left shows the basic framework for how a country's level of structural and rural transformation (vertical axes) and the extent to which a particular geographic place is connected to economic opportunities (horizontal axes) combine to determine the level of transformation of the agrifood system. To understand spatial connectedness, think of how economic opportunity will differ among remote rural areas, semi-rural areas closer to cities, and peri-urban areas surrounding major cities.

**Figure 1.** Stages of agrifood system transformation relate to a country's broader transformation and the connectedness of its geographic spaces



Source: Authors.

The graph on the right provides the example of maize value chains at different stages of transformation. The chain serving a small town in the southern highlands of Tanzania may involve whole grain transported by farmers or small traders primarily to the town's open-air market, where consumers purchase it for processing at home. This value chain is represented by point A—a traditional system. To reach Dar es Salaam, that same maize grain moves over a long distance through a series of traders before reaching a small or micro miller in the city, who grinds it into refined meal, packages and brands it, and sells it in a traditional formal store or small supermarket, or even (but much less commonly) to a supermarket chain. This value chain is represented by point B—the same level of national structural transformation but located in a more connected geographic space, which allows for more transformation in the kinds of activities it undertakes.

Meanwhile, point C on the graph represents a modern value chain—for example, maize in Mexico shipped to a large modern processing plant where it is made into tortillas, packaged, branded with a national brand (with a large advertising budget behind it), stamped with government-mandated nutritional and ingredient labels, and shipped through a cold chain to a *Comercial Mexicana* supermarket outlet located in Mexico City. Still, in Mexico, locally produced maize reaching small towns will be processed at a smaller scale, and the tortillas may not move through a cold chain and will likely be sold through a wider array of smaller and less modern retail outlets. Yet this chain will operate at a larger scale and feature more out-of-home processing than the chain serving the small town in Tanzania. This chain will lie somewhere in the transitional stage of transformation, represented by point D.

#### *Transformation, firm consolidation, and employment: The J-curve*

The J-curve of firm consolidation is an empirical regularity seen over the course of agrifood system transformation (Reardon 2015). Before the structural adjustment policy reforms of the 1980s, dualistic systems typically prevailed, in which a

large-scale food processing and distribution system, and often large-scale processors of traditional export crops, overlaid a small-scale traditional system. The large-scale system featured public ownership, typically of food distribution systems for mostly urban consumers, and private ownership of food processing that was protected by public policy, as in South Africa's maize sector prior to reform.<sup>5</sup> This dualistic system is represented by the left side of the J, with a moderate overall level of firm consolidation. As policy reforms took hold, these public firms quickly became insolvent, the public policies that protected large-scale private firms eventually disappeared,<sup>6</sup> a plethora of micro- and small-scale firms filled the gap, and measures of firm consolidation plummeted. This is the bottom portion of the J-curve. These changes created a boom in entrepreneurial and employment opportunities within the agrifood system.

Typically, as growth continues economies of scale in processing and distribution drive renewed consolidation, now driven by more sustainable private sector investment. Micro-, small-, and even medium-scale firms find it difficult to compete, and large firms begin to dominate post-farm operations. While this fuels the rise of more formal wage employment, it also means that the agrifood system may offer less total employment—large processing firms have far lower employment to output ratios than do smaller firms (Snyder et al. 2017)—and that more skills are required to qualify for that employment. This is the rising, right side of the J-curve.

### *Stages of transformation*

**Traditional:** At the traditional stage of the agrifood system, foods travel short distances and go through few transactions. Production is small in scale and dispersed, and most food is consumed on the farm. Grains and other starchy staples account for 60 to 70 percent of diets. Supply to markets is highly seasonal and mostly unprocessed. Consumers process and prepare the products themselves in the home or take them to custom mills. Retailing is in open-air markets, roadside stands, and traditional (not self-service) formal shops. Quality differentiation is minimal.

Examples of traditional systems are staples markets in rural villages in Mali, hill villages in eastern Myanmar, and food markets in the hinterlands of Bolivia. These areas are the poorest and farthest from cities in countries that have achieved little transformation. Traditional systems generate little post-farm value added and therefore create few jobs off the farm. Farming with little technology and low returns is the main option.

**Transitional:** As incomes rise and urban populations grow, diets shift from grains and other staples to more perishable and processed foods, contributing to a wave of structural change in the agrifood system. Rural-to-urban food value chains emerge in zones that are more productive. Foods travel longer distances and go through more transactions from farm to plate. The urban share in the food market (by value) is high, at 50–70 percent. Production of nongrains such as fresh produce, oilseeds, dairy products, and poultry and other meat grows rapidly. At farm level, input use rises, along with farm demand for services such as spraying and ploughing. Traders invest in more storage, including cold storage, making supply to the market less seasonal.

Consumers now purchase staples primarily in processed form—for example, as packaged and branded maize meal in cities and towns in East Africa. Entirely new ultra-processed foods, such as flavored yogurt and milk, sugar-sweetened beverages, breakfast cereals, and fatty and salty snack foods, begin to be widely available. Expenditure on food prepared and consumed away from home skyrockets, and small-scale food vendors emerge to meet the demand. Concerns about food safety begin to arise. Off-farm labor in processing rises rapidly, and women, who are responsible for most food preparation in the household, gain time for other potentially remunerative activities. Supermarkets spread fast, though their share of total food retail remains small. Small and medium firms still dominate, but larger firms start emerging in marketing and processing.

Examples of transitional agrifood systems include Dhaka's fish industry, which now sells farmed-raised rather than wild-caught fish (Hernandez et al. 2017); teff in Addis Ababa, which is now sold at specialized shops that provide additional

<sup>5</sup> Ownership of cash crop processing was more often public, e.g., for cotton in many countries of Africa prior to reform in the 1990s. See Tschirley et al. (2009).

<sup>6</sup> See Jayne and Rubey (1993) for evidence from Zimbabwe.

services to consumers (Minten et al. 2017); potatoes in the Delhi market, which now move through a cold chain (das Gupta et al. 2010); maize grown in northern Nigeria sold to feed mills (themselves a feature of transitional systems) in the south and packaged rather than live chickens sold in Ibadan (Liverpool-Tasie et al. 2017); Tanzanian sunflower oil processed and packaged in medium-scale mills and sold in Dar es Salaam and other cities; and maize meals that are now branded and packaged rather than sold loose throughout East and Southern Africa.

This stage predominates in West and East Africa, South Asia and parts of Southeast Asia. It is the boom stage for employment opportunities in small and medium enterprises and to a lesser extent in wage employment in the agrifood system (the bottom of the J-curve) as well as in more remunerative, technologically enabled, and commercially oriented farming. Yet it is also during this stage that the competitive landscape begins to change in important ways for farms and firms. Overall, the number of opportunities fall at farm level (even as new and more attractive opportunities arise for some) and rise rapidly after the farm. At both levels, new skills need to be learned and old ways of doing business need to change if smallholder farmers and small-, and medium-scale enterprises (SMEs) are to take advantage of these opportunities and grow their incomes.

**Modern:** As incomes continue to rise and urban populations grow, diets move heavily into processed and animal-sourced foods. Goods travel long distances, but there are fewer transactions than in the transitional stage and they are conducted by larger firms. Medium-scale and larger farms predominate, along with larger food processing companies (the right side of the J-curve). Most food is processed in some form before being sold to consumers, and entirely new ultra-processed foods are common. Supermarkets hold most of the market share at retail, food consumed away from home continues to boom, and demand for fast food grows rapidly (for Latin America, see Popkin and Reardon 2018). Quality differentiation has advanced and is dominated by private standards, though public regulation and standards are also more advanced. Food safety and nutrition are key concerns for consumers. Seasonality is minor, as foods reach consumers from a wide array of production zones, including from overseas. Advertising on food and beverages has exploded, and food choice is increasingly a statement of values and lifestyle.

Examples of modern agrifood systems include strawberries traveling from the state of Michoacán to supermarkets all over Mexico (Berdegué et al. 2005); milk to Nestle in Brazil (Farina et al 2005); farmed tilapia to large processors in Guangdong Province and then through an advanced cold chain for export or sale to cities across China (Bai et al. 2017); and chicken produced, processed, and distributed through a cold chain by the Nigerian poultry firm Zartech (Liverpool-Tasie et al. 2017) to cities in Nigeria and many other African countries.

Value added is very high, but resides mostly in large, capital-intensive firms. This is a challenging stage for nonfarm employment in the agrifood system. Employers require higher-level skills as automation replaces low-skilled manual labor; entry requirements for businesses (including market-oriented farming) are stiff; small and medium enterprises dwindle; and the few small farms that remain are concentrated in small, “protected” hinterland areas.

## Opportunities and challenges from patterns of change

### **Labor is shifting off the farm, but farming remains crucial to rural areas’ welfare and broader economic growth**

Intersectoral transfer of labor—the movement of labor off the farm into nonfarm activities—is both a cause and consequence of economic transformation. It is a cause because, except in the later stages of transformation, average labor productivity is higher in nonfarm activities than in farming. As a result, an economy can achieve a quantum of “easy” growth simply by moving labor from the low-productivity farming sector into higher-productivity nonfarm sectors. In this way,



overall growth may be faster than the growth within either sector (McMillan and Rodrik 2011; 2014). By driving income growth, the flow of labor out of farming drives changes in spending patterns that spur further transformation. Consumers redirect increasing shares of their food spending from starchy staples to perishable and value-added products (via Bennett's Law; Bennet 1954). By doing so, they draw labor out of farming into post-farm segments of the agrifood system. They also channel more of their overall spending into nonfood items (by Engel's Law), thereby drawing labor into sectors outside the agrifood system.

By the same dynamic, labor flow out of farming as a *consequence* of transformation; labor must eventually follow demand, and if demand is moving off the farm, so too must labor. It is important to note, however, that much of this reallocation of labor from farm to nonfarm activities is driven fundamentally by farm productivity growth (Christiaensen and Martin 2018; Snyder et al. forthcoming). This underscores the importance of policies aimed at sustaining and further raising farm productivity growth.

### *Sectoral employment patterns*

FSP made two major contributions to the analysis of employment structure in low-income countries. First, it pioneered the use of employment data from living standards measurement surveys (LSMSs) to quantify labor in terms of full-time equivalents (FTEs). The use of FTEs was a departure from previous approaches, which focused on the "primary" sector in which a person worked. The major contribution of this work was to provide a more accurate picture of where households allocated their labor efforts. One revelation was that farming's labor share was substantially lower than had been previously found by primary activity analyses.<sup>7</sup> FSP's second major contribution (Tschirley et al. 2015b) was to disaggregate the distribution of nonfarm labor into (1) nonfarm labor within the agrifood system, (2) labor entirely outside the agrifood system, (3) and labor in segments of the post-farm agrifood system. This approach provided, for the first time, a window into the role of the full agrifood system, farm and post-farm, in employment.

Tschirley et al. (2015b) linked employment to changes in diet, and projected the evolution of the structure of employment over the period of 2010 to 2025 across six countries in East and Southern Africa.<sup>8</sup> Their results suggested that farming would capture about one-third of all new jobs, post-farm segments of the agrifood system would capture 17 percent, and employment entirely outside the agrifood system would capture about half. In interpreting these results, recall from above that diet change is but one element of change in a co-evolving system featuring rising farm productivity, broadly rising incomes, and the technology and behavior change throughout the agrifood system and broader economy that make them possible.

This essential result—that farming had a high starting share in employment but would see that share fall steadily, that employment in the post-farm agrifood system would grow rapidly but from a small base, and that employment outside the agrifood system would capture the largest single share of new employment—has held up in later analyses. Tschirley et al. (2016) showed that farming's share in FTE labor in seven African countries ranged from a low of 35 percent in Nigeria, to 54 percent in Malawi, to a high of 78 percent in Mozambique. These figures are much lower than the commonly cited figures of 70 to 80 percent across Africa. Yeboah and Jayne (2018) analyzed FTE labor shares using successive cross-sections of LSMS data for six African countries between the mid-2000s and about 2010. They showed that for every country but Nigeria shares in FTE labor fell by between 9 and 15 percentage points in farming, rose by 3 to 9 percentage points in the post-farm agrifood system, and rose by 3 to 10 percentage points outside the agrifood system. Overall, FTE employment shares ranged from 33 to 54 percent in farming, 9 to 23 percent in the post-farm agrifood system, and 36 to 44 percent outside the agrifood system during the second rounds of each survey. Nigeria was an outlier, with the farm employment share rising by 12 percentage points, the post-farm agrifood system share rising by 19 points, and the non-agrifood system employment falling by a whopping 30 percentage points. These anomalous results may have been related to structural adjustment in Nigeria's economy, with labor being shed from public sector employment as a result of falling oil prices.

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<sup>7</sup> Haggblade, Hazel, and Dorosh (2007; page 4) were the first to note how the primary occupation approach was likely to underestimate the share of rural nonfarm employment—and overestimate farming's share—in total labor effort in rural areas. To illustrate this, they pointed to the fact that nonfarm income share data were consistently higher than corresponding labor shares. They did not quantify full-time equivalents.

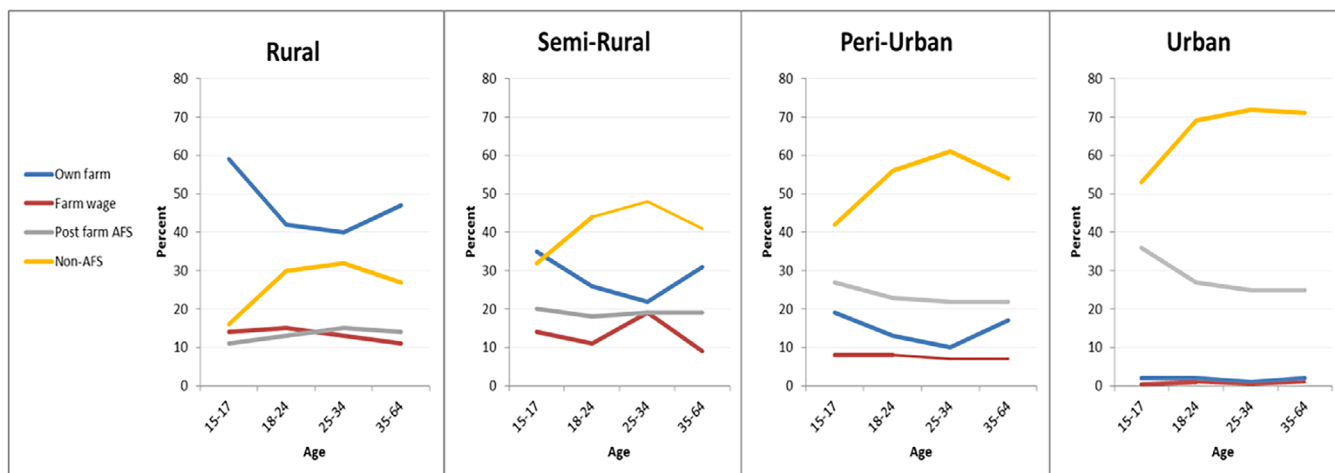
<sup>8</sup> Ethiopia, Uganda, Tanzania, Mozambique, Malawi, and Zambia.

