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



Seed Systems in Fragile States HAITI CASE STUDY



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Activity Title: Feed the Future Global Supporting Seed Systems for Development activity

Activity start date and end date: Aug 24, 2018 – Aug 23, 2023

Cooperative agreement number: 7200AA18LE00004

Document title: Seed Systems in Fragile States - Haiti Case Study

Publication date: September 30, 2021

Author's names: Marcia Croft

Citation: Croft, M. Seed Systems in Fragile States - Haiti Case Study. 2021. A Feed the Future Global Supporting Seed Systems for Development activity report.

Sponsoring USAID office: LOC Unit, Federal Center Plaza (SA-44)/M/CFO/CMP

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Activity Goal: Improved functioning of the high-impact integrated seed systems

Language of document: English

Submitted on behalf of: Catholic Relief Services

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Acknowledgements

The authors would like to thank the key informants who supported this study with their time, insights, and experiences. During the study period, Haiti experienced a presidential assassination, a major earthquake, and a hurricane. The invaluable time of the key informants is greatly appreciated.

Cover page photo credit: Oscar Leiva for CRS

DISCLAIMER

This report was made possible by the generous support from the American people through the U.S. Government's Feed the Future initiative and the United States Agency for International Development through Cooperative Agreement 7200AA18LE00004. The contents are the responsibility of Catholic Relief Services and do not necessarily reflect the views of USAID or the United States Government.

Feed the Future Consortium Partners in the Feed the Future Global Supporting Seed Systems for Development activity:



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Acronyms

CECOSAM	Centre de Conditionnement et de Stockage des Semences de Maïs
CIPDSA	Commission Intersectorielle de Production et Distribution de Semences Améliorées
CIAT	International Center for Tropical Agriculture
CIMMYT	International Maize and Wheat Improvement Center
CRS	Catholic Relief Services
EGS	Early Generation Seed
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FEWSNET	Famine Early Warning Systems Network
GAP	Global Agriculture Practices
GDP	Gross Domestic Product
HDI	Human Development Index
IDB	International Development Bank
MARNDR	Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural
MYAP	Multi-Year Assistance Program
NGO	Non-Government Organization
ORE	Organization for the Rehabilitation of the Environment
QDS	Quality Declared Seed
SERA	Service d'Etudes et de Recherches Agricoles
SNS	Service National Semencier
SSSA	Seed System Security Assessment
UN	United Nations
UNDP	United Nation Development Programme

Abstract

This overview of seed systems in fragile states focuses on Haiti, with insights drawn from the literature and key informant interviews. While the Haitian context is constantly evolving, the lessons drawn from this case study can help inform seed system development in fragile states. Specifically, there is a need for definitive seed law and regulatory frameworks for private sector investment, which was echoed across many stakeholders. Despite limitations in government capacity, this regulatory framework would go a long way towards providing the assurance the private sector needs to develop in the seed sector. In addition, informal traders play a very important role in seed systems in fragile states and need to be incorporated into seed sector development; informal sector traders are as important if not more important than formal sector seed traders in developing resilient seed systems in these contexts. There is also a need to better understand the gender dynamics of the seed sector, especially the role of female informal traders. The informal market plays a crucial role in seed systems in fragile states but ignoring the gendered dynamics of women's work in the formal and informal seed sectors would jeopardize the future inclusive development of these systems.

Introduction

Background: Seed system development in fragile states

Definitions and indicators vary, but – according to USAID - the term ‘fragile state’ is used to refer to countries where the legitimacy of the government is in question, and the state itself is either unable or unwilling to adequately assure the provision of security and basic services to significant portion of its population (ILO, 2016). USAID’s definition of fragile states includes a broad range of failing, failed, and recovering states. The Fragile States Index (The Fund for Peace, 2021) usefully provides an annual ranking of 178 countries across 12 indicators of the risks and vulnerabilities faced by individual nations.

The formal seed sector is either weak or non-existent in fragile states. Farmers rely on the informal seed sector, and many also receive seed and related support through emergency interventions. Current approaches to emergency seed provisioning aim to support farmers with access to seed in the short term, but these approaches often do little to support the emergence of sustainable seed systems in the long term. Existing formal sector models are not viable in the context of fragile states due to severe lack of capacity, insecurity, and on-going political and economic instability. The context of fragility – which is often combined with natural disasters such as drought and floods, pests such as locusts and fall army worm, and now COVID-19 – necessitates that seed systems are resilient. There are various different approaches and many unanswered questions as to how seed systems should be developed and made resilient in fragile states. Governance arrangements between government, private sector, NGOs, international organizations and donors are considered to be key, and the division of power and decision-making between actors is central (Cordaid & Wageningen University, 2014). In general, the emergence (or re-emergence) of private seed enterprises in fragile states is almost completely dependent on serving the needs of donor-driven emergency seed provisioning. The private sector’s reliance on emergency seed provisioning for seed sales makes it difficult to transition to more sustainable business models, especially when farmers are accustomed to receiving seed for free through humanitarian interventions.

Given the many challenges outlined above, humanitarian and development agencies working in fragile states need guidance in designing support to seed systems that are consistent with USAID’s resilience agenda and appropriate to the humanitarian-development-peace nexus. The broader study for which this case study was undertaken will contribute to resilience-building among farmers by proposing ways in which seed systems can provide farmers in fragile states with access to quality seed of appropriate varieties. It will contribute to resilient seed systems by proposing models for the (re-)establishment of new, more robust seed systems that are able to adapt and transform to withstand the various shocks and stresses that characterize fragile states. The interventions that will be proposed must necessarily bridge the divide between humanitarian and development assistance to ensure that short-term, emergency seed interventions do not undermine longer-term development objectives within seed systems.

Haiti: State Fragility and Historical Context

Currently, Haiti is ranked 149 out of 182 countries on the Human Development Index, indicating that life expectancy, education, and per capita income are extremely low in comparison to other countries. On the other hand, Haiti is ranked 13 out of 179 countries on the fragility index indicating

high risk and vulnerability to shocks. Haiti also experiences the most inequality of any country in the Western Hemisphere as measured by the Gini Index and has high levels of food insecurity due to unstable domestic food supply, market power disparities, population pressure, and limited economic opportunities. Haitians pay 30%-77% more for food as compared to other countries in the region when income and purchasing power are accounted for (FEWS NET, 2018). Haiti has also suffered from political instability over the past decades, with frequent president and cabinet changes and poor governance and accountability (FEWS NET, 2018). Agriculture makes up just 28% of GDP despite 60% of the population identifying farming as their primary source of income (Seed System Security Assessment - Haiti, 2010¹).

Historical overview in relation to agriculture

Haiti became one of the first nations to free themselves from colonial rule in 1804 when a slave revolt expelled the French colonialists and established Haiti as an independent country. Located on the western portion of the Hispaniola island in the Caribbean, agriculture has been a critical part of Haiti's past, present, and future economy. Agriculture still forms the backbone of the nation of over 10 million, with 80% of the population engaged in agriculture as part of their livelihood (FEWS NET, 2018).

Though Haiti has suffered from political instability for many decades, it was self-sufficient in key staples until the early 1980s. Since then, it has been increasingly dependent on imported food, especially rice, wheat, and edible oils (FEWS NET, 2018). While this has had negative implications for the stability of food prices, Haiti has a thriving agro-export sector for a number of key commodities including vetiver oil, coffee, cocoa, bananas, mangoes and other fruits. Food riots in 2008 led to a change in government, and the large primary and secondary impacts of the 2010 earthquake increased the vulnerability of the poorest. Average household sizes increased from 6.44 to 8.68 people, while meals fell from 2.48 per day to 1.59 from pre-earthquake levels to immediately after the 2010 earthquake (Seed System Security Assessment - Haiti, 2010). This disaster was followed by unprecedented levels of aid to Haiti, with implications for the seed sector, as discussed below.

