CHAPTER 7

Policy Responses to Rapidly Transforming Midstream Value Chain Segments in Africa: The Case of the Millet Sector in Senegal

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Reflecting the faster pace of economic growth and recovery among African countries, African agricultural value chains have been transforming and modernizing rather rapidly over the last two decades. The regained dynamism of agricultural value chains is observable both in terms of growing foreign export volumes and in expanding local food markets. For instance, the real value of African agricultural exports has increased from less than US$20 billion in 2000 to more than US$60 billion in 2013, a threefold increase in less than two decades (Traore and Sakyi 2018). The volume of marketed food in local markets has expanded sixfold over the last 40 years, with much of that growth taking place in the 1990s and 2000s (Reardon et al. 2015). Moreover, current projections indicate that agrifood markets in Africa will expand by another 600 percent in the next four decades (Haggblade 2011).

Major drivers behind this rapid pace of expansion and transformation include a rapid rate of urbanization (the fastest in the world), an equally rapidly rising middle class, and a still young and growing population, all of which are fueling a booming demand for food, in particular processed food, in local and regional markets (Tadesse 2018). As a result, experts project that by 2040, two-thirds of the demand for traditional staples will consist of processed foods (Badiane and Ulimwengu 2017; Tschirley et al. 2015).

Currently, growth in food demand is far outpacing growth in production, despite record rates of agricultural sector growth, leading to rising food imports and a widening food trade gap in recent times (Traore and Sakyi 2018). The dynamics of local food markets therefore offer considerable opportunities to boost enterprise creation and growth in domestic value chains and promote agro-industrialization. This effort calls for well-thought-out and well-designed public policy interventions that respond to the needs of economic actors along all key segments of agricultural value chains.

While encouraging, the transformation described above is at the very beginning stage and comes in the aftermath of several decades of decline and stagnation in Africa's agricultural sector. Accelerating and deepening the modernization of traditional value chains must be a key component of national strategies to restore and maintain growth in the agricultural sector on the trajectory of rapid growth of the 1960s (Badiane and Makombe 2015). Currently, processing and other mid-chain segments1 constitute the main bridge linking smallholder farmers to food demand, which is increasingly dominated by middle-income consumers in rapidly growing and advancing urban markets (Tschirley et al. 2015). The performance of the domestic processing sector and related segments will, therefore, determine the performance and future growth potential of smallholder producers. Public policies to boost the performance of the emerging processing sector and other mid-chain segments will be at the heart of efforts to promote rural development, improve nutrition outcomes, and enhance prosperity in African economies.

In principle, value chain development interventions should aim to capitalize and sustain emerging transformations driven by local, regional, and global trends instead of trying to induce transformation from "ground zero" (Stamm 2004). This approach requires the alignment of policy targeting and prioritization with the changing needs of the rapidly transforming value chains, which are characterized by a number of features that were less pronounced in the traditionally shorter staples value chains that barely extended beyond production centers and their satellite rural towns (Badiane and Ulimwengu 2017).

Today's longer value chains reach far beyond larger cities and megapolises into the wider regional markets. They involve a much broader and rapidly growing set of economic actors across old and new segments, including transport, processing, packaging, distribution, branding, grading, safety, and so on. They tend to be dominated by a large and rising number of small and informal enterprises engaged primarily in processing and retailing activities that are struggling to meet the equally rapidly changing dietary preferences of a more sophisticated urban middle class. Value chain policies in this context not only need to deal with the complex set of challenges and opportunities across all key segments, but they also need to be able to adapt to changing technology and market trends.

This chapter aims to assess the performance of and policy responses to Africa's rapidly emerging traditional staples value chains, which are dominated by small and medium-sized enterprises (SMEs) in the processing and trading segments. It addresses questions related to policy process issues such as (1) whether public intervention policies in Africa are in line with the needs and performance of the rapidly transforming value chains, and (2) how African

1 "Mid-chain segment" is used here to refer to those actors or activities at the midstream of the value chain. Specifically, mid-chain segments are wholesalers (wholesaling), processors (processing), retailers (retailing), and other support-providing activities such as logistics. "Mid-chain" is used synonymously with "midstream."

governments should align policy interventions in emerging mid-chain segments to foster effective value chain development. The chapter uses the example of one of the most dynamic and fastest-growing staples value chains in Africa, the millet value chain in Senegal, thus contributing specifically to Senegal's agro-industrial policy discourse. We begin with a review of value chain development evolution as a concept and in practice in Africa as a whole and outline a comprehensive list of critical policy concerns and priorities that must be addressed to respond to the needs of midstream value chain segments.

Review of Value Chain Development Policies in Africa

The concept of value chain development first emerged as a business development strategy of private-sector companies in the 1980s (Girvan 1987; Porter 1985, 2001). The original concept rests on the idea that a firm can develop strategies to improve and maintain its competitive advantage by disaggregating its core activities and quantifying the value of each activity (Stamm 2004). Lately, this firm-level analysis has been extended to entire supply chains and distribution networks. As a result of the shift in focus from firm to system levels and a more evident link between growth driven by the private sector and poverty reduction, the concept of value chain development attracted public investors such as donors and governments in the late 1990s (Altenburg 2007).

Though the idea of developing the entire range of agricultural actors has long existed, value chain development as an agricultural transformation strategy became prominent in the 2000s (Altenburg 2007). The emergence of value chain approaches helped address the long-standing development issue of farmers and other producers of primary commodities receiving only a fraction of the retail price of the end products created from those commodities. This approach has helped policymakers focus on the entire chain, from production to consumption, of a specific commodity and is increasingly seen as an important approach to agricultural development that explicitly recognizes the role of the private sector and the fact that agricultural markets and institutions rarely function efficiently. It goes beyond interventions that develop input and outputs markets in general to making more focused interventions to improve the competitiveness of selected commodities.

In addition to fostering agricultural transformation to meet the ever increasing and diversified urban food demand, value chain development has been praised for its role as a poverty reduction strategy (Horton et al. 2016). It has also helped policymakers rethink the need to transform the long-lived trends of exporting primary products and importing processed food products and creating value and employment opportunities for the rapidly growing young population (Monga, Shimeles, and Woldemichael 2019).

Recognizing all these benefits, the African heads of state, through the Malabo Declaration of 2014, adopted value chain development as one of the key areas of the Comprehensive Africa Agriculture Development Programme agenda (AUC 2014). The strategy advocates the importance of targeted public investment in selected value chains for which a country has a competitive and comparative advantage, focusing around three major objectives: (1) commercializing smallholders, (2) improving agricultural markets, and (3) boosting and sustaining agribusiness and agro-industries.

