



AVANSE FINAL REPORT

Appui à la Valorisation du Potentiel Agricole du Nord,
Pour la Sécurité Économique et Environnementale
(AVANSE)

April 2013 – January 2020

FINAL REPORT

Appui A la Valorisation du Potentiel Agricole du Nord, pour la Sécurité Économique et Environnementale (AVANSE)

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Cover Photo: Grison Garde, North Haiti. The USAID/AVANSE Jardin Lakay (Home Garden) program trained women to raise vegetables for their families in small gardens near their homes.

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

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ABBREVIATIONS AND ACRONYMS

APFL	<i>Association des Producteurs de la Ferme La Chapelle/La Chapelle Farmers' Association</i>
AVANSE	Appui à la Valorisation du Potentiel Agricole du Nord, pour la Sécurité Économique et Environnementale/Support for the Promotion of the Agricultural Potential of the North, for Economic and Environmental Security
AU	Auburn University
BRGM	Bureau de Recherches Géologiques et Minières/ French Geological Survey
CLES	Collectif de Lutte contre l'Exclusion Sociale/Collective Fight Against Social Exclusion
CPCN	Northern Cacao Producers Cooperative
DR	Dominican Republic
EC	Environmental Compliance
EMMP	Environmental Mitigation and Monitoring Plan
FFS	Farmer Field School
GOH	Government of Haiti
ha	Hectare
HTG	Haitian Gourde (currency)
IR	Intermediate Result
kg	Kilogram
LOP	Life of Project
M&E	Monitoring and Evaluation
MARNDR	Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural/Ministry of Agriculture, Natural Resources, and Rural Development
MT	Metric Ton
NGO	Non-Governmental Organization
NRM	Natural Resource Management
PEA	Project Environmental Assessment
PERSUAP	Pesticide Evaluation Report and Safer Use Action Plan
PHS	Post-Harvest Survey
PIF	Production Intensive par Fragmentation/Intensive Production via Fragmentation
PISA	Produit des Iles S.A. (A Northern Haitian cacao processor and exporter)
SIBA	Système d'Incitation via les Bons d'Achat/System of Incentives through Vouchers
SIMA	Système d'Information sur les Marchés Agricoles/Agricultural Market Information System
SRA	Système de Riziculture Améliorée/System of Rice Improvement
SRI	Le Système Rizicole Intensive/Intensive Rice-Production System
UCNH	University of Northern Haiti
UEH	National University of Haiti
UPBH	L'Union des Producteurs de Banane d'Haïti/Union of Haitian Banana Producers
USAID	United States Agency for International Development
WUA	Water User Associations

OVERVIEW

OBJECTIVE AND SCOPE

The \$85.8 million, seven-year *Appui à la Valorisation du Potentiel Agricole du Nord, pour la Sécurité Économique et Environnementale* (AVANSE) project, started in April 2013, with the specific objective of increasing agricultural incomes in Haiti's Northern Corridor. Prior to the project, farmers' average income in that area was restricted by limited access to technology and services and inefficient agricultural production practices. AVANSE aimed to increase farmers' income by achieving the following outcomes in the rice, cacao, and plantain value chains: 1) agricultural productivity increased, 2) watershed stability above selected plains improved, 3) agricultural markets strengthened, and 4) capacity of local organizations strengthened. Over the course of the last seven years, AVANSE has realized all of these goals and achieved its targets, except for strengthening the capacity of local organizations, which was removed from the project goals following a scope of work modification in 2015.

TECHNICAL APPROACH

A value chain approach—guided by the core tenets of local ownership of solutions, increased use of technologies, market-led interventions, gender mainstreaming, and active collaboration with local institutions—informed AVANSE's interventions. As appropriate, AVANSE employed a farmer field school (FFS) approach to extend and disseminate improved agricultural production practices. FFS is a participatory approach, which allows farmers to test and adapt improved techniques to their particular circumstances. A parallel focus on market-based solutions enabled innovative inclusive, profitable public-private partnerships to be forged between agribusinesses, farmer associations, and producer groups. The gender mainstreaming approach contributed to 26 percent of the project beneficiaries being women and 22 female-owned agribusinesses being established or upgraded. Collaboration with local institutions, particularly local universities and the regional branches of the Ministry of Agriculture, facilitated the sustainability of AVANSE's varied, widespread, and high-impact interventions.

MAJOR OUTCOMES AND ACCOMPLISHMENTS

During the life of the project, AVANSE made significant contributions to transformative, positive change in the agriculture sector in the Northern Corridor of Haiti. Not only did average farmers' yields and income more than double, but 32 improved technologies were introduced and used by more than 50,000 farmers, and over 30 small, medium, and large agribusinesses were assisted and strengthened. The major outcomes and achievements of the AVANSE project follow. Detailed outcomes and achievements for each component are presented in the various subsections of this final report, and additional detail is available in the previous annual and quarterly reports.