Dolislager et al. (2019) analyzed employment by age group and by geographic location across thirteen countries in Africa, Asia, and Latin America. For geographic location, they developed a disaggregated classification of rural hinterland, semi-rural, peri-urban, and urban areas (see also IFAD [2019] for details on methods). Two results stood out. First, the FTE labor share of the post-farm agrifood system rises systematically as areas become more urban. Depending on the age of the worker, this segment accounts for 10 to 15 percent of all labor in the rural hinterland, rising persistently to 25 to 35 percent in urban areas. Farming's share falls from about 45 percent in the rural hinterland to low single digits in urban areas, and work entirely outside the agrifood system rises from 15 percent to 30 percent in the rural hinterland to between 52 and 70 percent in urban areas (Figure 2).

Yeboah and Jayne (2018) added a new dimension to this question in their analysis of six African countries. They found that while post-farm agrifood system employment was higher in urban than in rural areas (consistent with Dolislager et al. [2019]), it was generally growing more rapidly in rural areas than in urban centers, possibly signaling rural dynamism due to linkages with growing agricultural sectors. Combined with the strong overall growth they showed in post-farm agrifood system employment (essentially equal to growth outside the agrifood system), these results paint an encouraging picture of the contribution that this sector can make to employment growth in transitioning countries.

The second main result from Dolislager et al. (2019), shown in Figure 2, is that those entering the workforce at the youngest age (15 to 17 years old) prioritize farming, but the importance of farming quickly falls, and nonfarm work quickly rises among older youths and adults. The youngest workers in rural and semi-rural areas put more time into farming than workers in every other age group in every geographic area. Farming accounts for less than half of total work effort among older youth (18 to 24 years old), even in the most rural areas. Farming is less important than work outside the agrifood system in semi-rural areas and less important than post-farm agrifood system work and work outside the agrifood system in peri-urban and urban areas. This pattern likely reflects the fact that the youngest entrants (15 to 17 years old) tend to come from the poorest families and have the lowest educational attainment. Those who enter the workforce later are generally less poor and more likely to have completed secondary school, and for that reason more are likely to engage in nonfarm work.

**Figure 2.** Employment in the post-farm agrifood system rises—and becomes an entry point for young workers—in more urban areas (FTE labor shares by age and sector in Africa, Asia, and Latin America)



Tschirley, Kondo, and Snyder (2016) examined employment by gender in Tanzania, Nigeria, and Rwanda. In addition to farming and nonfarm employment, they broke down the post-farm agrifood system into marketing and transport, food manufacturing, and food away from home. They found that the post-farm agrifood system was an especially large source of employment for women. In every segment of the post-farm agrifood system of every country, women's share in FTE employment exceeded their share outside the agrifood system (Table 1). This was nearly the reverse of the pattern

among men. In Tanzania, women accounted for 71 percent of all employment in food away from home and 62 percent in food manufacturing. Overall, half of all agrifood system jobs were occupied by women, whereas they held just 37 percent of jobs outside the system. In Rwanda, post-farm agrifood system employment shares for women ranged from 44 to 53 percent compared with 37 percent outside the agrifood system; in Nigeria, women's employment shares were 90, 82, and 62 percent in food away from home, food manufacturing, and food marketing and transport, respectively. It bears noting that food away from home is a small sector, but in every country analyzed in East and Southern Africa, it had the highest expenditure elasticity of demand, suggesting very rapid growth as urbanization and income growth advance.

**Table 1.** The post-farm agrifood system offers many employment opportunities for women (labor shares, FTE basis, in farm, post-farm agrifood system, and non-agrifood system)

	Own farm	Farm labor	Post-farm agrifood system			Entire agrifood system	Non-agrifood system
			Food mfg	Food mktg	Food away from home		
	----- % female employment, FTEs -----						
Tanzania	52%	39%	62%	48%	71%	50%	37%
Rwanda	58%	55%	53%	48%	44%	56%	37%
Nigeria	38%	35%	82%	62%	90%	48%	45%

Source: Tschirley, Kondo, and Snyder (2016), Table 3.19

### *The predominance of informal employment in Africa and the challenge of automation in manufacturing*

The first industrializers in Europe and the United States, as well as the “Asian Tigers,” Hong Kong, Singapore, South Korea, and Taiwan, which began to industrialize in the 1980s, transformed by absorbing labor leaving the farm into a rapidly growing labor-intensive manufacturing sector. This process involved formal wage labor with relatively reliable earnings and social protections such as insurance and sometimes retirement, and saw wages and productivity rise over time as companies invested in technology. This productivity escalator (McMillan and Rodrik 2011) was central to the rapid and sustained growth and poverty reduction seen by industrializing countries through the 1990s.

It is now widely accepted that, due to the impacts of automation made faster in recent years by the advance of artificial intelligence in manufacturing, this traditional path to transformation and exit from poverty is increasingly unavailable to countries that have not yet industrialized. Service sector jobs are replacing those in manufacturing, and many analysts are pessimistic that the service sector can generate the technological dynamism needed to drive the income growth historically seen in manufacturing (McMillan, Rodrik, and Sepulveda 2016).

Less manufacturing means less wage employment and an increasing role for informal self-employment. Workers leaving the farm in Africa go primarily into self-employment in the service sector. Latin America has also seen increased informalization from previously high rates of formal wage employment, due to the decline of its manufacturing sector after the failure of import-substituting industrialization (Tschirley and Reardon 2016). Hourly earnings in self-employment are often not far above those in farming (McCullough 2015), and there is no clear path to raising them quickly, given the difficulty of introducing technology in the production processes of individual entrepreneurs operating without broader institutional supports (Filmer and Fox 2014). Yeboah and Jayne (2018) found that self-employment accounted for 65 percent to nearly 90 percent of all employment in the countries they studied and, like many others, suggested that self-employment will remain a key feature of African labor markets for the next several decades (see Tschirley and Reardon [2016, section 4.2] for a discussion of possible policy responses).

These trends raise thorny issues of how to achieve the productivity growth—and growth in stable and remunerative jobs—needed to fuel continued economic transformation in countries that have not yet industrialized.

*Why does farming—including smallholder farming—still matter?*

Farming's share in the economy is falling across the world, as is smallholder farmers' share of the farming economy. Why, then, do farming and the smallholder sector still matter in low-income countries? We identify two reasons. First, the vast majority of rural residents in these countries are people with little education and few assets who depend at least in part on farming. Although their share in the economy is falling, their absolute numbers, at least in Africa, are rising and will continue to rise for the next decade or two. If these farmers remain mired in low-productivity farming, progress on poverty reduction and inclusive transformation will be slow. Second, the extensive literature on farm–nonfarm growth linkages (Haggblade, Hazell, and Brown 1989) makes it clear that the productivity of farming has a major impact on the growth of the nonfarm economy. Yeboah and Jayne (2018) show that smallholder agricultural productivity is strongly associated with the rate of exit from farming, meaning it is strongly associated with the growth of the nonfarm economy. As they note, most “studies of early developing countries found that multiplier effects from agricultural productivity growth are considerably higher than those from off-farm productivity growth (for a useful review, see Haggblade, Hazell, and Dorosh 2007; also Christiaensen, Demery, and Kuhl 2011).

Without raising productivity among a meaningful share of the smallholder farming sector, agricultural productivity growth will be hard to achieve; without agricultural productivity growth, growth in the rest of the economy will slow. While being realistic about the implications of agrifood system transformation for the prospects of different kinds of smallholder farmers, it is imperative that at least some segment of the smallholder farming sector receive assistance in increasing productivity and incomes. Such assistance should include facilitating smallholders' access to a wide range of technologies, extension support, and markets. There is also another group of smallholders with serious land constraints and degraded soils who are unlikely to increase productivity without improved technologies and support services to address soil-related challenges.

*Do food imports pose a threat to job growth in Africa's agrifood system?*

FSP studies in 2015, 2016, and 2018 investigated issues around Africa's rising food imports. According to Yeboah and Jayne (2018), food imports rose sevenfold between 2001 and 2014. During the same period, the ratio of food imports to food output rose from 9.2 to 24.1 percent (based on FAO data). Because imports generate no farm employment and likely generate less post-farm employment than domestic production, the authors conclude that import trends are “a major threat to job growth in African agrifood systems.”

Looking at imports from the demand side, Tschirley et al. (2015a) and Snyder et al. (2016) find less cause for alarm. The former show that the import share of food in diets does not rise with income in East and Southern Africa, because higher consumption of imported grains such as wheat and (in some countries) rice is counterbalanced by higher consumption of meat, dairy, and fresh produce, which have higher local production shares. The latter focus on imports as a share of total food expenditure in East and Southern Africa. By estimating food expenditure time series, the authors show that, between 2008 and 2015, food imports as a share of total food expenditure fell in two countries (Malawi and Uganda), were flat in two (Nigeria and Tanzania), and rose in two (Mozambique and Rwanda). They suggest that per capita food imports should be expected to rise as incomes rise, and that the evidence does not support general alarm about the continent's imports.

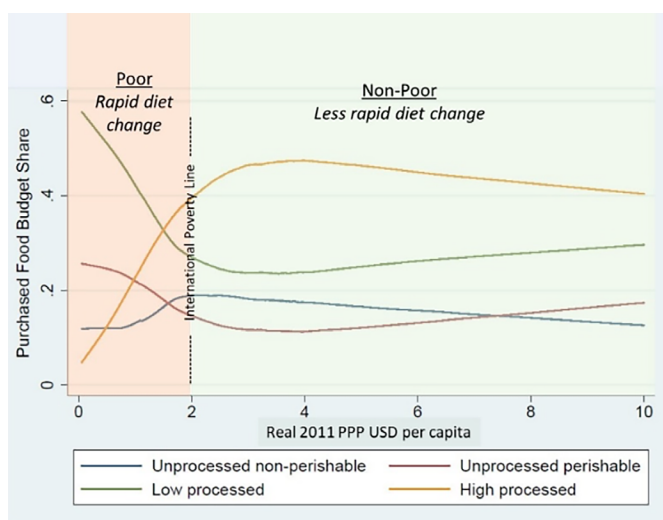
Despite their differing views all three studies agree that to promote food security and strong and inclusive economic growth, policy should stay focused on increasing productivity growth in African agrifood systems, from farm to retail. Few, if any, outside analysts would argue for increased trade barriers as a response to rising imports. In fact, more open trade is seen as a cornerstone of more effective policy for the continent's agrifood systems. Whether or not food imports are too high, the best policy remains improving productivity throughout the system, within a framework of stable and transparent trade policy.

## **Rising incomes, together with urbanization and globalization, are transforming diets across the developing world in broadly similar directions**

Together, income growth, urbanization, and globalization are transforming diets across the developing world—within

and across countries, and within countries and communities of all income levels. People all over the world are increasingly moving away from traditional diets to diets made up of cheap and convenient ultra-processed foods. The transformation is far-reaching, from the urban middle class in middle- and lower-middle-income countries to the urban and rural poor in low-income countries. In fact, research shows that this dietary transformation is advancing rapidly even among households that are still below the international poverty line ( Figure 3; see also Tschirley et al. 2015a). Food systems are therefore under enormous pressure to respond to these widespread changes in dietary patterns; private actors need to invest to produce the kinds and volumes of food that consumers are demanding, while public agencies have to deal with new challenges of food safety and rising overweight and obesity.

**Figure 3.** Diet changes very rapidly among the poor (food budget shares by processing category and income in East and Southern Africa)



Notes: Definition of each processing level as defined in Tschirley et al., 2015. Perishable and non-perishable categories of Low processed High processed categories were combined into Low and High processed. All shares sum to 100%. Total expenditure is 2011 real purchasing power parity USD per capita, per World Bank. Countries included are Malawi, Mozambique, Zambia, Tanzania, and Uganda.

pattern across Africa and in Zambia, specifically. With the exception of West Africa below the Sahel, highlands in East Africa, and areas around the Great Lakes, most of the continent holds fewer than 10 people per square kilometer. The numerous dark narrow lines on the map of Zambia show how rural populations settle along lines of transport.

As a result of these patterns, rural areas increasingly demonstrate characteristics of urban areas, including in their food-related behavior. For example, nearly half of all food consumed by rural residents across East and Southern Africa in 2010 was purchased in markets (Tschirley et al. 2015a). Nearly three-quarters of this purchased food—and 30 percent of all food consumed—was processed in some way. More recently, purchased shares in rural areas of the region averaged around 50 percent (Tschirley et al. 2017).