The first two objectives above are dealt with in other chapters of this report. When it comes to boosting and sustaining agribusiness and agro-industries, public policies have for many decades failed to recognize the central role played by the private sector. The role of the private sector has since been increasingly acknowledged, starting with the major reforms carried out in the 1980s under the structural adjustment programs and accelerating with the recent embrace of the concept of value chain development as an agricultural transformation strategy in the late 1990s (UN 2001; AUC 2014;). Previously, middlemen and other private sector actors were perceived rather negatively as "exploiters" or "rent seekers" (AGRA 2019). Many governments were extremely reluctant to recognize the central and positive role of the private sector in agriculture (Stampini et al. 2013). With acceptance of the role of the private sector well established, more attention is now being paid to issues such as competitiveness, sector transformation, and inclusiveness in agribusiness and agro-industries. As a result, the private sector today accounts for the largest share of actors involved in agricultural trading; processing; and services such as agricultural finance, input distribution, and transport operation, among others (Stampini et al. 2013).

The strong rationale for supporting the private sector in agrifood value chains stems from the need to create jobs for the growing number of unemployed youth and to encourage creativity and innovation (Michael and Pearce 2009;

Dodgson 2000). Governments pursue these policy objectives using two types of public interventions. Public policy interventions in the first category, focusing on incubation and other enterprise-level measures, tend to be more adapted to the needs of traditional staples value chains, which are dominated by millions of small enterprises facing a myriad of barriers to access services, technology, financing, or markets. Most of the private enterprises in agricultural value chains are SMEs, the majority of which lack basic experiential and financial capacities. Support strategies often tend to focus on the incubation of SMEs to facilitate access to technology, financial services, and networking. There is strong evidence of the benefits of providing financial intermediation and other support to incubated small businesses in the short term (Blattman, Fiala, and Martinez 2018; Blattman, Dercon, and Franklin 2019).

Interventions in the second category are more aligned with the needs of large-scale agro-industrial enterprises in global or traditional export value chains, such as those of vegetable oils, tropical beverages, cotton, sugar, and so on. These interventions are made at the value chain level, targeting job creation for youth. A prominent example is the practice of establishing agro-industrial parks or zones to facilitate linkages among value chain actors, boost access to services, encourage innovation, reduce transaction costs, and enhance competitiveness.

Whether one is dealing with SMEs or large-scale agro-industrial enterprises, public policy interventions can broadly be classified into three domains, which we refer as the three I's of value chain development policy: infrastructure, institutions, and incentives (Badiane et al. 2015; Donovan et al. 2015). Policy interventions in the *infrastructure domain* seek to overcome obstacles that impede, and thus raise the cost related to, the provision or movement of goods and services. Ultimately, they reduce firms' cost of access to needed technologies, services, and markets. The same applies to policy interventions targeting the *incentives domain*, with the difference that policy measures here focus primarily on rewarding (or sanctioning) desired (or undesired) business operations. Policies in the *institutions domain*, in contrast, define the rules of the game to facilitate efficient operations and transactions by firms and economic actors.

Policies in the incentives domain tend to be of a corrective nature, as they seek to protect or empower a specific group of actors in some part of a value chain to make business decisions or carry out transactions that would not otherwise take place in the context of existing infrastructural and/or institutional environments. In that sense, these policy interventions tend to correct or compensate for failures in the infrastructure and institutional spheres. The effectiveness and net welfare benefit of the various polices depend on the extent to which they are effectively targeted to the right segments and actors along the value chain as well as the timing of their rollout over the stages of value chain growth and firm maturation.

In all policy domains, real policy planning and implementation challenges persist and significantly determine the success or failure of the interventions. A first major policy concern relates to the extent of complementarity among infrastructural and institutional support. A classic example is the promotion of extension services to deliver improved production services without accompanying investments, policies, and regulation to boost transport and market infrastructure. More recent cases include efforts to extend access to mobile technology without the necessary institutional and regulatory arrangement to stimulate ag-tech services and content creation (Tadesse and Bahiigwa 2015); warehouse receipt system and commodity exchanges (Sitko and Jayne 2012); and emerging industrial parks (Boamah and Sumberg 2019; Ulimwengu and Jenane 2019).

A second set of concerns relates to the scalability of successful interventions. Conway, Badiane, and Glatzel (2019) argue that several good practices have contributed to the recent progress in terms of economic growth and poverty reduction in Africa. But sustaining and expanding such growth and poverty reduction depends on the capacity to scale up these innovations and broaden their reach, both at the enterprise level and at the value chain level.

A third concern revolves around the effective combination of public policy interventions to enhance entrepreneurship in agribusiness value chains—for instance, the combination of training with financial support interventions. An experimental study of interventions providing business training with and without financial grants has shown that business training alone improves business practices but not business profits, sales, or capital stock. However, the combination of grants plus training increases business profitability, but only in the very short run (De Mel, McKenzie, and Woodruff 2012). Other evidence confirms that the provision of business grants with training improves the performance of investments in income-generating enterprises, more than do subsidized microcredits with training (Tadesse and Zewdie 2019). Many studies confirm that

entrepreneurship business training can generally improve the performance and business practices of youths and SMEs, provided that the training is well targeted and comprehensive (Al-Awlaqi, Aamer, and Habtoor 2018; Gielnik et al. 2017; Krause, McCarthy, and Chapman 2016; Ladzani and Van Vuuren 2002).

The fourth and probably most important concern relates to the adequacy and prioritization of policy responses to emerging and continuing changes in agrifood value chains. As staples value chains continue to transform, new segments and clusters, more and larger enterprises, and a rising number of more diverse and specialized actors enter the chain. This in turn leads to a steadily changing landscape of obstacles, challenges, and opportunities that call for different policy responses. Thus, an effective public policy response must align with emerging needs and constraints in order to sustain and accelerate the transformation process: the prioritization of sectors and market actors must be revisited, new policy solutions identified, and failed policies replaced by successful ones, among other efforts. If these are done, , the timeliness and orderliness of interventions play a significant role in determining policy effectiveness and outcomes (Sonobe and Otsuka 2011).

Performance of Midstream Segments of the Millet Value Chain

The Role of Millet in the Senegalese Economy and Policy

Millet is one of the main cereals grown under rainfed agriculture in Senegal, in addition to sorghum and maize. It is the first agricultural staple in Senegal and covers 42.9 percent of total harvested areas (Fall and Dièye 2008). Millet and sorghum represent 69 percent of the area planted with cereals (MAER 2018). They are grown either in continuous pure cultivation in box fields, or in rotation with groundnuts, or in mixed crop with cowpea. The main production regions are in the center (Groundnut Basin) and in the south of the country (Casamance, Tambacounda).