- **Farmers' income increased.** Average agricultural income for beneficiary households more than doubled: from \$443 in 2013 to \$960 in 2019.
- **Agriculture yields significantly increased.** Annual plantain yields increased from the baseline value of 6 metric tons (MT) in 2013 to 18 MT in 2019. Single crop rice yields increased from

2.5 MT in 2013 to 6 MT in 2018, and annual cacao yields increased from 319kg/ha in 2013 to 455 kg/ha in 2019.

- **Greater utilization of improved practices/technologies by farmers leading to increased yields.** Thirty-two different techniques or technologies were disseminated across the Northern Corridor and applied by 51,455 farmers on 27,930 ha.
- **Increased export sales of cacao from the North.** In 2013, a particular bad year for Haitian cacao production, AVANSE calculated a baseline value of \$942,360 (427 MT) in export cacao sales. In 2019 export sales were estimated at \$6,899,937 (8,630 MT). AVANSE's efforts to increase total production and its assistance to growers and exporters had helped them to expand total exports and their percentage of sales into the premium markets for fermented, organic, and fair-trade cacao and contributed to this positive trend.
- **Market system change in cacao sector.** AVANSE's assistance has expanded the capabilities of all three major cacao exporters in the Northern Corridor to export fermented cacao, leading to greater revenue for the sector and for farmers.
- **High-demand and essential agricultural services developed and established locally.** AVANSE applied market-based solutions to remove inefficiencies in supply chain by enabling small suppliers to import fertilizer in bulk; to introduce and increase the availability of clean, high-yield rice seed and plantain planting materials; and to deliver irrigation, cultivation, and harvesting services to remote agricultural lands.
- **Greater access to irrigation.** Two irrigation systems were rehabilitated and constructed, including 7.2 km of masonry canals, to irrigate 430 hectares. Approximately 200 irrigation pumps were subsidized to allow the provision of irrigation water to at least 660 hectares annually. Ten three-wheeled motorcycles and 20 irrigation pumps given to the Ministry of Agriculture to encourage local entrepreneurs to provide irrigation services to remote agricultural lands.
- **Hillsides stabilized.** More than 6 million trees and crop plants were distributed, contributing not only to soil conservation and erosion prevention by stabilizing slopes above selected plains, but also contributing to household food security and increased income for farmers.
- **Three key public-private partnerships forged.** AVANSE's funds were used catalytically to leverage private sector (agri-enterprises) investments to benefit farmers, for example through expanding farmer's access to the higher-value organic and fermented cacao markets and through enabling increased farmer engagement with a local agro-processor rice firm.
- **Small and medium enterprises strengthened.** Twenty-two enterprises, 13 of which are female-owned, upgraded through investment in value-added processing that transform unprocessed commodities into market goods with higher value, boosting job creation, and generating greater revenues for local enterprises.
- **Youth and women (agri-preneurs) eagerly engaging in commercial, agricultural activities.** Youth and gender mainstreaming in AVANSE activities contributed to 1,207

formerly unemployed and/or underemployed youth and 22 female-led agribusinesses starting to generate income from their agriculture activities.

AVANSE'S ACHIEVEMENTS



46,123

Farmers applying new and improved agricultural technologies



27,747

Hectares under improved technologies or management practices



51,650

Households with increased agricultural incomes

INCREASE IN YIELDS

PLANTAIN



200%

RICE



140%

CACAO



42%



700%

Increase in annual exports of cacao

\$8,000,000
\$6,000,000
\$4,000,000
\$2,000,000
\$0

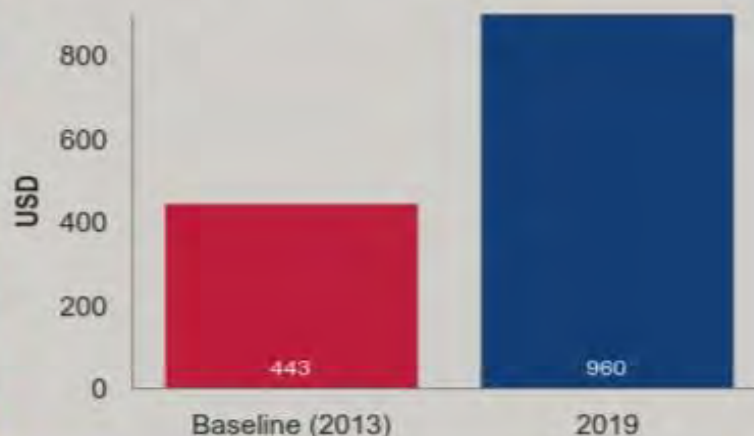


2013 2014 2015 2016 2017 2018 2019

Annual Cacao Exports



Doubled Household Income



LESSONS LEARNED & RECOMMENDATIONS

Lasting change in the way farmers produce.

