



CHAPTER 6

Tapping the potential of midstream small and medium-sized enterprises

Many developing countries, with their rapidly growing urban populations, are experiencing a food midstream transition. And their food midstreams – the main purveyors of food to consumers in developing regions – are becoming longer and more complex. They too are growing rapidly (Reardon, Liverpool-Tasie and Minten, 2020; Vos and Cattaneo, 2020). The midstream includes all intermediary entities and activities before and after the farm gate that handle supplying inputs and trading, storing, processing and distributing food to the consumer. The midstream is sizeable and it is essential for achieving desirable food system outcomes: health, livelihoods and sustainability.

This chapter focuses on small and medium-sized enterprises (SMEs) in domestic food midstreams. Their growth offers developing countries potential opportunities for a healthy, inclusive and sustainable food system transformation. It also affords smallholder farmers new ways to access both markets and non-farm employment opportunities, while supplying healthier foods to meet consumer demand.

The chapter focuses on how the expansion and transformation of midstream activities can contribute to livelihoods (especially rural and peri-urban livelihoods), how SME growth can enhance food quality, safety and diversity, and how market linkages through midstream SMEs can support sustainable agricultural production. The chapter develops five key messages:

1. **Midstream SMEs link small-scale farmers to markets.** Whether in input services, food processing, logistics, retailing or wholesale, midstream SMEs have the potential to generate value added while ensuring adequate margins for smallholders. They can strengthen market functions – such as packaging, marketing, safety and standards – and they can blunt the collusion that creates market power in the food chain and reduces farmers' profits. Ensuring that linkages with input and output markets become more direct, and reducing market transaction costs, are key food system governance priorities for improving small-scale farmers' livelihoods.

2. **They can deliver affordable food to urban and rural consumers, with implications for diets, nutrition and health.** They can improve the quality and diversity of food through effective value chains for perishable nutrient-dense products, and through food processing and packaging practices that promote higher nutritional quality and longer shelf life. But since they are largely informal, food safety can be a challenge – and their activities could promote excessive consumption of ultra-processed food (UPF) and food services, harming health.
3. **They generate employment, female entrepreneurship and livelihood opportunities.** The midstream enables rural people to look beyond primary agricultural production for income, providing marginal rural households with critical alternative entry points into the labour market, as well as access to good self-employment opportunities. Midstream employment can be highly volatile, though – surrounded by uncertainties and vulnerable to fierce competition, with potential for low remuneration and limited social security. In many agrifood midstream sectors, incomes are less than a living wage and working conditions are far from decent, while insecurity and uncertainty are high.
4. **They can support circular and sustainable food systems if barriers are addressed.** A special challenge for midstream SMEs is their often limited capacity to ensure environmental and social sustainability. The midstream supplies a large share of farmers' agrochemical inputs, generates a large share of food waste and discarded packaging, and uses considerable energy and water resources. Efforts to encourage midstream sustainability could include the education of midstream constituencies about sustainable production practices and circular food system principles (CHAPTER 4), combined with delivery contracts that support long-term relationships and co-investment with upstream or downstream partners.
5. **Midstream SMEs need governance structures to support infrastructure development, public and private investment and technical innovations – especially to meet standards for safety, quality, sustainability and social responsibility.** Shaping midstream SME development to deliver desired food system outcomes involves several key governance challenges. Investments will be needed to improve midstream SME market access through infrastructure, to build their human capital and to expand their financial access. Given the informality of many SMEs and the resulting challenges for compliance with standards, midstream governance will require not only public policies but social networks to establish effective norms for food safety and quality, in a governance structure that imposes some constraints on stakeholders.

In view of the diversity of midstream activities and the wide implications of these activities, readers should note that this chapter's discussion of midstream SMEs and desirable food system transformation is not comprehensive: other chapters also address pieces of the midstream puzzle. For example, the contribution of the midstream to improved nutrition and health will depend heavily on policies to develop rural-urban market linkages and on incentives for improving food product quality (CHAPTERS 1 AND 7). And the contribution of the midstream to environmental sustainability depends in part on strategies to reduce food loss and waste all along the value chain (CHAPTER 4). Finally, along with the opportunities presented by midstream SME growth come substantial challenges and risks. All else being equal, agrifood midstream SMEs can reduce food prices by transmitting farm productivity gains to consumers, especially with investments in SME capacity and efficiency – but this transmission may not occur if local markets are inefficiently integrated or insufficiently competitive (CHAPTER 5). Another challenge arises from midstream SMEs' largely informal status: while constraining SME access to formal finance, informality also increases the risk that they will not meet food safety standards, thus preventing them from participating in high-value export chains where standards regulate markets (CHAPTER 5).

Serious concerns were raised worldwide about potential severe disruptions that the COVID-19 pandemic could have generated for the food system and for people's livelihoods, as well as for local and global economies, and about the role of local and global food supply agents and SMEs. But food systems "resisted" the shock and SMEs played a key role locally, especially in the informal market (Reardon and Swinnen, 2020; Béné et al., 2021).

Improving small-scale farmers' access to markets

The great majority of smallholder farmers' midstream transactions today are with SMEs (Reardon, Liverpool-Tasie and Minten, 2020). In the regional consultations that we cite throughout this report, respondents overwhelmingly affirmed that midstream SMEs were very or extremely relevant to inclusive food system transformation (**BOX 6.1**).

BOX 6.1 MIDSTREAM SMEs HAVE KEY ROLES IN FOOD SYSTEM TRANSFORMATION

In the regional consultations, the large majority of respondents felt that SMEs in the "hidden middle" played a vital role in inclusive food system transformation, calling them either very relevant (42 per cent) or extremely relevant (43 per cent) to their own context. Similarly, the statement that public investment and policy incentives

are needed to engage the private sector in food system transformation processes was rated by a similar share of respondents (82 per cent) as either very relevant (45 per cent) or extremely relevant (31 per cent) to their context. Each statement was found to be not relevant to their context by just 4 per cent of respondents.

Source: Regional consultations.

Whether in South-East Asia, sub-Saharan Africa or Latin America and the Caribbean, domestic value chains and especially midstream SMEs supply most of the food consumed by both rural and urban residents – even though imports of some staple foods and processed foods are growing rapidly (CHAPTER 5 and Reardon et al., 2021). In addition, SMEs provide smallholder farmers with complementary services normally available through contracts with larger firms (**BOX 6.2**).

For inclusive food system transformations, transactions between smallholder farmers and midstream SMEs should enable the smallholders to benefit from access to yield-increasing inputs and from sales at more distant markets while also reducing the smallholders' transaction costs and risks. In most low- and middle-income countries today, local shops and delivery networks operated by private agents supply farmers with inputs and provide them with technical assistance. In Africa, wholesale and retail input firms – such as seed and fertilizer dealers – serve farmers who may not be able to travel to cities (Liverpool-Tasie et al., 2019).

SMEs in the output value chain also supply farmers with inputs, as with Uganda's medium-sized dairy processors (van Campenhout, Minten and Swinnen, 2019). Farmers on occasion may receive cash or in-kind advances from traders, conditioned on a commitment to sales after the harvest. SMEs also provide agricultural services, such as combine harvesting for rice in China (Zhang, Yang and Reardon, 2017); land preparation, spraying, pruning, harvesting and marketing for mangos in Indonesia (Qanti, Reardon and Iswariyadi, 2017); and seed propagation, well and pond digging, spraying, land preparation, harvesting and loading trucks for vegetable farming in Ethiopia (Minten, Mohammed and Tamru, 2020). These services help farmers who may lack the funds to invest in machinery and the skills to use machines and other inputs. Or they may simply cut the time needed for farming, enabling more rewarding off-farm employment.

BOX 6.2 SMEs LINK FARMERS TO MARKETS AND PROVIDE COMPLEMENTARY SERVICES

Based on a scoping review of 202 studies, Liverpool-Tasie et al. (2020) find that SMEs in non-contract relationships commonly undertake complementary resource provision: this includes input provision, credit, logistics and, more generally, information, extension and training. Providing these services improves farmers' welfare through technology adoption and greater productivity.

Complementary services appear to be instrumental in fostering positive outcomes from farmers' interactions with input and output market channels. Training and capacity-building support small-scale producers in upgrading their

production to satisfy the requirements of modern market channels. Market information increases the speed of farm product sales while allowing farmers to bargain more effectively and obtain better prices. Providing timely access to credit supports the adoption of technology.

Caution is needed here about the effects of midstream actors' market power. When SMEs in the input and agricultural service value chains are able to condition the availability and cost of inputs to farmers, this power may constrain the farmers' ability to make productive investments (Reardon et al., 2021).