Globalization of goods and services and information and ideas means that this dietary transformation—especially the turn toward ultra-processed packaged foods<sup>9</sup>—is occurring at progressively lower levels of national income than in the

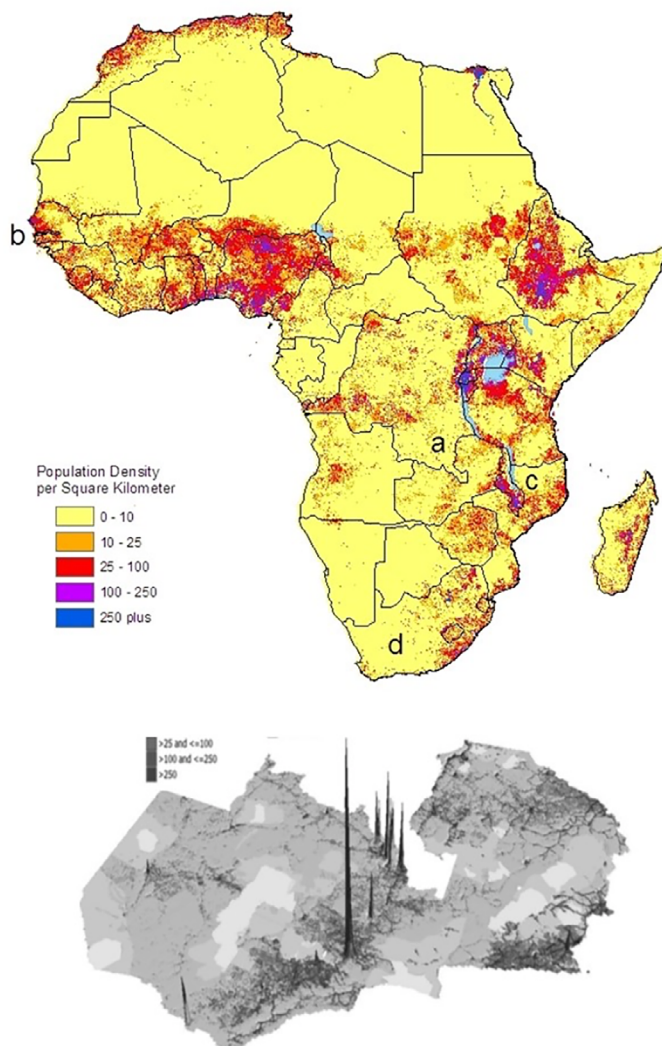
### *The role of urbanization, rural densification, and globalization*

Globally, urban populations are growing faster than are rural populations, and this is especially true in the developing world. Over the past 20 years, urban populations have grown from 30 to 40 percent in sub-Saharan Africa, from 27 to 34 percent in South Asia, and from 34 to 55 percent in developing East Asia and the Pacific. Urban areas' share in total food consumption has risen even more, because urban dwellers tend to have higher incomes and thus purchase more food per capita (Reardon et al. 2019). As urban population growth continues to severely outpace rural population growth, the links between rural farmers and urban markets must take a central position in addressing questions of rural poverty and food security.

Despite slower population growth in rural areas, rural densification is a major force shaping food behavior. Typically, Africa's rural population is growing between 1 and 2 percent per year. Because rural residents tend to settle in more productive areas and, more recently, along transport routes, “the vast majority of non-urban land in the developing world is very sparsely populated, while the vast majority of rural residents live in areas that are relatively densely populated” (IFAD 2019; see also Haggblade, Longabaugh, and Tschirley 2009). Figure 4 illustrates this

<sup>9</sup> Ultra-processed foods are typically defined as ready-to-eat packaged foods made mostly or entirely from food ingredients rather than whole foods. See Monteiro et al., 2013. Examples include all sugar-sweetened beverages, salty, fatty snack foods, and frozen pastas and nuggets.

**Figure 4.** Rural Africans live predominantly in densely populated rural areas (population density in Africa and Zambia)



Source: Haggblade, Longabaugh, and Tschirley (2009)

product is acquired, not a change in diet per se. It saves time and hard labor for women, who have much else to do in and out of the household. As transformation proceeds, however, the complexity of processing increases. It involves the use of multiple food ingredients (e.g., basic packaged bread with no preservatives), addition of food additives (that same bread with corn syrup, preservatives, and added vitamins), and often chemical processing rather than just physical, to ensure homogenization or agglomeration for attractiveness to consumers. These foods are entirely distinct from traditional staples that move through a progression from home production and processing to purchase in processed form, as discussed above.

Fourth, foods are becoming *more prepared and consumed away from home*. This ranges from traditional food preparation in open-air markets under often deplorable sanitary conditions to fast-food outlets and high-end sit-down restaurants. As a consumption category, food away from home in every country analyzed in Africa has the highest income elasticity of demand, well above 1.0, meaning that its budget share is rising with incomes and absolute expenditures are rising even more rapidly (Tschirley et al. 2015 a or b).

Along with these four key changes, the composition of demand among different types of grains is also changing (see Reardon et al. 2019). The rise of processed convenience food has increased demand for wheat and rice. Wheat consump-

past (Popkin 2002; 2017). Highly processed foods are now available throughout cities and towns of developing countries, including in low-income neighborhoods (Massingue et al. 2015). Availability has also pushed into rural areas even of low-income countries such as Tanzania (Keding et al. 2012). Availability is complemented by ubiquitous advertising of sugar-sweetened beverages, breakfast cereals, and snack foods in urban areas.

#### *Four dimensions of diet transformation*

Diets are changing in four ways. First, they are becoming *more purchased*. This change is driven initially by urbanization, as people in cities rely heavily on markets for their food provision, and is accentuated by the typically higher incomes of urban consumers, meaning that on average they consume more food per capita than rural residents. Reliance on markets is not, however, just an urban phenomenon. For example, in rural areas of East and Southern Africa, Tschirley et al. (2015 a or b) found that 40 to 50 percent of the value of all food consumed by rural households was purchased, not produced on their own farms. In rural Nigeria, this share is around 70 percent, and in Bangladesh it reaches 80 percent (Reardon, et. al. 2018).

Second, diets are becoming *more perishable*. The share of animal source foods (meat, fish, dairy) and fresh produce (fruits and vegetables) now makes up about half of all consumption (by value) in rural Africa, two-thirds in urban Africa, and three-quarters in urban Asia.

Third, diets are becoming *more processed*. In traditional and early transitioning food systems, this processing is simple, for example, maize grain being milled and sold loose out of large bags in traditional markets, rather than being purchased as grain and pounded at home. This kind of processing is simply a change in how a traditional final

tion, mainly as noodles and bread, has risen across Asia (Pingali 2006). In Southeast Asia between 1961 and 2010, wheat imports rose from one million tons and wheat quadrupled its food budget share relative to rice (Timmer 2015). Wheat consumption via noodles and bread has also risen in West Africa, where sandwiches are also becoming more popular (Liverpool-Tasie et al. 2016b). Yet many of the salty, fatty snack foods now ubiquitous in developing-country cities and towns—and increasingly produced by local companies—are based on maize or potatoes. Fast food prepared away from home also relies heavily on potatoes, for example, for french fries and chips, suggesting that demand for these commodities will grow as transformation proceeds. Finally, consumers everywhere, even in low-income countries, want high-quality grains: in Bangladesh, consumers are demanding finer rice; in Ethiopia, people are turning away from cheaper red teff toward more expensive white teff; and in urban areas of Tanzania, consumers strongly prefer Mbeya rice from the southern highlands.

### Two broad implications

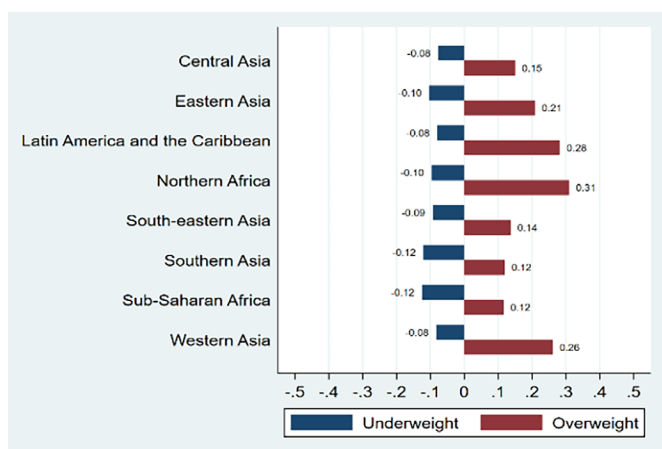
The diet transformation has two broad implications.<sup>10</sup> One is dramatic growth in agribusiness opportunities. We discuss this in the next sections, since these opportunities lie primarily in the midstream and downstream, along with new opportunities for a limited number of entrepreneurial farmers.

The other implication is a rapidly changing mix of nutritional challenges. The early stages of transformation usually bring improvements in nutrition. Rising productivity and incomes lead to increased dietary diversity and food security, with major positive effects, especially for children and youth. From 1976 to 2016, the prevalence of underweight children, both girls and boys, declined sharply in developing countries. Among youth aged 20 to 24, underweight fell to 11 percent during the same period (Kadiyala et al. 2019). Underweight prevalence among adolescent girls is falling in all regions except South Asia, Eastern Europe, and Central Asia. The largest declines are in sub-Saharan Africa and Asia.

However, agrifood system transformation also drives overweight and obesity, especially as a country moves into the transitional stage. Changes in the food environment associated with this transformation (heavily advertised “junk foods” and sugar-sweetened beverages, and easy access to processed foods in general) can promote unhealthy dietary behaviors (on the

“food environment,” see Turner et al. 2017 and Tschirley 2018). Again, youth especially are caught in these trends, as they are often the target of large food companies’ marketing (Chacon et al. 2015; Kelly et al. 2015). Small-scale local production of unhealthy foods is also rising rapidly.

**Figure 5.** In every region, overweight is rising among youth more rapidly than underweight is falling (percentage point change in underweight and overweight/obesity for youth aged 12 to 24, by region, 1976–2016)



Source: Kadiyala et al. 2019

As a result of these dietary changes, in every region of the developing world overweight and obesity are rising as fast or faster than underweight is falling, especially among young people (Figure 5; see also Popkin 2002). Demmler et al. (2018) analytically link increased consumption of processed foods to negative nutritional outcomes in a small study in Kenya, and recent work (Tschirley et al. 2019) links such consumption to large increases in overweight and obesity at the national level in Tanzania.

In Tanzania between 2009 and 2015, the ratio of overnutrition to undernutrition at the household level doubled: for every 100 households that had problems of underweight or stunting, the number with problems of over-

<sup>10</sup> There is a third set of implications, which FSP did not meaningfully address and are therefore not discussed here: the environmental impacts of changing diets. These include increased energy intensity as they feature more animal-sourced foods and value added after the farm; increased contribution to CO<sub>2</sub> emissions from beef cattle and other livestock; and increased use of plant protection chemicals as farm production intensifies to meet demand, with potential implications for environmental contamination and human health.

weight or obesity rose from 40 to 80 (Tschirley et al. 2019). Figure 5 suggests that similar trends would likely be found in other countries.

At the same time, micronutrient deficiencies persist due to the poor nutritional quality of many processed foods and beverages, and are found even among those who are overweight (Development Initiatives 2017; Haddad et al. 2016). The top risk factor for this “triple burden” of malnutrition (simultaneous existence of undernutrition, overnutrition, and micronutrient deficiency) is low dietary quality (Lozano et al. 2012). All this is a consequence of the diet transformation and is contributing to the escalating levels of diet-related chronic conditions such as cardiovascular disease and diabetes that many developing countries are experiencing (Popkin et al. 2001).

## **Dramatic changes in structure and behavior in the midstream and downstream are generating real benefits while creating new concerns**

Consumers see three main benefits from the changes taking place in the midstream and downstream: (1) reduced seasonality of food supply, as food is sourced from broader geographic areas; (2) lower prices, resulting from increased scale of operations of firms throughout the agrifood system; and (3) more diverse and convenient foods, as firms experiment with products to meet consumer demand and generate a profit. For entrepreneurs, the major benefit of these transformations is the rapid growth in demand for value-added products, driving a huge increase in the number of micro, small, and medium enterprises engaged in logistics, processing, and packaging and distribution. Farmers also benefit from a general improvement in market access due to improved public infrastructure and private investment in input supply and output trading at scale, which reduces costs to farmers.

These changes also bring new challenges. Beyond the nutritional changes discussed above, two main concerns arise. The first is food safety; the second relates to the rate of consolidation at different levels of the system (the J-curve). We address each of these issues below.

### *Supply chains become longer and more complex, with five effects*

Supply chain configurations change in three ways during transformation. First, they lengthen spatially and temporally, facilitated by improved transport infrastructure, expansion of private cold chains, and generally improved private logistics. These changes mean that food can be sourced from increasingly distant areas and stored for longer periods. Second, rural–rural supply chains emerge and become denser and longer, as rising reliance on markets in rural areas leads to more diverse marketing opportunities beyond major cities. Third, urban–rural and rural–urban–rural supply chains emerge. Urban–rural chains arise to distribute imported foods (or locally produced foods, such as bread made in the major port city from imported wheat) to rural towns and villages, as incomes and market reliance there rise.

This complexification of supply chains has five effects. First, seasonality of supply at retail declines. Since seasonality in production varies over space, increasing the catchment area around a market dramatically reduces the seasonality of supply to that market, as does adding a cold chain. Low-income consumers especially benefit, as the sharp seasonality that characterizes staple grain markets in traditional systems falls steeply, reducing the severity of the hungry season in rural areas and likely driving measurable improvements in food security (Tschirley et al. 2009).

Second, supply to consumers in these chains becomes more stable. This is a direct result of expanded geographic and temporal scope, and reduced seasonality of prices is a key indicator of this stability.

Third, in some cases, the potential for disruption from shocks, and the cost of those disruptions, rises dramatically. Long, highly integrated supply chains are more vulnerable to climate change shocks (Reardon et al. 2018), energy price spikes, disease or pest outbreaks at farm level (e.g., fall armyworm), food safety crises, and civil strife. Typically, this vulnerability to shocks is a feature of modern supply chains, but it also can be seen in less transformed systems, as with egg supply chains and south–north and north–south maize supply chains in Nigeria (Liverpool-Tasie et al. 2016a, 2016b).

Fourth, concerns about food safety rise sharply. A key reason for this is that, typically, the lengthening and complexification of supply chains long precede meaningful improvements in water and sanitation in public markets or in regulatory capacity to deal with food safety challenges. These supply chain changes are already happening in early transitional systems,



when traditional (though changing) markets continue to dominate wholesale and retail food distribution. Public investment is notoriously slow to improve infrastructure for water and sanitation in these markets, and trash collection services are typically poor.

This creates a perfect environment for a surge in food safety problems. Contamination by human coliform bacteria and heavy metals from contaminated irrigation water, or other disease agents picked up in unclean wholesale or low-income retail markets, become real risks. Chemical contamination in fresh produce is common, often by organophosphates that are banned in other areas of the world (Haggblade et al. 2017). Counterfeit chemicals are common in many areas, and often contain dangerous byproducts from nonstandard manufacturing processes. Use of organophosphates on vegetable crops shortly before harvest can lead to excessive residue levels on fresh produce purchased by consumers. Mycotoxin contamination in grain increases with storage (see Liverpool-Tasie et al. 2018b, for evidence from Nigeria), and can reach deadly levels, as shown by periodic outbreaks in Kenya. On the demand side, rising incomes mean that consumers can worry less about having enough food and more about the quality and safety of the food they have.

Together, these supply-side and demand-side trends combine to drive big jumps in concern about food safety among consumers. A key challenge for policymakers—and one they have often not met well—is to get ahead of this issue with proper regulation before food safety crises erupt. Programs to sensitize actors along the chain about proper storage and handling practices are also needed.