Farmers and others including universities and the Ministry of Agriculture have accepted the improved production practices AVANSE promoted. In addition, there has been a lasting change in farmers' practices and in how agriculture, especially rice production, is taught in the local universities. However, in some cases, farmers found some technology packages, namely the System of Rice Intensification (SRI), too demanding, and farmers did not adopt the entire system. Consequently, we recommend gradual or stepwise introduction of technology packages. AVANSE recommends future projects work with farmers to tailor new technologies to farmers' particular agro-ecological conditions and financial resources. This tailored approach, along with introducing agronomy students to new technologies and providing them with field experience, will help increase the overall adoption rate of new and improved technologies.

BOX 1: EARLY TRANSPLANTING

"Early Transplanting" is one of the five SRI principles. This practice—transplanting young rice seedlings about 8 to 12 days after germination instead of the traditional 40 days—has been adopted by nearly all the rice farmers in the Northern Corridor.

An AVANSE survey found that adopting this simple practice alone leads to higher yields, in the range of 20 percent increase.

Collaborating with farmers on adapting technologies to their specific circumstances yields encouraging results. Techniques adapted by farmers to their circumstances are likely to yield more sustainable results than those given to them in a top-down approach. This accounts for the success of the Farmer Field School approach, which uses a participatory method allowing farmers to test and to adapt technology to their circumstances. For example, in the cacao value chain, changing from large nurseries delivering in bulk to small community nurseries, as recommended by farmers, reduced cacao seedling mortality. Local rice seed production, as opposed to imported seed, contributed to lower costs and increased production. Locally produced, clean plantain plantlets eliminated the problem of transporting, often low quality, plantain suckers from other regions. The recommendation, therefore, is to continue collaboration with farmers, further integrating them into the extension process, in order to identify the best solutions to farmers' main production problems.

Working to expand innovations encourages market system change. Expansion of successful innovations stimulates system improvements and encourages competition amongst private sector actors, steering the private cacao sector toward more inclusive ways of doing business with farmers. For example, all three of the main cacao exporters in the Northern Corridor have engaged in or expanded their involvement in cacao fermentation; AVANSE's support facilitated their shift to this higher priced market. All of the exporters now have the capabilities to improve the quality and expand the amounts of fermented cacao they produce, which increases their revenues. These changes in turn encouraged exporters to engage in two other profitable specialty markets: fair-trade and organic. We recommend continuation of these efforts to partner with the private sector in order to incorporate even more farmers into higher value markets, and to multiply these profitable, agri-business activities.

Deepened engagement with private sector to foster inclusive economic growth. AVANSE, through public-private partnerships and grants, made progress toward creating sustainable "win-win" partnerships between agribusinesses and farmers' groups and associations. Examples include the

Collectif de Lutte contre l'Exclusion Sociale/Collective Fight against Social Exclusion (CLES), L'Union des Producteurs de Banane d'Haïti/Union of Haitian Banana Producers (UPBH) and Produit des Isles (PISA). Future projects can build on these successes, by scaling up these partnerships and encouraging more farmer involvement. Key to expanding inclusive economic growth is to work with firms that have shown interest in fostering win-win economic opportunities for farmers.

Greater investment in irrigation and water management system is crucial. Deferred maintenance increases the subsequent costs for rehabilitation of and repairs to irrigation systems. Because these maintenance needs are not being addressed, the ensuing system inefficiencies and failures have reduced water availability in most of the Northern Corridor's irrigated perimeters. This lack of a reliable water supply affected the uptake of the technologies AVANSE promoted, reduced farmers' investments in improved agricultural technologies, and subsequently reduced the overall impact of AVANSE's programs. Going forward, more emphasis should be placed on developing the capacity of the Ministry of Agriculture and water user associations to maintain, repair, and rehabilitate the existing irrigation systems and expand improved water management on the major perimeters in Northern Haiti.

A flexible approach, in light of current climate realities, to facilitate resilience outcomes. Long periods of drought and erratic rainfall negatively affected agricultural production in the Northern Corridor throughout the duration of the AVANSE project. This trend is likely to continue. To prevent significant losses in farmers' livelihoods caused by climate shocks, flexibility in project design, implementation, and even crop selection, is needed. Crop diversification and mixed farmer systems, for example interspersing cacao with yams, plantain, vanilla, fruit, and timber trees can contribute to short-term cash flow and a long-term increase in farmer's revenue, and spreads the cash returns across the year, making farmers more resilient.