In sum, input and agricultural service midstream SMEs can – and in principle should – increase farmers’ profit margins by reducing wholesale and retail margins and reducing transport and transaction costs. Note that midstream SMEs often condition the availability and cost to farmers of inputs for new investments that will increase their productivity (see **BOX 6.2**).

However, in many countries – notably those where markets function poorly and transaction costs are very high – a large part of farmers’ potential profit margin is captured by intermediaries. While these intermediaries provide seed and other inputs on credit (to be repaid after the harvest), the returns to farmers are very low. Still, the farmers must depend on such intermediaries because of a lack of alternatives. Ensuring that midstream SMEs provide key mediating functions at reasonable prices and allow farmers to realize fair profit margins hinges on farmers’ bargaining power – and on the degree of input and output market competition (Lipper, Anderson and Dalton, 2010; Cavatassi et al., 2011).

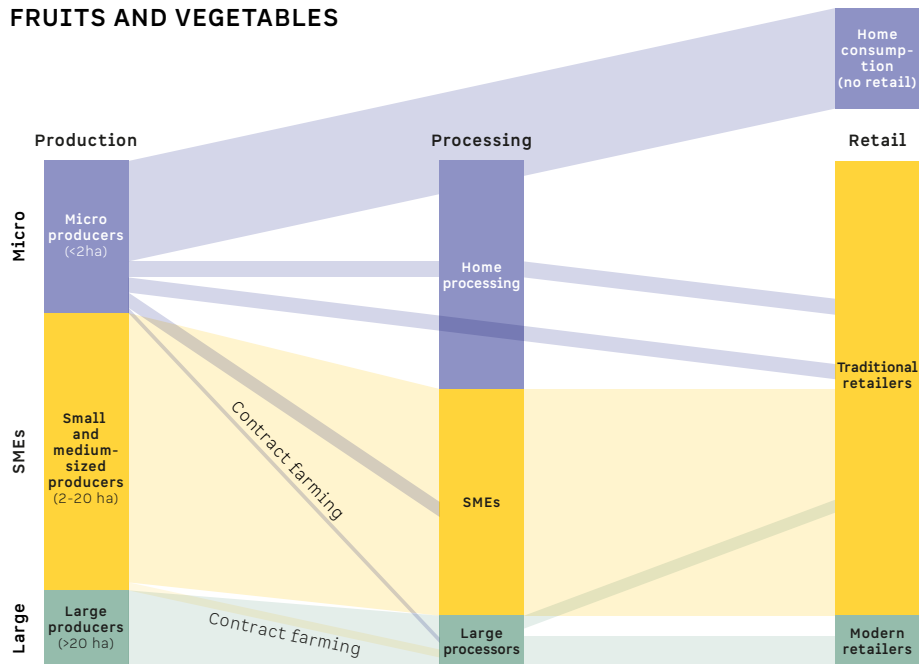
Food supplies are delivered to consumers largely by midstream SMEs, including traders and processing, wholesale and logistics enterprises (**BOX 6.3**). Because such SMEs often operate informally – without contracts – and are often not registered as companies, their activities are not fully reflected in official statistics. Still, many indications point to fast growth in the agrifood midstream in recent decades, given the pace of growth in rural-urban midstreams. For sub-Saharan Africa, Haggblade (2011) showed that the traded volume in rural-urban midstreams had grown by 800 per cent during the previous 25 years. For South-East Asia, Reardon and Timmer (2014) calculated that rate at 1,000 per cent. According to a recent estimate, 43 million microenterprises and more than 1 million SMEs exist in sub-Saharan Africa (Bruhn et al., 2017).

BOX 6.3 THE FLOW OF PRODUCTS ALONG THE FOOD VALUE CHAIN

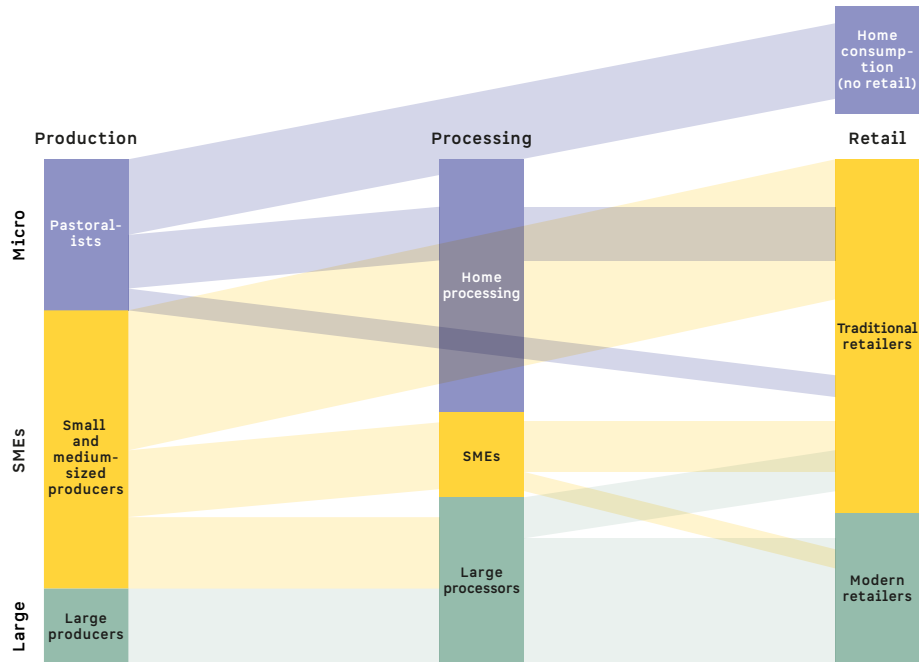
In Africa, SMEs play a critical role in producing, processing and marketing fresh fruits and vegetables, as well as meat, dairy, cereals and legumes, particularly for low-income consumers.

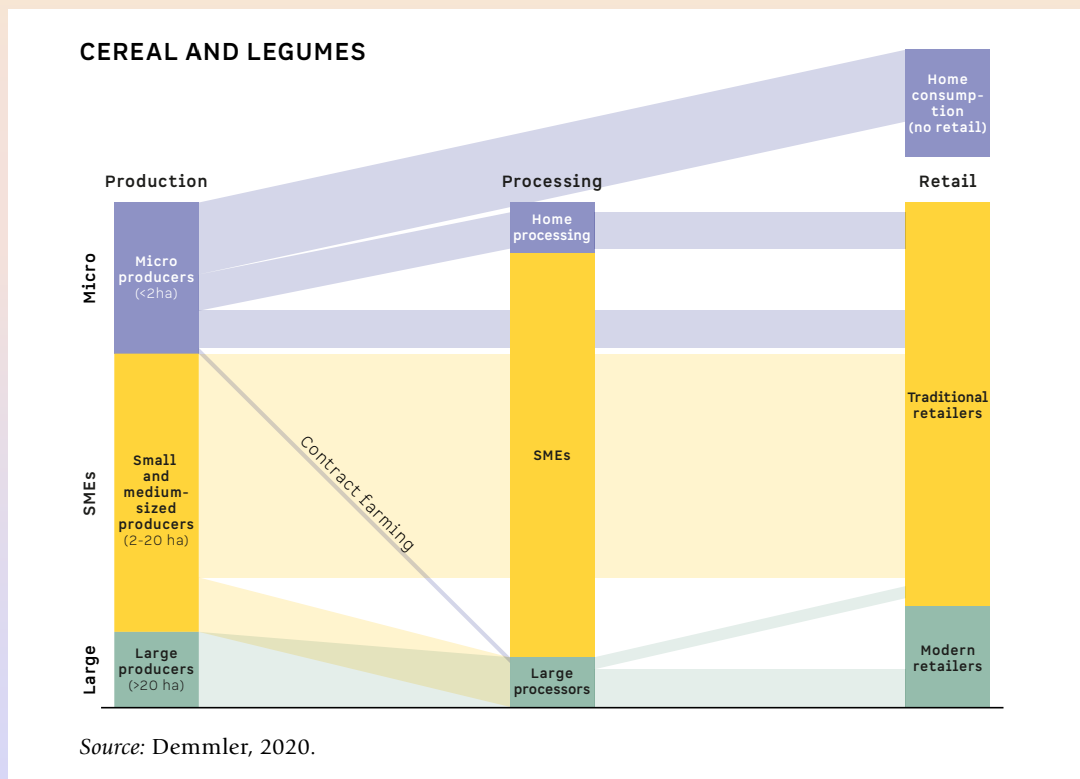
The relative importance of various segments of the value chain is illustrated here in the flow of food products from producers and processors to retailers.

FRUITS AND VEGETABLES



ANIMAL-SOURCE PRODUCTS



BOX 6.3 (CONT.)