Eventually, as a country reaches the late transitional stage and more elements of fully modern chains prevail, food safety threats decline. However, this typically happens only when scale of production and distribution has risen, meaning that any food safety outbreak that does occur quickly becomes a crisis, as experience in China over the past decade clearly shows. Nonetheless, evidence is emerging that processing practices that companies engage in to maintain their brands' reputation can minimize problems such as aflatoxin contamination even in transitional systems (Ademola et al. 2017, 2018).

The fifth result of the complexification of supply chains is that smallholder farmers are exposed to much more competition. This stems from the rising number of productive medium-scale farms (see next section), and from more entrepreneurial or simply better-positioned smallholder farmers in other areas, and the fact that these supply chains now pull from broader geographic areas (including imports) to serve much larger markets. The result is that smallholder farmers, who wish to remain in farming and escape from poverty, or not fall back into it, cannot continue to practice business as usual. They must find ways to increase productivity on their farms and link more efficiently to markets, including identifying product characteristics that consumers want. If they are unable to do this, they will have to leave farming or be consigned to a life of poverty or near poverty on the farm.

#### *Branding has spread even to very small firms, but there are big questions about the veracity of claims*

Large agribusiness firms have for many decades put enormous effort into building and maintaining brands. New in transforming food systems in developing countries is the explosion of branding among SMEs. For example, Ijumba et al. (2015) counted more than 60 brands of maize meal in Dar es Salaam, nearly all from micro and small firms. Waized et al. (2019) found more than 90 maize meal brands in surveyed outlets in the center of the country. Branding is now a requirement for any firm, even the smallest, wishing to expand beyond traditional open-air markets and penetrate the rapidly growing network of modern micro and larger supermarkets.

The signaling function of these brands, however, in terms of the reliability of product characteristics that consumers can associate with them, is open to real question. Indeed, Dar es Salaam has a market in branded bags for maize meal, and different millers may sell their product under the same brand, or even change brands depending on which bags are available. Also open to question is the veracity of health claims and ingredient lists of products like the mixed meals that have grown rapidly in Tanzania.

#### *Dramatic increase in the size of the post-farm sector means rapid growth in agribusiness opportunities*

Reardon et al. (2018) use FAOSTAT data to show that product flow, in tons, through agrifood systems in Africa, Asia,

and Latin America grew by four times between 1970 and 2013, or an average of 3.3 percent per year during the 43-year period. Growth was faster from 1990 to 2013. Growth in value was certainly higher, because higher-cost commodities such as fresh produce and animal-sourced proteins accounted for a larger share of expenditure during this time, and value added rises dramatically off the farm.

Individual food categories can see far higher growth. Together, per capita income growth of 2 to 4 percent, urban population growth of more than 3 percent (in some African countries), and demand elasticities for many processed foods (and food away from home) currently exceeding 1.0 mean that total demand for some product categories can double in five years and quintuple in ten. These are huge increases, and during the transitional stage of transformation, local small and medium enterprises capture a substantial share of this market.

*A quiet revolution of SMEs in logistics, processing, and packaging provides employment but also raises food safety concerns*

Agri-food systems in nearly all of Africa, South Asia, and the lower-income countries of Southeast Asia are predominantly in the transitional stage of transformation, with traditional markets in rural hinterlands, modern supermarkets having single- or low-double-digit market shares in cities, and the vast majority of food flowing through SMEs. This is the bottom and early rising portion of the J-curve of consolidation.

Following are ten examples of the dominance of SMEs in countries at this stage.

- Supermarkets hold, at most, only a fifth of the food market; roughly 80 percent of food reaches consumers via SMEs and informal micro entrepreneurs.
- MSMEs also dominate rural trading. Even in Zambia, where the large-scale grain trade has grown, the combined share of national and international large-scale traders was only 11 percent in 2015, with the rest of the volume handled by SMEs (Sitko et al. 2018).
- MSMEs increasingly dominate grain milling in Tanzania—so much so that Bakhresa, the largest grain miller in the country, decided it could not compete with the influx of SMEs selling branded maize meal.
- In the growing poultry sectors of Africa and Asia, particularly in peri-urban areas, many small poultry and egg producers are linked to a single large-scale day-old chick producer (Liverpool-Tasie et al. 2016a or 2016b).
- SME potato cold storages have grown rapidly in Bihar (Minten et al. 2014) and western Uttar Pradesh (das Gupta et al. 2010). The rise of nearby cities, improvement of road links and electricity grids, and the introduction of potato varieties better suited to storage and transport, drove this expansion.
- Agricultural services including spraying, tractor-based land preparation, and mini-combine harvesting are booming in Asia and Africa (Reardon et al. 2019).
- Driven by the enormous growth in Addis Ababa and improvement of road links to it, SME mills that also act as wholesalers, retailers, and logistics firms have transformed Ethiopia's teff value chain (Minten et al. 2014).
- The growth of sunflower production among smallholder farmers in Tanzania has spurred the development of an extensive small-scale crushing industry.
- Local snack food production has boomed all over Africa and Asia, using simple extrusion technology to produce “puffs” of maize meal loaded with salt and vegetable oil.
- Third-party logistics operations have proliferated, and many are SMEs. Maize traders are highly dependent on these services, which include warehouse rental and third-party storage (Liverpool-Tasie et al. 2018a).

Two overarching points must be made about the proliferation of SMEs in so much of the developing world. First, it is functionally related to the continued vigor of a smallholder farming sector. Small farmers, and the traditional markets in which they sell most of their product, are SMEs' natural supply sources. If the trend toward medium- and larger-scale farms and larger rural assembly in Africa progresses quickly, it could speed up the consolidation of firms in the midstream. Second, the consolidation that drives the J-curve can start at various points in the system, and becomes self-reinforcing, as scale seeks similar scale to do business efficiently.

This matters because the rate of consolidation is central to the ability of the agrifood system to provide employment. The SMEs that dominate many of these value chains have very high employment-to-output ratios (Snyder et al. 2017). As consolidation proceeds, however, many of these firms will be displaced, and overall employment per unit output can fall rapidly. Finding ways for meaningful numbers of MSMEs to remain competitive for a longer time becomes important to ensuring a more inclusive and less disruptive transformation.

## **Farm structure change is fueling technical change and farm productivity growth, with multiplier effects throughout the economy**

National development policy strategies in Africa (including national CAADP strategies and investment plans) officially regard the smallholder farming sector as an important vehicle for achieving agricultural growth, food security, and poverty reduction objectives. In sub-Saharan Africa, smallholder farmers constitute the bulk of agricultural producers, and most remain mired in low productivity. Farming productivity is a key driver of real incomes and productivity in the rest of the economy. While expansion of area under cultivation, *agricultural extensification*, has for many decades been the major source of growth in agricultural production in Africa, the scope for continued agricultural extensification to drive up agricultural production is increasingly limited in light of growing land scarcity resulting from population growth. *Agricultural intensification*, or raising productivity on existing farmland, has been touted as crucial strategy for improving the continent's agricultural growth.

There is mounting evidence, however, that the positive relationship between population density and land productivity breaks down at high levels of rural population density. Agricultural intensification is found to rise with population density up to a point; beyond this threshold, it is associated with sharp declines in agricultural intensification (Muyanga and Jayne 2014; Ricker-Gilbert et al. 2014; Josephson et al. 2014). These unsustainable productivity trends are being attributed to factors such as shortened fallows, deterioration in soil quality, and land fragmentation. Deterioration in soil quality leads to binding nutrient constraints associated with reduced crop yield response to inorganic fertilizer application that further reduces crop productivity (Willy et al. 2019; Mbuvi et al. 2019).

However, sub-Saharan Africa has witnessed a rise in the number of medium-scale farmers (emergent farmers) in many countries over the last decade. These are farmers operating between 5 and 100 hectares. This group has little in common with large-scale commercial farmers in terms of farm size, access to finance, input application rates, and farm management strategies. The rise of emergent farmers requires attention to how farm structure and food value chains are changing in Africa. The growing medium-scale farms rarely feature anywhere in the debate on Africa's agricultural transformation. Even though much remains unknown and the story is still unfolding, medium-scale farms are an important driver of rural transformation in much of Africa. Medium-scale farms have contributed to sub-Saharan Africa's 4.6 percent annual rate of agricultural production growth between 2000 and 2015 (Jayne et al, 2018). This is the highest of any region in the world over this period.

Medium- and large-scale farm investment is injecting important sources of capital and expertise into underperforming farming systems. In addition, medium- and large-scale cropping activities may generate significant positive spillover benefits for adjacent smallholder communities (assuming appropriate institutional arrangements exist or are designed), such as improved access to agricultural technologies, credit, and extension and marketing services, which in turn improve food security and wellbeing. Medium and large farms may also provide a valuable source of off-farm agricultural wage employment (and thus additional income) for adjacent smallholder communities.

In terms of agricultural productivity differences, evidence is emerging that medium-scale farms are in fact more (land and labor) productive than smallholdings (Muyanga and Jayne 2019). Medium-scale farmers are more capitalized and educated compared with their smallholder counterparts. This productivity advantage is due largely to mechanization and input-use intensity. Consequently, improving medium-scale farms' access to land can help countries increase domestic production of key staple crops.

The rise of land markets is creating a new class of landless workers who depend on the local nonfarm economy for their livelihoods. Land administration policies seem to be lagging behind in terms of supporting more sustainable and inclusive land dynamics for agriculture, in particular, and rural transformation, more generally. Policymakers will need guidance on how to minimize hardships—protecting those who are most vulnerable as the processes of economic transformation gradually raise living standards for the majority of the population.

This section explores the changing farm structure and how it will likely affect agricultural transformation in Africa.

### *The number of medium-scale farms is growing rapidly*

Recent evidence suggests that changing structure of land ownership in sub-Saharan Africa is one of the major new trends affecting African agrifood systems. Research in several African countries shows the rapid rise of a medium-scale farms (5 to 100 hectares). This group has little in common with large-scale commercial farm in terms of size, access to finance, input application rates, and farm management strategies. Of Ghana, Kenya, Tanzania, and Zambia, only Kenya has a substantial majority (about two-thirds) of national farmland under small-scale farming. In Ghana, Tanzania, and Zambia, medium-scale farms make up 32, 39, and 53 percent of national farmland, respectively (Table 2). In every case, including Kenya, land controlled by medium-scale farms exceeds that under the control of large-scale farms (more than 100 hectares) (Jayne et al. 2016).

Within the past decade, the amount of agricultural produce that these farms contribute to national output has also risen rapidly. In some countries, like Tanzania and Zambia, medium-sized farms now account for roughly 40 percent of nationally marketed agricultural produce (Figure 6). The importance of medium-scale farms appears to be greatest in countries with relatively abundant land: Ghana, Tanzania, and Zambia clearly fall into this category. Meanwhile, the sector is much smaller in more densely settled countries such as Nigeria, where it accounted for less than 20 percent of marketed output in 2016, and Rwanda, where its share was well under 5 percent in 2014. Note, however, that even in these densely populated countries, this sector's share of output has risen substantially since the mid-2000s. This is exactly what we would expect over the course of agrifood system transformation, as long as policy does not create major impediments.

Patterns of medium-scale participation by crop suggest that grains and oilseeds are major focuses for these farmers (Figure 6). Among medium-scale farms in Nigeria and Rwanda, grains are the leading crops, whereas in Ghana and Tanzania, they are oilseeds, with grains coming in a close second in Tanzania. Involvement in horticulture varies across countries: vegetables, fruits, and nuts are the sector's second-most-farmed crops in Ghana, but the least-farmed in Tanzania.<sup>11</sup> Given this sector's growing importance, more needs to be known about cropping patterns, sales behavior, and on-farm employment.

### *The growth in medium-scale farming is attributable in part to a prolonged surge in global food prices*

The processes driving the growth of medium-scale farming largely remains unclear. Is it driven by land accumulation of relatively productive small-scale farmers who are transitioning to larger-scale production through capital and assets accumulation? If this is the case, is this evidence of farm consolidation and successful smallholder-led agricultural transformation? Or is the growth driven by market-oriented land institutions and policies that encourage investment in land based on willingness to pay and hence largely by individuals from outside the small-scale farming sector? In some countries, like Nigeria, we also find that many current medium-scale farmers started out as small-scale farmers who successfully expanded their operations. In some other countries, medium-scale farming is driven by capital generated from nonfarm sources.

Emerging evidence shows four reasons for the striking growth of medium-scale farms. The first reason is a roughly decade-long surge in world food prices, which ushered in major, and highly publicized, investment in African farmland by foreign investors. What happened largely under the radar was very large, in aggregate, farmland investments by African

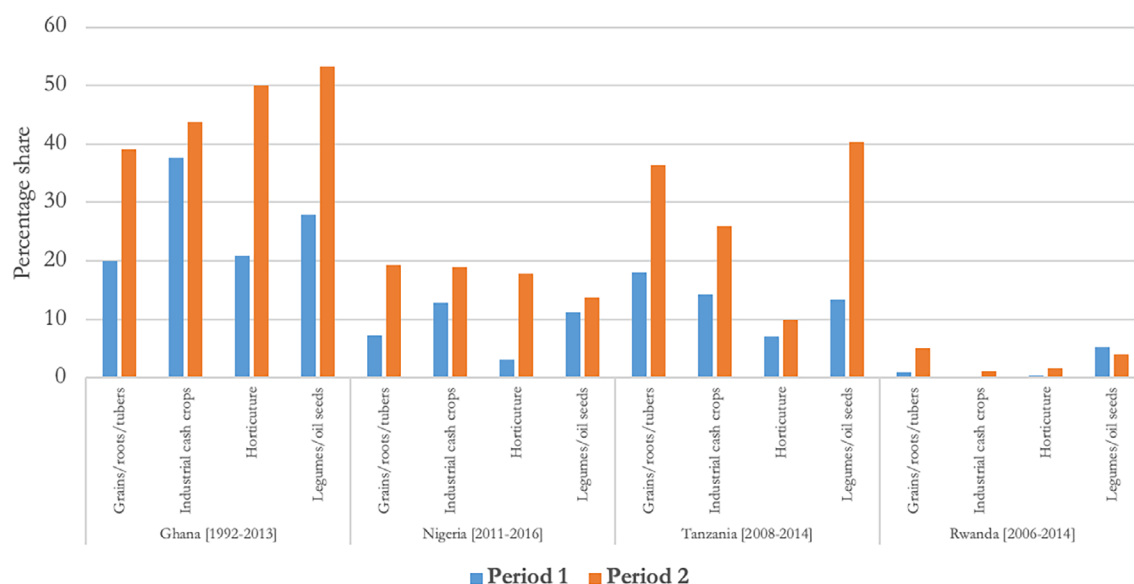
<sup>11</sup> The analysis uses LSMS/NPS panel data and agriculture census data. Even though these datasets are nationally representative, datasets based on population sampling miss information on urban households that are likely to be engaged in less land-intensive and high-value enterprises such as horticulture. The surveys are also conducted during the short and long rainy seasons, and are thus likely to miss the bulk of horticultural production that tends to take place in the dry season.