Harmonization with other projects and the Ministry to maximize impact and avoid duplication. In a bid to promote sustainability, AVANSE gradually reduced subsidies on agricultural inputs and services. However, other projects provided these inputs and services for free, resulting in a disincentive for collaboration with AVANSE. The recommendation is to ensure that the relevant authorities and other projects are included in the design phase of new projects and in the annual work planning process. While the Ministry of Agriculture was appreciative of AVANSE's information sharing and its incorporation of their local staff into project activities and trainings, the Ministry needs to be encouraged to play a greater role in implementing sustainable approaches across all projects.

IR 1: AGRICULTURAL PRODUCTIVITY INCREASED



Sixty percent of the rural population in Haiti works in agriculture, yet agricultural yields, virtually across all value chains, are low when compared to those of neighboring countries. To increase agricultural productivity, and by extension the agricultural income of farmers, from 2013 to 2019, AVANSE implemented a number of extension and training activities with rice, plantain, and cacao farmers. These activities increased Northern farmers' use of improved technologies and practices, boosted the commercial supply of agricultural inputs/services, built the resilience of farmers to drought, and strengthened AVANSE's beneficiary farmers' knowledge and capacity in crop husbandry, integrated pest and disease control, soil and water management, and post-harvest procedures.

RICE

MAJOR OUTCOMES AND ACCOMPLISHMENTS

INCREASE IN INCOME. Average gross margins increased from \$217/hectare in 2013 to \$990/hectare in 2019.

THREE-FOLD INCREASE IN YIELDS. Rice yields increased from a baseline value in 2013 of 2,561 kg/ha to 6,290kg/ha in 2018. AVANSE shared information about improved methods of rice production, provided of machinery for threshing, land preparation and weeding, subsidized inputs (fertilizer and seed) on a

declining scale, and promoted SRI, a production methodology that allows rice farmers to increase yields while using less inputs.

TECHNICAL CAPACITY OF A WIDE RANGE OF STAKEHOLDERS STRENGTHENED. Over the life of the project (LOP), AVANSE trained 6,799 rice farmers, extension agents, input suppliers, agricultural workers, agronomy students, and professors from all the regional universities on various improved rice production techniques. This wide-ranging approach increases sustainability likelihood of AVANSE interventions. The North and North East regions now have ample competent professionals to guide farmers in integrated pest management, proper pesticide application, and improved production methods for growing healthy rice crops with little to no technical training needed from external experts.

LOCAL SEED PRODUCTION ESTABLISHED TO REMOVE INEFFICIENCIES IN SUPPLY CHAIN. AVANSE trained a selected group of farmers in the production, marketing, and storage of quality rice seed for their own use and also for sale. This activity helped reduce seed imported from Dominican Republic, increased the use of high-quality seeds by farmers, expanded the availability of high-quality seed of local varieties, and generated extra income for farmers. The farmers trained are now producing rice seed and selling to agro-enterprises and other farmers across the region.

LESSONS LEARNED AND RECOMMENDATIONS

MECHANIZATION. Labor became increasingly difficult to find, particularly at peak periods such as land preparation, transplanting, and harvesting. While mechanized services are available, especially close to the border from suppliers in the Dominican Republic (DR), the lack of accessible roads delayed the availability of these tractor services to Haitian farmers. Nonetheless, AVANSE organized and subsidized plowing services through an IR3 program, but competition from the tractors available under a Haitian government program reduced the long-term viability of these private services. As agricultural labor becomes increasingly scarce, our recommendation is to encourage nascent private sector service providers to provide more plowing and harvesting services, while pursuing better harmonization with competing government programs.

BOX 2: MECHANIZATION



AVANSE farmer demonstrates the use of a mechanical cultivator to Haiti's President Jovenel Moise.

Labor, especially at peak periods during land preparation, is often unavailable or difficult to find, inefficient, and frequently cost prohibitive—it accounts for as much as 40 percent of the cash costs for rice farmers.

Access to improved equipment that is appropriate and cost-effective for small farms—from hand tools to mechanical power-driven machines such as mechanical cultivators and rice threshers—is crucial to increasing production and reducing inefficiencies.

AVANSE subsidized, at 75 percent, mechanical cultivators for rapid land preparation and provided rice threshers to associations to help farmers to reduce their production costs.

FLEXIBLE APPROACHES TO RESPOND TO EXTERNAL SHOCKS.