Agriculture and Food Security

Cropping systems

Haiti has year-round crop production, thanks to its climate and varied agroecological zones (FEWS NET, 2018). Rice, maize, beans, peas, roots and tubers, and plantains are some of the most common staple crops grown in Haiti. Rice is the most important staple crop in Haiti (average consumption of 50 kg/year/person) followed by maize and sorghum. Bananas/plantains, tubers, beans, and peas are also important staples produced locally while wheat flour is an imported staple. Red beans, black beans, and pigeon pea are the most commonly grown peas and beans while tubers include sweet potatoes, cassava, and yams. Some of the most high-value crops are fruits such as mangoes, papaya, pineapple, mangosteen, guava, and citrus as well as cocoa, tobacco, coffee, and sugarcane (FEWS NET, 2018). Other vegetables and fruits that are increasingly common include cabbage, tomato, eggplant, leaf amaranth, watermelon, and tree fruits such as acerola. While there are not specific 'women's crops' identified in the literature, many women do cultivate high-value vegetables and are

¹ <https://seedssystem.org/wp-content/uploads/2014/03/SSSA-Haiti-Main-Report.pdf>

responsible for selecting healthy foods to feed their families (Kellum et al., 2020; Seed System Security Assessment - Haiti, 2010).

One third of the land area is arable in Haiti. There are five basic production systems across the 1.2 million ha cultivated each year: rainfed lowland agriculture, dryland lowland agriculture, rainfed hill and mountain agriculture, dryland hill and mountain agriculture, and irrigated areas most commonly associated with rice production (Seed System Security Assessment - Haiti, 2010). Haiti also includes a somewhat unusual combination of fruit trees and root crops in arboriculture (Seed System Security Assessment - Haiti, 2010)

Agroecologies and Livelihood Zones

Agroecologies in Haiti include both drought-prone areas and slightly wealthier irrigated zones (Seed System Security Assessment - Haiti, 2010). The majority of agricultural land is rainfed, with only 13% of productive units with access to irrigation. Two rainy seasons take place between April and June and then August to November. Roughly 60% of Haiti has steep slopes of over 20%, contributing to soil erosion and degradation (FEWS NET, 2018). Due to the diversity of agroecologies, bean seeds are available year-round through an exchange from the highlands to the lowlands that ensures beans are always present in informal markets.

Though agriculture makes up a part of the majority of the population's livelihood, production is not high enough to meet current demand. Haiti produces an average of 380,000-455,000 tons of agricultural produce per year and yet is a net importer of food (12% of net imports) including many staples (Ng & Aksoy, 2008; Seed System Security Assessment - Haiti, 2010). While Haiti is self-sufficient in tubers, plantains, maize, and sorghum, it still experiences a deficit in two of its most important staples: rice and beans (FEWS NET, 2018).

The majority of production comes from smallholder farmers; 75% of productive land is made up of parcels of less than 1ha. Approximately 25% of smallholder farmers are women and 11% are youth up to 29 years, though these figures may be underestimates as family members make up the labor force for 95% of farms (FEWS NET, 2018; UNCTAD, 2006).

Eighty-five percent of the Haitian economy is informal and dominated by women's commercial activities (Seed System Security Assessment - Haiti, 2010). Haiti has one of the highest rates of economically active women in the developing world with 62% of women active in the labor force (approximately equal to men) (Correia, 2002). Agricultural trade provides the most common occupation for women which means that women are often responsible for purchasing and preparing the food for their household as well as generating the income needed to purchase it (Seed System Security Assessment - Haiti, 2010). Female traders in the agricultural sector are commonly known as Madam Saras.

Food security challenges

Haiti faces multiple challenges to food security in terms of availability, access, utilization, and stability. These challenges include environmental degradation, political and economic instability, and agricultural productivity. Haiti has one of the highest rates of food insecurity in the world, with nearly half of the population (4.4 million) in need of food assistance and 1 million classified in emergency status (World Food Programme, 2018). Almost one quarter of children in Haiti are chronically malnourished and 10% are underweight due to many factors, including poor diet.

Haiti is one of the most vulnerable countries to natural disasters. Between 2000 and 2016, there were 74 natural disasters in which 12 million people were impacted and 237,176 people lost their lives, principally the 2010 earthquake (FEWS NET, 2018). Natural disasters include earthquakes, floods, storms, droughts, and epidemics (See Figure 1). In events per square kilometer, Haiti surpasses all other Latin American and Caribbean countries. These disasters destroy crops and market infrastructure and displace thousands of people.



Figure 1. Major natural events affecting Haiti. Source: (FEWS NET, 2018).

Environmental challenges have worsened food insecurity, especially in rural areas. Forest cover is currently only 1% of Haitian land area, contributing to landslides, erosion, and reduced resilience to extreme weather events (FEWS NET, 2018). Due to the highly mountainous nature of Haiti's geography, steep slopes exacerbate the effects of deforestation. Cutting trees for charcoal for both cooking and income has been a critical driver of deforestation, but also a stopgap measure for the most vulnerable families seeking to close consumption gaps. Approximately 37 million tons of soil from 12,000 ha are eroded each year (Seed System Security Assessment - Haiti, 2010). This means that 30-50% of the population of Haiti are working on extremely fragile lands with arid land, steep slopes, or fragile soils.

Market dependence is high in Haiti, especially for the most vulnerable households. These households purchase 45%-85% of their food, leaving them vulnerable to price spikes and market volatility, even in areas of agricultural production (FEWS NET, 2018). While food processing contributes to improved food stability, processing capacity is limited and concentrated in Port-au-Prince but includes milling imported wheat, fermenting sorghum into alcoholic and other beverages, and mixing and bottling imported vegetable oil. Smaller mills with limited production capacity exist across the countryside (FEWS NET, 2018). In addition, the major food processors have

demonstrated non-competitive behavior in the past; each of the largest food companies offer products with virtually no overlap with others, supporting the establishment of monopolies. This may be due to government inaction or a lack of willingness to confront large and powerful food corporations. Road availability and accessibility determine commodity flows far more than distance between locations, which can be impacted by security and extreme weather events (FEWS NET, 2018).

Women face additional food security challenges in general. Women have fewer job opportunities than men and are 20% more likely to be unemployed. They also receive 32% less in wages when they are able to secure employment. Women receive less education, face more health challenges, and are more likely to face domestic violence (FEWS NET, 2018).

Agricultural productivity in Haiti remains low, limiting food availability. A variety of factors contribute to low productivity, including low use of high-quality inputs, low access to finance, pests and diseases, extreme weather events, soil degradation, land fragmentation, and poor agricultural practices (FEWS NET, 2018). The Haitian seed system for sorghum was devastated by the Sugarcane Aphid that wiped out sorghum production in 2015, demonstrating the fragility in the seed system. Government programs regularly provide access to agricultural inputs, but these are often delivered late, limiting their impact.

External support

Haiti receives external support from a variety of sources, making up 60% of the national budget (Seed System Security Assessment - Haiti, 2010). Haiti receives extensive food aid, totaling 95,000 MT in just three years between 2004-2006 (FAO, 2009). This often comes under the name of emergency aid, but is not always appropriately targeted (Seed System Security Assessment - Haiti, 2010). External agricultural support comes from a variety of NGO and UN agencies, while the Haitian government also distributes large amounts of seed on an annual basis. The 2010 earthquake marked an unprecedented level of seed aid in Haiti, with dramatic impacts on the private sector, displacing the work of female traders and entrepreneurs, Madam Saras. Rural small-scale commerce declined in 91% of cases, but seed availability was cited as a reason in only 4% of cases. Humanitarian actors were advised to move away from an emergency focus on agricultural interventions in favor of medium-term farmer-driven agricultural marketing systems (Seed System Security Assessment - Haiti, 2010).

The Haitian government has subsidized and distributed fertilizer for over ten years to promote agricultural productivity. The distributions have often come late or been impacted by stockouts, and the fertilizer programs have increased dependence on foreign aid that already covers the majority of the national budget. These market distortions have provided fertilizer to farmers at below-market prices but have not succeeded in boosting food production (Seed System Security Assessment - Haiti, 2010).