Delivering nutritious and safe food, with implications for diets and health

Midstream SMEs support food security by increasing food access – including access to more diverse foods, which can improve nutrition and diets. They can also support food quality through upgrades in storage and processing. They often face challenges in supporting food safety and quality standards, so policies and programmes need to raise awareness and promote compliance.

Midstream SME development can result in cheaper and more diversified food

Agrifood midstream SMEs make value chains more effective, link consumer demand to producers and process primary products to improve shelf life or to add other qualities appreciated by consumers (CHAPTER 4). One major contribution that midstream SMEs can make is to reduce the seasonality of access to various foods – offering consumers more diverse, and potentially nutritious, diets over a longer period. Cold-storage investments can greatly reduce the seasonality of the potato market in Delhi, India (Das Gupta et al., 2010; Minten et al., 2014), and SMEs that dry and smoke fish have reduced

seasonality in the fresh fish market in Nigeria (Liverpool-Tasie et al., 2021). Reductions in the seasonality of access are directly linked to reduced food prices – along with increased prices paid to farmers.

Midstream SMEs are often core suppliers of nutritious foods. For example, about 75 per cent of all mangoes produced in Indonesia are consumed in rural areas and supplied through a chain almost entirely run by SME traders and retailers (Qanti, Reardon and Iswariyadi, 2017). In Uganda, SMEs in processing, logistics and wholesale are the mainstay of milk supply (van Campenhout, Minten and Swinnen, 2021). In Nigeria, SMEs account for a large majority of the fish and chicken supplied to urban areas, which is where these foods are mostly consumed (Liverpool-Tasie et al., 2017, 2021). In the vegetable midstream for Addis Ababa, Ethiopia, SMEs are the mainstays of transport, packing and wholesale (Minten, Mohammed and Tamru, 2020).

Nutritious traditional meals are sometimes both produced and sold by SMEs, especially in urban areas. One example is *teff enjera* (pancakes) in Ethiopia (Minten et al., 2016). Others include millet and dairy dishes in Burkina Faso (Reardon, Thiombiano and Delgado, 1989) and Senegal (Chase-Walsh, 2018). In Tanzania, SMEs mill nutritious flour from pulses and coarse grains and sell it as weaning food (Snyder et al., 2015). Fermented foods are usually produced by small-scale enterprises under female entrepreneurship (CHAPTER 7).

Nevertheless, among SMEs that produce and market processed foods, some make UPF that carry health risks to consumers. Examples include a range of snack-food SMEs in Africa (Reardon, Liverpool-Tasie and Minten, 2020). In Kenya, SMEs tend to dominate sales of UPF – mainly because food retail is still dominated by small traditional shops (Demmler, Ecker and Qaim, 2018).

Midstream SMEs can contribute to food quality

Midstream SMEs contribute to product differentiation and economies of scope, which constitute a key factor in quality upgrading. Trends towards custom wholesaling for supermarkets, fast-food chains and processors put greater demands on timing, volume and quality transactions. Meeting these demands requires investment in dry-storage and cold-chain facilities. Wholesalers who make these investments then become specialized dedicated wholesalers (Reardon and Berdegue, 2002), or quasi-agents for the modern food industry. They may also manage contract farming schemes to enhance input use and support farm-level quality management (CHAPTER 5).

The size of processing enterprises is correlated with the quality, as well as the quantity, of machines, in the sense that larger firms are more able to invest in processes that diversify and differentiate products. In Bangladesh and Viet Nam, the larger a rice mill, the more likely it is to have colour-sorting and rice-polishing equipment lines that increase the rice grade (Reardon et al., 2014). This equipment reflects a significant threshold investment – not one that is feasible for small mills. The same holds for milk collection centres and dairy plants.

Food quality management has become a key ingredient in creating consumer loyalty and guaranteeing compliance with lead times in agricultural food chains. It is also a mechanism for increasing productivity and reducing loss and waste. Next generation technologies for food e-commerce and home delivery of fresh food are even more demanding of consistent food quality. Public investment in infrastructure and in spatial planning provides opportunities to ensure that consumers have access to affordable nutritious foods, support informal food vendors' livelihoods and reduce food loss.

Fortifying wheat flour is fairly centralized, but Ethiopia has more than 300 mostly small-scale wheat mills. Fortifying maize flour involves thousands of small-scale millers. Fortifying salt can be fully centralized (as in Nigeria), almost fully centralized (as in Kenya) or done by a combination of SMEs and large businesses (as in Ethiopia, Mozambique and Tanzania). Similar variation in the involvement of SMEs and large enterprises is seen for wheat flour and oil fortification (Demmler, 2020).

Food safety management by midstream SMEs

Food safety and quality are generally assured by standards, but in low- and middle-income countries well-functioning national food safety systems remain a major challenge (see Roesel and Grace, 2014; Grace, 2015; and Lamuka, 2015, for examples in sub-Saharan Africa, and Minten, Singh and Sutradhar, 2013, for India). Agrifood SMEs typically cannot afford the cost of compliance with formal standards because of their small size, their generally informal status and the perception of banks that lending to SMEs is risky (Randolph, 2021; Reardon et al., 2021). Moreover, SMEs may have difficulties enforcing food safety and quality standards or imposing practices on farmers and intermediaries. These challenges imply a need for programmes that:

- **Create awareness and inform midstream SMEs about food safety and quality regulations.** Programmes are needed to raise awareness of hazard analysis and critical control points to upstream, midstream and downstream actors – explaining the rules and promoting the benefits of compliance. In sub-Saharan Africa, past food safety measures have had little impact, or even an adverse impact: the reason is that SMEs, including vendors, small eateries, traders and processors, have little awareness of the rules or do not know how to follow them correctly (Randolph, 2021).
- **Create incentives to encourage investment in standards compliance.** Ensuring food safety and quality requires SMEs to make investments and to innovate – and they will do so if the market rewards them for it. In Nigeria, SME processors that made a porridge called *ogi* for weaning infants adopted lactic acid fermentation to reduce aflatoxin and fumonisin in maize. Also in Nigeria, a medium-scale chain of food service outlets selling *fura da yoghurt* (a traditional millet and dairy dish) has competed and expanded by promoting its product as more hygienic than the traditional version made with fermented milk (Reardon et al., 2021).

Midstream SMEs will become more likely to invest in food safety when labelling regulations are added to food safety regulations – and when both are combined with public assistance to pay for the investments needed and build human capacity (for example, digital apps to train processors in best practices). Policies need to allow for the fact that, in most developing countries, consumer willingness to pay for safe food is low. While technical assistance programmes can help an industry upgrade its food safety, such programmes are unlikely to succeed by themselves: they should be accompanied by subsidies, tax incentives and consumer education.

Providing attractive alternative livelihood opportunities

The development of agrifood SMEs generates many rural and urban employment opportunities. As part of an inclusive food system transformation, desirable livelihood outcomes can be stimulated by improving labour conditions in midstream SMEs.

Agrifood SMEs are a major source of rural and urban employment

Domestic food value chains are a major source of both rural and urban employment. According to livelihood surveys from 13 countries in Africa, Asia and Latin America (Dolislager et al., 2020), agrifood midstream employment (post-farm-gate) accounts for about 21 per cent of rural employment in developing regions – measured in full-time equivalents (FTEs) – while own farming accounts for 29 per cent. For comparison, in urban areas of the same 13 countries, agrifood midstream employment accounts for 25 per cent of all employment (**TABLE 6.1**). A large share of this midstream employment is in SMEs: in Africa and South Asia, they make up at least 80 per cent of all agrifood midstream activity (Reardon et al., 2021, based on Dolislager et al., 2020).

Data reveal some clear differences among regions (**TABLE 6.1**). In sub-Saharan Africa, agrifood midstream employment makes up a significantly higher share of all urban employment (31 per cent of urban FTEs) than in the other two regions, which have more developed economies (27 per cent of urban FTEs in Asia, 18 per cent in Latin America). Agrifood midstream employment is also a larger share of rural employment in sub-Saharan Africa than in the other two regions.

TABLE 6.1 RURAL AND URBAN EMPLOYMENT, ON AND OFF THE FARM

REGION	RURAL EMPLOYMENT				URBAN EMPLOYMENT IN FOOD SYSTEM ACTIVITIES
	OWN FARMING	FARM WAGE EMPLOYMENT	NON-FARM SME EMPLOYMENT INSIDE THE FOOD SYSTEM (SELF-EMPLOYMENT + WAGE EMPLOYMENT IN AGRIFOOD ACTIVITIES)	NON-FARM EMPLOYMENT OUTSIDE THE FOOD SYSTEM	
Sub-Saharan Africa	39	3	24	34	31
Asia	27	13	18	43	27
Latin America and the Caribbean	16	12	21	50	18
Overall	29	9	21	41	25

Source: Reardon et al., 2021 based on Dolislager et al., 2020.