**Table 2.** Changes in farm structure in sub-Saharan Africa

Farm size	Number of farms		Percent of farms in Period II	Percent growth in number of farms between two periods	Percent of total cultivated area		Percent growth in area operated between two periods
	Period I (year)	Period II (year)			Period I (year)	Period II (year)	
<b>Zambia</b>							
	2001	2012			2001	2012	
0–5 ha	797,157	1,167,315	83	46.4	79.1	47.9	-39.4
5–10 ha	20,832	165,129	12	692.7	14.3	25	74.8
10–20 ha	2,352	53,454	4	2,172.7	6.6	15	127.3
20–100 ha	--	13,839	1	--	--	12.1	--
Total	820,341	1,399,737	100	70.6	100	100	--
<b>Tanzania</b>							
	2008	2012			2008	2012	
0–5 ha	5,454,961	6,151,035	91	12.8	62.4	56.3	-9.8
5–10 ha	300,511	406,947	6	35.4	15.9	18	13.2
10–20 ha	77,668	109,960	2	41.6	7.9	9.7	22.8
20–100 ha	45,700	64,588	1	41.3	13.8	16	--
Total	5,878,840	6,732,530	100	14.5	100	100	--
<b>Ghana</b>							
	1992	2013			1992	2013	
0–5 ha	2,037,430	2,580,685	84	26.7	60.7	45.5	-25.0
5–10 ha	116,800	320,411	10	174.3	17.2	22.8	32.6
10–20 ha	38,690	117,722	4	204.3	11	16.1	46.4
20–100 ha	18,980	37,421	1	97.2	11.1	12.2	--
Total	2,211,900	3,057,978	100	38.3	100	100	--

Data sources: Zambia, MAL Crop Forecast Surveys, 2001 and 2012; Tanzania, LSMS/National Panel Surveys, 2008 and 2012; Ghana, GLSS, 1992 and 2013.

professionals, entrepreneurs, and civil servants. The amount of land acquired by these medium-scale African farmers since 2000 far exceeds the land acquired by foreign investors. Many medium-scale African farmers appear to have started out as small-scale farmers who successfully accumulated land and expanded their agricultural operations. Others are relatively wealthy and influential, often professionals, entrepreneurs, or retired civil servants. Many accumulated wealth from nonfarm jobs, invested in land, and became either part-time or full-time farmers. Many are based in rural areas and have political or social influence with local traditional authorities. Others are urban “telephone farmers” who have city jobs and

**Figure 6.** Medium-scale farms’ (5–100 hectares) share of national value marketed crop output

hire managers to attend to their farms, occasionally visiting on weekends.

The second reason is key 1990s-era policy reforms, including the removal of restrictions on private movement of agricultural food commodities across district borders and the related demise of government grain marketing parastatals. These reforms improved the conditions for private investment in African agrifood systems. After world food prices suddenly skyrocketed, the effects of these reforms took hold, enabling thousands of small, medium, and large private firms to respond rapidly to profitable incentives.

The third reason is a key complementary policy reform related to land markets, leading to the rise of land markets and capture of agricultural policies by wealthy urban and rural people as well as farm lobbies and unions. Unlike in the past, land sales and rental transactions are now mostly legal, even in areas of customary tenure. Agricultural policies have also become more favorable to the interests of medium- and large-scale farms. Most national farmers' unions and lobbies support policies that raise food prices, promote the conversion of land from customary tenure to statutory land to promote access to land through market transactions, and input and credit subsidy programs that allow bigger farms to participate in the programs. Increased government spending on agriculture, where benefits are related to size, is disproportionately captured by large farms. Common rhetorical themes used to justify this position are that public support should go to "progressive" farmers who view "farming as a business" and have adequate access to capital (Jayne et al. 2016).

The fourth reason is rapid urbanization, which together with rising incomes, the diet transformation, and the continuing effects of the 2007/08 commodity price surge have made farming a more attractive commercial opportunity in Africa.

#### *Medium-scale farms are a source of dynamism, technical change, and commercialization in African agriculture*

We identify three channels through which these farms are likely to bring new sources of capital and know-how to African agriculture. First, the rise of this sector is associated with increased large-scale investment in grain wholesaling, often but not only by multinational grain trading companies such as Cargill. Urbanization increases demand for food, but this demand can be met with imports or domestic production. Investment response by private traders in domestic value chains is due at least in part to the growing surpluses of medium-scale farms, which dramatically reduce the unit cost of rural assembly. High costs of such assembly in systems dominated by many dispersed smallholder farmers is a major impediment to change in scale and technology further down the chain.

Second, by attracting private investment around them, these farmers may improve input and output market access for surrounding smallholder farmers. Quantitative evidence on this topic is not yet strong, but anecdotal evidence of major changes abounds. A recent quantitative study found some evidence that a higher concentration of farms of 5 to 10 hectares (the low end of the medium-scale farm class) leads to higher rural incomes in Tanzania (Chamberlin and Jayne 2017). Large trading firms are setting up buying depots in areas with many medium-scale farms, which improves output market access for surrounding smallholder farmers. Medium-scale farms attract tractor rental providers, who now provide mechanization services to smallholders that they otherwise would not, since making a trip for a few smallholder farmers would not be profitable. This allows smallholders to farm their land with much less labor input, freeing up opportunities to work off the farm. Smallholder farmers' use of tractor rental services in Tanzania between 2008/09 and 2014/15 rose from an average of roughly 5 percent to about 15 percent (van der Westhuizen 2018). Similar synergies might be expected in markets for variable inputs such as fertilizer and plant protection chemicals, though data are lacking on this effect. Evidence from Nigeria shows that medium-scale farms are offering extension services, selling farm inputs, purchasing farm inputs together with, and renting tractor and farm machinery to smallholders (Muyanga et al. 2019). Finally, medium-scale farmers have been engaging smallholder farmers in outgrowing schemes, whether on their own or in the context of donor-funded development programs. If such arrangements prove profitable for medium-scale farmers, they could become another channel of opportunity for smallholders.

Third, to the extent that these farmers spend in the local economy—hiring labor or purchasing food and services—they will stimulate off-farm employment opportunities for rural people formerly dependent on subsistence farming. Quantitative evidence is again limited, but local shop owners in Tanzania's Kilombero Valley have reported that most of their

household goods are being purchased by “medium scale farmers who have moved into the area” as a result of rural electrification and improved roads (Poulton 2018). These farmers are more likely than larger medium-scale farmers to make most of their expenditures locally, which is consistent with the finding that it is the smaller medium-scale farms making the biggest contributions to nonfarm income growth among surrounding rural households (Chamberlin and Jayne 2017).

*While there are a lot of positives associated with growing medium-scale farming, there are some negatives*

While there are many positives associated with the growth of medium-scale farming, there are also some negatives. The rapid rise of medium-scale holdings has led to an increasing concentration of land ownership and use, as evidenced by the rising Gini coefficient of land ownership in the countries we examined—rising from 0.51 to 0.54 in Kenya and from 0.54 to 0.65 in Ghana between the early 1990s and the mid-2000s, and from 0.42 to 0.49 in Zambia between 2001 and 2012; these levels of concentration “far exceed those of most Asian countries in the 1980s” (Jayne et al. 2014). This rising concentration is driving increased land scarcity that may be constraining the growth of small-scale farm holdings and raising barriers of entry into farming. Medium-scale farms obtain land from traditional chiefs or by purchasing it, including from small-scale farm households. Though data are scarce, a strong trend in Africa over the past 10 to 15 years has been the transfer of land from customary to statutory tenure, sometimes resulting in smallholders’ losing land.

### **Smallholder farmers face major challenges competing in this new environment, making it hard for them to prosper<sup>12</sup>**

The discussion so far has made it clear that the competitive landscape facing smallholder farmers begins to change rapidly as countries move into and through the transitional stage of agrifood system transformation. Two questions arise. First, how many smallholder farmers and their children will be able—and will choose—to make the adjustments needed to prosper as *farmers* in this new environment? The alternatives are to (1) transition out of farming, either in their rural area or by migrating to an urban center, or (2) to be trapped in poverty or near poverty, unable to raise farm productivity enough to prosper or to gather the range of resources needed to transition out. The study found that very few medium-scale farmers started as small-scale farmers, and most of those who did graduate into medium-scale farming operated at least two hectares when they started. Smallholders operating two or more hectares stand a better chance to develop and commercialize if they engage in high value crops and embrace productivity-enhancing technologies. Smallholders operating one hectare or less will find it exceedingly difficult to prosper, especially in the context of shrinking farm sizes and degrading soils. This group will need safety nets and policy support to exit farming. Second, how can policymakers and development organizations identify the farmers that stand a good chance to prosper as farmers, and what kinds of services can they deliver to them that will be affordable and effective? We deal with the first question here and the second in the final section.

We suggest that there is opportunity for smallholders in nongrains, which make up a half to two-thirds of marketed food. Around the world, smallholder farmers thrive in nongrains because many of these crops are not mechanized and do not show economies of scale, so one can earn a lot in a small area with intensive use of labor. Smallholder dairy farming has also been successful in some areas, including the Kenyan highlands. Nongrains are differentiated products where variations in quality can make a big difference in consumer acceptability and price. Small farms can compete on costs and quality if they invest in production, and if they can understand and consistently meet marketing requirements on quality, volume, and timeliness. Those that do not or cannot, will be unable to compete. This means that it is the more progressive set of smallholder farmers that mostly capture these opportunities, while those disadvantaged by location or assets, or not keenly focused on market requirements, are largely left out.

In contrast, everywhere that smallholder farmers must compete with medium or large farms and with imports, especially in grains, they stand to lose because grain production and processing both have economies of scale. Grain processing tends to be fairly cheap compared with nongrain value chains, in which consumers value quality as well as price. Because smallholder farmers tend to be spread over broad areas, the cost of collecting grain from them is high. As a result, large processors strongly benefit from sourcing as much as possible from medium and large farms, large traders, or imports. They could also source grain from small farm cooperatives; so far, in Africa few of these can provide the volumes needed, though

<sup>12</sup> This section draws heavily on Tschirley et al. (2017).

the record may be better in parts of Asia and Latin America. Farm inputs and price support policies also tend to favor medium- and large-scale farms.

### *Context*

Several contextual points need emphasis. First, products not traditionally produced by smallholder farmers, such as fruit, vegetables, meat, milk, and fish, are seeing the most rapid growth in demand. Meeting this demand poses a particular challenge for smallholders: firms want efficient and predictable delivery of specific types and quantities of products; thus if farmers want to enter and remain in the new markets, they will have to bundle delivery with farm production. In addition, smallholder farmers need to add new products and to produce them in far greater volumes. This is a major challenge, not a gradual shift.

Second, smallholder farmers now need to deal with cost competition and thresholds. These factors were minimal in traditional settings. Farmers sold what surplus they had without having to compete with imports, smallholders in other zones or nearby countries, or medium-sized farms. They did not have to compete for procurement quotas—specified quantities of product delivered on an agreed schedule—sought by private processing firms, nor did they have to meet quality requirements of urban wholesalers or emerging supermarkets. They are increasingly facing such requirements now, however, and in a context of much greater competition than in the past. This, too, can be a big and sudden challenge, not a gradual shift.

Third, making these shifts requires substantial investment. Economists call this a “threshold” investment. For example, if a smallholder farm wanted to become a regular supplier of fresh vegetables to an urban wholesaler or supermarket chain, it would typically need to at least have irrigation and possibly a greenhouse. These are big investments for a small farm. It would also need to know how to grow and supply the product as the buyers specify; even if the farm had produced the product in the past, it would not have been in the quantities or with the regularity and reliable quality demanded by this kind of market. The small farm might also need a packing shed to sort the product as well as a vehicle to get the product to market, not to mention an all-weather road and maybe a bridge. Even with all this in place, having to collect product from many smallholders might make small farm suppliers unattractive to a wholesaler or supermarket. Therefore, a small farm might need an aggregation facility or even a cooperative, which is uncommon, with the exception of groups organized around cash crops such as cotton (see Tschirley, Poulton, and Labaste 2009).

The reality in Africa and low-income countries of South Asia and Southeast Asia is that as markets broaden and commoditize during the transitional stage, smallholder farmers are exposed to new competition from multiple directions. It is usually during the transitional stage of agrifood system transformation, when products are “commoditizing” through the changing practices described above, that smallholder farmers are most challenged.

### *Empirical patterns*

Several empirical patterns emerge from these contextual factors. First, wholesalers, processing firms, and supermarket procurement units tend to choose sourcing areas based on quality, cost, and consistency of volumes. In the early transitional stage, supermarkets have tiny market shares, but wholesalers are increasing in size and processing firms are growing by leaps and bounds. These buyers’ sourcing zones are generally not too far away or are connected by good roads, have low risk of breaks in supply (so may feature irrigation), and have relatively low costs of aggregating and collecting the product. Evidence from processing and supermarket operations in India, Madagascar, Mozambique, and Nicaragua shows that hinterland zones and resource-poor zones tend to be avoided by procurement teams (Barrett et al. 2012).

Second, even “commodity” nongrains (e.g., potato, onion, and other vegetables; cotton and other cash crops) require substantial threshold investments by smallholder farmers. This is why many studies of supermarket and processor procurement find that it is the upper tier of smallholder farms, even commercialized ones, or the medium-size farms in favorable or intermediate zones that tend to participate in these systems.

