International Development Working Paper

No. 2017-04
September 2017

The Sorghum Value Chain in Haiti: A Mapping and Analysis

Elizabeth Eckert
Annah Latané
RTI International

RTI International
3040 East Cornwallis Road
P.O. Box 12194
Research Triangle Park, North Carolina 27709-2194
USA

International Development Working Paper

The Sorghum Value Chain in Haiti: A Mapping and Analysis

Elizabeth Eckert
Annah Latané

RTI International
3040 East Cornwallis Road
Post Office Box 12194
Research Triangle Park, NC 27709-2194
202-728-2479
alatane@rti.org

September 2017
No. 2017-04

Prior International Development Working Papers include:

- *No. 2013-01: Strengthening Local Councils in Uganda*
- *No. 2013-02: The Political Economy of Adopting Public Management Reforms: Patterns in Twenty Indonesian Districts*
- *No. 2013-03: Capacity Development for Local Organizations: Findings from the Kinerja Program in Indonesia*
- *No. 2014-01: Strategies for Improved Delivery of Basic Services: A Concise Framework and Selected Cases*
- *No. 2014-02: Does Better Governance Improve Service Delivery? Evidence and Lessons Learned from the Guinea Faisons Ensemble Project*
- *No. 2014-03: From Supply to Comply: Gauging the Effects of Social Accountability on Services, Governance, and Empowerment*
- *No. 2015-01: Social Accountability in Frontline Service Delivery: Citizen Empowerment and State Response in Four Indonesian Districts*
- *No. 2015-02: Systems Thinking and Institutional Performance: Retrospect and Prospect on USAID Policy and Practice*
- *No. 2015-03: Business Environment Constraints for Micro and Small Enterprises in El Salvador: Disparities between Male and Female Entrepreneurs*
- *No. 2015-04: Guide to Assessing Social Accountability Efforts Across Sectors*
- *No. 2016-01: Distance, services, and the decoupling of citizen perceptions of the state in rural Africa*
- *No. 2016-02: RTI's Workforce Development Ecosystem Framework and Survey Tool: Findings from Caribbean Pilot Tests*
- *No. 2016-03: State Fragility, International Development Policy, and Global Responses*
- *No. 2017-01: Doing Reform Differently: Combining Rigor and Practicality in Implementation and Evaluation of System Reforms*
- *No. 2017-02: Repetition of Primary 1 and Pre-Primary Education in Uganda*
- *No. 2017-03: Universities as the Engine of Economic Growth: Insights from Developing the First Industry – Higher Education Clusters in El Salvador*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

BRANA	Brasserie National d'Haiti
CGRFA	Commissions on Genetic Resources for Food and Agriculture
FAO	United Nations Food and Agriculture Organization
GDP	gross domestic product
NGO	nongovernmental organization
SMASH	Smallholders Alliance for Sorghum in Haiti
SSSA	Soil Science Society of America
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNIDO	United Nations Industrial Development Organization
USAID	United Agency for International Development
VCA	value chain analysis

ABSTRACT

Agricultural value chain development has emerged as a key methodology employed by multi- and bilateral donors, nongovernmental organizations, and research institutions to drive economic development. Value chain upgrading can result in significant economic impact in developing countries, contributing up to 30% of gross domestic product (United Nations Conference on Trade and Development, 2013). Through a case study of the Smallholders Alliance for Sorghum in Haiti (SMASH), we examine the process of creating an "inclusive" value chain that seeks to explicitly include smallholder producers to increase incomes while establishing a sustainable sorghum value chain. Using a qualitative value chain analysis methodology paired with secondary data review, we describe the current state of the Haitian sorghum value chain and provide recommendations for the SMASH program, contributing to the evidence base for international development programming in agriculture value chain upgrading. We find that the current state of the Haitian sorghum value chain is unstructured and largely informal, though the diversity of potential value-added products provides significant opportunities for smallholders to participate in value chain upgrading.

ACKNOWLEDGMENTS

This research was support by internal research funds from RTI International. We thank our colleagues from Papyrus SA and RTI and the sorghum value chain stakeholders who provided their insights and expertise without which this research would not have been possible. We thank Ken Smarzik, Value Chain Specialist, RTI, for the initial seed of the idea and for providing connections and guidance. Alice Nkunzimana, John Currelly, and J.R. de Ruiter of Papyrus SA are acknowledged for allowing us to come in and spend so much of your time untangling the story of sorghum of Haiti and for facilitating connections with countless others. Gael Pressoir of Chibas Bioenergy provided much of the history and background of sorghum as a crop in Haiti and information about the potential for future growth. We also thank Sara Lawrence of RTI who is an expert interviewer and brainstormer. Michael Hogan and Maggie O'Neil of RTI also provided invaluable support.

INTRODUCTION

Agricultural value chain development has emerged as a key methodology for driving economic development in many lower income countries. Multi- and bilateral donors, research institutions, and nongovernmental organizations (NGOs) working in international development (e.g., the United States Agency for International Development [USAID], Institute for Tropical Agriculture, International Labor Organization, Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance, and Catholic Relief Services), employ this methodology as a means to address rural poverty, income inequalities, and food insecurity. Webber and Labaste (2010) and Taglioni and Winkler (2016) defines value chain development as "an effort to strengthen mutually beneficial linkages among firms so that they work together to take advantage of market opportunities."

Evidence has found that upgrading within value chains can have a significant impact on developing countries: value-added trade contributes nearly 30 percent of gross domestic product (GDP) in developing countries, as opposed to 18 percent in developed (United Nations Conference on Trade and Development [UNCTAD], 2013). If developing agricultural value chains can increase GDP, it is natural to consider ways in which smallholder producers of those agricultural products can also benefit from this wealth generation. Explicitly including smallholder farmers in value chain development (coined as "pro-poor" or "inclusive" value chain development) focuses on developing "positive or desirable change in a value chain to extend or improve productive operations and generate social benefits: poverty reduction, income and employment generation, economic growth, environmental performance, gender equity, and other development goals" (United Nations Industrial Development Organization [UNIDO], 2011). Fernandez-Stark, Bamber, and Gereffi (2012) describe a shift in agricultural products markets through inclusive value chain development, in which small farmers transition from selling products primarily on open or informal markets to competing in a sophisticated, consolidated, and regulated value chain. The authors describe four common barriers to smallholder farmers' ability to compete in an agricultural value chain: lack of access to markets, lack of or skills and/or training, lack of collaborative networks, and lack of finance. These barriers are often compounded by weak regulatory institutions, poor infrastructure, and a lack of upstream and downstream value chain actors that provide important supplies and services for upgrading.