Note: Data are from Living Standards Measurement Study surveys of 178,794 households with 460,654 individuals in sub-Saharan Africa (Ethiopia, Malawi, Niger, Nigeria, Tanzania, Uganda), Asia (Bangladesh, Cambodia, Indonesia, Nepal) and Latin America (Mexico, Nicaragua, Peru), in all age cohorts (youth aged 15-24 and adults aged 25-64) and both genders. Employment is reported in full-time equivalents (FTEs). Non-farm employment inside the food system includes post-farm-gate food processing, wholesale food, food-related logistics, food retail and food service.

Rural women depend more than rural men on agrifood SME employment: on average, across all three regions and in all 13 countries studied (Dolislager et al., 2020), the share of such employment in total FTEs is 30 per cent for women, compared with 19 per cent for men. These findings coincide with SME studies. For example, in Ghana women dominate the agroprocessing segment (Ampadu-Ameyaw and Omari, 2015, cited in Reardon, Liverpool-Tasie and Minten, 2021).

Dolislager et al. (2020) also show that dependence on food system employment is similar between youth and adults in the segment of wage employment (**FIGURE 6.1**). Wage work in the post-farm segment of the agrifood system is the only category where youth between the ages of 18 and 24 spend more time than any other age group. Young adults between the ages of 25 and 34 also dedicate more time to wage work in the agrifood system than do adults above that age. Self-employment is most important for those above 25 years of age, given the time needed to accumulate savings, experience and skills to start up one's own business.

One reason for the growing importance of urban food system employment is that urban settlements now dominate the market for food consumption, accounting for about 60 per cent of all food consumption in Africa and South Asia, 70 per cent in South-East Asia and 80-90 per cent in Latin America. Two studies of Ethiopia and Nigeria, while estimating the numbers of people employed in various midstream and downstream food system segments, highlight the creation of employment through interactions among parts of the midstream (**BOX 6.4**).

FIGURE 6.1 FULL-TIME EQUIVALENT SHARES IN EMPLOYMENT CATEGORY BY AGE GROUPS

Note: AFS = agrifood system.

Source: Dolislager et al., 2020.

BOX 6.4 OFF-FARM AGRIFOOD EMPLOYMENT IN ETHIOPIA AND NIGERIA

Based on primary surveys in three cities (Addis Ababa, Dire Dawa and Nekemte) and statistical analyses of food processing and household consumption and expenditure data, Minten et al. (2016) conclude that commercial *enjera* (teff pancake) markets in urban Ethiopia employ 100,000 people – mostly women – and are growing rapidly. Along with food processing and preparation, these jobs often extend to retail sales. The study also showed that 1 million workers are employed in food processing by larger *enjera* processing firms, which are more capital-intensive and sell the product at scale (both to the food service sector and for export).

Sauer, Reardon and Liverpool-Tasie (2020) estimate employment effects in selected segments of Nigeria's maize-food-poultry complex – chicken

Source: Reardon et al., 2021.

farms, maize farms, maize traders, feed mills and chicken retailers – taking two consumption centres as the first node (Greater Ibadan in south-west Nigeria, Kaduna City in northern Nigeria). This part of the segment employs roughly 900,000 people, 34 per cent of them women. Including all labour employed by the maize farms and urban traders, the total increases to about 5.7 million people. These figures underestimate the off-farm total employment impact of the complex. Rural maize traders, chicken and egg traders, and third-party logistics firms serving traders (an important missing piece – for example, maize traders in Nigeria move 75 per cent of their volume through these firms) were important key agents left out of the survey, together with farmers, traders and other “lateral” midstreams for inputs.

Food system transformation can be stimulated by improving labour conditions

Agrifood midstream development – especially by SMEs, which are more labour-intensive than large enterprises per unit of output – can support inclusive food system transformations by creating decent jobs. This effect can be magnified with investments to relieve two constraints on SME employment generation, one pertaining to labour, the other to financing:

- To match future labour demand in food processing and services, better technical and vocational education and non-cognitive skill development will be needed (AGRA, 2019).
- To afford future expansion, midstream SMEs will need greater access to finance and loans (KIT, 2015; Dalberg, 2018; van Manen, 2018).

Agrifood midstream SMEs in low- and middle-income countries will very likely employ increasing numbers of youth and women in the coming decades, as food systems shift their emphasis from primary production to processing, trade and services. For people currently poor in rural areas – many of them smallholders who increasingly rely on multiple sources of income, while others are landless wage labourers – these new employment opportunities outside primary production will be beneficial. However, if the midstream becomes dominated by larger enterprises that rely on labour-saving technologies, these effects will be lost.

Policies will thus be needed to protect against the risk that midstream SME expansion could create a poverty trap for rural residents, incorporating lessons from the COVID-19 pandemic, which has highlighted the importance of skills and technology. Specifically, employment conditions will need to improve through labour-intensive value-adding operations in the midstream and through employee skill development. Moreover, public regulations on work conditions – such as minimum wage requirements and rules on the freedom to organize – need to accompany job creation. Civil society representation of employee interests is critical to level the playing field with employers and to bring about a food system transformation that is inclusive and resilient.

Midstream SMEs provide critical conditions for circular and sustainable food systems if barriers are addressed

A potential trade-off in midstream SME growth is the limited capacity of many SMEs to ensure environmental sustainability. This trade-off can be addressed only by understanding the reasons why SMEs face challenges in meeting sustainability standards. One reason is a lack of awareness and knowledge about the potential of circular agrifood systems (CHAPTER 4). Another constraint is a lack of means and insights to establish inclusive food governance systems. Finally, the costs of adopting measures that increase

sustainability are a major barrier, particularly where there is no financial benefit associated with better environmental performance.

Midstream SMEs' technological choices can have direct effects on the environment. An example of where such choices can be beneficial is the rapid and profound shift over just a decade that Ethiopian grain-trucking SMEs made in the size of their trucks, with a concomitant 50 per cent transport cost decline translated into lower fuel use per ton of grain moved, despite a parallel elimination of fuel subsidies (Minten et al., 2014). In a similar vein, investments in energy-efficient food processing and solar-powered cooling facilities are important to reduce dependence on fossil fuels.

Midstream SMEs can also influence the environment and natural resource management practices on farms. The combination of intensification and sustainable practices in Africa – called “sustainable intensification” (CHAPTER 3) – is correlated with farm links to the midstream (Reardon et al., 1995). That intensification can in turn reduce pressure to use land more extensively and to extend into the commons (Angelsen and Kaimowitz, 2001). Sometimes SMEs get involved, directly affecting farmer sustainability practices: agro-dealer SMEs sometimes bundle training in proper input use with the proviso that chemicals could harm the environment if used incorrectly or excessively (Liverpool-Tasie et al., 2020). By facilitating and encouraging small farmer intensification, midstream SMEs in input value chains and food midstreams can lead small farmers to use more inputs that can cause pollution from farm chemicals, siltation from aquaculture, manure from pig and chicken production, and so on – in short, negative externalities for the environment. A good example of a project that triggered and supported SMEs while protecting the environment is the Community-based Forestry Development Project in Southern States (DECOFOS) in Mexico (BOX 6.5).

Important environmental externalities from midstream SMEs are also related to their operational efficiency. A tension appears here between the use of plastic and aluminium packaging, which generate environmentally damaging rubbish, and the need for modern packaging to reduce food loss and waste. Consumers in Africa and Asia have diverse expectations for package size, labelling and ease of use. Simple changes in package size can greatly affect sales volumes and top-line revenue. Better packaging also extends product shelf life and prevents decay.

As the growth of fast-moving consumer foods and beverages in developing countries drives increasing demand for packaging materials, recycling companies have begun operations. The public's awareness of the environmental harm caused by packaging is gradually on the rise. An alternative to plastic and aluminium might be innovative, moisture-resistant coatings made from biodegradable material. Otherwise, quality-controlled logistics can make fresh product chains smarter by aligning product quality with consumers' quality demands. Sensor measurements and data exchange throughout food value chains could overcome the trade-offs between quality and sustainability in packaging. Such technologies create occasions for a new, comprehensive look at logistics and packaging in midstreams.

BOX 6.5 COMMUNITY-BASED FORESTRY DEVELOPMENT IN MEXICO

The DECOFOS project was designed to address and overcome problems linked to deforestation and forest degradation in rural communities of marginalized forest areas in Campeche, Chiapas and Oaxaca. The project was carried out through the restoration and reforestation of degraded areas, together with the provision of technical and financial support for the development of microenterprises and sustainable production initiatives.