Historical and Current Seed Sector Development

Farmers' Seed Sources

Farmers use multiple channels to access seed, including both formal and informal seed systems (Table 1). In Haiti, the vast majority (98%) of sources are informal (Seed System Security Assessment - Haiti, 2010). The lack of formal sector outlets limits their penetration in rural areas,

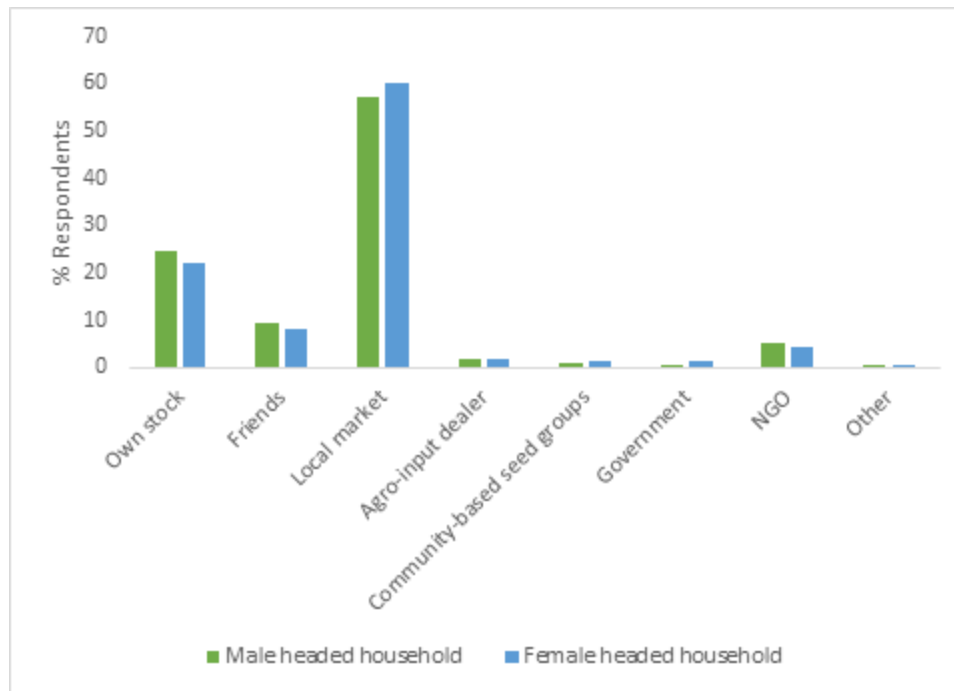
however the formal sector seed is common in rice and vegetable crops and reaches farmers through Madam Saras. Excluding eggplant and amaranth, 100% of all other less common vegetable crops are sourced from improved, imported formal seed (Seed System Security Assessment - Haiti, 2010).

Table 1. Quantities of seed (kg and percentages) farmers sow or plan to sow second season post 2010 earthquake by seed source and crop. N = 2,975, includes 3 priority crops per household; 983 households (*Seed System Security Assessment - Haiti*, n.d.).

CROP	TOTAL KG	PERCENTAGE DISTRIBUTION						TOTAL
		STOCKS	INPUT STORE	MARKET	FARMER SEED PRODUCER	FAMILY OR FRIEND	SEED AID	
Maize	63070	25.4	1.5	67.0	0.9	1.6	3.6	100.0
Beans	18202.9	17.0	1.2	78.5	0.0	1.3	2.0	100.0
Rice	3871.3	17.4	3.4	66.1	0.0	9.0	4.1	100.0
Sorghum	1122.2	35.2	2.5	51.7	1.8	4.0	4.9	100.0
Peanut	4153.4	40.2	2.1	54.3	2.5	0.2	0.6	100.0
Pigeon pea	697.1	12.4	0.0	78.1	1.1	4.1	4.3	100.0
Cowpea	295.0	9.7	5.1	68.2	13.6	0.0	3.4	100.0
All above crops	34648.8	21.8	1.6	71.1	0.7	2.2	2.5	100.0

Approximately 15-20% of seed comes from farmers' own stocks, primarily maize and sorghum and in limited areas, peanuts. Legume and cereal seeds are occasionally sourced from other farmers for an additional 2% of seed, with the exception of rice where approximately 9% of seed comes from family and friends. Vegetatively propagated crops like banana, sweet potato, yam, and manioc often come from other farmers (Seed System Security Assessment - Haiti, 2010). The low amounts of seed from farmers' stocks may be in part due to the difficulty of storing large-seeded crops like beans, cowpeas, and other legumes. On-farm storage for cereals like maize and sorghum is more common, but cash needed for school fees or debts may induce farmers to sell their produce at harvest and save less of their own production. Especially for beans, the purchase of most or all seed is common even in times of crisis. Many farmers prefer not to carry the risk of storing seed when they know they can purchase appropriate seed from the market at sowing time (Seed System Security Assessment - Haiti, 2010). Figure 2 disaggregates seed source by gender of household head, demonstrating minimal differences between male- and female-headed household seed purchasing patterns.

Figure 2. Seed sources by household head gender (Source: Seed System Security Assessment, 2010).



Haitian farmers occasionally access seed through decentralized seed production initiatives that generally produce relatively small (800-900 MT) amounts of seed, often led by NGOs or the FAO (Seed System Security Assessment - Haiti, 2010). These groups primarily produce key crops like rice and beans, but specialized farmer seed producers are only used for 1% of seed. While this seed may meet higher quality standards than most informal sources, there is no legal framework for Quality Declared Seed (QDS) in Haiti. QDS still remains uncommon for most farmers (Seed System Security Assessment – Haiti, 2010).

The dominant source for seed is informal markets, providing 70% of all seed but especially critical for beans, peanuts, and cowpeas. Unlike other low-income countries, local market use remains high and was consistent both before and after the 2010 earthquake (Seed System Security Assessment – Haiti, 2010). Seed trade at the community level is often a role played by women. Women are generally responsible for selling harvest and purchasing seed for the coming season. Roughly half of women in rural areas also store grain at the household level for resale when prices rise. Smallholder farmers spend an average of \$60-\$70 per season on seed purchases (Seed System Security Assessment – Haiti, 2010). For the most vulnerable farmers, this represents a large expense and can be a poor investment if seed quality is low.

The local seed or grain markets can be weekly in rural locations or permanent in larger towns. Farmers are known to travel to specific (and sometimes distant) locations to procure seed. For women, who spend an average of 1.8 hours cooking and 2.0 hours fetching food and water the time burden of traveling to purchase seeds may cut into critical childcare activities (Kellum et al., 2020). For example, in the South Department farmers travel 80 minutes each way by foot to reach markets an average of 45 times per year (Shields, 2001). These informal markets in Haiti, as in other countries, are often stocked by vendors who sell seed and grain separately, with seed at prices 50%-100% higher than grain and with distinction between the qualities of each (Seed System Security Assessment – Haiti, 2010). Seed and grain travel to and from these markets through a network of

producers, importers, wholesalers, retailers, Madam Saras (as defined on p. 6) and other intermediaries who provide a robust trade network across the country (Seed System Security Assessment – Haiti, 2010). There are also women’s community groups that collectively buy large quantities of grain for sale before prices increase during planting time, including one example in Bassin Bleu, a collective which purchases roughly 450 kg per month (Seed System Security Assessment - Haiti, 2010).

Different methods are used to differentiate seed from grain within the informal market. While some sources state that farmers are careful to question vendors about the quality and origin of the seeds when making their selections (Seed System Security Assessment - Haiti, 2010), others note that farmers do not distinguish between grain and seed (Walters, & Brick, 2010). Sellers that differentiate between grain and seed use size and uniformity to separate seed while others expect buyers to do their own sorting. Farmers often select larger grains for seed and remove broken or damaged seeds (Walters, & Brick, 2010). It is not clear the extent to which source is used to differentiate seed from grain. Farmers do generally prefer seeds that are local over imported for key staple crops like maize, sorghum, pigeon pea, and peanut, though they may differentiate depending on the crop. While 41.3% of farmers report buying bean seed they did not consider local, this is closer to 12%-14% for sorghum, maize, pigeon pea, and peanut (Walters, & Brick, 2010).