Third, scope does exist for smallholder farmers with some assets, and located in advantageous zones, to supply wholesalers in traditional wholesale markets and small processors in cities and towns with commodity products. As noted above, such wholesalers and small processors abound during the transitional stage. These markets are less actively coordinated than the



“modern” markets of large wholesale buyers, large processors, and supermarkets. They do not require producers to supply stipulated quantities of specific quality on a regular schedule. The investment requirements to supply to these types of markets may thus be within the reach of smallholder farmers who are close enough to towns to deliver the product. For example, many women in rural villages in northern Nigeria produce chickens and eggs for the market; farmers in northern Mozambique responded to improved road connections by selling commodity vegetables in cities that had previously been less accessible; and farmers in central Tanzania supply sunflowers to small- and medium-sized sunflower processors that have emerged in the past five years (Liverpool-Tasie et al. 2016a).

Fourth, contrary to the common perception of stagnant African small farms, productivity in African agriculture has begun to show impressive growth, driven in part by increased use of external inputs, especially chemical fertilizers and herbicides (Jayne 2016; Haggblade, Minten, Pray, Reardon, and Zilberman 2017; Liverpool-Tasie et al. 2017; Minten, Reardon and Chen 2017; Sheahan and Barrett 2017).

Fifth, some smallholder farmers climb the “value ladder” beyond subsistence farming into successful commercial farming. The paths to success vary; successful commercial smallholder farmers producing maize, cotton, and horticulture, respectively—three crops with strikingly different market institutions—display distinct behavioral patterns that facilitate success (Chapoto et al. 2013).

Sixth, this discussion focuses on the paths of and challenges to individual farmers. At this point, the discussion often turns to the need to form cooperatives so that buyers and input sellers see small farmers as an attractive market. However, many studies find few independently functioning farmer cooperatives in Africa, though the record is better in Latin America. The few that do exist in Africa are usually connected to donor or NGO initiatives or processing firm relations such as the cooperatives for milk collection centers in Zambia or for cotton in West Africa (see Tschirley, Poulton, and Labaste 2009).

A key reason for the paucity of functioning African smallholder farmer organizations, despite enormous support by governments and donors, is that unreliable markets make it risky to invest the time and effort needed for these organizations to succeed. A reason now for some optimism is that the rise in demand for processed foods and quality-branded foods during the transitional stage creates more focused points of demand—specific processing plants or large-scale buyers emphasizing quality—that need regular supplies of product. This may make it worth farmers’ time and effort to organize to satisfy these markets. Assistance in this regard from food industry firms and/or NGOs may therefore have a higher payoff.

In sum, only a small share of smallholder farmers are in a good position to compete effectively in the medium term to supply cities and big businesses. We hazard an estimate by referencing three recent classifications of smallholder farmers that focus on commercialization potential and orientation toward farming. On the low end, Christen and Anderson (2013) estimate that only 7 percent of the world’s 500 million smallholder farmers currently operate in “tight” supply chains that require a more business-like approach to farming and deliver higher returns to farmers. These are smallholder farmers that have already commercialized. On the high end, Hazell (2017) classifies about a quarter of all smallholder farmers in Ghana, Tanzania, and Ethiopia combined as commercialized, and suggests that these, plus some share of the countries’ “pre-commercial” smallholders, might be able to make the transition. In the middle, IFAD (2019) uses similar metrics as Hazell but different cutoffs, and estimates commercial smallholder shares in 13 countries of Africa, Asia, and Latin America to be 15 percent, 21 percent, and 9 percent, respectively.<sup>13</sup> With these numbers in mind, and considering the rapidly advancing challenges that will confront smallholder farmers over the next two decades as well as the attractive off-farm opportunities that are emerging, we think it clear that well under half—perhaps just a quarter—of today’s smallholder farmers or their children will be prospering in farming in 20 years’ time.

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<sup>13</sup> The low share in Latin America reflects the fact that farming there is far larger in scale, and most smallholder farmers earn most of their incomes off the farm.

## Policy responses

In conclusion, we provide policy responses to assist smallholder farmers, small entrepreneurs, and consumers in transitioning agrifood systems.<sup>14</sup> We focus in this section on transitional agrifood systems, which predominate across Africa, South Asia, and the poorer parts of Southeast Asia and are characterized broadly by the following:

- Smallholder farmers will be under increasing competitive pressure at the same time that more attractive opportunities are opening up off the farm. Many will choose to leave farming, so this sector will be declining as a share of the working population and, in the late transitional stages, will be declining in absolute numbers. Those that remain in farming will need to master new ways of doing business focused on market engagement, increased productivity, and meeting new demands on quality, timeliness, and safety. Few will be successful in grain markets, but some will find success in higher-value commodities.
- Post-farm value added and the associated agribusiness opportunities will be rising rapidly. SME numbers will be expanding dramatically, though they will not match the numbers of farmers (employment in this sector will remain lower than in farming for a couple decades, but with an opposite, upward trend). Large firms will also exist but will not be uniformly more competitive than these SMEs—the better smaller firms will have room to operate for a couple of decades. Employment opportunities—most in self-employment but some in wage work—will be abundant, and technical skills and knowledge will not yet be too demanding;
- Most consumers will be better nourished—but not all. Problems such as stunting, though declining, will continue to impose a large toll on the economy and society. Large numbers of consumers will turn their attention to issues of food safety and quality, and measurable food safety risks will increase. Consumers will be increasingly exposed to advertising for ultra-processed foods and beverages, will be consuming more of them, and as a result will be far more likely to be overweight or obese and to suffer from related noncommunicable diseases such as diabetes, hypertension, and heart disease.
- Policymakers will be operating in organizations not fully informed about the kinds of change taking place and quite unaccustomed to the rates of change that are now unfolding. These organizations will be slow to respond, both for reasons of limited knowledge and of attitude; distrust of nongovernmental actors (both private and nonprofit) should decline but will remain an important issue (see Hazell [2017], p. 15). Innovative approaches collaborating with the private sector and NGOs that show results, however, can serve as levers of change in attitude and practice.

These are the structural and behavioral patterns that must inform any policy and programmatic actions. In designing policies and programs, three overarching points need to be kept in mind.

*First*, the transformations discussed above are bigger than any policy or program. No policy or program will stop or fundamentally alter them. Policies and programs can, however, nudge them in more inclusive and healthy directions; they can create conditions for more people to prosper; they can help those on the margin who might be able to prosper to actually do so; and they can protect those unable to prosper. This amounts to a socially informed business approach that “goes with the flow” while maximizing positive effects and managing negative ones.

*Second*, SMEs and smallholder farmers are natural partners. A quick demise for either one will harm the other. Though each will be declining over time—the most successful will grow out of the status and others will leave for better opportunities—a gradual rather than abrupt transition is in the interests of both and is the only approach conducive to inclusive transformation.

*Third*, the foundations of any effective approach to helping smallholders, SMEs, and consumers, are policy and infrastructure. These are the elements that expand the number of people who might benefit from change and that nudge the change

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<sup>14</sup> Portions of this section draw extensively from Tschirley et al. (2017), section 5.

in more inclusive and healthy directions. The transitioning economies we focus on have large gaps in infrastructure and still pursue many policies that impede, rather than promote, inclusive transformation. Getting these right is the only way to ensure a payoff to other, more targeted investments such as specialized training, building of relationships between firms and farmers, preferential credit access, and other “project” activities.

Finally, helping those on the margin who might be able to prosper to actually do so, and protecting those who are unable to do so, requires targeting different elements from a portfolio of approaches to different kinds of people.

We conclude this section with some discussion on infrastructure, policy, and targeted support for smallholders, small enterprises, and consumers.

### *Infrastructure*

Beyond the standard refrain for investment in roads, energy, and water and sanitation, we advance two propositions about infrastructure investment in the service of inclusive agrifood system transformation. The first is that secondary cities and towns need to be a central focus for three reasons. First, they hold about 60 percent of Africa’s urban population and, according to census data across many countries (citypopulation.de), they are growing faster than larger cities. Second, they are economically and geographically closer to more farmers, making them an easier “stepping stone” for rural residents moving into the nonfarm economy (Christaensen and Todo, 2014); they also provide nearby markets for local production and farm inputs. Investments should emphasize improving links from rural areas to these towns and from these towns to larger urban centers, increasing the reliability of energy and water supply in the secondary cities and towns, and providing the market infrastructure they need to efficiently receive rural production and redistribute it. Finally, secondary cities and towns currently have very little food marketing infrastructure in most transitioning countries and so provide an opportunity to “get it right” from the beginning and avoid the severe problems seen in this regard in larger cities.

Our second proposition regards the degraded state of urban marketing infrastructure. We focus on this because such infrastructure remains central to the performance of urban food systems, which are increasingly central to the ability of farmers to earn remunerative livelihoods in farming. Supermarkets have expanded their sales dramatically but still hold, at best, low-double-digit market shares in most products. Although they work to create parallel supply channels relying on preferred suppliers, they regularly source fresh produce from wholesale markets to ensure sufficient supply in their stores. Likewise, as medium- and large-scale food processing grows—for example, of oilseeds in Tanzania—they do more direct sourcing that bypasses wholesale markets. Yet we believe that small shares of overall domestic trade go directly to these kinds of processors; witness the still very large number of micro and small sunflower processors in Tanzania, and the near take-back of the maize meal market in Dar es Salaam by micro and small processors.

Thus, while the trend over time will be the decreasing importance of such marketing infrastructure, it is very likely to remain central to these domestic trading systems for several decades, especially in countries in the earliest stage of transformation. Increasing the efficiency with which urban wholesale markets can receive and redistribute food, their ability to maintain product quality and safety, and the two-way flow of information between these markets and rural farmers would therefore have major positive effects for small farmers, entrepreneurs, and consumers (Tschirley et al., 2009). Currently, the state of this infrastructure is too often deplorable, sanitary conditions are alarming, and efficient logistics and trade are impossible. Linking vastly improved urban wholesale markets to improved rural assembly markets (as has been done, for example, with collaboration from Mwiwata in Tanzania) would further tighten the link and benefit farmers and small entrepreneurs. Crucially, this investment must be made only in the context of new ownership and management models that feature much more private-sector engagement and far more active partnering between public and private sectors (Tschirley et al., 2009).

A telling fact is that urban food systems are nearly entirely absent from the urban planning agenda in sub-Saharan Africa and Asia. Morgan (2009; 2013) trumpets the rise of urban food planning but finds little evidence for Africa, and Jaffee (2017) notes the absence of food from urban planning in the World Bank’s agenda. This needs to change.

### *Predictable policy environment*

The foundational elements in any effective policy approach are transparency and predictability. Rule-based approaches to regional and global trade, in which policymakers and political leaders agree to transparent decision-making procedures regarding any changes in trade policy, remain a preeminent need in the agricultural policy arena (Jayne 2012; Chapoto and Jayne 2009). Bureaucratic procedures for registering businesses and accessing public permits and services need to be streamlined and transparent. Land law, including but not limited to land titling procedures, needs to be transparent while recognizing the special assistance that smallholder farmers may need to use the rules in their own interest (Ghebru and Lambrecht 2017; Ghebru and Girmachew 2017). Public standards for food safety and quality need to be clear and transparently enforced. Regulation on plant protection chemicals, fertilizers, and seeds needs to be based on the latest science and uniformly enforced.

The continuing informality of much economic activity in these transitioning economies poses special challenges for regulatory policy. This challenge is rooted in an essential trade-off between the safety of foods on offer and consumers' broader welfare. First, the sheer number of mostly micro and small firms make enforcement very difficult. Second, this difficulty is compounded by the fact that informality is most common where public-sector institutional capacity is weakest, that is, in most early-transforming countries. Third, it is far more expensive per unit output for SMEs than for larger companies to meet quality and safety standards, since larger companies have more capital and are more able to attract the trained personnel needed to meet the standards. This means that strict enforcement of quality standards, if it could be achieved, would favor large firms. Given the evidence on the labor intensity of small firms, such an approach would hinder job creation in economies that desperately need it.

On the other hand, clear and credible public standards that consumers trust could in principle help SMEs if they can adhere to those standards and gain consumers' confidence on this basis. Otherwise, they have to invest in brands, and though they are doing so now, they are doing it without the attention to quality control and consistency of characteristics that are associated with good brands. Only medium and large firms are able to build robust brands that maintain consumer confidence in a cost-effective way. Yet hitching their wagon to strong public standards means that SMEs need to be able to meet those standards, which brings us back to the comparative difficulty that these smaller firms have in doing so.

In searching for the appropriate balance between these competing objectives in early-transforming countries, we suggest the following approach. First, realize that strict standards are likely not to be enforced except through the inability of micro and small firms to gain certification. The result will not be to keep these firms out of the market, but to keep them in continued informality, with resulting difficulty in growing and meeting the standards that have been set. Second, in light of this reasoning, one potentially productive approach is to establish softer minimum standards while putting in place incentives and support to meet progressively higher standards. Incentives could include progressive labeling standards allowing stronger claims as firms meet certain standards. Support could include access to training and to food manufacturing clusters and their related services and infrastructure. Third, decision makers must recognize that consumers have multiple objectives, are willing to pay only a finite premium for perceived safety, and that this premium goes up with income. This suggests that donor organizations need to take special care to avoid creating a situation in which countries mimic Western best practices in this area while not pursuing effective implementation of the resulting regulations.

As part of this commitment to rule-based approaches, stronger commitment to open regional trade is a key component in growing efficient local agribusiness capacity to the benefit of farmers and consumers. By providing a larger market with consumers and firms that have similar demands and capacities in quality, timeliness, and types of products, regional trade is a key element in the incremental learning that agribusinesses have to undertake to expand their operations and compete over time on a broader stage. As they do this, they will source more raw material from small local farmers.

### *Targeting productive programmatic assistance to those who can benefit*

**Farm level:** Targeting at farm level involves a spatial dimension combined with an ability to infer capacity at the household level. A spatial filter needs to be used first: dispersed farmers in rural hinterlands will not be able to benefit from productive assistance until their isolation is reduced by infrastructure investment, while those in more densely settled rural

areas near transport routes may be able. New data tools now make it far more possible than it was even 10 years ago to develop and apply a spatial filter, then classify farmers across space based on their characteristics. These tools consist of global GIS datasets on population densities including urban settlements, road infrastructure, and agro-ecological potential (e.g., the enhanced vegetation index); and geo-referenced household datasets that can be matched to the spatial data. Hazell et al. (2017) used such tools to illustrate a targeting approach in Tanzania. IFAD (2019) used a similar approach to classify all geographic space in the developing world by commercial and agricultural potential, and then linked household datasets in 13 countries to it. These approaches can be improved, then collaboratively adapted and applied at country level by local researchers and policymakers to vastly improve targeting at this level.