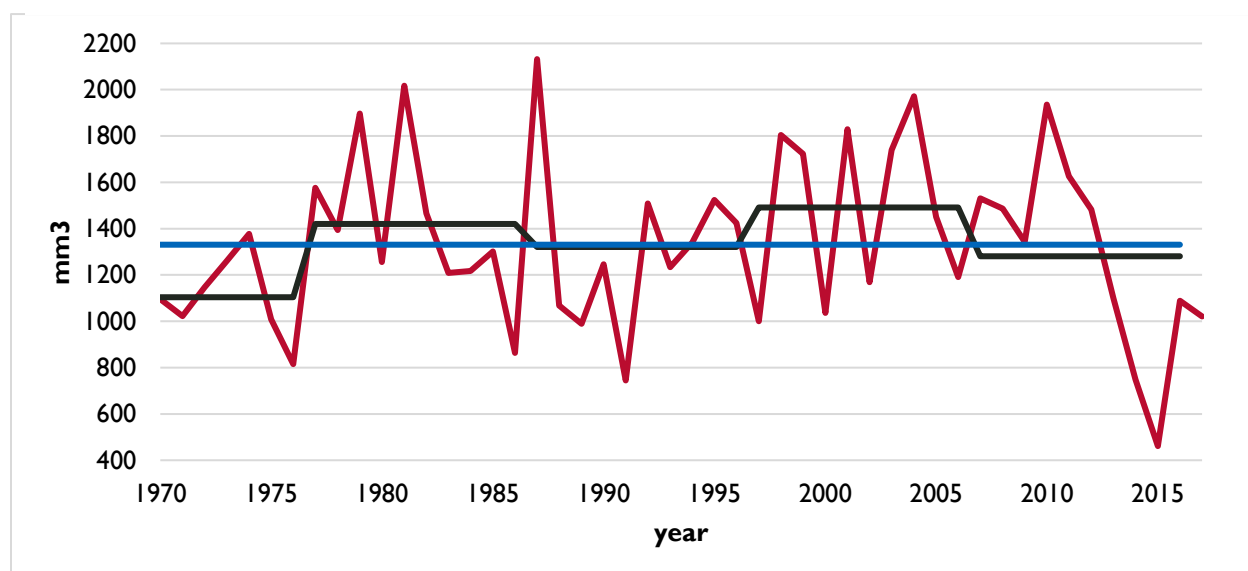
Throughout the project, intermittent and localized droughts were a significant challenge for rice. Farmers who planted their rice nurseries at the traditional time either lost their seedlings, or had to replant. Other farmers, uncertain of the availability of water, either avoided planting entirely, or reduced their investment in inputs such as fertilizer. AVANSE adapted and shifted its focus on building farmers' resilience to the drought by informing them about mitigation measures including growing more short season crops that require less water than rice, such as okra, beans, and maize. However, the project was not allowed to work directly with crops other than the ones stipulated in the contract. As a result, farmers did not receive specific training and inputs from AVANSE for these crops, which was a missed opportunity to improve farmer's revenues under difficult conditions and to strengthen their ability to recover from drought. Going forward, a flexible approach, and perhaps one that is crop agnostic, should be adopted during periods of external shocks and environmental shifts to prevent significant losses in farmers' livelihoods.

BOX 3: PEST MANAGEMENT

A combination of classroom and practical in-field training on integrated pest management provided AVANSE rice farmers and other stakeholders with the knowledge and tools to combat apple snails and rats, two major causes of losses in rice production. The project developed pictorial guides in Creole and French that helped participants analyze, identify, and manage pest and predators in their rice fields. Stakeholders also now have access to "Rice Doctor," a field diagnostic tool from IRRI that enables farmers to quickly identify problems in their rice crops by answering a few simple questions.



Figure 1: Total annual rainfall for Cap Haitien over 47 years (with the 10-year averages in red)



DEVELOPMENT OF GREATER CAPACITY TO CONSTRUCT AND REHABILITATE IRRIGATION SYSTEMS. A widespread tendency to defer irrigation maintenance increases the need for rehabilitation and repairs. When these needs are not addressed in a timely manner, they cause system inefficiencies and failures that over time have resulted in reduced availability of water on nearly all the irrigated perimeters in Northern Haiti. The uncertainty this created around the timing and volume of water available slowed the uptake of SRI plus reduced the level of farmer investment. These factors reduced the overall impact of AVANSE's rice program. Going forward, more emphasis should be placed on working with the Ministry of Agriculture to repair and rehabilitate the existing irrigation systems and expand improved water management on the major perimeters and rivers in Northern Haiti.

TAILORED APPROACH TO SRI EXTENSION. While SRI uses significantly less water, both in the nursery and during the growing season, and increases yields over farmers' traditional practices, the adoption of the entire SRI package without any modifications was somewhat limited. Farmers frequently made adaptations to address the higher labor requirements of SRI at transplanting time, unreliable access to irrigation water, or their limited financial resources. While optimum results only come from adoption of the complete SRI package, there are still significant benefits to partial adoption. Our recommendation is therefore to tailor the introduction of SRI using a gradual, step-wise approach, based on the agroecological factors of the region and the farmers' socio-economic capacities.

BOX 4: MULTIPLYING REVENUE WITH SRI

Skeptical of the promises of SRI, 67-year-old Florvil Saincius tested the methodology on the smallest and most deteriorated portion of his rice field. The increased yields from that first trial silenced his doubts. With each passing year, Saincius expanded the area under SRI and saw his production costs gradually reduce and his rice paddy output increase, and he became more and more convinced of SRI's effectiveness.