Value chain development can take many forms depending on the country context, market environment, governance environment, and relationships between country governments, multi- and bilateral organizations, and private sector actors. Value chain terminology and methodologies differ by donor and organization and are continually being refined and revised. For the purpose of this paper, we define a value chain as the process by which a product moves from farms through markets and to consumers, accruing value along the way. Our definition considers opportunities for value chain actors to increase value accrual through improving efficiencies, transforming products, or diversifying product offerings or services (Humphrey & Schmitz, 2000). We also consider the institutional rules (formal and non-formal) that govern the value chain and the supporting infrastructure and services that enable (or limit) the journey of an agricultural product from the field to the end-consumer.

This paper aims to contribute to the knowledge base on "pro-poor" or "inclusive" agricultural value chains in developing countries through a case study of a public-private partnership value chain development program in Haiti. The Smallholders Alliance for Sorghum in Haiti (SMASH) provides unique insights into the process of creating an "inclusive" value chain because of several features, including 1) the location in Haiti, which has weak institutional structures; 2) the public-private partnership with a commercial partner, Heineken Breweries and 3) the status of sorghum as a traditional crop in Haiti. We describe the historical context and current state of the sorghum value chain in Haiti, including a break-down of the input-output structure of the value chain by actor and the institutional rules and norms that govern the chain. We conclude with recommendations and opportunities for SMASH and other actors for inclusive value chain development in Haiti and for future value chain analyses (VCAs).

METHODOLOGY

Donovan, Franzel, Cunha, Gyau, and Mithöfer (2015) reviewed 11 value chain development guides and identified the following unifying methods of a VCA: 1) review of existing information, 2) key informant interviews with chain actors 3) participatory chain mapping, and 4) workshops and focus groups with value chain actors. Following this best practice, we employed a mixed methods approach to conduct our analysis and adopted a qualitative VCA framework structured as follows:

1) **Input-Output Structure**: How does the produce flow along the supply chain, from production through processing, manufacturing, distribution, and consumption? What relationships exist vertically (along different steps in the supply chain) and horizontally (amongst actors at the same node in the supply chain)? What are consumers demanding?
2) **Institutions, Rules, Norms, and Trends:** Who determines and enforces the rules (formal and informal) that govern the value chain? How are these rules developed and communicated?
3) **Key Infrastructure Inputs and Market Support Services:** What financial, technical, input, infrastructure, and other services support the supply chain's functioning? Where and why are there gaps?

First, secondary data review included reports, gray literature, and journal articles on the status of Haiti's development, ongoing agricultural development work in Haiti, the role of value chains in development, and information on the role of public-private partnerships in development. We also reviewed data from the United Nations (UN), UN Food and Agriculture Organization (FAO), and other sources to document the size, dynamics, and other characteristics of the global, regional, and Haitian sorghum markets, as possible.

Stakeholders Consulted

- Small-scale producers
- Associations (producers, processors, and marketing)
- Processors
- Traders
- Distributers
- Retailers
- Consumers
- NGOs
- Bi- and multilateral donors
- Field agents
- Input providers
- Financial services organizations

Primary data collection for our VCA of the sorghum value chain in Haiti was conducted through two trips in 2015. We held key informant interviews with farmers, traders, business owners,

and processors who are part of the sorghum value chain, in addition to large nonprofits seeking to increase the use of sorghum in local food for the poor services. We developed a framework of topics and questions, which we referred to during discussions but did not follow explicitly—rather, it was used as a checklist during interviews. It was important to allow interviewees to guide the flow of the conversation, allowing for richer details and unexpected topics to emerge. This is especially important given the reluctance of many private sector actors to share details of their business operations. An interview with a Haitian expert in sorghum offered foundational understanding regarding sorghum's history and future prospects.

Next, we conducted direct site visits to farms and markets and gathered market information. During site visits, we collected information on sorghum pricing from local grocery outlets in Port-au-Prince to better understand the local pricing dynamics against the international market prices. Site visits to farms helped us understand the cultural and economic dynamics that inform farmer's decisions to produce and their sorghum production practices.

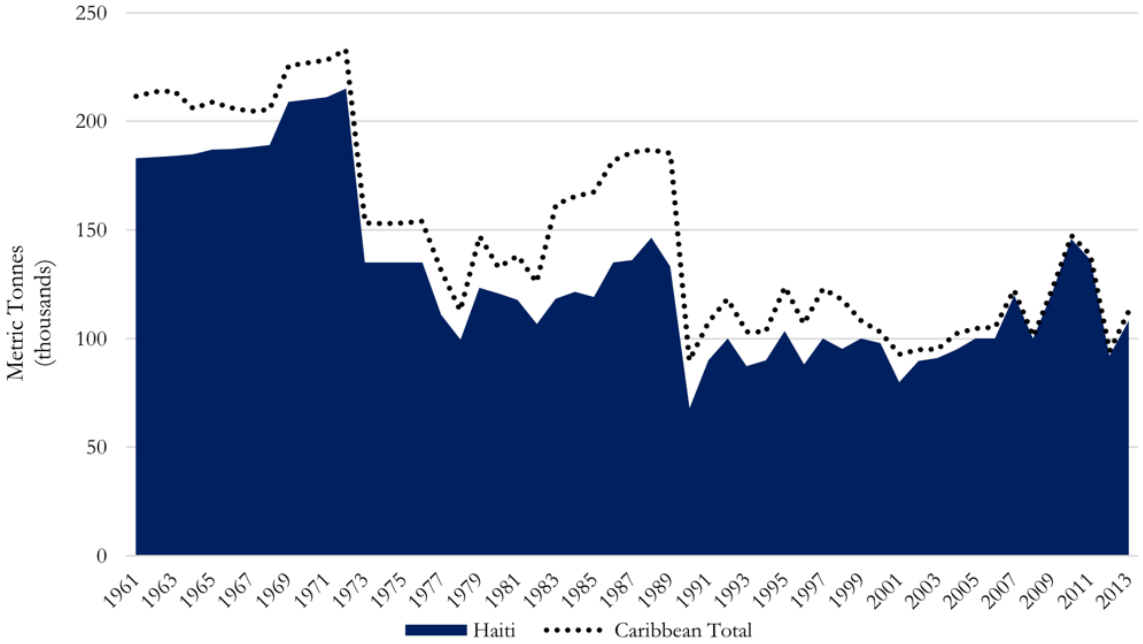
Finally, we conducted an iterative and participatory value chain mapping exercise with core value chain actors in Haiti. The value chain maps below were developed through interactions with actors across all levels of the value chain and extensive conversations with SMASH staff. Once the first round was developed, SMASH staff and stakeholders verified the maps for accuracy to provide a picture of our collective understanding of the sorghum value chain, SMASH's approach, and the potential for future growth. Together, the results from these discussions and activities provided a more robust understanding of the context in which the sorghum value chain can be upgraded through projects like SMASH and offers a broader perspective on the potential for greater sorghum production, value addition, and consumption. For both informal and formal rules, proxy information from other stakeholders is presented.