The project was designed based on an analysis of the problems affecting Mexico's forestry sector – problems driven mainly by deforestation and lack of resources, investments and technical capacity. The project had two main components. The first aimed to improve the organizational, planning and managerial capacities of local communities/*ejidos* through the delivery of training courses and workshops related to climate change effects and the adoption of good agricultural/environmental practices to adapt and mitigate these effects, and the formulation of local development plans, participatory environmental assessments and

Source: Cavatassi, 2019.

business plans. The second supported the start-up of microentrepreneurial projects and small businesses related to sustainable production of timber and non-timber forest products and ecotourism. It also promoted the adoption of agroforestry and good environmental practices for climate change mitigation and adaptation.

DECOFOS increased the total asset wealth of beneficiary households by 15 per cent and productive asset ownership by 41 per cent, which resulted in a 22 per cent increase in total annual income among beneficiaries. Results also suggest positive environmental impacts, particularly in Campeche, where the use of natural resources from common land increased by 37 per cent for beneficiaries. In Chiapas, where the project intervention concentrated on supporting small businesses, total income per year increased by 39 per cent among beneficiary households, which translates into a higher average income from business activities of about US\$165 a year over non-beneficiary households.

Investing in infrastructure, financial access, human capital and business organization

Shaping midstream SME development to deliver desired food system outcomes involves several key governance challenges (**BOX 6.6**). Generally, midstream governance in food value chains needs to account for multiple networks of interactions that shape conditions for co-innovation: it requires both technical capacity (hardware) and knowledge and information (software), along with norms and organizations for steering food system transformation (Klerkx and Begeman, 2020). Inclusive, bottom-of-the-pyramid business models in food systems must be based on quality improvement innovations, broad-based marketing and distribution strategies, and training programmes – as well as coalition-building to create new norms and overcome institutional and cultural gaps (Danse et al., 2020).

BOX 6.6 VALUE CHAIN DEVELOPMENT IN NIGERIA

In Nigeria, the Value Chain Development Programme enhances rural incomes and food security by targeting inefficient midstream operations and communication. It works with local government, public and private institutions, and regulators to establish action plans within the midstream for specific commodities. It also enhances multi-stakeholder platforms to allow different actors in the supply chain to share knowledge and conduct business transactions more efficiently. It is a key example of incorporating household methodologies to target disadvantaged groups, using the Gender Action Learning System methodology.

To improve market and business linkages of smallholder farmers, the programme promoted an innovative market-led public-private-producer

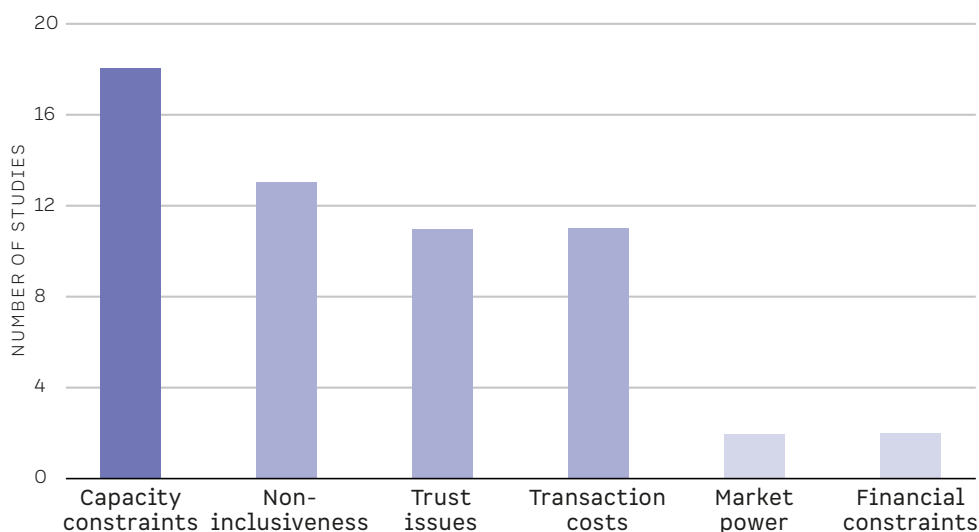
partnership through commodity alliance forums. The forums bring together key private and public stakeholders on a single platform to facilitate business transactions, knowledge-sharing, conflict resolution and policy dialogue. Through the forum, smallholder farmers benefit from market information on, for example, input and output prices, demand (upstream and downstream), loanable funds and more. A spillover effect is a strong producers-off-takers arrangement where farmers have some leverage in price setting and can influence agricultural policies. By 2019, 70,558 women-headed households were engaged through project services, and 41,617 women were supported by the programme (95 per cent above target).

Source: IFAD Value Chain Development Programme, Nigeria, project completion reports and impact assessments.

Distilling the lessons from Liverpool-Tasie et al. (2020), governance initiatives can start by looking at four key constraints on SME participation in healthy, inclusive and sustainable food system transformation:

- **Inadequate infrastructure.** Public investments are needed in physical and communications infrastructure.
- **Weak training and education.** Midstream SMEs can benefit from training in entrepreneurial skills.
- **Limited financial capacity.** Policies are needed to expand SME access to finance.
- **Informality.** This common feature of many midstream SMEs should be seen less as a problem in itself than as a challenge calling for the use of innovative governance approaches.

All of these midstream governance efforts need to focus on midstream transactions, how they are organized and the relationships among parties. Trust between exchange partners needs reinforcement, and reliability must be guaranteed. Also critical is strengthening the bargaining power of smallholder producers, traders and consumers. We know relatively little about this challenge, as it is studied far less than most other constraints facing midstream SMEs (**FIGURE 6.2**). But creating farmer cooperatives and consumer organizations is one promising approach. Another less-studied challenge is financial constraints on midstream SMEs.

FIGURE 6.2 CHALLENGES FACING MIDSTREAM ACTORS IN AGRIFOOD VALUE CHAINS

Source: Liverpool-Tasie et al., 2020.

Infrastructure investments will contribute to inclusive food system transformation

Midstream SMEs working with smallholder farmers in the informal sector have been quite successful in linking farmers to markets – a sign that further support to SMEs in agrifood systems will boost SME development and benefit smallholder farmers economically. Investments in infrastructure and services, aimed at lowering transaction costs, are key to initiating SME activities and increasing rural smallholders' market participation and resource productivity (AGRA, 2019).

In many rural areas of low- and middle-income countries, midstream SMEs are constrained by poor infrastructure, including digital infrastructure (AGRA, 2019; FAO, 2020). Alongside problems with roads and regular access to power, weak digital infrastructure deprives SMEs of an increasingly important element in competitiveness. More generally, poor infrastructure increases transaction costs and reduces the profitability of midstream firms, affecting product retail prices as well as food waste and food quality. Investments in infrastructure – public roads, railways, ports, wholesale markets and electrification, along with mobile phone infrastructure – are thus vital for connecting urban food demand to the midstream entrepreneurs eager to meet that demand.

Transport infrastructure

The importance of good transport infrastructure for reducing transaction costs appears in a recent example from Ethiopia (**BOX 6.7**). Another example is from Nigeria, which expanded highways and rural roads between its northern and southern areas. The expansion spurred development in the trader and

logistics segment, which comprises numerous SMEs, and thus drove growth in the domestic maize midstream: maize producers in the north were connected with retail markets in both the north and the south over a length of about 1,000 kilometres (AGRA, 2019). One immediate effect of the new roads, railways, storage facilities and wholesale markets was to reduce transport time and thereby cut transaction costs – not only for output markets but also for input markets (in fertilizers and feed). Another effect was to improve produce quality through faster handling and better storage.

Although evidence is scarce, wholesale traders' profit margins appear to fall as their numbers increase with the size of operations – an effect of lower handling costs and rising competition. In Ethiopia, as SME traders and truckers invested and multiplied over a decade, three effects followed (Minten et al., 2014, 2016, cited in Reardon, Liverpool-Tasie and Minten, 2020):

- Midstream actors' profit margins – the price gaps between farms and consumers, including mill and retail margins – were reduced as the market became more efficient.
- Spatial integration over the country's wholesale markets increased.
- The number of traders rose, competition rose greatly and average trader size declined somewhat.

Digital technologies

The dynamic development of the midstream is also supported by investments in mobile telephone infrastructure, which boost the use of mobile devices. Digital technologies, including mobile phones, have enormous potential to improve connectivity between suppliers and market agents, and between market agents and consumers (Torero, 2019; Ceccarelli et al., 2021). Digital technologies can make populations of poor people and markets more resilient, as access to technologies can increase the amount and quality of information. For smallholder farmers and the rural poor, better information can mean higher agricultural yields, better trade deals and higher profitability, as well as better job opportunities. It can also promote learning – which will further enhance technology adoption among farmers (Deichmann, Goyal and Mishra, 2016).