Farmers’ use of improved varieties²

Improved varieties face many challenges entering the market and reaching widespread adoption in Haiti, as described below. Very few sources supply new varieties to the seed system, with the exception of rice and horticultural crops. Both rice and vegetables are important for income generation, which helps to account for the introduction of far more improved varieties than other crops (Seed System Security Assessment - Haiti, 2010). Roughly one quarter of farmers use fertilizer, which is often a prerequisite for some improved varieties. This may suggest that the wealthiest farmers are able to take advantage of high-quality inputs while the majority of smallholder farmers are excluded from the most productive and profitable production systems.

Most farmers indicated that their seed sources for major crops had not changed in the 5-10 years (Seed System Security Assessment - Haiti, 2010). While some stated that they have access to improved varieties, other farmer groups mentioned that this was only possible when provided by donors, with the exception of vegetable seeds, which are primarily imported (Walters, & Brick, 2010). The Seed System Security Assessment (SSSA) of 2010 found that 14% of farmers had tried a new seed variety in the last 5 years, primarily as a result of seed aid (Seed System Security Assessment - Haiti, 2010). A 2013 survey found that 13.9% of households reported received extension services, a relatively high number, though this primarily came from donor-funded projects,

² Improved varieties are the product of formal breeding programs that have undergone testing and are released through a formal process. Improved varieties are distinct from landraces which are local varieties of a domesticated plant species that have developed over time through a combination of farmer selection and adaptation to the natural and cultural environment in which they are found. Some improved varieties are developed through pure line selections of local varieties so that they conform to a particular standard of characteristics. This definition has been adapted from Context Network (2016). See also <https://agrilinks.org/post/seed-system-definitions#:~:text=Formal%20seed%20system%3A%20The%20formal,formal%20release%20and%20maintenance%20system.>

private sector, and NGOs. Over 50% of the extension services mentioned focused on seed (Goertz, 2016).

Seed distributions for ‘emergency’ responses have played a much larger role in diffusing new varieties than extension programs, especially for maize and beans as well as sorghum and rice to some extent (Seed System Security Assessment - Haiti, 2010). While the intention of emergency seed distributions might be to provide appropriate planting material, introducing new varieties may be ineffective or even cause harm. Emergency seed distributions are not accompanied by the technical assistance and multi-season follow-up necessary to responsibly introduce new varieties into the market and may leave farmers without a sustainable linkage to markets to purchase the same improved varieties.

Emergency Seed Provisioning

Emergency seed aid has taken place for decades in Haiti, in most cases in the form of direct distribution. CRS began using seed fairs as one alternative modality in 2009, which combines vouchers with NGO-facilitated fair events that gather many types of seed vendors. No examples of cash-based seed responses were found in Haiti.

Seed aid in Haiti reached unprecedented levels following the 2010 earthquake. Following the January earthquake, seed aid took place in south, central, and northern provinces in Haiti for the following two planting seasons (Spring and Summer/Fall), even though direct earthquake damage took place close to the capital of Port-au-Prince. The FAO alone aimed to reach 68,000 families and seed aid requests from the Government of Haiti and UN exceeded \$750M (Seed System Security Assessment - Haiti, 2010). Following the earthquake, however, there was significant migration out of the capital, roughly 85,000 people. Many planned to stay in the more rural regions that they moved to (Walters, & Brick, 2010).

While the impacts of the earthquake were multi-faceted, the seed aid response may not have strengthened the already fragile seed market in Haiti (*Seed System Security Assessment - Haiti*, 2010). Though farmers stated that they were likely to shift to short-season crops and shift from high-cost seeds like bean to cheaper seed like maize, seed availability does not appear to have been restricted (Seed System Security Assessment - Haiti, 2010; Walters, & Brick, 2010). Roughly 18% of farmers stated that they would decrease land area planted, but in the case of female-headed households their initial (before-earthquake) land areas were significantly smaller than male-headed households (Table 2). While formal and informal vendors sometimes faced challenges accessing seed on credit following emergencies (Walters, & Brick, 2010), vendors noted that they would be able to source more local seed if needed. This suggests that markets had sufficient supplies of seed but that purchasing power is the barrier. Though seed was distributed, seed aid – both emergency and development aid – accounted for only 4% of seed sown post-earthquake (Seed System Security Assessment - Haiti, 2010). In fact, no vendor interviewed for the SSSA could ever recall a time when they were not able to find seed in the past 40 years (Seed System Security Assessment - Haiti, 2010).

Table 2. Farmer perceptions of effects of earthquake on land, by sex of household, all sites (Source: Seed System Security Assessment – Haiti, 2010). * *Difference in mean land area before earthquake is significantly different by sex of household head with t-test at <10% assuming equal variances and <5% assuming unequal variances, but no significant differences after earthquake.*

Effect		Household head		Total
		Male	Female	
Sex of household head	n	723	234	957
Farmers citing impact on agricultural production system	n	287	104	391
	%	39.7	44.4	40.9
Farmers citing changed land area	n	150	48	198
All farmers citing changed area	%	20.7	20.5	20.7
Attributed to earthquake	%	38.8	47.9	41.9
Not attributed to earthquake	%	47.3	37.5	44.9
Did not explain	%	14.0	14.6	14.1
		100.1	100.0	101.0
Direction of change – land area				
Increased	%	2.6	6.4	3.6
Decreased	%	18.3	15.5	17.6
Area before, all farmers (karo)	mean	1.04	0.87	1.00*
Area after, all farmers (karo)	mean	0.95	0.85	0.93

Note: Sex of household head was not reported in all cases

Direct distribution appears to have been the most common response to the 2010 earthquake. It is likely that as much as 40% of the emergency seed distributions in Haiti come from imported seed (Seed System Security Assessment - Haiti, 2010). However, some aid came in the form of vouchers and fairs, which can use existing market channels to connect voucher recipients with seed, fertilizer, tools, and other inputs. This approach has smaller negative impacts on the market and can benefit farmers as consumers and suppliers, depending on how the approach is implemented (Seed System Security Assessment - Haiti, 2010; Walters, & Brick, 2010).

Community-Based Seed Production

The vast majority (70%) of seed is purchased by farmers through the informal market, with relatively little coming from community-based seed production. While often project supported, these farmer seed production enterprises still only provide modest amounts of seed to farmers. These enterprises may have the potential to build on strengths in the formal and informal sector but have yet to reach scale (Seed System Security Assessment - Haiti, 2010).

The most commonly cited collection of community-based farmer groups is the NGO Organization for the Rehabilitation of the Environment (ORE), which works through farmer groups to produce high-quality seed. Working with 200-300 contract farmers, ORE multiplies roughly 800-900 MT of maize and bean seed (Seed System Security Assessment - Haiti, 2010; Walters, & Brick, 2010). While these decentralized multiplication systems have been effective in the Sud, they are not yet being replicated elsewhere.

Formal Seed Sector

The formal seed sector captures only a small (2%) percentage of the market, imported formal sector seeds are available and common in rice and horticultural crops (Seed System Security Assessment - Haiti, 2010). Formal seed companies capture this market, however formal plant breeding in Haiti has not been extensive since the 1990s. The formal seed sector and plant breeding is regulated to some extent by the National Seed Service, which is severely understaffed and underbudgeted. The NGO ORE has been one of the only organizations regularly breeding and screening crops, such as maize, beans, and sorghum (Seed System Security Assessment - Haiti, 2010).

In terms of seed regulations, Haiti has experimented with several forms of regulation and bodies to carry it out. In 1970, the Service d'Etudes et de Recherches Agricoles (SERA), was created as a research arm of the then Department of Agriculture. This lasted 13 years until SERA was closed in 1983 and its authority and activities were transferred to the Faculty of Agronomy. In 1978, the Centre de Conditionnement et de Stockage des Semences de Maïs (CECOSAM) was created specifically to regulate and improve seed quality in maize, though this was later extended to other crops. It had impressive facilities, with the capacity to store 500 MT and process 1 MT of maize per hour. Unfortunately, poor management of a large quantity of maize seed caused financial issues for CECOSAM and it has not resumed operations since it was looted in 1994. In the previous year, 1993, the Commission Intersectorielle de Production et Distribution de Semences Améliorées (CIPDSA) was formed. CIPDSA contributed to distribution of seed to Haitian farmers, funded by UNDPN and the EU. A number of private seed companies and institutions (see Seed Companies, Agrodealers, and Formal and Informal Traders section below) were created to supply seed to CIPDSA and FAO around the same time. CIPDSA's mandate was not renewed in 2002 when it was dissolved due to lack of funds (Seed System Security Assessment - Haiti, 2010). Currently, the Service National Semencier (SNS) is in charge of the seed sector but has limited capacity and resources to fulfill its mandate.