BACKGROUND OF SORGHUM IN HAITI

Sorghum is a traditional crop in Haiti, with the first varieties likely introduced by West African slaves brought to the Caribbean to work on sugar-cane plantations in the 18th century. Many brought with them seeds and cultivated gardens in which both seeds and farming techniques have been passed on from generation to generation. As evidence of that, most sorghum varieties now grown in the country share characteristics with Guinea-type photobiotic varieties, unlike modern sorghum varieties grown elsewhere in the world. Though it is a long-standing traditional crop and was once a staple of Haitian diets, sorghum lost its principal place in Haitian diets after the introduction of rice in the 20th century.

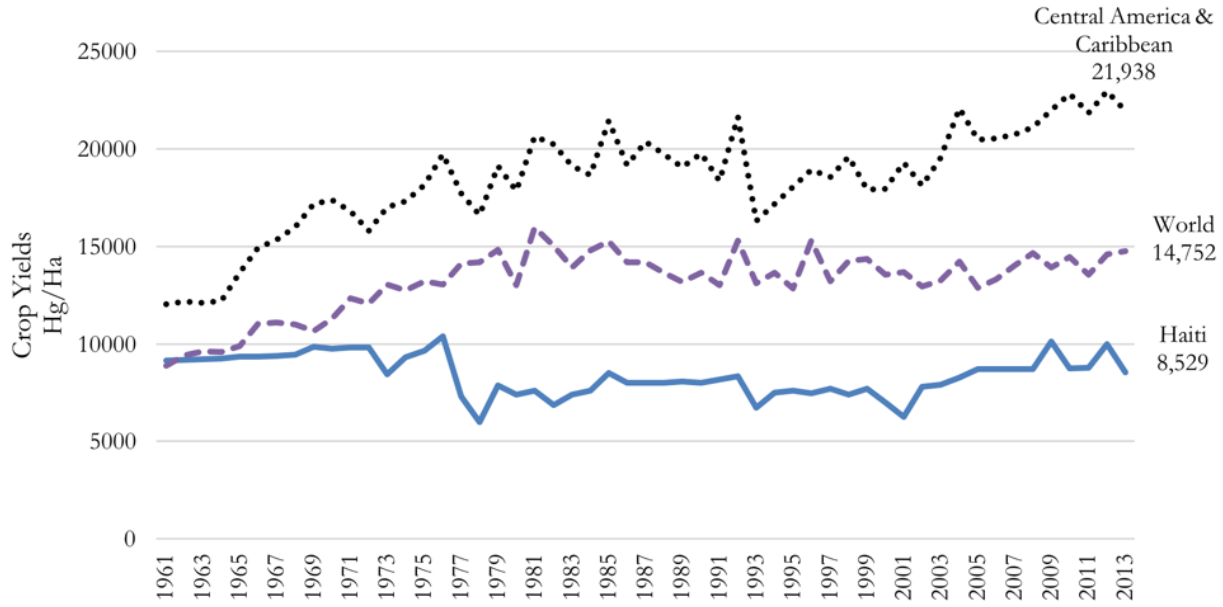
According to the FAO (2016), only approximately 10 percent of the world's sorghum is produced for export. Of the world's largest sorghum producers, the United States and Argentina are the primary exporters; together, they control 70 percent of the global export market. Haiti is the only country in the Caribbean with significant domestic sorghum production: since 2007, it has accounted for nearly all of the production in the region, while countries such as the Dominican Republic have increased their production of rice and cane sugar. However, the region's production has been in a steady decline since its peak in the early 1970s and produced over 100,000 MT in 2013. This sharp decline followed an increase in production between 2005 and 2010, partially because of instability after the 2010 earthquake.

Figure 1. Sorghum Production in Haiti and the Caribbean, 1961–2013



On a global scale, sorghum yields have increased by 50 percent since the 1960s, with productivity nearly doubling in Central America and the Caribbean. However, Haiti's yields declined sharply in the 1970s and slowly returned to pre-1970s levels in the 2000s (Figure 2). Haitian agricultural practices and environmental issues contribute to low productivity, leaving the country at a further disadvantage in global markets for sorghum and other agricultural products. Many believe, however, that if Haitian sorghum productivity increased, there would a number of market opportunities for it. The potential for increasing the production of sorghum is high, as sorghum is a relatively drought-tolerant crop and is able to withstand higher levels of water stress than maize and rice. There are nearly limitless potential uses of sorghum, including as a grain for direct human consumption, sorghum flour as a substitute in pastas and breads, and in nearly any product that currently uses maize flour (e.g., tortillas and tortilla chips, popped sorghum, and cereal bars). Sorghum can be blended with other grains and fortifying agents for animal feed. Moreover, some varieties of sorghum can be fermented and distilled for use in malted and alcoholic beverages; it can also be used for bio-energy (G. Pressoir, personal communication, September 2015).

Figure 2. Sorghum Yields, 1961–2013



THE CURRENT STATUS OF THE SORGHUM VALUE CHAIN

The Haitian sorghum value chain is best characterized as unstructured and predominately informal and is more easily conceptualized in a visual format. Figure 3 maps our understanding of the sorghum value chain, beginning with the sources of sorghum entering the Haitian markets at the top and progressing through the chain to end sources of consumption at the bottom. The left bar indicates the characteristics of the market environment, including institutions, norms, rules, and trends, that affect the current structure of the value chain. The right bar indicates key services, including infrastructure, inputs, and markets, that support the value chain. The assessment below is generalized for the country; regional variation affects the prominence of the roles of some actors and the prices and transportation methods.