Public investment and legislation can stimulate and guide the construction and use of digital networks so that as many people as possible have access to digital services at the lowest possible price. For example, government policies should entice private investors to invest in networks in sparsely populated areas and should ensure healthy competition among private investors to make service prices affordable. Next, policies should stimulate private-sector investments in network rollout and should encourage the offering of useful content in accessible forms. The types of content that could benefit farmers and agrifood SMEs include data specific to the agriculture sector, weather forecasting, advisory and information services (including market information), financial services and midstream management (Ceccarelli et al., 2021).

BOX 6.7 THE ETHIOPIAN TEFF MIDSTREAM TRANSPORT BOOM

In the 2000s, Ethiopia's teff midstream experienced rapid growth and upgrading, driven by investments by large numbers of SME truckers and wholesalers. None of the investments were publicly subsidized – on the contrary, the fuel subsidy was eliminated during that time, making fuel 60 per cent more expensive. Yet transport costs dropped 50 per cent in that decade, and travel time from farm to market fell by 20 per cent.

The drop in transport costs was attributable to three factors. First, the government invested

Source: Minten et al., 2014, 2016, cited in AGRA (2019).

in surfaced roads, which doubled in length over 15 years. Second, private SME truckers invested hugely in trucks to meet increasing demand. Third, the share of small trucks declined: the share of 7.5-ton trucks went from 15 per cent in 2001 to 33 per cent in 2011.

Thanks to these investments, teff sales on wholesale markets across Ethiopia increased by 70–80 per cent over a single decade – and farmers' grain sales doubled, while their fertilizer use also skyrocketed.

The risk is that poorer segments of society, and women generally, will be excluded in the digital age if they do not receive specific support, for example in meeting the cost of use. Digital technology is not gender-neutral: in many situations, men dominate the service industry as well as the user community. But mobile phone services also enable women's access to home delivery of food and can be helpful to overcome customary constraints that limit market access.

The COVID-19 pandemic has shown the potentially positive effects of an acceleration towards digitalization, but it has also shown the differences in accessing digital devices, in internet penetration and in access to technology across countries, genders and groups. The pandemic crisis could be a catalyst to help close the current gaps, particularly in low- and middle-income countries, accelerating digital transformation in sectors such as financial services, retail, education, agriculture and government (Ceccarelli et al., 2021).

Investments in educational and training programmes should promote entrepreneurial capacities

Two types of human capital investment are considered to overcome current constraints: educational programmes and training in emotional and organizational skills for the workplace. Less in demand is general technical training – labour skills and quality, along with labour quantity, are not regarded as areas of major constraint (AGRA, 2019).

Where specific skills are needed, a case can be made for targeted vocational training. Many examples pertain to the digital revolution: SMEs will require training to use ICT-enabled technologies for production, food safety and commercial procedures (AGRA, 2019). But young SME entrepreneurs also need assistance to analyse market potential, identify priority policy and regulatory issues and access specialized training in the face of emerging downstream challenges – such as how to meet local and international food safety standards (Allen et al., 2016).

Generally, for midstream development to continue reinforcing food supply, employment and diversified incomes, SMEs need vocational training and sector-wide business organization – and better financial access. The “hidden middle” of midstream agrifood enterprises requires support to fill the “missing middle” of agrifood support services.

Improved lending facilities for SMEs are key for longer-term midstream development dynamics

While access to finance is a major constraint for all types of SMEs, those involved in agricultural midstreams have especially limited access to credit. To banks, SMEs’ informal management and lack of collateral appear risky (Alibhai, Bell and Conner, 2017). Further, banks do not give agriculture high priority because it faces risks that banks struggle to understand and manage, such as price volatility and drought – and also because of the high cost of serving rural customers. As a result, agriculture is highly underfinanced. Recent studies show that the trade finance to agrifood midstream SMEs in developing markets is both promising and challenging (**BOX 6.8**).

The generally high operating costs of reaching rural SMEs and the high risk of lending to informal SMEs in agricultural value chains both point to a need for guarantee and risk-sharing facilities. Such facilities can reduce investment risks to lenders, whether the lenders are local or foreign, private or donor. To absorb risk among newer and less formal borrowers, Dalberg (2018) suggests donor interventions such as new types of credit guarantee schemes. Also suggested is capacity-building for lenders with limited agricultural experience, to improve their underwriting and risk assessment. To unlock the flow of finance to agrifood SMEs, four types of blended finance instruments are further recommended for exploration:

- **Output-based incentives.** A financial incentive facility can encourage lending to segments that lenders find unprofitable to serve in the short term but that demonstrate high-impact potential.
- **Risk mitigation.** A risk-absorbing facility, such as a system of partial credit guarantees, can encourage lenders to explore riskier segments, which is particularly important in the context of climate change adaptation.
- **Direct funding.** Providing concessional funding to lenders can lower their required rate of return.
- **Technical assistance.** In addition to direct financial support to lenders, advisory support on risk management or on the use of improved technology can help by lowering lenders’ operating costs.

BOX 6.8 LENDING TO AGRIFOOD SMES

Based on an analysis of 3,600 individual loans provided by nine members of the Council on Smallholder Agricultural Finance, Dalberg (2018) finds that, while over 50 per cent of the trade finance loans were profitable, an average loan of US\$665,000 lost about US\$1,800 (not including the cost of funds). Further analysis shows that the economics of the loans varied substantially by certain characteristics, including loan size and midstream. Specifically:

- Larger loans performed better than smaller ones – operating costs are similar across different loan sizes, but interest and fee income are proportional to loan size.
- Loans to existing borrowers were significantly more profitable than loans to new borrowers.
- Loans in more formal coffee and cocoa midstreams performed better than loans in other crop markets.
- Short-term loans (less than 12 months) performed better than long-term loans (12 months or more).

Source: Dalberg, 2018.

Generally, poor access to finance is among the main constraints on the private sector's ability to improve food system outcomes. Agrifood SMEs generally are small businesses, without proper accounting, licensing and official registration as commercial enterprises. For midstream SMEs to gain more access to finance, they must become better organized and more professional, lowering the risk perceived by lenders. That requires capacity-building and technical assistance in setting up and running a business – including ways to meet market requirements and comply with standards. This largely informal sector must become part of the food system transformation strategy.

Informality

In low- and middle-income countries, vast numbers of midstream SMEs operate informally through self-regulated networks without legal status – a fact with both positive and negative implications. On the positive side, informality supports inclusiveness in food systems, as informal arrangements are more accessible to small-scale producers than are formal contracts with larger companies. The informal sector has played a notable role in guaranteeing food security since the onset of the COVID-19 pandemic (Wegerif, 2020). On the negative side, one effect of weak institutions, governance and enforcement is a lack of trust between farmers and buyers (Liverpool-Tasie et al., 2020).

Improvements in food system governance need to fully account for the large category of informal midstream SMEs – including street vendors and hawkers – and be informed by a thorough insight into how these businesses function. In contrast to conventional strategies for formalizing informal SMEs, policy approaches may consider alternative strategies that harmonize the informal economy with the needs of more disadvantaged segments of rural society.

The effects of the COVID-19 pandemic on food systems and their resilience indicate the importance of knowing more and in a more granular manner about the actors that operate in food systems and of which SMEs and the midstream are a big part (Béné et al., 2021). Particularly important is knowing more about the formal and informal systems, processors, retailers, transporters, distributors and so on. Granular and precise data related to this segment of food systems would contribute to expanding and deepening knowledge on food systems and their resilience.

Policy priorities for expanding midstream SMEs

Agrifood midstream SMEs can support desired food system outcomes by improving livelihoods and – if properly supported – by improving inclusion, nutrition and sustainability. While linking smallholder farmers to both input and output markets, the midstream segment also creates employment and income opportunities outside primary production, particularly for women and youth. Midstream SMEs are proliferating rapidly in developing regions, and are very likely to develop further and provide employment to growing numbers of rural residents outside agriculture.

Midstream SMEs are proliferating rapidly in developing regions, and are likely to develop further and provide employment to growing numbers of rural residents.