Summary

In Haiti, the informal seed sector remains the strongest and most dominant, while also demonstrating substantial resilience in the face of crises like the earthquake of 2010. The formal seed sector has an important role to play in introducing new varieties, but these channels are not well established and have not made inroads into the most important Haitian crops other than rice and vegetables. Community-based seed multiplication may have some promise but is yet to be scaled up.

One of the most important lessons learned from Haiti is the importance of coordination and thorough seed assessments in response to crises. The earthquake of 2010 deeply impacted Haiti in multiple ways, but markets for informal seed were still functioning post-earthquake. Rather than distributing imported seed, the response to this emergency had an opportunity to strengthen seed market systems rather than circumventing them. While many actors carried out seed fairs and used vouchers, future responses have the opportunity to be more coordinated. Even when farmers do not have seed stocks on hand post-crisis, this is often commonplace for certain crops (especially beans) and does not necessarily imply that direct distributions are needed.

Introduction of improved seed is an important challenge to address in the future. While emergency distributions have been responsible for a large portion (53%) of new varieties, these are often not the best situations to introduce new varieties or new crops. Sustained technical support for new

varieties and extension services are critical to variety introductions, as well as consistent market linkages to improved seed suppliers.

Stakeholder Perspectives

To complement the literature review, key stakeholder interviews were carried out between July and September 2021. Key informant interviews were carried out remotely based on a semi-structured interview guide (Annex 1). Key informants came from private sector, university, NGO, and UN backgrounds and helped to provide depth to the information gathered through the literature as well as a more up-to-date view of seed systems in Haiti, following the dynamic events of 2021 including the presidential assassination, earthquake, and hurricane. Stakeholders were selected to represent diverse sectors and perspectives and contacted through a snowball sampling technique.

The Role of Farmer Groups

Stakeholder interviews confirmed the important role farmer groups could play in the Haitian seed system, though their potential is largely untapped. In addition, women farmers have been shown to have limited leadership roles in farmers' associations (Kellum et al., 2020). Though there are many active farmer organizations, they are not often consulted or considered in government decision making. Women's associations are starting to increase in number, but these receive less support than others (Kellum et al., 2020). Many stakeholders confirmed the important role ORE is playing in working with farmer groups on seed production and reaching out to this stakeholder group.

In total, there are at least 1,050 farmer groups that have been trained in Quality Declared Seed (QDS) production since 1993. While the seed may be quality declared, there is no formal legal framework for QDS in Haiti, meaning that no government body certifies the quality of the seed. The Ministry of Agriculture facilitated the creation of seed producer groups before the 2010 earthquake but not many of these groups had the capacity to produce quality seeds at that time. Following the earthquake and the humanitarian response by many different agencies, most seed included in the responses was imported. The Haitian Government sought to change this and worked with the FAO to train many producer groups on QDS seed production, so that future emergency responses could incorporate local seed.

Though these farmer groups are free to sell their seed to anyone, only 10-20 of these groups have the capacity to sell directly to NGOs or the FAO due to the heavy administrative burden on farmer groups of institutional buyers like NGOs. The majority of the groups sell QDS seed to intermediaries or wholesalers who might then sell the seed to institutional buyers or retailers. In general, the farmer organizations do not have the internal capacity to market seeds themselves and so rely on seed intermediaries of all sizes.

Seed Companies, Agrodealers, Formal and Informal Traders

The seed sector is primarily informal and lacking in regulation. Following the end of CIPDSA, there has not been a strong government presence regulating seeds either in the capital or in the rural areas. The formal seed companies that exist in Haiti import seeds rather than producing locally and specialize in rice and vegetables. There are very few formal seed companies with outlets outside of the capital, even fewer that provide extension advice in limited areas. This has contributed to the lack of technical assistance supporting improved variety adoption.

Formal Haitian seed companies include COMAG S.A., Agroservice S.A., and Darbouco S.A. Of these, Darbouco is the oldest (founded in 1948), with 85% of their sales in vegetables, especially cabbage, carrots, onions, cucumbers, and beets. Cereals make up the remainder. Seeds are imported

into Haiti from locations like Japan, the US, and the Dominican Republic, but Haitian companies conduct some variety trials to identify the best candidates. The primary direct customers for seed are agrodealers, mostly male, as well as some Madam Saras. Formal seed companies rely on these networks to reach the last mile rather than establishing their own proprietary distribution systems. For Darbouco, roughly 20% of seed sold goes to institutional buyers like NGOs, and 80% primarily address individual farmers' needs through networks of intermediaries.

Many ad-hoc seed businesses exist to respond to NGO and institutional buyer needs but do not serve farmers as part of their business model. These businesses start up when there is a large request for seed but don't operate between donor funding cycles. Working with both Haitian government and other institutional buyers, these local seed entrepreneurs tend to purchase seed from informal markets but often sell the seed as certified. Private companies stated that they have had few successful NGO collaborations, as they tend to be short lived.

There have been successful examples of public-private partnerships with public universities in Haiti. Haitian companies like Acceso, Etoile du Nord, and BRANA/Heineken work with contracted outgrowers to produce seed, while Quisqueya University helps select the best varieties. This makes improved varieties accessible, and the private companies are able to pay a premium. Social enterprise Acceso works with farmers to link them with input and output markets, especially for beans and peanuts, and works to create local processing centers that employ women. Etoile du Nord is a grain elevator and processor of sorghum that works closely with BRANA/Heineken to source sorghum for their beverage products and both have collaborated to connect farmers with high quality sorghum seeds. No youth-specific collaborations with private sector actors were found.

One of the main challenges facing formal seed companies is the low storage quality at rural agrodealers. The large seed companies can invest in quality storage infrastructure but they cannot guarantee the quality to the final customer because of the various ways the seed is stored along the supply chain.

Security conditions in Haiti are also a challenge for seed companies, as roads are often controlled by different gangs making transport across the country dangerous. While these security risks are often borne by the intermediaries including Madam Saras, they impact the ability of seed companies to reach rural consumers. These insecure conditions often translate into higher prices for customers when goods reach the market. The COVID-19 pandemic has also disrupted the seed markets in unexpected ways as US seed suppliers have had shipping delays and challenges meeting orders. Californian seed producers in particular faced water shortages, which impacted Haitian farmers' seed supply.

Beyond the formal sector, cereal, legume, and root or tuber crops are almost exclusively traded through the informal sector. Madam Saras play an important role in the informal seed sector. In rice, seed is usually acquired through Madam Saras who often provide seed on credit. The same Madam Sara may also be the buyer of the product and determine which variety farmers receive, though both parties negotiate this transaction. While Madam Saras bear the risk of default from the farmers to which they give seed on credit, they also gain significant power in the negotiation and transaction process.

Bean seeds are available year-round through an exchange from the highlands to the lowlands that ensures beans are always present in informal markets. This exchange was disrupted when international donors funded the distribution of bean seed that was well adapted to lowlands but not the highlands.

National research organizations involved in seed system development

National research organizations include the American University of the Caribbean, where agricultural researchers conduct variety trials in collaboration with international research centers like CIAT and CIMMYT for maize, cassava, rice, high iron beans, zinc, and disease resistance. These collaborations often include crossing improved varieties with locally adapted varieties to get both sets of traits.