Figure 3. Conceptual Map of the Haitian Sorghum Value Chain

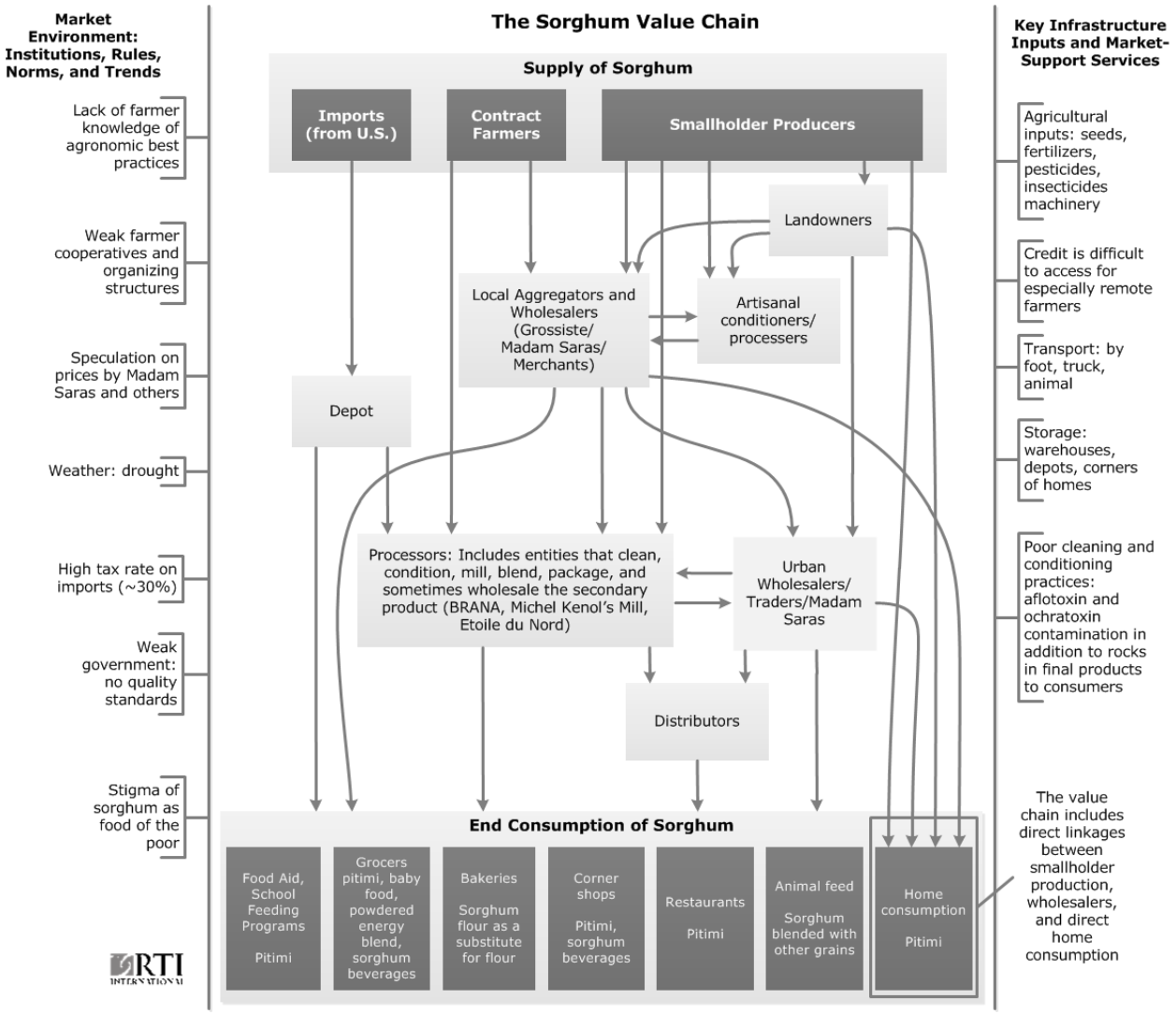


Table 1 describes each actor's roles and functions within the value chain, followed by an analysis of the input-output structure, the institutional rules and norms, and the key infrastructure and market support services to further uncover the complex relationships and functioning of this informal chain.

Table 1. Description of Value Chain Actors and Their Roles

Actor	Role in the Value Chain	Key Characteristics, Activities, and Functions
Smallholder Farmers	Suppliers/ Consumers	Sorghum is typically grown with other crops using few inputs and saved seed on a few hectares of land, leading to low yields. Farmers will save approximately one third of their crop for home consumption, and land tenancy customs can result in additional portions given to landowners. Farmers are frequently subject to profit losses because of price speculation from *Madam Saras*.
Contract Farmers	Suppliers	These farmers are relatively well organized and grow sorghum under a contract with a processor or mill. They may oversee a number of farmers and are more insulated from price speculation than smallholders.
Landowners	Consumers/ Suppliers	Landowners of arable land may have *mwatye-mwatye* agreements with smallholder farmers, where half of the harvest goes to the landowner and half to the farmer. *Mwatye-mwatye-mwatye* agreements are also common, where one third goes to the landowner and two thirds to the farmer. Landowners may resell the sorghum on the market through *Madam Saras* or other wholesalers.
Local *Madam Saras* and *Grossistes:* Aggregators and Wholesalers	Collectors, Transporters, and Merchants	These actors are the "go-betweens" in the sorghum value chain, filling the gaps between local production and local markets. They take on various roles depending on the level of information farmers have and the market prices. The terms *Madam Sara* and *Grossiste* are fluid, referring to both male and female individuals (predominantly female), who ultimately transport sorghum from farmers' fields to local markets for sale. *Madam Saras* negotiate with farmers on prices and sometimes harvest their fields. At other times, they may buy already-harvested sorghum from the farmers. They aggregate volumes of sorghum from many smallholders and transport it to market. *Grossistes* (wholesalers) may serve similar functions to *Madam Saras,* with the exception of harvesting. They may buy from both smallholder farmers but more often buy from *Madame Saras* or other first-level aggregators. *Grossistes* may hand off their sorghum to merchants to sell in the local markets.
Artisanal Conditioners/ Processors	Clean and process	Artisanal conditioners or processors are intermediary actors who remove rocks and debris from the sorghum grain. They may receive the sorghum directly from farmer's fields or from *Madam Saras* or *Grossistes.*
Local Merchants	Sell produce	Merchants serve to connect the producers, local processors, and traders of sorghum with end consumers. Merchants can also take the role of *Madame Sara* or *Grossiste* or purchase from *Grossistes, Madame Saras*, or local conditioners/processors.
Urban Wholesalers/ Traders	Transport and sell	These actors link the regional markets with the urban markets, primarily Port-au-Prince.
Processors	Clean, process, and manufacture	Processors are larger entities that clean, condition, mill, blend, package, and sometimes wholesale and distribute the secondary product. They process products for both human and animal consumption. Processors generally have larger scale equipment and storage capacity than are available to artisanal producers. Examples include Brasserie National d'Haiti (BRANA), Etoile du Nord (the National Conditioning Center), and SOTRAPAL S.A., a mill and processor of a variety of grains.
Distributors	Sell or distribute product	Distributors serve to connect the processors of sorghum and manufacturers of sorghum products with end consumers. They include formal grocery stores, institutions (e.g., schools, prisons, and feeding programs), and animal feed stores.