Policymakers should focus on seven priorities:

1. **Enable midstream SMEs to raise agricultural productivity.** In addition to midstream SMEs' role in supporting smallholders in gaining access to quality inputs and good agricultural practices, downstream investments in processing and packaging facilities, transport logistics and cold-chain management help to guarantee continual production and consistent product quality. SMEs are therefore considered key multipliers for investment in domestic and regional markets.
2. **Facilitate midstream SMEs in contributing to food quality and diet diversity.** Food trade in low- and middle-income countries is largely an informal activity. There are substantial benefits to adopting a facilitative approach towards informal businesses. In particular, light-touch interventions centred around training and behaviour change can yield significant improvements in the quality of products and services (Robinson and Yoshida, 2016). In addition, engaging SMEs in food fortification programmes, public food distribution systems (vouchers) and school feeding programmes contributes to healthier diets. Other public support to midstream SMEs includes financial incentives to comply with food safety standards, and facilities to implement technical

- assistance programmes to ensure that midstream SMEs deliver safe and healthy foods.
3. **Improve labour market functioning and the business climate.** Further development of agrifood midstream SMEs can support competitive conditions and contribute to a better functioning labour market. These SMEs are the drivers of economic growth, socio-economic inclusion and long-term sustainability. Technical and vocational training provided to youth, adolescents and women has proved helpful in strengthening entrepreneurial activities and enabling entry into self-employment activities. Further public efforts should seek to reduce business start-up costs and to improve the business climate.
 4. **Provide market incentives for SME investments to strengthen more circular and sustainable food systems.** Midstream SMEs generate substantial environmental externalities through agrochemical use and through unresolved trade-offs between packaging materials and food waste. Investments in better equipment, technical innovations and knowledge can help midstream SMEs meet sustainability standards. Joint efforts are needed to raise awareness about sustainable production practices and circular principles in the midstream constituency – and will depend on the creation of market incentives for the fair and true pricing of products and services.
 5. **Enhance midstream contributions for food system sustainability.** Long-term delivery contracts that support mutual relationships and co-investment with upstream or downstream partners offer interesting experiments in enhancing midstream contributions to food system sustainability. ICT approaches (that is, the use of mobile phones, internet and/or data processing for market information) for smart chain integration and integrated quality logistics based on multi-stakeholder cooperation can speed up the transition to more resilient and circular food systems.
 6. **Base supply chain governance on social norms, public policies and private investment.** Because SMEs face challenges in standards compliance, transforming food systems requires a combination of public policies, private investments and social networks to foster adherence to norms – whether for product quality, food safety, decent labour conditions or sustainable practices. Investments are needed to improve midstream SMEs' market access, to build their human capital and to expand their financial opportunities – all within a highly informal, network-based structure.
 7. **The “hidden middle” of midstream agrifood enterprises needs support to fill the “missing middle” in agrifood support services.** Beyond improved access to material services, shared norms – for the establishment of mutual trust, reliable transactions and transparent

relationships – are critical to reduce risks of collusion and exclusion. Food system transformation will succeed only if SMEs can overcome discriminatory norms and practices.

Lessons from the COVID-19 pandemic and the resulting restrictions should support SME innovations that were triggered in response to the shock. So far, not much systematic information is available on these entrepreneurial responses, and more granular data are needed. Anecdotal evidence suggests that these innovations will be crucial to shaping the future of the agrifood system and to strengthening its resilience.

Simulation 6 in annex 1 illustrates how subsidizing labour to increase midstream employment, against a business-as-usual baseline, improves inclusiveness but has mixed impacts on nutrition and sustainability.

References

- AGRA. 2019. Africa Agriculture Status Report: The Hidden Middle: A Quiet Revolution in the Private Sector Driving Agricultural Transformation (Issue 7). Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA).
- AGRA. 2020. Africa Agriculture Status Report. Feeding Africa's Cities: Opportunities, Challenges and Policies for Linking African Farmers with Growing Urban Food Markets (Issue 8). Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA).
- Alibhai, S., Bell, S. and Conner, G. Eds. (2017). What is happening to the missing middle? Washington, D.C.: World Bank.
- Allen, A., Howard, J., Kondo, M., Jamison, A., Jayne, T., Snyder, J., Tschirley, D. and Yeboah, K.F. 2016. Agrifood Youth Employment and Engagement Study (AgYeEs report). Michigan State University.
- Ampadu, R.A. and Omari, R. 2015. Small-Scale Rural Agro-Processing Enterprises in Ghana: Status, Challenges and Livelihood Opportunities of Women. *Journal of Scientific Research and Reports*: 6(1): 61-72.
- Angelsen, A. and Kaimowitz, D. (eds). 2001. Agricultural technologies and tropical deforestation, Wallingford, UK: CAB International.
- Béné, C., Bakker, D., Chavarro Rodriguez, M., Even, B., Melo, J. and Sonneveld, A. 2021. *Impacts of COVID-19 on people's food security: foundations for a more resilient food system*. Report prepared for the CGIAR COVID-19 Hub Working Group 4, CGIAR.
- Bruhn, M., Hommes, M., Khanna, M., Singh, S., Sorokina, A. and Wimpey, J.S. 2017. MSME finance gap: Assessment of the shortfalls and opportunities in financing micro, small, and medium enterprises in emerging markets. Washington, D.C., World Bank Group. Retrieved from <http://documents.worldbank.org/curated/en/653831510568517947/MSME-finance-gap-assessment-of-theshortfalls-and-opportunities-in-financing-micro-small-and-medium-enterprises-in-emerging-markets>.
- Cavatassi, R. 2019. DECOFOS Impact Assessment Report. https://www.ifad.org/documents/38714170/41096508/MX_DECOFOS_IA+brief.pdf/bed6fcb9-6488-e915-1b49-b664924ebd9f.
- Cavatassi, R., González-Flores, M., Winters, P., Andrade-Piedra, J., Espinosa, P. and Thiele, T. 2011. Linking Smallholders to the New Agricultural Economy: The Case of the Plataformas de Concertación in Ecuador. *The Journal of Development Studies*. 47:10, 1545-1573, DOI: 10.1080/00220388.2010.536221.
- Ceccarelli, T., Kannan, S., Cecchi, F. and Janssen, S. 2021. Contributions of ICT and Digitalization to Food Systems Transformation. Background paper for the *Rural Development Report 2021*. IFAD. Rome: Italy.
- Chase-Walsh, S. 2018. Willingness to Pay for Processed Grains in Dakar Senegal: an analysis Using Discrete Choice Experiments. Department of Agricultural, Food, and Resource Economics, Master of Science Thesis. Michigan State University.
- Clay, D., Reardon, T. and Kangasniemi, J. 1998. Sustainable Intensification in the Highland Tropics: Rwandan Farmers' Investments in Land Conservation and Soil Fertility, *Economic Development and Cultural Change*, 46 (2) (January): 351-78.
- Dalberg. 2018. The Economics of Agri-SME Lending in East Africa, Dalberg/CSAF.
- Danse, M., Klerkx, L., Reintjes, J., Jorrit, Rabbinge, R., Rudy and Leeuwis, C. 2020. Unravelling inclusive business models for achieving food and nutrition security in BOP markets. *Global Food Security*. 24. 100354. 10.1016/j.gfs.2020.100354.
- Das Gupta, S., Reardon, T., Minten, B. and Singh, S. 2010. *The Transforming Potato Value Chain in India: Potato Pathways from a Commercialized-Agriculture Zone (Agra) to Delhi*. IFPRI Report to the Asian Development Bank.
- Deichmann, U., Goyal, A. and Mishra, D. 2016. Will Digital Technologies Transform Agriculture in Developing Countries? World Bank Policy Research Working Paper 7669 (WPS7669). World Bank. Washington, D.C.
- Demmler, K.M. 2020. The Role of Small and Medium-sized Enterprises in Nutritious Food Midstreams in Africa. Global Alliance for Improved Nutrition (GAIN). Working Paper Series #2. Geneva, Switzerland, year. DOI: <https://doi.org/10.36072/wp.2>.
- Demmler, K.M., Ecker, O. and Qaim, M. 2018. Supermarket shopping and nutritional outcomes: A Panel data analysis for urban Kenya. *World Development*, 102, 292-303.
- Dolislager, M., Reardon, T., Arslan, A., Fox, L., Liverpool-Tasie, S., Sauer, C. and Tschirley, D. 2018. "Youth Agrifood System Employment in Developing Countries: A Gender Differentiated Spatial Approach," IFAD Research Series 43 (IFAD, Rome).
- Dolislager, M., Reardon, T., Arslan, A., Fox, L., Liverpool-Tasie, S., Sauer, C. and Tschirley, D. 2020. Youth and adult agrifood system employment in developing regions: Rural (Peri-urban to hinterland) vs urban. *Journal of Development Studies*. Published online Sept14. <https://doi.org/10.1080/00220388.2020.1808198>.
- FAO. 2020. *The State of Agricultural Commodity Markets 2020. Agricultural markets and sustainable development: Global value chains, smallholder farmers and digital innovations*. Rome, FAO.
- Grace, D. 2015. Food Safety in Low and Middle Income Countries. *Int J Environ Res Public Health*. 2015 Sep; 12(9): 10490-10507. Doi: 10.3390/ijerph120910490.