Millet has a prominent place in Senegal's food security strategies.I It has long been the daily food staple for rural populations, despite a notable breakthrough of rice in dietary habits. Millet consumption has been on a downward trend, falling from 78.0 kilograms per capita in 1990 to 48.9 kilograms per capita in 2009. The share of millet in cereal consumption thus dropped from 42 percent to 25 percent in 2008 (ReSAKSS, MSU, and Syngenta 2011). However, this share has remained above 70 percent in the Groundnut Basin area and in the southeast region of Tambacounda (Duteurtre, Faye, and Dièye 2010).

Despite this downward trend, the introduction of mills and equipment for the processing of small quantities of millet has greatly facilitated the preparation of millet-based foods in rural areas and fueled consumption in urban areas, among the wealthier segments of the population, as well as in food-deficit rural towns (Faye and Gueye 2010). The expansion of supply and greater accessibility of processed products, ready-to-cook as well as ready-to-eat, has reversed the above trends in millet consumption. As seen in Table 7.1, per capita consumption of unprocessed millet among the upper two quintiles is higher than among the bottom two. More importantly, the per capita consumption (49.5 kilograms) of processed millet alone in 2018 is higher than the national average of millet

TABLE 7.1—ANNUAL CEREAL CONSUMPTION BY INCOME QUINTILE, SENEGAL (2017/2018)

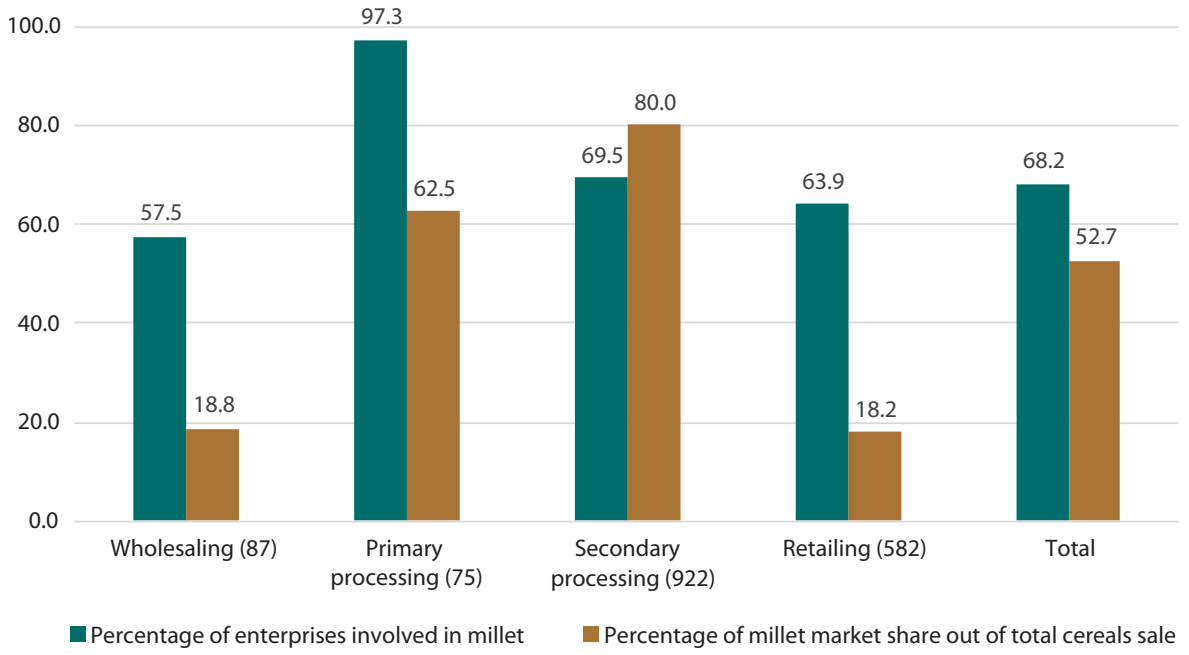
Income (in CFA francs / capita)	1st quintile [15,834–176,935]		2nd quintile [176,947–267,369]		3rd quintile [267,385–382,103]		4th quintile [382,110–579,781]		5th quintile [580,307–9,729,004]	
(in kg/capita)	kg	share	kg	Share	kg	share	kg	share	kg	share
All cereals	119.0	100%	156.7	100%	177.1	100%	205.8	100%	290.4	100%
Millet	25.5	21%	25.3	16%	28.4	16%	26.1	13%	33.3	11%
Millet (processed)	12.0	10%	22.3	14%	25.8	15%	40.0	19%	49.5	17%
Maize	9.4	8%	11.8	8%	12.5	7%	13.0	6%	16.8	6%
Maize (processed)	5.9	5%	7.6	5%	9.2	5%	12.0	6%	14.9	5%
Sorghum	3.2	3%	2.4	2%	2.1	1%	2.1	1%	4.4	2%
Sorghum (processed)	1.9	2%	1.4	1%	1.6	1%	1.5	1%	0.8	0%
Fonio	0.2	0%	0.2	0%	0.2	0%	0.2	0%	0.5	0%
Local rice	26.5	22%	41.5	26%	43.8	25%	53.0	26%	78.1	27%
Imported rice	34.1	29%	43.7	28%	53.3	30%	58.0	28%	92.2	32%

Source: Ulimwengu et al. (2020).

consumption (48.9 kilograms) in 2009. Millet products' share of consumption among high-income earners (upper two quintiles) is now close to 30 percent, compared to 32 percent for imported rice(Ulimwengu, et al. 2020)

To better understand the changes that took place along the millet value chain as well as the underlying factors, we use the extensive database constructed under the recent Projet d'Appui aux Politiques Agricoles (PAPA), which covers activities by a sample of 87 cereal wholesalers, 582 retailers, 75 primary processors, and 922 secondary processors. The details of the sample characteristics of the surveys, which were carried out in 2018, are presented in Appendix Table A7.1. Strikingly, nearly all (98 percent) the secondary processing firms are owned and managed by female entrepreneurs. More than 65 percent of them started as self-employing businesses and have no employees. This is particularly the case for secondary processors and retailers, of which more than 85 percent started as self-employing small businesses. At start-up, the average total employee count was as low as 0.19 for retailers and as high as 1.8 for wholesalers. The maximum number of employees was 33 for wholesalers, followed by 30 for secondary processors. The percentage of enterprises hiring employees had also increased by about 15 percentage points since start-up. At start-up, more than 80 percent of the midstream actors were informal businesses. Processors were more informal than traders, a typical characteristic that distinguishes local staples value chains form global value chains. Only 12 percent of the secondary processors and 8 percent of primary processors were formally registered firms. Both the median and average initial capital investments of secondary processors were smaller than those of other segment actors. An average secondary processor invested about 237,000 CFA francs at start-up for equipment, workplace, and other fixed assets.