Because classification is never perfect, it will often be useful to structure productive programmatic assistance to require some level of financial or in-kind buy-in from farmers as a condition of participation.

Whatever classification is used, farmers viewed as commercialized need two kinds of assistance: (1) to strengthen and expand their ability to engage with private markets and businesses for inputs, farm services, finance, land, or outputs; and (2) to expand their productivity and scale of operation through intensification or extensification, in order to drive down their unit cost of operation. Farmers judged to have the potential to become more fully commercialized need the same thing, potentially more intensively, and potentially with a subsidy element that is both modest and time limited (this should not, however, involve eliminating the buy-in requirement mentioned above). As infrastructure is extended to reach more areas, productive programmatic investment can follow to enhance the response to the new opportunities.

The farm technologies and practices associated with integrated soil management and sustainable intensification may vary spatially according to the heterogeneous ways in which economic transformation and population dynamics are influencing agricultural factor prices. Long-term trends in many areas are encouraging intensification of capital inputs, including fertilizer use. However, low agronomic efficiency of nitrogen is a major constraint on fertilizer profitability and use. Integrated soil and agronomic management practices can improve the agronomic efficiency of fertilizer use, but achieving greater adoption of such practices will require greater understanding of best practices for the wide range of environmental conditions and farmer resource constraints in the region. Because sustainable resource management best practices are highly localized and knowledge intensive, increased investment in localized adaptive farm-level research and extension systems is needed to catalyze sustainable intensification in Africa (Jayne et al. 2019).

Though the record promoting farmer organizations is not encouraging, assistance in this regard to already commercialized but still small farmers to link better to medium- and large-scale agribusiness, can have significant payoffs. NGOs can be effective in bearing start-up costs and risk as relationships start and then withdraw as they become stronger.

The work by MSU also stresses the need for policies and programs to create greater awareness of land-related legal procedures for improving women's tenure security, which in turn can promote land-based investments by women that promote agricultural productivity.

SME level: Despite the popularity of programs for direct provision of micro- and small-scale credit and of business-development services to SMEs and sometimes to micro firms, little is known about their effectiveness (Cravo and Piza, 2016). Certainly, programs need to be sensitive to local contexts and must pay close attention to cost control, as their cost per beneficiary can be high and their benefits low (Haggblade, Hazell, and Reardon 2007).

The risk of unproductive public investment is thus high, leading to two recommendations. First, SMEs' access to credit—key for expanding and remaining competitive—can be improved by collateral registries and secured-transaction laws that enable banks to lend to small entrepreneurs, using movable assets as collateral as opposed to real estate, for example (de la Campa 2017). Tanzania is currently considering such legislation, in part due to efforts by FSP together with other US-AID-financed programs.

Second, targeting is as important for SMEs as it is for smallholder farmers. Spatial filtering can be done in a similar fashion as it is for farmers, since it focuses on identifying areas where commercial success is more likely. The difference in targeting is that, unlike farmers, nonfarm SMEs are by definition commercialized, and predicting success on the basis of other characteristics is quite difficult. The best predictor is size: very few micro enterprises ever rise beyond the level of survival strategies for poor people (Mead and Liedholm, 1998; Daniels and Mead, 1998). With a size cutoff and buy-in requirements in place, direct assistance such as training in technical and managerial skills, assistance in navigating regulatory requirements, credit guarantee funds and other measures to ease access to finance, and investment in agroprocessing clusters stand some chance of generating a positive payoff in terms of successful businesses, expanded efficient output, and increased employment. Providing these services to a cluster of similar firms is likely to be more effective and less costly than working with individual firms.

**Farm and SME level combined:** Developing packages of policies and public and private investments to promote sustainable market-led inclusive agricultural transformation requires an integrated value chain approach based on a combination of tools and datasets, such as spatial filtering, partial equilibrium modeling, computable general equilibrium modeling, and value chain analysis. However, quantitative evidence is not sufficient and has to be linked to active and continuous stakeholder engagements that are critical for a deeper understanding of real-world market and policy dynamics (BFAP, 2018). A component of FSP's training and in-country capacity building focused on the development of partial-equilibrium models in combination with value chain mapping techniques in various countries. See Appendix A for a case study of sunflowers in Tanzania, and Appendix B for a case study of soya in Malawi and Zambia.

In the case of Tanzania, the FSP effort was incorporated into a pilot study undertaken by the Bureau for Food and Agricultural Policy (BFAP) in collaboration with Sokoine University of Agriculture in Morogoro, Tanzania, and funded by the Bill and Melinda Gates Foundation to develop an approach on policy prioritization through value chain analyses. The pilot study was based on an approach of active engagement with stakeholders in industry and government to identify specific constraints in Tanzania's sunflower value chain that are also supported by quantitative evidence generated from a suite of tools and models. Incorrect classification of imported palm oil, in combination with a lack of oil-refining capacity, resulted in underutilization of the country's crushing capacity and, consequently, inhibited the sector's growth. On the supply side, constraints included access of smallholder producers to higher-yielding sunflower cultivars and the timing of operations on the farm. Following the pilot study, the Tanzanian ministry intervened and improved the import classification system at the ports.

The case study in Malawi and Zambia involved a scenario-modeling exercise to project the impact of transformation in the oilseed sector on policies and investments in Southern Africa. The simulations provided are not indicative of a particular import replacement policy but rather serve to illustrate the value of applying a set of empirical tools and data that consider an entire market balance and are therefore able to illustrate the impacts of specific policy options on supply, demand, and trade dynamics. In this case, the approach highlights the difficulties in expanding the soybean sector in Malawi and Zambia and suggests some of the complementary objectives that need to be pursued if this is to happen.

An integrated approach that considers the complete value chain at the farm and SME levels enables the identification and development of very specific policy packages and investments. Active and continuous engagement with private-sector and government stakeholders is essential to increasing the impact of this approach.

### *Dealing with the rapidly changing mix of nutritional challenges*

Consumption of processed foods is rising rapidly across all countries, in rural and urban areas, and among the poor and nonpoor in developing countries (Pingali 2006; Tschirley et al. 2015a; Reardon et al. 2019; Popkin and Reardon 2018). Evidence is now emerging that links this consumption to negative nutritional outcomes (Demmler et al. 2018; Tschirley et al. 2019). The result is that the prevalence of overweight and obesity now rivals or exceeds that of stunting and overweight throughout the developing world, and the social cost of diet-related noncommunicable diseases (NCDs) is rising rapidly. Countries must now deal with both challenges if they wish to maintain healthy populations.

Stunting and underweight are reduced by inclusive economic growth and by programmatic approaches that are largely understood; these include water and sanitation, control of malaria, and improved antenatal care and birthing facilities for expectant mothers, in addition to widely practiced nutrition programs focused on mothers and children. The challenge now is to maintain growth, to use local knowledge and creativity to adapt programs to country and subregional circumstances, and to maintain the commitment to drive these problems out of existence.

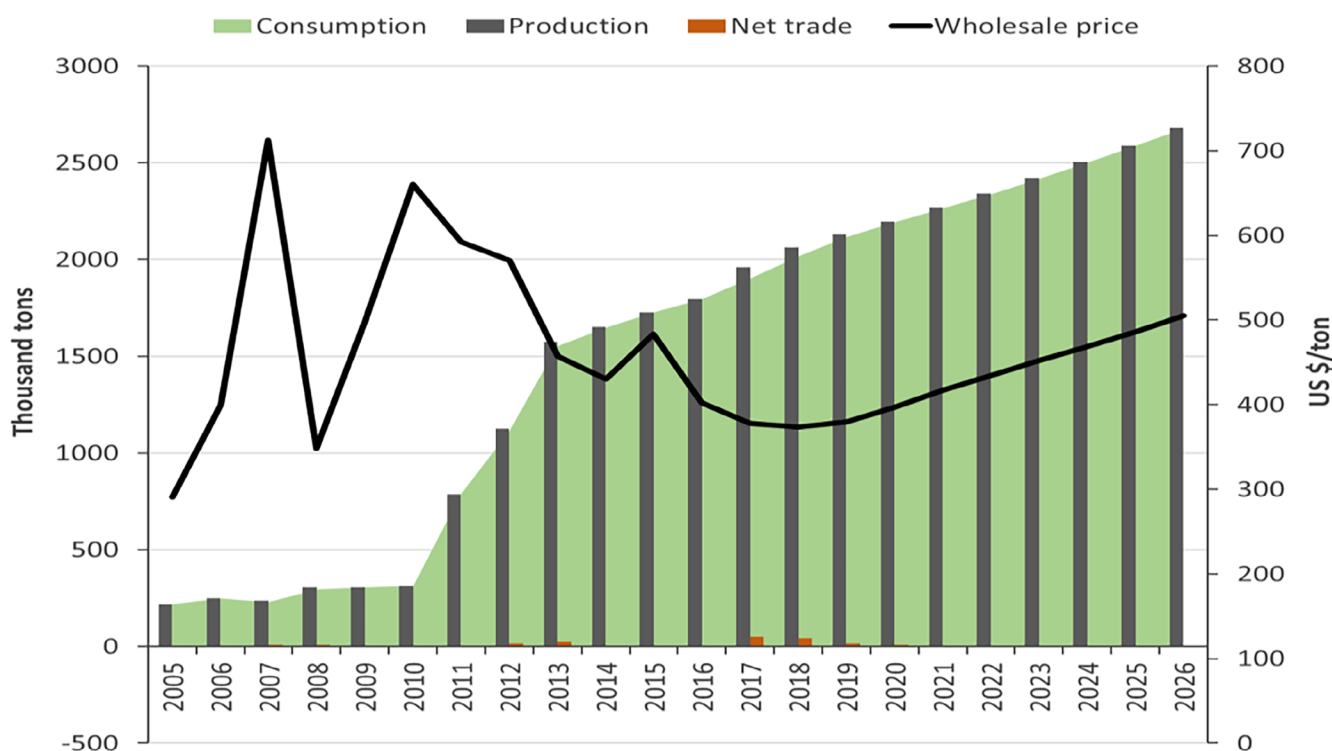
Much less is known about how to stem the tide of rising overweight and obesity. The concept of the food environment—the prevalence of healthy and unhealthy foods on offer, the details of their accessibility and visibility, and the overt and implicit messaging that consumers receive—is now of great interest, but little research has been done to quantify it and link it to consumer choices. The idea of the aspirational filters that consumers bring to their food choices in increasingly industrialized food systems, and how to influence these filters in a healthy direction, is also of interest but still in its research infancy (private food corporations are far ahead, using such research to move their most profitable food products). Regulatory and labeling approaches are being tested with vigor at least in Latin America, and some evidence is emerging of what works and what does not (Popkin 2017). This is an applied research area that needs greater focus, with an emphasis on adequately describing rapidly changing food environments, linking them to consumer food behavior, and testing approaches to modifying that behavior.

## Appendix A.

### Policy prioritization using partial equilibrium modeling and value chain analysis in the Tanzanian sunflower market

In 2012, the Regional Network of Agricultural Policy Research Institutes' (ReNAPRI) launched an outlook initiative as part of a set of sector-level and value chain analyses. As part of the effort to build analytical capacity, a partial-equilibrium (PE) model was developed to undertake policy analysis and market outlook projections in national and regional contexts. Since 2015, this initiative has been supported by the University of Pretoria's capacity-building and training program on partial equilibrium modeling under the Food Security Project Innovation Lab (FSP-IL). In the case of Tanzania, training and capacity building were undertaken at Sokoine University of Agriculture. Recently, the Tanzania PE modeling was applied in conjunction with a detailed value chain analysis to prioritize policies and public investments in Tanzania's sunflower industry toward inclusive agricultural transformation.

**Figure 7.** Tanzanian sunflower market outlook



Source: BFAP 2018

Tanzania's sunflower industry is fast-growing and contributes significantly to national edible cooking oil requirements. Figure 7 presents the rapid growth in supply and demand of sunflowers over the past decade. According to the ReNAPRI PE model, the industry is expected to expand over the next ten years to reach approximately 2.5 million tons of production, all consumed domestically by 2026. It is important to note that expansion in sunflower planted area was the key driver of growth over the past decade, as yields have remained fairly stagnant in the past five years at around one ton per hectare.

Apart from small volumes of informal trade across borders, all sunflower seed is processed domestically by large commercial crushers (35 percent market share) or smaller and medium-sized processing plants (65 percent market share) in rural areas. In other words, the sunflower industry offers significant opportunity for self-employment in the midstream.

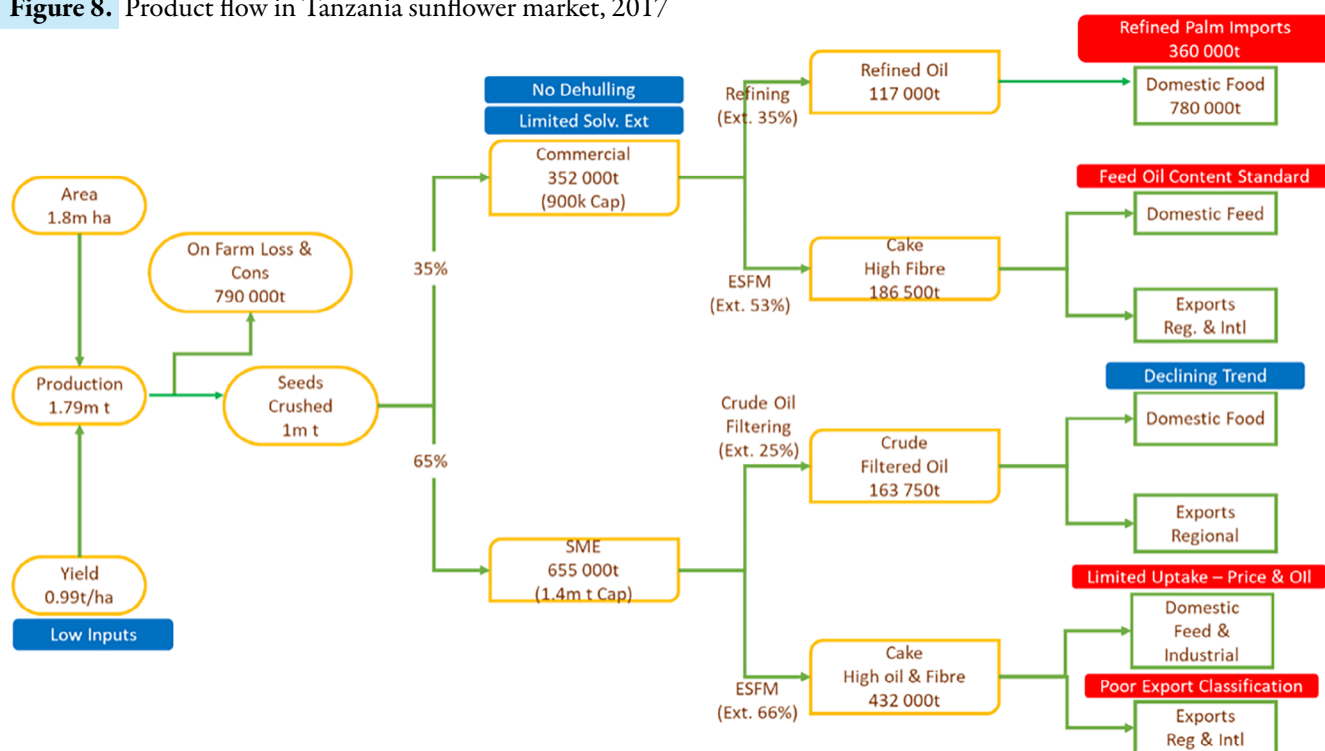


Although market prices have been volatile over the past decade, the general price trend has been in line with world market prices and has declined significantly as production has increased. As in many developing countries, edible oil consumption in Tanzania is dominated by palm oil, which is the cheaper source of vegetable oil but also holds more potential health risks. Figure 8 presents a detailed breakdown of the current flow of sunflower and its products through the value chain.