- Haggblade, S. 2011. Modernizing African agribusiness: Reflections for the future. *Journal of Agribusiness in Developing and Emerging Economies* 1(1): 10-30.
- Haggblade, S., Hazell, P.B.R. and Reardon, T. 2010. The Rural Nonfarm Economy: Prospects for Growth and Poverty Reduction, *World Development*. 38(10): 1429-1441.
- KIT. 2015. Balancing risk and striving for impact – Providing finance to SMEs in developing countries. Royal Tropical Institute, Amsterdam.
- Klerkx, L. and S. Begeman (2020). Supporting food systems transformation: The what, why, who, where and how of mission-oriented agricultural innovation systems, *Agricultural Systems* 184(2):102901, DOI: [10.1016/j.agsy.2020.102901](https://doi.org/10.1016/j.agsy.2020.102901).
- Lamuka, P.O. 2015. Challenges of management of food safety in African countries. Presentation at the Food Safety Summit Africa, May 28-29 2015, Nairobi, Kenya.
- Lipper, I., Anderson, C.L. and Dalton, T. 2010. *Seed Trade in Rural Markets Implications for Crop Diversity and Agricultural Development*. FAO, Rome, Earthscan.
- Liverpool-Tasie, S., Reardon, T., Sanou, A., Ogunleye, W., Ogunbayo, I. and Omonona, B.T. 2017. *The transformation of value chains in Africa: Evidence from the first large survey of maize traders in Nigeria*. Nigeria Agricultural Policy Project Research Paper 91. Feed the Future Innovation Lab for Food Security Policy, Michigan State University.
- Liverpool-Tasie, L.S.O., Okuku, I., Harawa, R., Reardon, T. and Wallace, S. 2019. Africa's Changing Fertilizer Sector and the Role of the Private Sector. Chapter 9 in AGRA, *Africa Agriculture Status Report: The Hidden Middle: A Quiet Revolution in the Private Sector Driving Agricultural Transformation (Issue 7)*. Nairobi, Kenya.
- Liverpool-Tasie, L.S.O., Wineman, A., Young, S., Tambo, J., Vargas, C., Reardon, T., Adjognon, G.S., Porciello, J., Gathoni, N., Bizikova, L., Galiè, A. and Celestin, A. 2020. A scoping review of market links between value chain actors and small-scale producers in developing regions. *Nature Sustainability*. October. <https://doi.org/10.1038/s41893-020-00621-2>.
- Liverpool-Tasie, L.S.O., Sanou, A., Reardon, T. and Belton, B. 2021. Demand for Imported versus Domestic Fish in Nigeria: Panel Data Evidence. *Journal of Agricultural Economics*. Accepted December 16, forthcoming.
- Minten, B., Singh, K.M. and Sutradhar, R. 2013. Branding and agricultural value chains in developing countries: Insights from Bihar (India). *Food Policy*. 38: 23-34.
- Minten, B., Mohammed and B., Tamru, S. 2020. Emerging Medium-Scale Tenant Farming, Gig Economies, and the COVID-19 Disruption: The Case of Commercial Vegetable Clusters in Ethiopia. *The European Journal of Development Research*. 32: 1402-1429.
- Minten, B., Reardon, T., Singh, K.M. and Sutradhar, R. 2014. The new and changing roles of cold storages in the potato midstream in Bihar. *Economic and Political Weekly*, XLIX (52), December 27: 98-108.
- Minten, B., Assefa, T., Abebe, G., Engida, E. and Tamru, S. 2016. *Food processing, transformation, and job creation: The case of Ethiopia's enjera markets*. Washington, D.C.: International Food Policy Research Institute, Ethiopia Strategy Support Programme (ESSP) Working Paper 96.
- Qanti, S.R., Reardon, T. and Iswariyadi, A. 2017. Triangle of linkages among modernizing markets, sprayer traders, and mango-farming intensification in Indonesia. *Bulletin of Indonesian Economic Studies*. 53(2): 187-208.
- Randolph, 2021. Food safety in formal & informal markets and food systems transformation. Background paper for the *Rural Development Report 2021*. IFAD. Rome: Italy.
- Reardon, T. 2015. The Hidden Middle: The Quiet Revolution in the Midstream of Agrifood Value Chains in Developing Countries. *Oxford Review of Economic Policy*. 31(1), Spring: 45-63.
- Reardon, T. and Berdegue, J.A. 2002. The Rapid Rise of Supermarkets in Latin America: Challenges and Opportunities for Development. *Development Policy Review*, 20 (4) 371-388.
- Reardon, T., Liverpool-Tasie, L.S.O. and Minten, B. 2021. The SMEs' Quiet Revolution in the hidden middle of food systems in developing regions. Background Paper for the *Rural Development Report*. IFAD Rome: Italy.
- Reardon, T. and Swinnen, J. 2020. *COVID-19 and resilience innovations in food midstreams*. Blog, IFPRI, COVID-19.
- Reardon, T., Thiombiano, T. and Delgado, C. 1989. L'importance des céréales non traditionnelles dans la consommation des riches et des pauvres à Ouagadougou. *Économie Rurale* 190, 9-14.
- Reardon, T. and Timmer, C.P. 2012. The economics of the food system revolution. *Annual Review of Resource Economics* 2012, 4:225-264.
- Reardon, T. and Timmer, C.P. 2014. Five inter-linked transformations in the Asian agrifood economy: Food security implications. *Global Food Security*. Volume 3, Issue 2, July 2014, pp. 108-117.
- Reardon, T., Crawford, E., Kelly, V. and Diagana, B. 1995. *Promoting farm investment for sustainable intensification of African agriculture*. MSU International Development Paper No. 18. Department of Agricultural Economics, Department of Economics. East Lansing: Michigan State University. ISSN 0731-3438.
- Reardon, T., Chen, K.Z., Minten, B., Adriano, L., Dao, T.A., Wang, J. and Das Gupta, S. 2014. The Quiet Revolution in Asia's Rice Value Chains. *Annals of the New York Academy of Sciences*. 1331: 106-118.

- Reardon, T., Tschirley, D., Liverpool-Tasie, L.S.O., Awokuse, T., Fanzo, J., Minten, B., Vos, R., Dolislager, M., Sauer, C., Dhar, R., Vargas, C., Lartey, A., Raza A. and Popkin, B.M. 2021. The processed food revolution in African food systems and the double burden of malnutrition. *Global Food Security* 28: 100466.
- Robinson, E. and Yoshida, N. (2016) Improving the Nutritional Quality of Food Markets through the Informal Sector: Lessons from Case Studies in Other Sectors, IDS Report 171, Brighton: IDS.
- Roesel, K. and Grace, D. 2014. Food safety and informal market. Animal products in Sub-Saharan Africa. International Livestock Research Institute, Nairobi, Kenya.
- Sauer, C., Reardon, T. and Liverpool-Tasie, L.S.O. 2020. A Million People in Motion: Labor Demand in the Nigerian Maize-Feed-Poultry Value Chain. Report for the Sustainable Intensification Innovation Lab (SIIL), May.
- Snyder, J.E., Ijumba, C., Tschirley, D. and Reardon, T. 2015. *Local Response to the Rapid Rise in Demand for Processed and Perishable Foods: Results of Inventory of Processed Food Products in Dar es Salaam*. Feed the Future Innovation Lab for Food Security Policy Research Brief 6. East Lansing: Michigan State University, May.
- Torero, M. (2019). The midstream of ICT by SMEs and LE's in Africa: effects on farms. In: AGRA, 2019. *Africa Agriculture Status Report: The Hidden Middle: A Quiet Revolution in the Private Sector Driving Agricultural Transformation (Issue 7)*. Nairobi, Kenya: Alliance for a Green Revolution in Africa (AGRA).
- van Campenhout, B., Minten, B. and Swinnen, J. 2019. Forthcoming. Domestic versus export-led agricultural transformation: Evidence from Uganda's dairy value chain. *Agricultural Economics*, accepted 2020.
- van Manen, B. 2018. Critical Capital for African Agrifood SMEs A review of demand for and supply of risk capital for agrifood SMEs in Sub-Sahara Africa. Based on field studies in Kenya, Tanzania, Zambia and Mali. AgriProFocus, ICCO Cooperation and Rabobank Foundation supported by the Food & Knowledge Business Platform.
- Vos, R. and Cattaneo A. 2020. Making Food System Value Chains Inclusive, Global Food Policy Report, pp. 14-26. Washington, D.C.: IFPRI.
- Wegerif, M.C.A. 2020. "Informal" food traders and food security: experiences from the Covid-19 response in South Africa. *Food Sec.* 12, 797-800. <https://doi.org/10.1007/s12571-020-01078-z>.
- Zhang, X., Yang, J. and Reardon, T. 2017. Mechanization outsourcing clusters and division of labor in Chinese agriculture. *China Economic Review.* 43: 84-195.