FIGURE 7.1—THE IMPORTANCE OF MILLET IN SENEGALESE CEREAL VALUE CHAINS



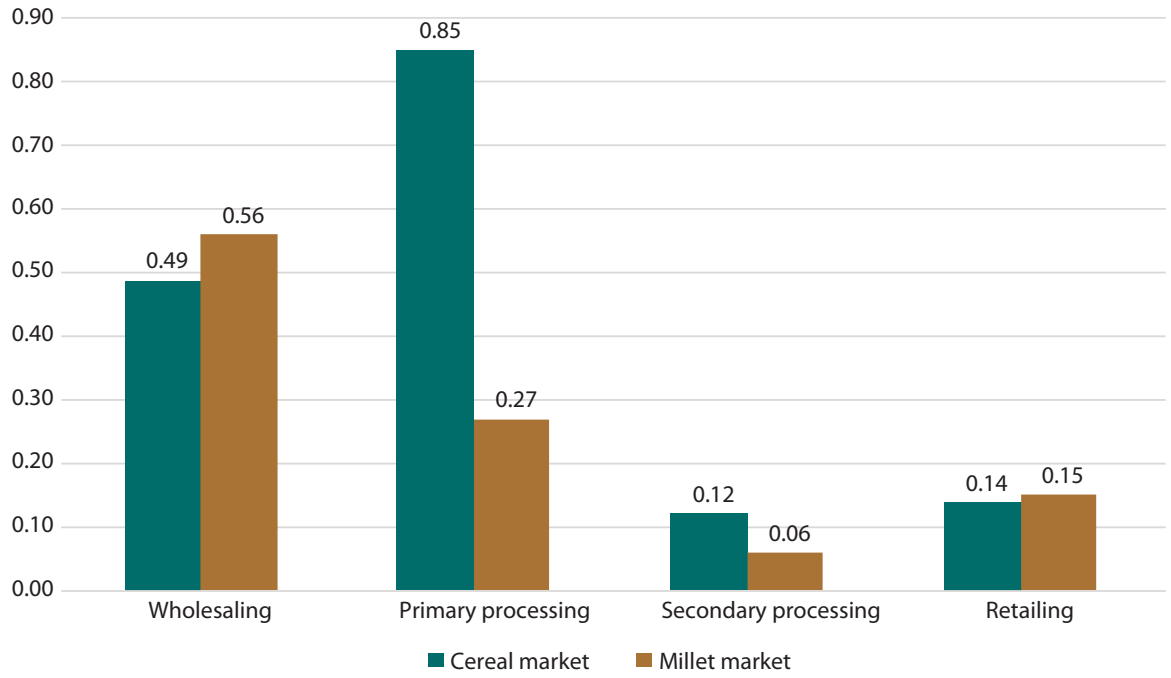
Source: Authors' estimation based on PAPA data collected in 2018.

Most midstream actors appear to be recently established businesses, with the median age of firms around 10 years. At start-up, the median processing capacity was as low as 7 kilograms per day for secondary processors and as high as 800 kilograms per day for wholesalers. Since start-up, capacity has significantly increased for all segments. The median capacity of secondary processors has increased to 12 kilograms per day, which is an increment of more than 70 percent. Currently, half of the sample secondary processors and retailers sell 117,000 CFA francs and 237,000 CFA francs per month, respectively. As expected, the average total sales of traders are higher than those of processors (more in Appendix Table A7.1).

In addition to commanding the largest share in the processing segment compared to all other cereals, millet processing firms also tend to operate in a much more competitive environment than other cereal processors. Figure 7.2 presents the ratios of the sales of the largest four firms to total sales. The higher the ratio, the lower the degree of competition in the given value chain segment for millet and all cereals. Of all millet enterprises, secondary processing is the most competitive segment. In contrast, more than half of the millet wholesale segment is controlled by the four largest firms. The primary processing segment is the least competitive, most oligopolistic segment of the entire cereal sector. The least competitive millet segment is the wholesale sector.

All these results indicate that, unlike in other cereal value chains, the millet chain is dominated by the highly competitive secondary processing segment, a situation that is likely to become increasingly common among the rapidly transforming regional staples value chains across Africa. This trend is likely to accelerate as millet and other traditional staples value chains respond to changing diets among middle-class consumers and modernizing distribution networks in rapidly growing urban centers.

FIGURE 7.2—FOUR-FIRM CONCENTRATION RATIOS IN ALL CEREAL AND MILLET MARKETS AND INDUSTRIES



Source: Authors' estimation based on PAPA data collected in 2018.

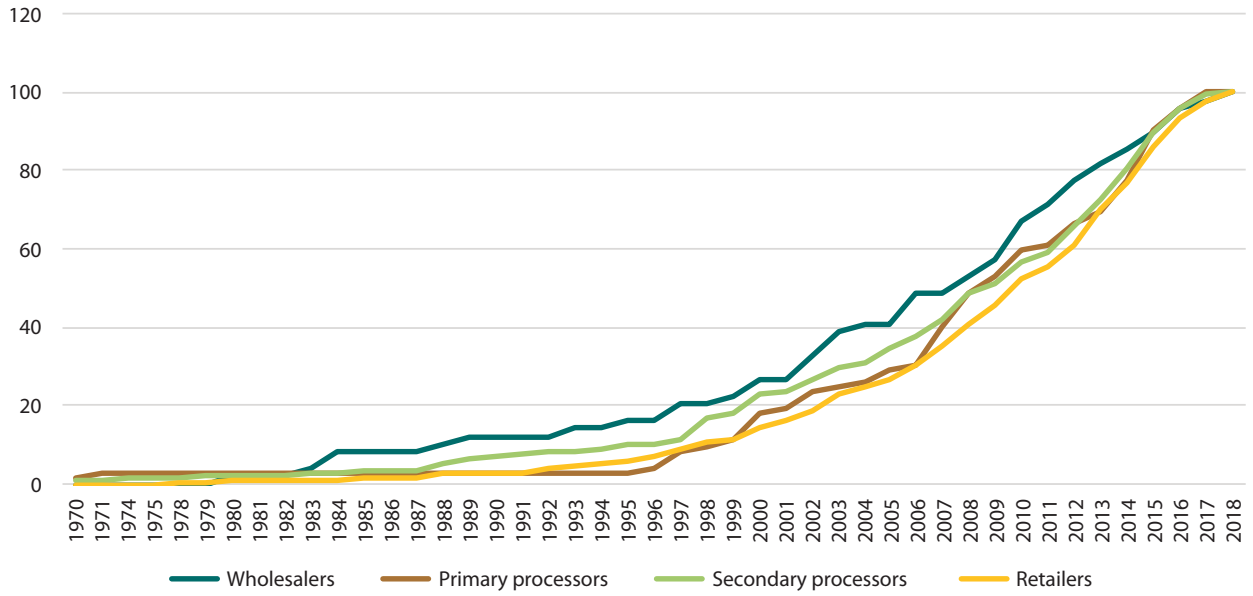
Note: The four–firm concentration ratio represents the share of the largest four firms in the segment. The higher the ratio, the less competitive the segment or industry.