Actor	Role in the Value Chain	Key Characteristics, Activities, and Functions
End Consumers	Consumers	Sorghum is consumed in a variety of ways in Haiti, including as *pitimi*, sorghum beverages (Malta H), baby food or energy blends made from powdered sorghum blended with other grains and fortifiers, and animal feed.

Input-Output Structure

Input-output structure analysis describes how the produce flows along the value chain and the relationships that exist between stages and actors. As depicted in Figure 3, production that is smallholder farmer driven typically goes to home consumption or passes through a number of go-betweens before arriving at a final consumer. As an interviewee noted, "it is a very inefficient value chain. Each time someone touches it, it is 15% added [to the cost of sorghum]." We describe the flow of the product through the value chain from production to marketing, aggregation, value-addition, and consumption.

Sorghum is typically produced by smallholder farmers as one of several crops primarily for home or animal consumption. Farmers invest little in the production—they tend to save or trade seed, plant by broadcasting seeds, and use minimal to no fertilizer or other agrochemicals (herbicides or pesticides). Many farmers lack knowledge of proper growing techniques because of the near non-existence of an agricultural extension. What access they have to extension training is provided by a predominantly uncoordinated network of NGOs. Production is driven by manual labor, and farmers tend to rely on neighbors to provide mutual labor at various points of the production to market cycle.

After harvest, the sorghum supply chain for sorghum that is marketed (not set aside for home consumption) involves fairly simple transactions between several buyers and sellers dictated by price. Farmers have little incentive to add value in terms of quality either in the field (through improved production practices or inputs or after-harvest). Further, they have limited resources to invest in other value addition options, such as aggregation (requires storage centers or equipment), bulk milling, or transportation. A multitude of marketing agents are engaged in the domestic value chain. Similar to the maize market, market agents do not have the resources or incentives to invest in upgrading their practices to enter more formal or lucrative sorghum markets. Price is primarily dictated by supply and demand, but some marketing agents engage in speculation and "spatial arbitrage" (i.e., taking advantage of geographic price differentials) (USAID Office of Food for Peace [FFP], 2013). Most farmers have options regarding who they sell at least a portion of their harvest to on the open market based on price. That said, there are many more captive relationships between individual farmers and *Madam Saras* resulting from long-standing relationships, physical proximity, transport constraints, and/or indebtedness to a *Madam Sara*. Further, individual farmers are often renting land from landowners, and thus, half of the harvest goes to the landowner and half to the farmer. *Mwatye-mwatye-mwatye* agreements are also common, where one third goes to the landowner and two thirds to the farmer. Contract farmers who sell directly to a mill or processor are generally larger land-holders who might in turn contract smallholder farmers.

Once traders (i.e., *Madam Saras* and *Grossistes*) have purchased the sorghum, they then market the sorghum at multiple rural and urban markets throughout the country. Of the 24 main markets (urban and rural) that the BEST Analysis (USAID-FFP, 2013) reviewed, only nine sold sorghum at harvest. The

Madam Saras do not specialize in product transformation. They add value to the sorghum by aggregating, transporting, and marketing it beyond the local village. Within the various levels of *Madam Saras*—from first-level aggregators to those closer to urban centers—limited value-addition occurs through aggregation, marketing, and transportation. Simultaneously, value is also lost because of spoilage, attrition, and other forms of quantity and quality loss.

Though there are many potential consumptive uses of sorghum, the majority of demand for sorghum is for the human consumption of *pitimi*, an oatmeal-like food, and blending with other grains for animal feed. Sorghum, or *pitimi* in Haitian Creole, was once a prominent part of many Haitians' diets. After the introduction of rice in the 20th century, however, diets shifted, and demand for *pitimi* fell. Some reasons for this phenomenon may relate to practicality: *pitimi* bought in the market often contains little stones and pebbles as a result of drying the grain on concrete slabs, which can cause considerable discontent among consumers who end up with broken teeth. Moreover, preparing *pitimi* requires more time than preparing rice. In rural areas, *pitimi* is often made from the family's supply of sorghum. While *pitimi* is still widely sold in street markets and grocery stores across Haiti, it carries a stigma of "food for the poor," and many interviewees emphasized that much work will need to be done to affect a change in the tastes and preferences of middle and upper class Haitians. At present, almost two thirds of Haiti's population is rural. However, since 2000, trends show that the urban population is growing by an average of 4 percent per year, while the rural population is declining by 1.6 percent annually. At the current rate of migration from rural to urban areas, Haiti's population will be over 80 percent urban by 2035. This shift will change both consumption patterns and agricultural production potential (with more of the former agricultural labor force relocating to cities).

New buyers have begun to try to source sorghum from Haitian farmers for use in value-added products: the SMASH project, which aims to purchase up to 2500 MT of sorghum per year for BRANA (the local brewery), and Etoile du Nord, the national grain processing plant, which aims to purchase up to 3,000 MT per year. Etoile du Nord will be purchasing and cleaning for local bakeries, breweries, and school feeding programs. Processors such as these are trying to avoid informal market channels and rural markets by developing systems to buy directly from smallholders, either as individuals or in groups. At present, these large processors are importing sorghum to meet both quality and quantity specifications. In 2009, an average of 4,441 MT of sorghum was imported on a yearly basis, making it the eighth highest imported commodity (rice is number one). All buyers we interviewed indicated that at present, it costs more to produce sorghum in Haiti than it does to import it from the United States. A large humanitarian feeding NGO sources 30 containers a month of sorghum internationally.