In January 2019, despite a prolonged drought, Saincius harvested 359 50 kg bags of rice, which he sold for 800 gourdes per bag, earning him a total of 287,200 gourdes. After deducting production costs for plowing, seeds, field levelling, and transportation, he netted 260,000 gourdes profit—10 times more than what he was earning before AVANSE trained him on SRI.



CACAO

Worldwide, market demand for premium cacao (whether for fermented beans, organic production, or from specialty niche suppliers) is strong. Throughout the life of the project, AVANSE worked with farmers and exporters to take advantage of these market opportunities and increased cacao producers' incomes by implementing activities that: 1) increased cacao production; 2) improved cacao quality (through fermentation and drying); and 3) certified cacao growers' plots as fair trade and organic. Below we present the main achievements of AVANSE's interventions in the cacao value chain.

MAJOR OUTCOMES AND ACCOMPLISHMENTS

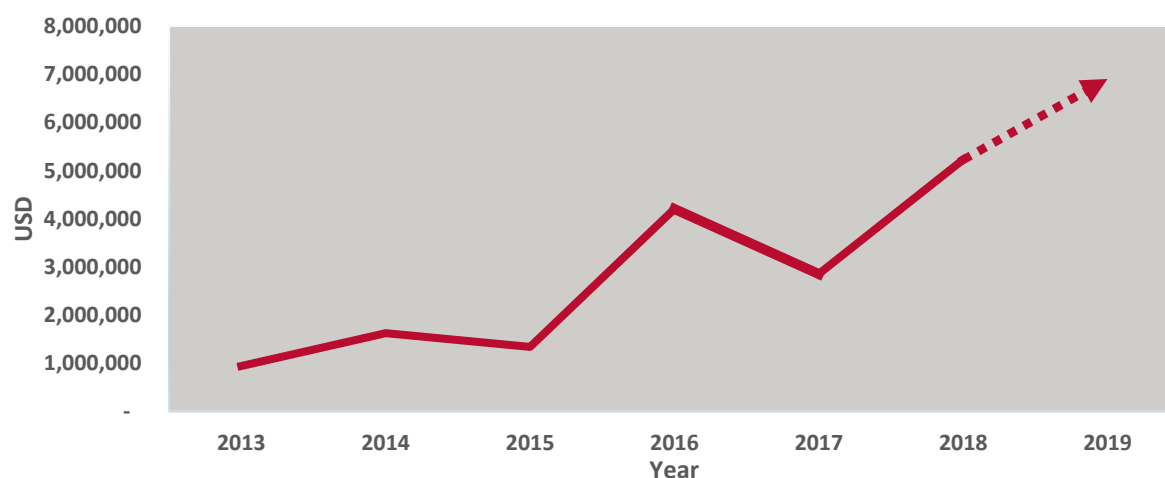
INCREASED INCOME. Average gross margins for cacao nearly doubled, from \$205/hectare in 2013 to \$403/hectare in 2019.

INTENSIFICATION AND EXPANSION OF CACAO. More than 2.9 million cacao seedlings were grown and transplanted with AVANSE's assistance. These seedlings have now begun producing, and as a result, a record quantity of cacao was harvested in 2019 (8,630 MT), despite a prolonged drought that reduced production.

INCREASES IN YIELD. Average cacao yields went from 319 kg/ha in the baseline survey of 2013, to 322 kg/ha in the third Post Harvest Survey (PHS) in FY 2106, to 455 kg/ha in the sixth PHS in FY 2019. AVANSE contributed to these increases by supporting farmers to produce seedlings and expand their area planted, and to intensify their production by improving their farm management through pruning, shade control, pest and disease management, and harvesting. Producers were supported to establish 173 nurseries to produce cacao seedlings, and 7,796 technical guides on improved production techniques were distributed to farmers.

A SUSTAINABLE TREND: INCREASED CACAO EXPORTS. Due in part to the increased production generated by AVANSE's activities, cacao exports from the North increased from 427 tons in the 2013 season to 2,717 tons in the 2019 season. Cacao valued at more than \$22 million has been exported from Northern Haiti over the past six years. The numerous new cacao plantings that AVANSE supported will help ensure that the positive trend in cacao export continues post-project.

Figure 2: Annual Cacao Exports



GREATER ACCESS TO PREMIUM FAIR TRADE AND ORGANIC MARKETS. AVANSE helped cacao exporter PISA and its associated cacao producers to gain fair trade certification, enabling farmers to benefit from fair trade premiums. In addition, AVANSE worked with NOVELLA to establish a new cooperative to represent cacao producers—the Northern Cacao Producers Cooperative (CPCN). The partnership entailed organizing local producers into groups and certifying their cacao parcels as organic and fair trade, which will enable CPCN to not only consolidate production and increase sales volumes, but also benefit from enhanced purchase prices once certification is received during the first half of 2020.