Evolution of the Modern Millet Value Chain

The expansion and transformation of the millet value chain is represented in Figure 7.3. The curve showing the cumulative percentage of enterprises involved in millet trading and processing over the years, arranged by start-up year, indicates a significant boom in the millet business in the last two decades. The figure illustrates the rapid rise of the millet processing sector and the deepening transformation of the millet value chain in Senegal. More than half of the sample millet traders and processors started their businesses after 2010. The trend shows that the sector has passed through three phases since 1970: a mainly stagnant phase throughout the 1970s until the early 1980s, an initial expansion phase from the middle of the 1980s until the late 1990s, and a rapid transformation phase over the last two decades. This trend cuts across all major segments.

Several factors explain the evolution of the millet value chain. The 1970s were in the middle of the era when operations in the agricultural sector were entirely dominated by the public sector. Prices paid to farmers for their crops and by consumers for food were determined administratively and enforced by the government. State enterprises were in charge of everything from input distribution to crop marketing and transport. Private sector operators had only a limited role to play and that often primarily within the system of public sector

FIGURE 7.3—GROWTH IN NUMBER OF MILLET TRADING AND PROCESSING ENTERPRISES IN SENEGAL, CUMULATIVE PERCENTAGES



Source: Authors' estimation based on PAPA data collected in 2018.

Note: The four–firm concentration ratio represents the share of the largest four firms in the segment. The higher the ratio, the less competitive the segment or industry.

intervention. The absence of a critical mass of private operators in the agricultural sector in general is reflected in the millet value chain.

The situation started to change gradually in the 1980s, thanks to two major developments. The government launched a series of reforms as part of its structural adjustment programs, which began with a change of leadership in 1979. Several of the state enterprises that controlled the agricultural sector were near bankrupt. The government was obliged to restructure them, reform their operations, and adjust the policy regimes that ensured their monopoly positions, thereby gradually creating room for the private sector.

The second factor that triggered the millet sector revolution is also linked to the prevailing government policies in the previous decade and the detrimental effects on overall performance of the agricultural sector. The severe and repeated droughts of the 1970s made an already bad situation worse, leading to stagnating domestic food production and a rapid increase in food imports, not just in Senegal but in the entire Sahel region. As a response, and under the banner of the Comité Permanent Inter-Etats de Lutte Contre la Secheresse dans le Sahel (Permanent Interstate Committee on Drought Control in the Sahel), a region-wide project was initiated to promote the consumption of local staples in order to slow the rate of growth in food imports and save scarce foreign exchange in the context of acute economic and food security crises. The objective of the Project pour la Promotion des Céréales Locales au Sahel (Project for the Promotion of Local Cereals) was to promote improved cooking and processing technologies and promote small-scale enterprises to encourage the uptake of these technologies. Across several countries in the Sahel, processed millet products started appearing in urban markets.

With the end of the economic crisis in the late 1990s and the onset of the longest economic recovery in the history of African countries, demand for food in general and local staples in particular began skyrocketing in urban centers. Urban consumers not only demanded more food, they also asked for better quality, improved safety, and greater convenience. This demand fueled the growth of the trading and processing sector, leading to a fivefold increase in the number of enterprises in that sector over the next two decades.

Performance across Enterprises of Different Sizes

The definitions of enterprise sizes vary across countries and industries. Most definitions depend on the number of employees, which does not apply to our sample enterprises as most of them (about 80 percent) are self-employing

enterprises without any formal/full-time employees, using at most part-time family and relative helpers. Even of the businesses with employees, only 2 percent have more than five employees. Thus, we used the initial capacity of the enterprises as a criterion to divide them into small, medium, and large enterprises. We define enterprises having a capacity of two times the median and above as large, half of the median and below as small, and in between these as medium. Since the enterprises are substantially different across segments (wholesalers, processors, retailers), we used the segment's median instead of the median of all segments together.

Table 7.2 compares small, medium, and large enterprises using different performance indicators. The market share, defined as the share in total volume of sales for the corresponding segment, varies significantly between segments. Large-scale enterprises account for the highest share of transaction volumes in the wholesale and retail segments. In contrast, medium-scale enterprises constitute the highest share in both the primary and secondary processing sectors. Taken together, SMEs command a combined share of at least two-thirds of the total sales in the primary and secondary processing segments. This implies that SMEs are the most important actors in the rapidly expanding processing sector among traditional staples value chains. They also perform better than the large enterprises, judged by most of the performance indicators. The only exception is with respect to labor productivity. But even here, SMEs have comparable labor productivity levels to those of large enterprises in the processing segments.

The results presented in Table 7.3 indicate that SMEs are not only the most important players in terms of market share in the processing segment, they are also growing more rapidly than larger enterprises. The relatively strong performance of SMEs as well as their dominance in the processing segment presents a unique opportunity to leverage growth in the sector to boost employment, create wealth, and enhance prosperity among youth and particularly women entrepreneurs. This opportunity suggests the need for a strong policy focus on the needs of these enterprises to hasten agro-industrialization in local staples value chains.

TABLE 7.2—PERFORMANCE OF MILLET ENTERPRISES BY SIZE

Performance indicators	Small	Medium	Large
Wholesalers			
Market share	6.41	29.82	63.76
Average annual capacity growth rate	0.50	0.57	0.22
Labor productivity (CFA francs per employee per month)	720.25	1,667.24	3,183.37
Average firm productivity (ratio of sales to initial capacity)	5.33	3.57	1.62
Primary Processors			
Market share	15.52	61.35	23.14
Average annual capacity growth rate	0.17	0.20	-0.02
Labor productivity (CFA francs per employee per month)	87.80	113.38	128.27
Average firm productivity (ratio of sales to initial capacity)	0.91	0.35	0.13
Secondary Processors			
Market share	16.38	49.32	34.29
Average annual capacity growth rate	0.36	0.13	0.12
Labor productivity (CFA francs per employee per month)	119.58	157.49	158.30
Average firm productivity (ratio of sales to initial capacity)	24.90	19.78	8.74
Retailers			
Market share	13.97	19.88	66.16
Average annual capacity growth rate	0.39	0.18	0.17
Labor productivity (CFA francs per employee per month)	161.56	330.92	639.42
Average firm productivity (ratio of sales to initial capacity)	9.56	6.44	3.62

Source: Authors' estimation based on PAPA data collected in 2018.