Currently, markets for sorghum-based products are limited to domestic buyers, and there are no sorghum exports from Haiti. More than one interviewee thought that it could be possible for Haiti to be a sorghum exporter to other Caribbean countries—either in the form of raw sorghum or processed sorghum as flours or feed. Within the local urban market, there are some local brands of *pitimi*. However, there are also foreign brands that are catering to a higher-end customer base; their packaging is modern, the grain is free of weevils and stones, and nutrient information is included on the package. Grocery stores in Port-au-Prince tend to have both local *pitimi* blends and more expensive foreign brands for sale. Animal feed is a particularly lucrative potential market; as the poultry sector continues to grow in Haiti, it will depend upon the local availability of components, such as sorghum, that go into animal feed. Sorghum for animal

feed can be procured at a few levels: on farms, food lost during harvest can be transformed into feed; at the market, different grades of sorghum can be sold for feed; and large operations can also purchase feed that has been produced with both locally purchased and imported ingredients.

Institutional Rules, Norms, and Trends

Institutional norms and trends describe how the value chain is governed (i.e., who determines and enforces the rules and how the rules are developed and communicated). Informal rules governing the value chain could include signals that encourage value chain actors to grow specific varieties, clean sorghum to specific standards, ensure that the sorghum has a specific moisture content, enforce food safety standards (including handling practices and measuring fungal toxin levels), supply sorghum in specific sizes and types of packaging, and/or mill the sorghum to a specific degree of fineness, among others. Because of the limitations of this study, we were unable to obtain first-hand information on the informal rules governing the chain from farm to mid-level markets. For example, it is unclear whether specific processors producing *pitimi* for supermarkets are requiring specific varieties or milling grain to a certain standard. It also unclear if *Madam Saras* or *Grossistes* require specific varieties, specific storage techniques, or milling standards. To unpack these issues, additional qualitative work is needed in-country. However, on a number of occasions, it was noted that these types of surveys would need to be administered by local Haitians in specific regions because of dialect considerations and the general reluctance of market traders to give accurate information on their business operations to strangers.

Informal norms determining the demand for or consumption of sorghum include the perception that it is a "poor man's crop," and thus, it is not consumed by Haitian families as much as it used to be. There is a relatively recent resurgence of "ancient" or "traditional" grains such as sorghum in upscale restaurants and the use of sorghum as a gluten-free option in products including beer, other malted beverages, and bread. This resurgence could play a role in developing cultural pride for Haitian-made products and drive an increase in sorghum demand and consumption. During our research, we found evidence that sorghum is gaining cultural cache, as evidenced by the international, high-quality *pitimi* being sold in Port-au-Prince and the interest of the bakery Epi D'or in adding a Haitian sorghum-based bread to their bakery offerings.

There are several formal obstacles that could thwart SMASH and potentially other value chain programs' and private sector actors' ability to scale sorghum production and yield. Policies that are old, out of date, and often lacking stymie sorghum growth. Landownership law and practices in Haiti make it difficult for smallholder farmers to make choices to scale crop production. There were no national-level policies regarding food safety requirements for sorghum that we could find through our desk review or interviews. The lack of macro-economic policies to support Haitian agriculture over imports also generally further complicates market incentives to scale. Until macro-economic policies are in place, one interviewee said, "it is like sticking fingers in the flood." As concluded by nearly all of our interviewees, without the support and involvement of the Haitian government, a robust sorghum (or any crop) value chain will be unable to develop into a system capable of achieving exports. One value chain actor noted that there should be a 15 percent import tax on the value of sorghum coming in the country and that there is currently no specific tax on sorghum, though there is a 30 percent tax on many other imports. However, another sorghum value chain stakeholder noted that there is a tax on the weight of sorghum coming in to

port, if not on the grain itself. This tax is in addition to the cost of transportation, which can add up to a 40–50 percent mark-up on the imported sorghum. A review of Haiti port tariffs showed that prior to 2009, there were no tariffs on sorghum, but since 2009, there is a 15 percent tariff, as confirmed by the US State Department's annual "Doing Business in Haiti" guide. There are also non-tariff barriers in terms of licensing fees. The confusion over the import tariff amongst stakeholders who are currently importing sorghum highlights how opaque the regulations are and may suggest that they are not uniformly enforced or explained.

Key Infrastructure and Market Support Services

Key infrastructure inputs and market support services were examined to determine what factors support the supply chain, where gaps exist, and why there are gaps in these services and inputs. The key support services examined here include agricultural extension, access to productive inputs, post-harvest handling and aggregation, transportation, and access to finance.

The dearth of both agricultural extension officers and input providers means that few farmers are planting with modern techniques or technologies. Structural adjustment policies required by the International Monetary Fund supported the downsizing of the agricultural ministries in the 1980s and the subsequent cutting of agricultural extension workers. The political turmoil in Haiti in the 1990s saw the productivity of the agricultural sector plummet, with private sector input companies shutting down. As a result, most agricultural extension at present is provided by NGOs under the auspices of "development aid." Some more recent public-private partnerships, such as SMASH and others in the coffee and mango industries, are facilitating private sector extension services. We were unable to uncover any evidence of standardized, nationally approved training curricula for sorghum production. To the extent that farmers are being trained in sorghum production, it is likely from other farmers or burgeoning initiatives, such as SMASH.

The shut-down of most private sector input companies in the 1990s has resulted in a severe lack of access to inputs, such as certified seed and fertilizers. Less than 2 percent of the seed planted by farmers is accessed through the formal sector. Most seed is either saved from previous seasons (15–20 percent), traded with neighboring farmers, or procured informally in the local market (non-certified seed). (FAO, Commissions on Genetic Resources for Food and Agriculture [CGRFA], 2011). In conjunction with trading seed types and, thus, varieties, seed given by donor-funded projects and government contributes to the mixing of the varietals in any given field. Saved seed that has not been bred specifically for seed degrades over time, and mixed varietals on a field make it difficult for larger buyers to procure from smallholder farmers as they require specifications of their sorghum (for example, the level of sugars). Additionally, there is very little in the way of formal plant breeding or multiplication efforts in Haiti. The National Seed Service (Service National Semencier) oversees this sector. However, it has severe capacity constraints and can only conduct some varietal evaluations. Meanwhile, the Organization for the Rehabilitation of the Environment has regularly bred and screened sorghum seed; they are the sole Haitian organization that multiplies seed to International Seed Testing Association standards (Sperling et al., 2010). The Ministry of Agriculture has introduced some improved varieties of sorghum through the Centre de Recherche et de Documentation Agricoles. One sorghum expert, Gael Pressoir, is engaged in sorghum breeding and multiplication through his company, Chibas. A recently awarded USAID grant to