Palm oil imports constitute Tanzania's single biggest agricultural product import (by value) and the second largest overall behind petroleum. The reliance of the domestic edible oil sector on imported palm oil is thus clear and results in massive foreign exchange outflows that could be reduced through replacement of imported refined palm oil with domestic sunflower oil. Tanzania has the agro-ecological potential to comfortably produce sufficient sunflower seed to meet local demand for vegetable oil. However, the size of the feed market is not large enough to absorb all sunflower cake that is produced as byproduct.

Although sunflower oil has traditionally been consumed in its crude form in Tanzania, this consumption pattern is rapidly

**Figure 8.** Product flow in Tanzania sunflower market, 2017



Source: BFAP 2018

switching to refined oil, driven by rising average incomes and the increased affordability of refined oil in the market. The incomes of SME crushers are therefore at risk, as they lack the financial capacity to invest in upgraded processing technology to extract higher percentages of oil from sunflower seeds or to refine the crude sunflower oil. As a result, the proportion of oil in the sunflower cake produced by these SMEs is substantial, making the oil-cake market extremely lucrative for SMEs in order to increase their overall business margins.

The position of the SMEs within the current sunflower value chain dynamics enables them to lobby against incentivizing policy aimed at increasing the affordability of domestic refined sunflower oil, as this is a direct threat to their business. Furthermore, any attempts to regulate the export of sunflower cake are strongly opposed by SMEs, as it is believed that large volumes of cake are processed outside Tanzania to extract the remaining 15 to 20 percent of oil that the SMEs are

unable to extract. The notion of oil cake being consumed outside Tanzania inhibits its value-added potential both within the commercial sunflower oil extraction sector and in the domestic livestock feed market.

The efficiency-inhibiting activities of SME processors leads to low capacity utilization by SME crushers and by commercial crushers and refiners. This drastically raises per unit fixed costs and reduces the affordability of locally produced sunflower oil. This, together with the illegal importation of palm oil, suppresses market incentives to invest in commercial refining facilities or to increase utilization of existing facilities. Therefore, industry estimates place capacity utilization of SME crushing and commercial refining at 30 to 40 percent. Low capacity utilization and induced high per unit fixed production costs create an ideal opportunity for cheaper palm oil to fulfill edible oil market demand. This is made even more lucrative through the lack of effective control of the import classification of palm oil, allowing refined oil into the country under the lower unrefined tariff.

By targeting key challenges inhibiting sunflower value chain transformation, the value chain dynamics are able to be altered to maximize production capabilities and ensure efficient supply of refined sunflower oil in the market. This case underlines the importance for detailed analysis and understanding of value chains to identify targeted policy interventions and public investments in order to unlock private sector investments that will drive inclusive agricultural transformation.

## Appendix B.

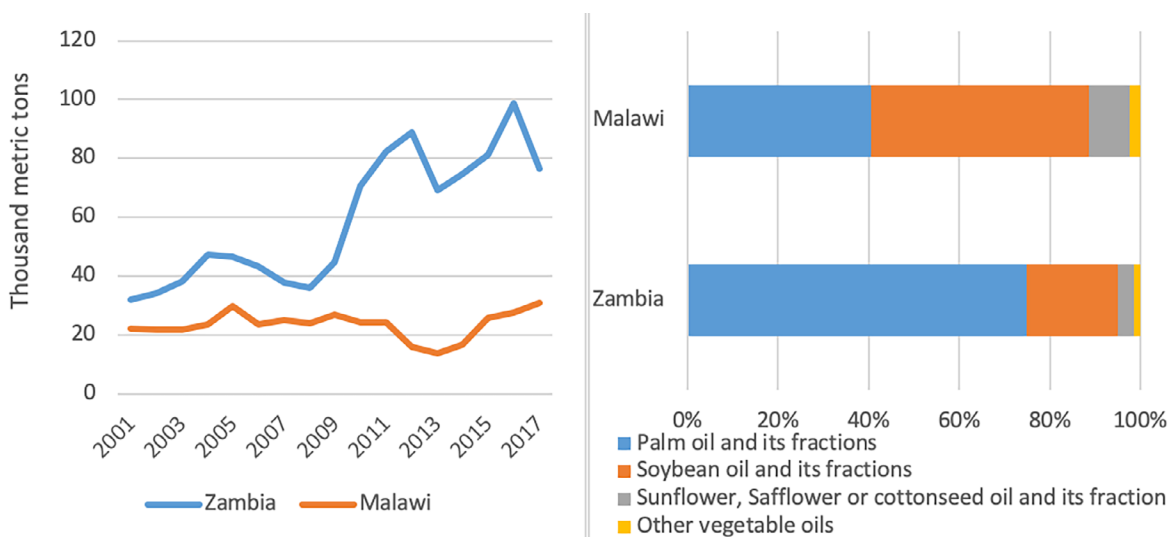
### Projecting the impact of transformation in the oilseed sector on policies and investments in Southern Africa

The oilseed sector in Southern Africa presents a good example of agrifood system transformation and value chains in transition. Higher incomes on the continent have driven annual increases of 4.4 percent in vegetable oil demand since 2000 (OECD-FAO 2018). Imports have met most of this demand, rising from 50 percent of total consumption in 2000 to 64 percent in 2010 at the continent level. In recent years, however, this share has stabilized at 65 percent, and a number of countries have invested in developing local value chains. One such country is Zambia, where oilseed crushing capacity has expanded from 125,000 mt in 2010 to 375,000 mt in 2016; and another is Malawi, where it expanded from 95,000 mt in 2010 to 465,000 mt in 2016 (Meyer et al. 2017). Despite this expansion in capacity, Zambia and Malawi crushed only 268,000 and 92,000 mt of soybeans, respectively, in 2017.

#### *Oilseed markets in Zambia and Malawi*

Despite investment, Zambia and Malawi remain net importers of vegetable oil. Palm oil constitutes the largest share of vegetable oil imports in Zambia, followed by soybean oil, whereas in Malawi soybean oil makes up the largest share (Figure 9). The rest of the soybean oilseed complex has undergone significant changes. Since 2008, soybean production has increased by an annual average of 17 percent in Zambia and 7 percent in Malawi. The demand for animal feed from intensive livestock production has not grown at the same pace, and consequently both countries have become net exporters of soybean oilcake (Figure 10), which has caused prices to decline. The resulting pressure on crush margins is contributing to low utilization rates. Despite excess crush capacity, both countries also remain net exporters of soybeans. Due to high transport rates in the region, surpluses drive prices down sharply, resulting in stagnant production growth in recent years.

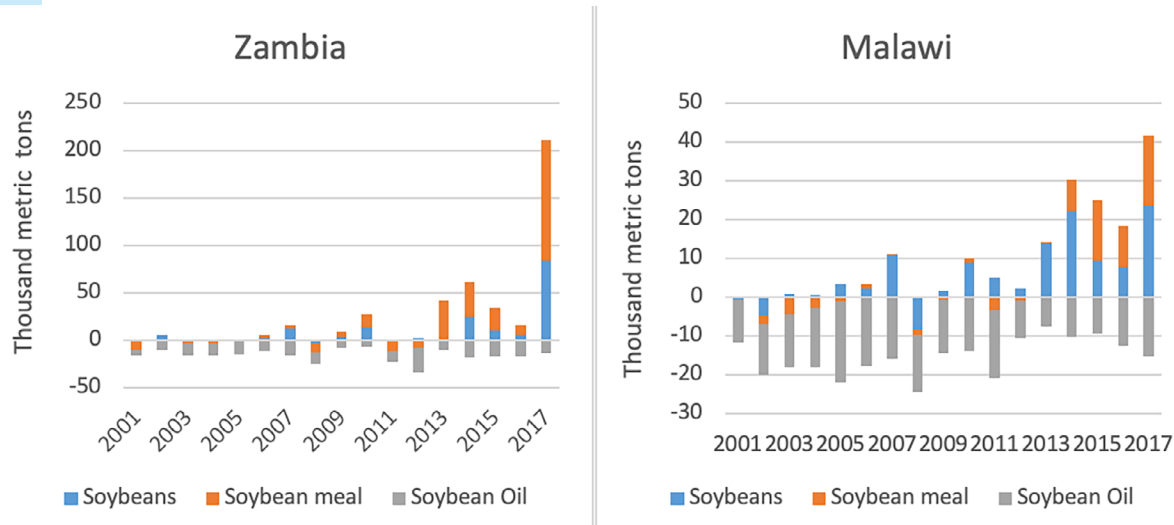
**Figure 9.** Vegetable oil imports into Malawi and Zambia—total quantity (a) and average share between 2013 and 2017 (b)



Source: ITC Trademap, 2018

#### *Implications of import replacement policies*

Over the eight-year period since 2009, vegetable oil imports into Zambia increased by 31,814 mt. Assuming linear growth in import demand, 106,822 mt will be imported by 2025. As in the past, palm oil is likely to make up the vast majority of such imports, as it is the cheapest to procure in the global market and carries an import tariff of only 6.6 percent, compared with the 17.8 percent currently imposed on soybean oil from outside the SADC region. Given the frequency with which policymakers in Africa have pursued import replacement policies, a partial equilibrium simulation model of the

**Figure 10.** Soybean and soybean product trade in Zambia (a) and Malawi (b)

Source: ITC Trademap, 2018

soybean sector in Zambia was used to illustrate the impact that such a policy would have on supply and demand in the Zambian soybean market. Soybeans are the major oilseed produced in Zambia and hence the scenario simulations depict a situation where, by 2025, the projected vegetable oil imports are replaced by domestically produced soybean oil.

Table 3 provides current volumes of soybean production and processing in Zambia, as well as the baseline outlook toward 2025. The baseline represents a “business as usual” scenario and reflects the growth projected for the Zambian soybean sector if policies remain unchanged. The scenario reflects an import replacement policy in which vegetable oil imports are replaced by domestically produced soybean oil. At current oil extraction rates in Zambia (14 percent), the replacement of 106,822 mt of vegetable oil by 2025 would require processing an additional 763,014 mt of soybeans by 2025. If produced locally, this could be obtained from an area expansion of 79 percent over the eight-year period, combined with yield gains of 18 percent.

**Table 3.** Alternative future scenarios for Zambia’s soybean sector

	2017	2025		Scenario vs. Baseline	
	Actual	Baseline	Import replacement scenario	Absolute change	Percent change
Soybean Area (ha)	232,000	257,000	461,000	204,000	79 percent
Soybean Yield (mt/ha)	1.52	1.89	2.24	0.34	18 percent
Soybean Production (mt)	351,000	488,000	1,033,000	545,000	112 percent
Soybeans Processed (mt)	268,000	363,000	1,031,000	668,000	184 percent
Soybean Oil Production (mt)	38,000	51,000	144,000	94,000	184 percent
Soybean Oilcake Production (mt)	199,000	269,000	763,000	494,000	184 percent
Soybean Oilcake exports (mt)	129,000	22,000	516,000	494,000	2,258 percent

The implications for the vegetable oil market cannot be viewed in isolation and must be considered with the oilcake market, as both products are produced in the processing of soybeans. Under the scenario where Zambia becomes self-sufficient in soybean oil, it would also produce 494,316 additional metric tons of soybean oilcake relative to the baseline. Given that Zambia is already exporting surplus oilcake, this additional production would also be exported. The most likely destination, despite high transportation costs, is South Africa, which has a well-developed intensive livestock sector that con-

sumed 1.2 million mt of soybean oilcake as feed in 2017, of which 550,000 mt was imported. South Africa's crush capacity has also expanded fivefold since 2012, and soybean production continues to expand. Consequently, the Bureau for Food and Agricultural Policy projects that soybean oilcake imports will decline continuously over the next decade, and by 2025 will be less than 150,000 mt (BFAP 2018). Zambia will therefore need to find an alternative market for its export volumes, one of which could be domestic livestock production. For the poultry industry to expand and consume all of the additional oilcake, it would have to produce an additional 1.5 million mt of broiler meat by 2025 over its current production of approximately 100,000 tons (assuming a feed conversion ratio of 1.8 and an average 18 percent inclusion rate of soybean meal in feed rations).

### *Policy and investment implications*

There has been significant investment in Zambia's and Malawi's soybean value chains over the past decade, but insufficient uptake of oilcake has led to surpluses exported at high cost. Consequently, despite continued vegetable oil imports, growth in local oilseed production has slowed in recent years and baseline projections point to a continued slowdown until 2025. Simulations show that sustainable additional development of these chains will depend on (1) improved transportation infrastructure to advance the efficiency of regional trade in surplus products, and (2) simultaneous development of secondary industries (such as intensive livestock operations) to enable uptake of domestic surpluses in country.

The simulations provided are not indicative of a particular import-replacement policy, but rather serve to illustrate the value of applying a set of empirical tools and data that consider an entire market balance and are therefore able to illustrate the impacts of specific policy options on supply, demand, and trade dynamics. In this case, the approach highlights the difficulties that this sector faces in continuing its expansion and suggests some of the complementary objectives that need to be pursued if this is to happen.

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