Millet Value Chain Policy Interventions

Nature and Reach of Value Chain Policy Interventions

This section explores the adequacy and targeting of three types of public policy interventions: (1) provision and access to start-up financing, (2) training and

skills development, and (3) facilitation of collective action and access to networking resources. Appendix Table A7.2 presents an overview of these interventions and their reach among value chain actors by segment. For instance, many of the sampled midstream actors depended on their own sources for business start-up investments; the next-largest source was gifts from family. Noncommercial loans, mainly from family and friends, constitute the third-largest. Commercial loans from banks and business partners are still very limited. Only 1.9 percent of processors received loans from public sources to start their business. Interestingly, access to public funding appears to be biased in favor of larger enterprises among primary processors at the expense of smaller operators. Regarding skills development, only 10 percent of traders and processors had access to training at start-up and fewer than 5 percent after start-up. Fewer than 15 percent of the actors reported participating in collective action and networking via commercial organizations. Secondary processors rely more on networks than others, which is somewhat consistent with the fact that enterprises in other categories tend to be larger in size and can pay for professional services to meet their needs. In general, however, public intervention in support of value chain actors tends to be narrowly focused and covers only a very limited fraction of enterprises.

To better understand what drives provision of and access to public policy support, we carried out a series of probit estimations and assessed the likelihood of receiving different types of public support across various size and age categories of secondary processing enterprises. Given the importance of these enterprises in transforming cereal value chains, we start by testing whether actors in the millet secondary processing segment have better access to public policy interventions than other value chain actors. However, the estimations suggest that operating in the processing segments of the millet value chain has no statistically significant effect on the likelihood of receiving support from public policy interventions (Table 7.3). The results are consistent across different policy interventions. This could be an indication of lack of value chain prioritization for policy interventions.

TABLE 7.3—ENTERPRISE TYPOLOGY AND ACCESS TO PUBLIC SUPPORT FOR SECONDARY PROCESSORS (PROBIT ESTIMATIONS)

Typology variables	(1) Access to public financing at start-up	(2) Access to training at start-up	(3) Access to training after start-up	(4) Access to organizational membership
Participation in millet processing (yes = 1, no = 0)	-0.396 (0.255)	-0.145 (0.130)	-0.0828 (0.165)	-0.0334 (0.136)
Sex (1 = female, 0 = male)		-1.018*** (0.336)	-1.214*** (0.345)	-0.457 (0.349)
Age of owner	0.0397*** (0.0128)	0.0311*** (0.00574)	0.0290*** (0.00732)	0.0246*** (0.00592)
Access to passable road (1 = yes, 0 = no)	-0.305 (0.261)	0.101 (0.119)	-0.0183 (0.150)	0.137 (0.122)
Medium vs. small (medium = 1, small = 0)	0.0208 (0.436)	0.360* (0.200)	0.844** (0.372)	0.230 (0.201)
Large vs. small (large = 1, small = 0)	0.594 (0.403)	1.281*** (0.194)	1.330*** (0.366)	1.100*** (0.194)
Age of enterprise	-0.0258 (0.0167)	-0.0205*** (0.00658)	-0.00439 (0.00750)	-0.00809 (0.00723)
Constant	-3.877*** (0.761)	-2.013*** (0.450)	-2.713*** (0.581)	-2.475*** (0.467)
Observations	807	824	824	824

Source: Authors' estimation based on PAPA data collected in 2018.
Note: Standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.

The results also indicate that large enterprises are more likely to receive public support than small enterprises. Though size is generally insignificant in access to public financing, large enterprises are more likely to receive support than small enterprises, in particular with respect to access to training and networking opportunities through collective action. Similarly, medium-sized enterprises are more likely to receive training than small enterprises. Though the demand for collective action seems high for SMEs, large enterprises are more likely to actually become members of commercial organizations.

It appears from the above evidence that, despite their significant and rising potential, SMEs benefit less from public policy support than do larger

enterprises. In other words, our data indicate that value chain development programs and policies in Senegal are not responsive to the needs of the emerging and better-performing value chain enterprises.

The regression results also show that the effect of enterprises' age on access to public support is statistically insignificant except in the case of access to training at start-up. In an ideal public support system that aims to respond to emerging opportunities, the provision of public financing, for instance, would be expected to show a negative relationship to enterprise age. In other words, as enterprises mature, they rely less on public financial support. Over time, the private sector would take over from the public sector to serve the needs of an increasing number of maturing enterprises. In the context of limited fiscal resources, the seeming lack of substitution of public funding through private sector financing suggests that the financial needs of value chain operators are going largely unmet. In contrast, the negative and statistically significant effect of age on access to training implies that access to start-up training has been increasing over time. While this is a positive trend, the type of training must fit with the needs of value chain actors, an issue that will be further examined in the next section.

The estimations also suggest that although almost all the entrepreneurs in the sample who received access to start-up financing are female (which is why the "sex" variable is dropped), a female entrepreneur still has less likelihood of accessing both start-up and operational training. This is at odds with the role of female entrepreneurs in the secondary processing segment of the millet value chain. We noted previously that 98 percent of the operators in this segment are female entrepreneurs.

Enhancing the Effectiveness of Value Chain Policy Interventions

The above evidence suggests that public policy interventions in support of millet value chain development are inadequate and less targeted to emerging enterprises. In particular, SMEs, which make up the dominant and most dynamic segment, tend to have less access, except for training services at start-up. According to Sonobe and Otsuka (2011), the effectiveness of public policy interventions in promoting growth, reducing poverty, and enhancing the competitiveness of nascent enterprises depends on the timing and appropriate sequencing of intervention and support services. Public interventions should align with the needs of agro-industrial firms in various industrial clusters. In line with this argument, the researchers identify three industrial clusters based on the industrial growth stages: initiation, innovation (emerging), and maturation (developing).

Though targeting interventions according to industrial growth stage represents an important angle, a comprehensive value chain (industrial) development strategy also needs to align policy interventions with the special characteristics of various value chains. Different value chains (1) operate in different market environments, for instance, regional or global; (2) face different demand conditions and consumer behaviors, say, tropical beverages versus fruits and vegetables versus regional staples; and (3) present different challenges to private enterprises and actors in midstream segments. For instance, firms operating in regional value chains such as millet, teff, or cassava are confronted with high marketing costs, rapidly changing diet preferences, and relatively unstructured markets. Enterprises operating in global value chains such as those for coffee, fruits, and vegetables, are faced with more mature, better structured markets; stronger competition; and more demanding consumers. Moreover, while midstream actors in traditional regional value chains are usually SMEs owned by local entrepreneurs, the same actors in global value chains are generally large enterprises, often with foreign ownership. Thus, different sets of policy priorities are needed for local/regional staples value chains as compared to global value chains. Public policy interventions for value chain development must therefore be prioritized not only based on growth stages but also in line with the characteristics of the various specific markets. However, within a given value chain, the stage-based approach maintains its full validity.