ENCOURAGED EXPANSION IN THE PRODUCTION OF FERMENTED BEANS TO INCREASE FARM GATE PRICES FOR FARMERS. Increased competition in the cacao sector was likely to increase farm gate prices for farmers, so AVANSE worked with all three private-sector exporters in the North on expanding the volume and the quality of fermented cacao. Fermented cacao brings higher prices on the international market. The increase in revenues that resulted from the improvements in cacao fermentation supported by AVANSE, led to higher incomes for both exporters and farmers. The same trend occurred in the other premium market expansions supported by AVANSE, fair trade and organic cacao.

As a result of all these activities, by the end of the AVANSE project, 28,682 cacao farmers had used some or all of these new and improved technologies on a total area of 16,631 ha.

Box 5: Port Margot, North Haiti. Distribution of seedlings from a community nursery



REFILLING GAPS

A study conducted in Q4 FY 2019 revealed a survival rate of 53 percent for cacao trees planted from 2014 to 2018. Cacao seedling mortality was largely attributed to the drought.

To intensify production, and to replace seedlings that died, AVANSE distributed 384,010 cacao seedlings grown from 50 AVANSE-supported local nurseries.

Planting Moringa, a fast-growing, drought-resistant tree that can reach up to three meters in height during its first year, was also promoted. A total of 8,732 moringa seedlings were planted to help shade young cacao plants from heat and the stresses caused by drought.

LESSONS LEARNED AND RECOMMENDATIONS

PROMOTION OF IMPROVED TECHNICAL PACKAGE TO ADDRESS PRODUCTIVITY CHALLENGES.

Notwithstanding the undisputed successes of the AVANSE cacao program, and despite similarities in climate, Haiti still lags well behind the Dominican Republic in terms of total production of beans per tree. This is due to a variety of reasons, many of which AVANSE has started to address, and, therefore, we recommend continued promotion of the technical package AVANSE promoted. In specific, trees that are 60 to 70 years old need to be replaced by new plantations or, at minimum, need pruning and shade management. Farmers need to continue to lay out new orchards with an optimum spacing while using nurse crops for shade and income. Community nurseries (perhaps funded by the exporters) should continue operating to replace seedlings that die due to drought or other factors.

HUSBANDRY AND MAINTENANCE OF EXISTING ORCHARDS. Pruning and managing shade in old farms can rapidly increase yields by up to 50 percent. To sustain the yield improvements already made through the AVANSE program, farmers must be supported to continue to maintain their cacao orchards. Without proper pruning and shade management, yields will decline again, and the trees will return to being unproductive. Future projects and the Ministry of Agriculture should prioritize this activity.

INTERCROPPING TO ADAPT TO DROUGHT IN NEW ORCHARDS: Over the past four years, long periods of drought have negatively affected cacao production in the Northern Corridor. As part of its adaptation strategy, AVANSE distributed yams, plantain, vanilla, and moringa, plus a range of fruit and forest trees to: i) provide shade and act as a nurse crop for the young cacao plants, ii) contribute to some short-term cash flow before the new cacao trees come into bearing, and iii) diversify risk and continue to provide a long-term supplement to the farmer's revenue from fruit and timber. The mixed cropping system is recommended because it spreads returns across the year, making cacao farmers more resilient.

CLONAL GARDENS MAINTAINED. AVANSE had preserved some of the elite cacao lines collected and evaluated under USAID's DEED program. These "super trees" are kept in 13 locations throughout the production area and, if used for seedling production in local nurseries, can lead to increases in yields of 100-200 percent. In addition, budwood from super trees grafted on existing trees can help regenerate old orchards. We recommend expansion of the availability of these improved varieties; a wider distribution of these improved materials can displace inferior varieties and improve the overall production of Northern Haiti's cacao. We also recommend that grafted material from these trees be widely available at the appropriate time. In order to facilitate these actions, AVANSE has funded the University of Northern Haiti (UCNH) cacao center of excellence to train grafters and maintain these clonal gardens.



PLANTAIN

Over the past seven years, AVANSE facilitated the use and expansion of improved technologies to intensify production of high-quality plantain in the region. The technologies promoted include high yielding, disease-resistant plantlets, and mechanized land preparation and irrigation pumps. Despite the challenges of drought and plant disease, the project was able to deliver some impressive results.

MAJOR OUTCOMES AND ACCOMPLISHMENTS

PLANTAINS YIELDS TRIPLED. Plantain yields went from a baseline of 6,040 kg/ha in 2013, to 9,175 kg/ha in the third PHS in FY 2016, to an average of 18,021 kg/ha in the sixth and final PHS in FY 2019.