The University of Quisqueya has also been active in agricultural research in Haiti and was instrumental in breeding the new sorghum variety resistant to the disease spread by the sugarcane aphid that wiped out sorghum production in Haiti in 2015. This new variety has been expanding to fill the gap left by the older sorghum varieties, but much of the production has reduced as farmers switched to other crops. With private sector partner, Etoile du Nord, this new variety is being multiplied across the country. Vegetable breeding, in contrast, is more likely to be project-funded and not as sustainable.

International research organizations involved in seed system development

International research organizations active in Haiti include many of the CG centers. CIP and CIAT have collaborated to conduct a seed diagnostic study on roots and tubers in Haiti, while CIMMYT is active in maize research. CIMMYT had been working with local NGO ORE and local universities on Feed the Future-funded support to maize seed systems and improved variety adoption in the Sud Department. It is not clear that this research has applied a gender lens to their work, though the focus on subsistence crops is likely to benefit female farmers. In addition, the University of Quisqueya and Cornell Innovation Lab for Crop Improvement have plans to test a variety of mechanized planters for improving planting density, fertilization, and adoption of improved seed with the aim of creating business opportunities for local entrepreneurs. Since the closure of SERA in 1983, the Ministry of Agriculture has not had the funding to complete its mandated research activities but may collaborate with national and international research centers instead.

As part of a USAID-funded Multi-Year Assistance Program (MYAP), CRS and CIAT partnered to work on testing, multiplying, and demonstrating the impacts of improved varieties with farmer associations. These trials included black beans, red beans, manioc, and maize. The program provided training and created a local association, which supplies farmers with high quality starter seed and helps to market the harvest (Walters, & Brick, 2010). This suggests that NGOs, especially local NGOs with high capacity like ORE, have an important role to play in research and connecting farmers at the last mile to improved varieties.

Public Sector and Government Seed Actors

One of the most common themes that emerged from stakeholder interviews was the necessity for greater public sector involvement in the seed sector. Though it was not possible to interview any government employees during the study period, there have been examples of successful government collaborations though more government involvement is needed.

There have been important government interventions in the past with attempts to address the weaknesses in Haiti's seed sector. The establishment of the Intersectoral Commission for the Production and Distribution of Improved Seeds (Commission Intersectorielle de Production et Distribution de Semences Améliorées, CIPDSA) under the Ministry of Agriculture, Natural Resources, and Rural Development (Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural, MARNDR) was an important milestone in the Haitian government's regulation of the seed sector. CIPDSA was established in 1995 and included MARDNR representatives, farmer organizations, NGOs, and private sector representatives as well as critical funding from the European Union and technical support from FAO. While CIPDSA was operational, it facilitated commercial sector development and the professionalization of private seed production. CIPDSA also provided 50% subsidies to improved seed for farmers, which was mentioned by several stakeholders as an important step in increasing adoption. However, the subsidy system and CIPDSA collapsed when the funding was used by MARDNR for other purposes.

Currently, the Ministry will respond to crises by working with local entrepreneurs to procure seed for distribution. This seed is often from informal markets and sometimes imported as well, which does not necessarily make it adapted to local conditions. There were not clear quality standards or certification required for the distributed seed, which may be an advantage in expediting emergency responses but a disadvantage in terms of providing consistent quality to farmers. No clear targeting criteria were found.

The Ministry of Agriculture does have guidance on seed quality but no national seed certification body, which can create problems when crises occur, and when NGOs try to verify that they are giving quality seed to affected populations. While the government guidance references seed quality standards, the lack of certification body means that there is not a formal structure to verify seed meet these standards. To verify the quality of the seeds selected for distribution, CRS has conducted its own germination tests in the past by taking seed samples during fairs but some seed qualities such as time to maturity (which are highly preferred) are hard to verify through rapid tests. This has also created tension between different seed intervention implementers as there is no certified seed available in many cases.

The FAO and the Ministry of Agriculture have worked together to create a draft seed law that would protect seed quality and distinguish between grain and quality seed. This would help protect farmers who often do not distinguish between grain and seed as well as help enforce current guidelines around seed quality. The SNS is currently responsible for verifying quality but does not have the capacity or funding to carry out its mandate and the new law would help to address the need for certified seed. With the law in place, the SNS could certify seed and introduce a new quality of seed into the market. While it might only be feasible to certify production from large producers initially, it would be a significant improvement over current conditions. However, the proposed law does not mention the role of women or gendered seed system roles, suggesting that it may not have been reviewed from a gender lens.

While the new seed policy has been validated by the parliament, the seed law has yet to be passed. Parliament is not currently operating (as of September 2021), which would be necessary to pass the seed law. However, the law has been presented to the parliament's Committee Against Hunger, which the FAO helped to create. Currently, the seed law is in the hands of the Minister of Agriculture, and the FAO has provided many technical documents to support its passage.

The FAO has also provided training and support to the SNS to certify seed quality. While SNS has an excellent facility, there is not sufficient human resources for it to operate at capacity. When the FAO purchases seeds for humanitarian responses, the seeds are verified by SNS for quality, but NGOs do not take this step due to the delay it would cause. With the new seed law, the SNS could enforce its role in verifying seed quality, but it would have to dramatically increase its capacity to be able to keep up with requests. It is estimated that currently only about 20% of seeds provided through emergency provisioning are checked for quality with the SNS before being distributed. If the SNS was able to certify large amounts of seed, this would provide a source for emergency distributions, when deemed necessary. With certification, government institutions and NGOs could be sure the seed they were using was good quality and met critical standards.

The biggest difference noted between Haiti and other comparable countries in fragile contexts is the extremely weak seed regulatory capacity. The SNS is very understaffed and underfunded for their mandate. Other similar countries such as DRC, Burundi, Madagascar, and Rwanda have many times more agronomists compared to the eight agronomists who work for the SNS. Haiti faces many natural disasters, so the country needs varieties adapted to all kinds of shocks and stresses, but without government capacity to maintain these varieties, the germplasm will not be available to Haitians when new climate-smart varieties are needed. There have been cases where FAO has worked with the faculty of agriculture to select stress resistant varieties but a few years later the varieties were lost. Haiti's many microclimates also require adapted seeds and while good local varieties may exist, they need to be purified and multiplied. Stronger institutions are needed to maintain existing varieties and seek out new ones. Haiti also doesn't have a national agricultural research center funded by the state, which is common even in other fragile states. This handicaps Haiti in terms of research compared to other similar countries. A more decentralized SNS would also help the government respond to the needs of the country.

Local and international NGOs involved in seed-related activities

Local NGOs

Many local NGOs have been working in Haiti on seed systems, including FONKOZE, Mouvement Paysan Papaye in the Central Highlands, and especially ORE. Local NGO ORE has the strongest reputation for its work with seeds in Haiti. This is in large part due to the expertise of the current director, who has degrees in plant breeding and decades of experience.

Initially, ORE began working with CIMMYT around 2006 to cross CIMMYT's varieties with local varieties to create new locally adapted options for farmers. Seed production for disaster response is prioritized, especially for the hurricane-prone south. ORE temporarily produced and sold hybrid maize seed but ran into disagreements with the Ministry of Agriculture. The Ministry was concerned that the hybrid varieties might be genetically modified; they were also concerned by the dropping price for maize due to the high yields from the hybrid maize. Eventually ORE and the Ministry reached an agreement that would allow ORE to continue producing maize for the remainder of their

project as long as they reduced production from two seasons per year to one season. Since then, ORE has stopped producing hybrid maize.

Currently, ORE produces maize, beans, and sorghum seed but have reduced production from about 220 MT/year to 50 MT/year. The reduction was in part to avoid conflicts with the government and in part because ORE was forced to sell a portion of their seed as grain each year when the government regularly distributed seed. ORE used to sell seed across southern departments of Haiti including Sud, Sud-Est, and Grand'Anse at a subsidized price for smallholders, who were their target market. ORE would also sell seed to institutional buyers, though this made up a smaller portion of their seed production.

ORE has also been active in working with the Ministry of Agriculture and FAO to analyze existing laws and improve seed regulation in Haiti through CIPDSA. The technical specialists at ORE have been supporting and guiding the development of a quality verification or certification system. Unfortunately, efforts have been slowed by leadership turnover in the Ministry of Agriculture.