the University of Kansas will support sorghum seed breeding and multiplication with Chibas. The SSSA Haiti (2010) notes that the lack of appropriate storage for seed has led to a high proportion of seed being purchased in the local market. Most interviewees indicated that farmers who purchased seed did not distinguish between grain and seed. However, the SSSA Haiti assessment indicated that buyers and sellers have a range of seed specifications, even if they are not formally certified; that farmers do distinguish between grain and seed; and further, that some markets or specific traders are known for better seed than others (SSSA, 2010, p. 37). Given this finding, it is integral for the value chain to develop market signals for specific seed varieties that are transparently shared with market agents (e.g., *Madam Saras*) and farmers.

Lack of seed storage is a symptom of a larger lack of adequate storage facilities for sorghum and grain in general. Farmers tend to store their grain in excess rooms in their houses or in bags and small storage shelters on their farmstead. Most have inadequate understanding of how to best dry and store their grain to maximize its shelf-life and avoid contamination (e.g., by insects, rodents, or fungus, including aflatoxins). *Madam Saras* and *Grossistes* do not offer any type of storage facility for farmers, and it is unclear how long traders hold on to grain before selling it into the market or to aggregators in larger towns and cities. In Port-au-Prince, large-scale storage facilities that would be adequate for larger buyers were reduced by the 2010 earthquake. Recent activities, such as the establishment of Etoile du Nord, are the first signs of privately owned processing and storage facilities. Etoile du Nord has the equipment to clean, polish, and dry sorghum before repackaging it for various clients. The lack of adequate post-harvest handling, processing, and storage facilities in rural areas means that large-scale buyers with specific quality requirements from Port-Au-Prince need to mobilize quickly after harvest to purchase sorghum and/or have a network of nimble *Madam Saras* to aggregate the grain and move it into urban areas.

The ability to get product to market is critical for any business operation. This is even more so in Haiti: the lack of good road infrastructure, particularly in the northwest, limits the ability of farmers, traders, and processors (as such) in that region to access more lucrative urban markets. Transport from the field to first-level aggregation is currently typically undertaken by bike, donkey, or truck. There are a limited number of actors with a specific role in the transport of goods rather than trading or buying those goods. In-region trucking businesses do exist, and some are being leveraged for agricultural commodities, though not to a large extent for sorghum. In general, road infrastructure has improved over the last few years, but critical rural roads and bridges are in poor condition in many areas and are susceptible to being washed out by floods or heavy rains during hurricane season.

Finally, for Haitian farmers to scale sorghum production, financial service providers need to enhance access to credit for smallholder farmers. Currently, the market operates almost purely on a cash basis, and access to credit is a challenge. Similarly, access to insurance will also need to be enhanced to protect farmers and end buyers. The lack of financial services in rural areas is particularly difficult. Mobile money services are not widely adopted. Further complicating the financial aspects of farming and value chain development is the lack of rules and regulations for land ownership.

CONCLUSIONS AND RECOMMENDATIONS

This type of VCA can be applied in two key ways. First, it can inform future programming. This analysis provides us with an understanding of both the enabling environment for and the barriers to the transfer of goods, information, and value within the sorghum supply chain. This, in turn, allows private sector buyers and those interested in "inclusive" value chain development to pinpoint key interventions that can remove barriers, improve efficiencies, and increase the value accrued for all actors involved. It can also be used as a coordinating mechanism. It is unlikely that one actor or one project can effectively address all the various constraints or opportunities within the system. This mapping can be shared amongst stakeholders to identify different priority interventions and ensure coordination. Secondly, the mapping can be seen as a baseline for the value chain, against which future projects or interventions can be assessed. Has the value chain changed since the intervention? While attribution can be difficult in a complex system such as this, the mapping can nonetheless enable a value chain upgrading intervention to assess progress and pivot as the mapping evolves over time.

This sorghum VCA provides an overarching picture of how sorghum travels from different points of origin to specific points of consumption or end-use in Haiti. It predominately focuses on the production pathway that originates with smallholder farmers. This was intentional, as the analysis was conducted to inform a pro-poor value chain development initiative—SMASH—and should, thus, be used to identify upgrading strategies which develop win-win outcomes for farmers and lead firms. Our qualitative analysis and process yielded recommendations for applying the knowledge uncovered by the analysis and for current and future value chain upgrading programs in Haiti and elsewhere.

Based on the descriptive input/output analysis, we find that the sorghum value chain is largely unstructured and dictated by informal institutional rules and norms with a dearth of key support services.

For interventions focused on value chain upgrading and inclusive value chain development, our recommendations are focused on the gaps between the current sorghum value chain and a truly inclusive chain. The sorghum value chain has seen significant renewed interested over the past few years. With BRANA's assured market, Epi D'or's interest in developing a sorghum-based bread, and local processing facilities being set up to address the needs of a variety of consumer-facing buyers, the local production of sorghum must increase. Whether smallholder farmers receive the benefit of the increased demand is yet to be seen. If they cannot meet quality and quantity demands, then larger farms and plantations may move in to fill that gap without explicit smallholder farmer purchasing commitments. Based upon this analysis and taking into consideration the types of activities that would be most beneficial to inclusive value chain development for smallholder farmers, we recommend three key focus areas for the development of the sorghum value chain.

First, smallholder production must increase. Farmers need both productive inputs and training in good agronomic practices, including post-harvest handling practices. To increase production, farmers need to invest in better agricultural practices and better seed varieties. They require information, including extension support and market information. We think that new buyers in the sorghum market, such as SMASH and Etoile du Nord, can build this type of extension and information into their business model. New development projects may be leveraged to support these initiatives. Seed multiplication efforts, seed

storage, and accurate information on seeds in circulation could greatly improve farmers' ability to access high-quality seed. A deeper dive into local informal seed systems would be beneficial. Anecdotal evidence suggests that some key *Madam Saras* focus exclusively on seed, and if so, this could be a key entry point for a development intervention. Learn how they procure seed, what qualities they look for and how and where they sell that seed. Seek to replicate this system by enabling these current informal input providers to develop into a business, perhaps with multiple buying and selling agents under them.