Using these growth stage and market criteria, we define six groups of value chains and propose different sets of priority policy interventions for midchain development (see Appendix Table A7.3). For instance, for emerging regional staples value chains such as millet, we propose priority policy interventions that reflect market characteristics for the value chain while also considering the various stages of value chain transformation. More specifically, public policy interventions would seek to motivate and equip midstream actors to boost product innovation to, for example, satisfy the growing urban demand for quality, safety, and product sophistication. Applying this concept to public policy

interventions relating to skills development in the millet sector as it transformed along the trajectory shown in Figure 7.3 would mean that policy interventions in the 1980s should have focused on vocational training to impart the skills necessary to start businesses, followed by policy interventions emphasizing demand creation and skills for market access in the 1990s. Policy interventions since 2000 should then have shifted to product innovation and branding.

We further assess the impact of policy interventions on the performance of secondary processors in the millet value chain to empirically verify the effectiveness of the interventions proposed in Appendix Table A7.3. For that purpose, we estimate a series of average treatment effects using propensity score matching (PSM) for several interventions with respect to two interrelated outcome indicators: one that measures the level and another the growth of installed processing capacity. The results appear to be very mixed across outcome variables and public policy interventions (Table 7.4). For instance, the average treatment effect on processors' capacity appears to be positive and significant for most institutional interventions such as training and participation in collective action and networking. Also, both start-up and on-the-job training are shown to have a significant effect on the level of processing capacity. This is particularly the case for vocational training. Access to networks through membership in an organization is also shown to have a significant positive impact on processing capacity. However, none of the incentive interventions related to financial support show any significant impact. Noncommercial loans from government, nongovernmental organizations, and family sources demonstrate no significant benefit over loans from other sources. This is consistent with our premise that for emerging value chains such as millet, institutional interventions are more important and effective than incentive-based interventions.

The growth effects of the interventions are quite different from the level effects of the interventions. Start-up training appears to be more important in boosting capacity and accelerating growth than any other intervention. This is in line with our earlier finding that public policy interventions that focus on enterprise-level capacities are more aligned with the needs of the transforming SME-dominated staples value chains. Vocational training seems more significant for enhancing capacity growth than does innovational training, which we define to include training on marketing, product development, and business strategy. This is also consistent with our argument that at start-up, vocational training is more effective than other type of skills development intervention. These findings confirm the importance of prioritizing policy interventions according to the value chain transformation trajectory as well as the characteristics and growth stages of enterprises in individual value chains. This is because the performance and needs of midstream actors vary as these conditions change from a given value chain to the next.

TABLE 7.4—IMPACTS OF POLICY INTERVENTIONS ON THE CAPACITY OF MILLET SECONDARY PROCESSERS (PSM ESTIMATIONS)

Policy interventions	(1) Processing capacity	(2) Growth rate in processing capacity
Start-up financing		
Commercial loan	9.103 (6.833)	-0.0778 (0.351)
Noncommercial loan from government, nongovernmental organization, or family	-3.309 (10.98)	-0.0375 (0.0389)
Gifts from family and friends	-1.714 (4.805)	-0.0734* (0.0397)
Start-up training		
Vocational training	44.03*** (6.410)	0.238*** (0.0578)
Innovational (marketing + product development) training	49.88*** (9.945)	0.276** (0.121)
On-the-job training		
Vocational training	29.58** (11.99)	0.0744 (0.103)
Innovational (marketing + product development) training	6.927 (8.197)	-0.00340 (0.0315)
Participation in collective action	40.73*** (8.455)	0.211 (0.131)
Observations	40.73***	0.211

Source: Authors' estimation based on PAPA data collected in 2018.
Note: Standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1. PSM = propensity score matching.

Conclusions and Lessons for Value Chain Policy Design

Fueled by the longest-lasting economic growth spell in post-independence Africa, traditional staples value chains are undergoing a rapid process of transformation. Millions of SMEs across the continent are entering all segments of these value chains in response to rapidly increasing demand for processed food by the fast-growing middle class. Demand for processed traditional foods in regional and urban markets is growing at such pace that their share in total consumption of domestic staples is projected to reach two-thirds by 2040.

The rising processing sector in staples value chains offers significant potential for job and wealth creation in African countries. The sector is dominated by a large and growing number of young (primarily female) entrepreneurs who are creating millions of jobs. The required future growth to exploit the potential of the sector will depend on countries' ability to help maintain a healthy rate of enterprise creation. This in turn will requires public policies that can effectively address the multifaceted challenges faced by operators in all value chain segments related to access to services, technology, financing, and markets.

Designing and implementing public intervention polices in the context of rapidly morphing value chains dominated largely by start-ups operated by a relatively newly emerged private sector is a very complex undertaking. In particular, aligning polices to the needs of different actors in various value chain segments is a major challenge facing policymakers and researchers.

Insights gained from the analysis of the millet value chain in Senegal offer several valuable lessons for the design of public policy interventions that can be adapted to other staples value chains in other African countries. The most important of these lessons are summarized below.

1. Value chain development policy interventions need to reflect and align with the transformation trajectory that represents the actual stages of growth and maturity of the various chain segments. Chains dominated by start-ups call for a different policy mix than chains with a large share of more mature enterprises. Chain promotion policies also need to take into consideration the special features of different value chains, such as market and demand characteristics. Traditional staples value chains such as those of millet, cassava, or teff that are catering to emerging regional and domestic urban markets require different policy emphases than traditional export value chains such as those of oilseeds, cotton, or tropical beverages that are working in more sophisticated global markets.
2. Policy interventions to support emerging regional staples value chains need to emphasize equipping midstream actors with access to services, technology, and skills to foster competitiveness and boost product innovation in order to meet the quality, safety, and product sophistication standards of urban consumers.
3. Public policy interventions that focus more directly on enterprise-level capacities have greater impact than chain-level interventions and better aligned with the needs of the many SMEs that dominate traditional staples value chains. Furthermore, it appears that basic vocational training targeting operational skills for start-ups is more effective at boosting capacity growth than is training on marketing, product development, and business strategy.
4. SMEs are not only by far the most important players in terms of market share in the mid-chain segments of emerging staples value chains; they are also growing more rapidly than larger enterprises. Efforts must be made to ensure that chain development policies are not biased against them in favor of their larger counterparts. On the contrary, care must be taken to ensure that value chain development programs and policies are responsive to the needs of SMEs in the emerging and better-performing value chain segments. Given limited resources, a failure to prioritize public policy interventions that encourage innovation as well as enterprise growth and maturation in the most dynamic value chain segments is likely to reduce their impact and retard progress in transforming staples value chains.
5. Female entrepreneurs are the dominant owners and managers of enterprises in the millet secondary processing segment, which is a typical characteristic of emerging value chains in Africa. However, there seems to be a gender bias in accessing public support. This calls for a significant effort to align policy interventions, particularly public support for skill development, toward the women entrepreneurs who are the dominant actors of the agro-processing industries and other mid-chain segments.