Currently, ORE is working on improved peanut varieties that can be used for peanut butter and peanut oil. ORE is also testing bean materials from CIAT for a short-cycle variety that does well in low nutrient soil. They are currently multiplying seed for three of these bean varieties. ORE is also testing F1 maize for corn grits and contracting production with female and male farmers. They had trouble in their first year of contracting maize production because local market prices peaked above what ORE had contracted to pay farmers, so in following seasons the prices remained flexible until harvest with final prices dependent on quality. ORE is now the largest buyer of maize (which they process into grits) in the South Department with capacity of 500 MT storage.

International NGOs

Of the international NGOs most active in the seed sector in Haiti, CRS, World Vision, CARE, and Chemonics were all cited by stakeholder interviewees. Collaborations with other organizations, like the FAO, as well as the Ministry of Agriculture, were common as well. Prior to the 2010 earthquake, these organizations were most active in the seed sector through their direct distribution activities. Following the earthquake, however, seed vouchers and fairs were generally more common.

As mentioned above, CRS and FAO have been some of the organizations to use seed fairs and seed vouchers the most frequently in Haiti. In response to the 2016 Hurricane Matthew, CRS determined that using local seed would be the most appropriate response while FAO decided to use imported seed. While there is a strong preference for local seed, it can be difficult to guarantee quality because of the lack of certified seed in country, especially in areas where QDS seed production does not take place. Germination tests on the local seed were carried out during CRS seed voucher fairs and the results were compliant with government guidelines. Unfortunately, following these fairs there was a high rate of mosaic virus in the bean seed, though the seed still performed well in other areas. The lack of seed certification standards leads to different approaches in emergency responses, as organizations are forced to choose between seed of locally adapted varieties or certified quality.

While seed fairs and vouchers have been well established in Haiti over many years, cash-based seed responses were not found. Seed vouchers, both with and without seed fairs, have been used over time. Some NGOs faced challenges with voucher programming as participants preferred short-season varieties while vendors provided only long-season seed. To avoid some of these issues,

others have used mixed modalities: local NGO FONKOZE has combined multi-purpose cash transfers with direct distribution of seeds. Especially for fruits and vegetables, direct distribution of imported seeds is most common. While gender-sensitive programming has not always been the norm in Haiti, it is growing more and more common in international NGO's seed interventions.

International development & UN agencies

The FAO and Haitian government have had extensive collaborations regarding seed regulation and seed quality. In the past decade, there had been efforts to regulate the seed industry in Haiti, but the collaboration did not result in a new seed law. While the government was working toward creating a class of seed that could be considered 'certified', the regulations failed to define what constituted a seed variety. This created challenges for plant breeders who couldn't defend or define their varieties without a legal definition. Today there is still no definition of a seed variety, as mentioned above.

In addition to their work with the Haitian government, the FAO has been working with farmer seed producer groups. This work has helped to strengthen the capacities of many groups who are able to produce QDS seed. This has opened up new modality options in response to crises, as both FAO and CRS have used seed fairs in areas where QDS seed is available and produced to ensure high quality and locally adapted seed at least as far back as 2012. In periods where conditions are better, FAO provides seed vouchers through fairs that cover 70% of the cost of seeds, but the levels of need in September 2021 are high enough to require 100% subsidy. However, for these activities to be fully sustainable, the certification would need to be transitioned to the SNS or a private entity to manage. Unfortunately, the SNS does not have the capacity or resources to take this on at the moment. FAO has also led youth-specific projects to reach youth in agriculture in areas such as food production, processing, marketing and tourism.

Donors involved in seed sector development

USAID has been a major donor in Haiti for many years. Currently, its funding has focused on strengthening government accountability and institutions, promoting economic and food security, and improving health and education outcomes. Feed the Future in particular has funded seed sector development projects, including work with CIMMYT on maize and the University of Quisqueya breeding programs. USAID manages 181 current activities across all sectors with 68 partners and an average annual budget of \$200 million.

Taiwan, through the Republic of China, has become one of the newest donors involved in the seed sector of Haiti. The Ambassador of Taiwan recently executed two projects in 2019 focused on building Haiti's rice production capacity (Haiti - Taiwan: \$22 Million for Increased Rice Seed Production, 2019). The \$22M will fund modern Rice Seed Treatment Centers in Artibonite, Nord, and Nord-Est departments, technical assistance, quality rice seed, Quality Control Laboratory, and maintenance and management for these structures. Over three years, the goal is to increase the supply of quality rice seeds, drawing directly on the Taiwanese rice varieties. The market for the rice is not yet clear, however.

In addition, the International Development Bank and Inter-American Development Bank play important roles in Haiti as well. IDB targets inclusive growth with specific objectives around the business enabling environment and government services. IDB has \$1.3B in approved loans, with agriculture holding the most projects of any sector. This includes work in the moringa and peanut

value chains, as well as emergency funding to the recent 2021 earthquake. The World Bank has also been an influential stakeholder in Haiti's development, with \$915M in active loans across 20 projects as of April 2021. While these banks have provided necessary capital to the Haitian economy, there have been some questions on the technical design and gender sensitivity of projects implemented with these funds regarding seed. In response to emergencies, vouchers have been distributed to farmers without verifying that quality seed is available in local markets. Farmers end up spending the vouchers on grain instead, as that may be all that is available in the markets. While this may be in line with farmers' typical practices, it raised questions from other stakeholders on the project design.

Summary and Vision

Many of the opportunities for strengthening Haitian seed systems resilience revolve around research, governance, private sector development, and technical assistance. Though the Haitian context experiences frequent shocks, its seed system has demonstrated remarkable resiliency, especially the informal system. Weaknesses in the informal system occur primarily in the lack of connections to improved varieties. Strengthening linkages between formal and informal systems, as well as farmers at the last mile, would help amplify the benefits of both sectors. While gender-specific and youth-specific seed interventions were not found, this could also be a new direction to explore in Haiti to reach vulnerable populations.

Research into crop breeding would help support sector development, with potential benefits for both formal and informal seed systems. Universities and research centers working together can cross improved imported varieties with local varieties to create new varieties adapted to biotic and abiotic stresses and responsive to the needs of female and male farmers. Especially in fragile states such as Haiti, the role of universities and CGIAR centers will be critical to supporting research efforts. Local NGOs such as ORE are also important in supporting selection and multiplication of adapted varieties. A decentralized set of crop variety screening centers could collaborate with research programs to create more cost-effective structures for quality assurance in new varieties. A critical link will be in making EGS available to businesses and farmer associations to multiply the foundation seed and make it accessible to smallholder farmers, rather than targeting institutional buyers like NGOs. Enhanced coordination among formal and informal seed producers would help ensure new varieties are produced for specific segments of farmers, including female and youth farmers. A national database would help identify seed varieties and their characteristics so that breeders can match available varieties with farmer preferences. Farmer multiplication programs with quality assurances have been successful elsewhere, though Haitian programs have not yet been able to scale widely. While increasing crop breeding efforts could be challenging given the lack of improved variety adoption in Haiti, increased coordination between formal and informal sectors may help reach farmers of all sizes.

One of the strongest themes that came across from stakeholder interviews was the need for stronger governance of the seed sector and government funding for seed regulation. Civil society and private sector stakeholders called for greater clarity from the government. A clear, concise law that outlines breeder protections and responds to the needs of women, youth, and other marginalized people would help address some of the researcher concerns mentioned above. Seed quality in Haiti could be dramatically improved with a law that created reasonable standards for certified seed and an institution like the SNS with the funding and capacity to enforce it. Compared to similar fragile

states, Haiti has relatively few staff and technical specialists in this area, which should be addressed to scale up seed certification. While existing government capacity may be low, alternative arrangements could be explored such as private sector led certification as an additional service or in place of government activities. As seen in the examples of Acceso, Etoile du Nord, and BRANA/Heineken, the private sector has a strong interest in improving seed quality and connecting input and output markets. Certifying bodies, whether public or private, would also ensure emergency responses have standard guidelines to follow as well as access to high quality seed, avoiding the need to choose between certified or local seed. Quality standards should be tailored with farmer production groups in mind, as these have been a critical part of seed multiplication in Haiti. The previous efforts of the Haitian government through bodies like CIPDSA have faced challenges but even the modest proposed regulation could dramatically change the seed sector in Haiti.