Second, financing is needed to reduce smallholder farmer risk. Sorghum is a high-risk, low-return crop, so traditional financing may never be an option at the smallholder farmer level. Alternative options could include developing better understanding of the local lending market. For example, if a large private sector buyer worked through local *Madam Saras*, they might be able to require those buyers provide specific purchasing rates and input loan repayment rates. Developing smallholder farmer capacity to set up village savings and lending clubs will also help bridge the gap between access and traditional financial options. A final alternative is to leverage private sector contracts to develop tripartite funding arrangements, whereby buyer contracts enable farmers to access inputs, and the buyer pays the bank or input company upon receipt of the sorghum at the end of the harvest.

Finally, lead firms can be leveraged in the system to develop a platform for multiple buyers. Heineken/BRANA's commitment to locally sourcing sorghum could be leveraged by the other market actors. BRANA can push for appropriate formal rules and regulations within the system in a way that local, informal buyers cannot. Their convening power can bring together a wide array of stakeholders to jointly tackle the development of this supply chain. Local aggregation and processing services in rural and urban areas will be essential for new buyers to enter the market and access smallholder farmer-produced sorghum. Developing these hub and spoke systems should be a priority that all consumer-facing buyers should consider investing in.

LIMITATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Any analysis that requires significant, nuanced input from a variety of stakeholders is limited by the availability of resources to reach them. With more resources and time, future research could focus on the informal market actors, such as *Madam Saras and Grossistes*, to unpack the various relationships these players have with farmers as input lenders, input providers, harvesters, transporters, and buyers. We could also conduct further research on land ownership and use, particularly digging into the complex system of *mwatye-mwatye*, and *mwatye-mwatye-mwatye* land tenureship rights. Financial institutions, such as banks, microfinance institutions, and mobile money providers, are also potentially key players in the formalization of the sorghum value chain. Finally, we could implement more in-depth surveys to better understand the decisions that smallholder farmers make when producing sorghum to incentivize increased production. Future research should account for the limitations of performing qualitative research in Haiti, where it is critical to have local researchers conduct interviews with market players, particularly informal players such as *Madam Saras*, to collect more accurate information than could be obtained by non-locals. These interviews could illuminate the informal rules governing the chain. Finally, our "snowball" method of asking interviewees to recommend others to interview revealed a reluctance to

refer government or ministry officials. More direct means of reaching out to government stakeholders were not successful, which limited our understanding of the formal rules governing the chain.

REFERENCES

Donovan, J., Cunha, M., Fransel, S., Gyau, A., & Mithofer, D. (2015). Guides for value chain development: A comparative review. *Journal of Agribusiness in Developing and Emerging Economies, 5*(1), 2–23.

FAO, Statistic Division (FAOSTAT). (2016). *FAOSTAT Statistics Database* [Data file]. Retrieved from http://www.fao.org/faostat/en/#data/BL.

FAO, CGRFA. (2011). *Strengthening seed systems: Gap analysis of the seed sector*. Retrieved from http://www.fao.org/docrep/meeting/022/am646e.pdf.

Fernandez-Stark, K., Bamber, P., & Gereffi, G. (2012). *Upgrading in global value chains: Addressing the skills challenge in developing countries* (OECD Background Paper). Durham, North Carolina: Duke University, Center on Globalization, Governance, and Competitiveness (Duke CGGC).

Humphrey, J., & Schmitz, H. (2000) *Governance and upgrading: Linking industrial cluster and global value chain research.* (IDS Working Paper, No. 120). Brighton, UK: Institute of Development Studies, University of Sussex.

Sperling, L., Brick, D., Ludger, J. S., Montgerard, J. B., Louis, M., Yueto, F. … Shannon, D. (2010). *Seed system security assessment: Haiti.* Retrieved from https://www.crs.org/sites/default/files/tools-research/seed-system-security-assessment-haiti.pdf

Taglioni, D., & Winkler, D. (2016). *Making global value chains work for development.* Retrieved from https://openknowledge.worldbank.org/handle/10986/24426

UNCTAD. (2013). *Global value chains and development: Investment and value added trade in the global economy*. Retrieved from http://unctad.org/en/PublicationsLibrary/diae2013d1_en.pdf

USAID-FFP. (2013). *Haiti USAID-Bellmon Estimation Studies for Title II (USAID-Best) Analysis.* Retrieved from http://pdf.usaid.gov/pdf_docs/pnaec206.pdf.

USAID, U.S. & Foreign Commercial Service. (2014). *Doing business in Haiti: 2014 country commercial guide for U.S. companies*. Retrieved from http://photos.state.gov/libraries/haiti/231771/PDFs/ccgfinalcopy.pdf.

Webber, C. M., & Labaste, P. (2010). *Building competitiveness in Africa's agriculture.* Retrieved from http://siteresources.worldbank.org/INTARD/Resources/Building_Competitiveness_in_Africa_Ag.pdf

World Trade Organization (WTO). (2015). *Trade policy review: Haiti*. Retrieved from https://www.wto.org/english/tratop_e/tpr_e/tp427_e.htm.

Value Chain-specific Resources

Lundy, M., Gottret, M.V., Ostertag, C., Best, R., & Ferris, S. (Eds.). (2007). *Participatory market chain analysis for smallholder producers*. Cali, Colombia: International Center for Tropical Agriculture (CIAT). Retrieved from https://www.crs.org/sites/default/files/tools-research/participatory-market-chain-analysis-for-smallholder-producers.pdf.

Organization for Economic Co-operation and Development (OECD). (2013). *Implications of global value chains for trade, investment and development and jobs.* Paper presented at the G-20 Leaders Summit. Retrieved from https://www.oecd.org/sti/ind/G20-Global-Value-Chains-2013.pdf.

Springer-Heinze, A. (2007). *ValueLinks manual: The methodology of value chain promotion*. Eschborn, Germany: German Technical Cooperation Agency (GTZ). Retrieved from https://www2.giz.de/wbf/4tDx9kw63gma/ValueLinks_Manual.pdf.

USAID. (n.d.). *Value chain development wiki*. Retrieved from https://www.microlinks.org/good-practice-center/value-chain-wiki.

UNIDO. (2011). *Pro-poor value chain development: 25 guiding questions for designing and implementing agroindustry projects*. Retrieved from http://www.unido.org/fileadmin/user_media/Services/Agro-Industries/Pro-poor_value_chain_development_2011.pdf.