Appendix

TABLE 7A.1—CHARACTERISTICS OF SAMPLE MIDSTREAM ACTORS

Characteristics	Wholesalers	Primary processors	Secondary processors	Retailers	All
Sample size	87	75	922	582	1,666
Percentage single owners		93.3	81.9		82.7
Percentage female owners	0.0	4.0	97.9	9.3	57.6
Percentage young owners (<35 years old)	41.4	36.0	14.9	54.6	31.1
Percentage Wolof	67.8	50.7	40.5	37.3	41.2
Percentage Halpulaar	18.4	38.7	20.9	46.6	30.6
Percentage uneducated	34.5	36.0	57.2	37.6	48.2
Percentage family business at start-up	11.5	8.0	3.5	10.8	6.7
Percentage family business current	11.5	9.3	5.2	10.5	7.6
Percentage registered enterprises	63.2	8.0	11.9	27.1	19.7
Percentage self-employed at start-up	43.7	60.0	80.5	85.2	79.3
Percentage self-employed current	13.8	52.0	69.7	68.4	65.5
Median age of enterprise (years)	11.0	10.0	10.0	7.0	9.0
Median investment at start-up (1,000 CFA francs)	1,500.0	1,075.0	24.0	435.0	75.0
Mean investment at start-up (1,000 CFA francs)	8,316.1	1,301.8	236.9	900.0	938.4
Median capacity at start-up (kg per day)	800.0	200.0	7.0	40.0	15.0
Median capacity current (kg per day)	2,000.0	250.0	12.0	50.0	24.0
Median total sales (1,000 CFA francs per month)	2,318.2	68.4	116.7	237.1	166.0
Average total sales (1,000 CFA francs per month)	11,130.6	243.1	257.6	559.91	985.0
Median millet sales (1,000 CFA francs per month)	51.7	30.9	92.7	17.8	55.4
Average millet sales (1,000 CFA francs per month)	847.6	156.2	167.7	110.8	184.4

Source: Authors' estimation based on PAPA data collected in 2018.

TABLE 7A.2—POLICY INTERVENTIONS IN SUPPORT OF MILLET SECTOR MIDSTREAM ACTORS

	Wholesalers	Primary processors	Secondary processors	Retailers	All
Sample size	87	75	922	582	1,666
Sources of start-up financing (%)					
Own income	90.8	80.0	49.1	80.9	63.8
Gifts from family and others	10.3	17.3	47.4	18.6	34.0
Commercial loan	11.5	9.3	8.2	4.8	7.3
Noncommercial loan	10.3	10.7	8.9	13.4	10.6
Public loan		4.0	1.7		1.9
Start-up training (%)	1.1	10.7	15.9	1.4	9.8
Nongovernmental organization	0.0	4.0	11.3	0.7	6.7
Government	1.1	8.0	8.6	0.9	5.5
Vocational	1.1	9.3	14.2	0.3	8.5
Marketing	1.1	1.3	5.5	0.7	3.4
Product development	0.0	1.3	9.3	0.0	5.2
Production	0.0	1.3	2.8	0.2	1.7
Administrative	1.1	4.0	5.1	0.7	3.3
On-the-job training	0.0	1.3	6.3	0.3	3.7
Vocational	0.0	1.3	5.7	0.2	3.3
Marketing	0.0	0.0	1.7	0.2	1.0
Product development	0.0	0.0	3.4	0.0	1.9
Production	0.0	0.0	1.3	0.2	0.8
Administrative	0.0	0.0	2.0	0.0	1.1
Membership in 2015	27.3	7.4	13.2	9.0	12.3
Membership current	23.0	6.7	12.6	8.6	11.5

Source: Authors' estimation based on PAPA data collected in 2018.

TABLE 7A.3—PRIORITY POLICY RESPONSES IN AGRICULTURAL VALUE CHAINS, CLASSIFIED BASED ON GROWTH STAGE AND TYPE OF MARKET

Value chain groups	Characteristics of value chain	Agro-industrial strategies	Priority policy interventions
Initiating regional value chains	Value chains that have high potential regional demand, but the demand has not yet been created *Examples: orphaned food staples, traditional beverage crops*	Enhancing upstream production and demand creation downstream through support for small and medium-sized traders	Technical support to producers, incentives for business start-up, and infrastructure to create demand
Initiating global value chains	Value chains for which a country has production potential and there is high global demand, but the supply chain is yet to be developed *Examples: quinoa, sesame, soybeans*	Enhancing upstream production and supporting the commercial capacity of midstream actors and exporters	Incentives to midstream actors and technical support to producers to help them meet the requirements of export markets
Emerging regional value chains	Value chains with regional and local specific demand; increasing production/producer price trends; expanding processing and distribution sectors; a growing supply of ready-to-cook and ready-to-eat food products; and increasing exports to expatriate communities *Examples: teff, millet, cassava*	Supporting small and medium-sized midstream processors to help them add value, innovate, and differentiate their products to meet rapidly changing diet preferences and capture a higher share of growing urban demand	Training for product and firm-level process innovation, collective action for market and technology access, and development of safety and quality standards
Emerging global value chains	These are globally traded value chains that had limited domestic demand but is increasing due to rising local and regional incomes *Examples: fruits and vegetables, floriculture*	Supporting large-scale midstream processors to help them add value and adopt global standards	Competition rules, agro-industrial parks, exchange markets, and institutional support to help firms comply with international standards
Developed regional value chains	Regional value chains that are well developed and industrialized, with large, formal cross-border transactions *There are no value chains of this type yet in Africa.*	Supporting integration of the regional value chain through elimination of cross-border barriers, demand creation, and branding	Institutional support for collective action by chain actors, competition policy, and access to regional private service providers
Developed global value chains	Value chains representing traditional sources of foreign exchange that are rapidly transforming due to sustained global and regional demand and have well-developed domestic and global markets *Examples: coffee, cocoa, tea*	Exploiting royalties and product differentiation	Property rights, support for collective action by chain actors, and access to global private service providers

Source: Authors' elaboration based on Sonobe and Otsuka (2011