Consistent and reasonable regulation can promote agroenterprise growth with the aim of providing a wide array of adapted products to smallholder farmers at the last mile. While the lack of regulation has been one challenge to the private seed sector in Haiti, the consistent seed distributions from government and NGOs have also weakened farmer willingness to pay for seed and distorted the market. As in 2010, it is critical to conduct a thorough assessment to understand whether seed is available in the market and whether distributions are in fact necessary. NGOs and Haitian government bodies have an important role to play in ensuring appropriate emergency response measures are taken that will not harm seed markets for actors of all sizes and genders.

Finally, extension services and technical assistance will be critical to supporting Haitian farmers to adopt improved varieties and realize greater harvests and profits. Extension could come from public or private sectors, but existing programs are fragmented and too small to cover existing needs. Extension services need to include targeted programs for women and youth farmers, as these segments are currently not receiving sufficient support. With frequent changes in the Ministry of Agriculture leadership, programs do not have the long timelines needed to support real behavior change on the part of farmers or new breeding efforts. The large number of emergencies in Haiti may mean that most project-based agriculture responses take place over short periods of time, but leadership from the Ministry of Agriculture could help to create continuity and even foster private-sector led extension programs.

While Haiti has received significant investment in agricultural development projects from donors to strengthen food security and seed systems, this support has not always been gender-responsive or inclusive of youth. Haitian seed systems will need to develop inclusively in order to address the needs of the most vulnerable and promote sustainable access to quality seed for all. Only by incorporating the needs of women and youth and addressing the barriers they face can Haitian seed systems overcome these previous omissions and reduce gaps. While there has been excellent analysis of the gendered barriers to quality agricultural inputs, these perspectives have not consistently been incorporated into the design of responses.

Though the Haitian seed sector faces many challenges, intentional support to research, governance, private sector, and technical assistance could strengthen the network of formal and informal seed intermediaries providing critical inputs to farmers of all sizes. Consistent leadership from the Ministry of Agriculture would go a long way toward these objectives and strengthening the enabling

environment for seed businesses. The pending seed law awaiting approval could be a major milestone in Haitian seed system development towards this vision.

Conclusion and Points for Consideration

Lessons drawn from the Haitian context on fragile states:

1. **There is a need for definitive seed law and regulatory frameworks for private sector investment**, which was echoed across many stakeholders. Despite limitations in government capacity, this regulatory framework would go a long way towards providing the assurance private sector needs to develop in the seed sector.
2. **Informal traders play a very important role in seed systems in fragile states and need to be incorporated** into seed sector development; informal sector traders are as important if not more important than other sectors in developing resilient seed systems in these contexts.
3. There is a need to **better understand the gendered dynamics of the seed sector**, especially female informal traders. The informal market plays a crucial role in seed systems in fragile states but ignoring the gendered dynamics of women's work in formal and informal seed sectors would jeopardize the future inclusive development of these systems.

Points for Consideration Specific to the Haitian Context

While the purpose of this study was to contribute to a three-country study review of fragile states, and not to make recommendations specific to the Haitian context, certain broad themes emerged from the literature and should be considered in future seed system development:

1. Crop breeding and research could benefit Haitian farmers through both the formal and informal seed sectors
2. There is a consistent call for stronger governance of the seed sector and government funding for seed regulation
3. Extension services and technical assistance will be critical to supporting Haitian farmers to adopt improved varieties and realize greater harvests and profits
4. Support to Haitian seed systems will need to be both gender-responsive and inclusive of youth to develop inclusively and address the needs of the most vulnerable.

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Annex 1. Key Informant Interviews and Tool

Key Informants

Name	Sector	Role
[REDACTED]	NGO	CRS Agricultural Team Lead
[REDACTED]	Private Sector	CEO
[REDACTED]	Research	American University of the Caribbean
[REDACTED]	NGO	Agricultural Lead
[REDACTED]	NGO	ORE Director
[REDACTED]	UN	FAO Haiti
[REDACTED]	NGO	CRS Senior Project Officer
[REDACTED]	NGO	CRS Business Development Specialist
[REDACTED]	Research	Quisqueya University
[REDACTED]	NGO	CRS Humanitarian Response Department

Semi-Structured Interview Guide

Introduction

1. What are the institutions and policies/regulations that currently exist in relation to the seed sector, and how effective are they? (e.g. relating to breeding, EGS production, seed multiplication, quality control, regulation, etc).
 - a. How are they positioned in terms of the political economies of the state and/or conflict dynamics and also the aid system?
2. Can you describe something about the history of seed sector development? Roughly when were different institutions/policies developed?
 - a. Which donor(s) supported seed sector development and through what type of funding mechanisms? What was the approach taken? What worked, what didn't?
 - b. What is left of these institutions now? How have they changed?

Private Sector

3. What is the level of private sector involvement in the seed sector?
 - a. Are there any interventions that aim to support private sector development in the seed sector? Describe if so, incl funding mechanisms.
 - b. Who are the main private sector seed companies, are they foreign or local, male- or female-owned, and when/how did they get established? How are they positioned in terms of the political economies of the state and/or conflict dynamics and also the aid system?
 - c. How big / how well-developed are they? What crops do they focus on? Who do they sell to? (Aid agencies? Other institutional buyers? Farmers?)

4. Who are the main seed importers, are they foreign or local, male- or female-run businesses?
 - a. When/how did they get established? How are they positioned in terms of the political economies of the state and/or conflict dynamics and also the aid system? How big / how well-developed are they? What crops do they focus on? Where do they buy from? Who do they sell to / how do they distribute their seed?
5. Are there any other key players / projects involved in the seed sector? Describe if so [Note that this might include informal and/or emergency seed sectors – keep it broad at this stage so that we don't miss anything by being too specific.]

Informal systems

6. What are some of the key features of informal seed systems that you're aware of?
 - a. What are the gender-based differences in farmers' seed management practices?
7. What are some of the challenges faced by farmers in saving seed and accessing seed from other farmers and local markets? Are there any particular challenges faced by women, youth and/or PWD?
8. Have there been any studies of informal seed systems? Are any reports available? [This question is not suitable for informal traders]

Improved varieties

9. Is there any data available on the use of improved varieties?
 - a. What is the range of crops / varieties for which improved varieties are available?
 - b. How old are these varieties, and how have they been made available to male, female and youth farmers (both in the past and present)?
10. What are some of the successes and challenges in making improved varieties available to farmers? Provide examples of specific projects / approaches.
 - a. How have gender and youth been taken into consideration?

Seed related support

11. Who are the main organizations / projects involved in seed interventions to support farmers? [This can include donors, NGOs, international organizations, etc]
 - a. What are the current modalities through which seed support is provided, and through what types of funding mechanisms? [This might include direct seed provisioning, vouchers, cash, seed fairs, community seed multiplication, seed banks, promoting improved varieties, etc]
 - b. Provide as much detail as possible on each of the current modalities that KII is familiar with, e.g. where is seed sourced (if direct distribution); what is the diversity of crops and varieties and provided; what are the motives behind the approach? How have considerations relating to gender and youth been incorporated into the design on interventions? What have been the successes and challenges?
 - c. Have the seed support modalities changed over time? Describe if so in relation to the historical timeline and any key events (e.g. relating to disasters, displacement and political/security context).

12. Are there any interventions that aim to build the capacity of male, female and youth agrodealers and/or traders to provide seed? Describe if so. What are the motives behind the approach? What have been the successes and challenges?
13. In your view, what have been some of the successes of seed system development in recent years? What were the factors that contributed to these successes?

Overall

14. What is your vision for the future in terms of seed system development, given the on-going state fragility? Are there any ways in which seed interventions and/or seed system development potentially influence or contribute towards the political economy of conflict / insecurity / instability and/or the political economy of the aid system?
15. What are some of the opportunities and constraints relating to the realization of this vision, given the current context?