MARKET-BASED SOLUTIONS FOR LOCAL PRODUCTION OF IMPROVED PLANTAIN MATERIAL. Eighteen for-profit plantain plantlet production centers, 13 of which are female-owned were established. These centers produced disease resistant and high yielding plantlets by using the Production Intensive par Fragmentation/Intensive Production via Fragmentation (PIF) method— which makes it possible for one plantain stem over the course of 2 to 4 months to produce more than 100 high-quality, small plants (plantlets). It is conservatively estimated that these centers have already produced 900,000 plantain plantlets—enough to plant a total of 562 hectares. Owners of PIF centers have seen revenues of 640,000 HTG (approximately \$7,000) over the course of just seven months of operation.

TRAINING AND PEST MANAGEMENT. AVANSE used FFS to demonstrate the application of good agricultural practices for increased plantain production. Farmers worked with field specialists to diagnose the main problems with their plantain crop. They then received field training on irrigation and water management, pruning, mulching, and removal of the male flower. In collaboration with the University of Auburn, an extension specialist provided AVANSE's farmers with techniques for identifying and limiting the spread of *sigatoka*, a serious fungal disease. Over the course of the project, AVANSE trained 9,228 farmers and extension agents on these various improved plantain production techniques. By the end of the project, 6,236 plantain farmers had applied some or all of these new and improved technologies on a total of 4,785 hectares.

IRRIGATION PUMPS TO RESIST DROUGHT. A subsidy program allowed farmers to purchase 186 pumps subsidized at 75 percent by AVANSE, in order to irrigate their land and those of others, contributing to at least 660 hectares able to be regularly irrigated. The pumps helped mitigate the impact of the drought, which had considerably reduced plantain yields. In addition, AVANSE distributed 10 three-wheeled motorcycles, 20 irrigation pumps, and 3,000 meters of flexible hoses to the Ministry of Agriculture, which in turn provided these machines to existing agricultural services providers. The motorcycles, pumps, and hoses allow the service providers to reach remote farms with irrigation services.

INCORPORATION OF YOUTH IN COMMERCIAL FARMING. Youth were increasingly mainstreamed in plantain activities, with 1,207 young farmers receiving training on the PIF method to grow high-yielding, disease-resistant plantain. These young farmers received material assistance and agricultural inputs from AVANSE to begin planting PIF parcels on 16.32 hectares. As many of the young farmers were either unemployed or under-employed, this assistance enabled them to engage in plantain production and represents a significant step toward increasing their income and establishing new commercial farming ventures.

BOX 6: MARKET INSTRUMENTS TO COMBAT DROUGHT



Only a limited number of farmers in Haiti's Northern Corridor have enough land to justify buying their own irrigation pumps, so many plantain growers have to just rely on rainfall, which is increasingly erratic and limited.

To help address this constraint, AVANSE distributed 10 three-wheeled motorcycles, 20 irrigation pumps, and 3,000 meters of flexible hose to the Ministry of Agriculture, which in turn provided these machines to existing agricultural services

Farmers can now procure the irrigation services they need at a fraction of the cost of buying a pump, meaning that farmers have greater capacity to manage the risk associated with the drought. Moreover, the service providers, many of whom are youths, have a viable means of generating an income.

LESSONS LEARNED AND RECOMMENDATIONS

DEVALUATION OF THE GOURDE COMPARED TO USD NEGATIVELY AFFECTED INCOME INDICATOR.

While some plantain farmers yields tripled, drought severely affected most of the Northern plantain farmers. At the same time the costs of imported inputs increased sharply due to the deteriorating USD/HTG exchange rate, and the local sales prices for plantain in HTG only increased slightly. The exchange rate deteriorated from 45 HTG/\$ in 2013 to 84.13 HTG/\$ in 2019. Both the drought and the unfavorable prices resulted in the gross margins for plantain, measured in USD, staying nearly static: from \$5,035/ha in 2013 (baseline) to \$5,021/ha measured in the sixth PHS at the end of 2019.

PROVIDING PLANT MATERIALS. In the early stages of the project, plantain suckers were purchased from commercial nurseries and distributed free of charge along with compost to beneficiaries. This approach had several problems: it did not adequately engage the farmers, who had no personal investment in the activity; suckers were delivered from the supplier in large quantities and often arrived at the farms before farmers had completed land preparation or had sufficient soil moisture at their location to plant; and the mixed varieties produced by these commercial nurseries often did not align with the farmers' preferences. All of these factors led to inefficiencies and did not help ensure sustainability.

In 2016, AVANSE shifted away from free distributions through large nurseries to encouraging local commercial production on a large scale of preferred varieties using the PIF method, but this did not prove economically viable. The next step was reducing the scale and providing training and support that allowed farmers to produce planting material using the PIF method to rapidly increase the number of plants for their own use or to sell to immediate neighbors. This was a much more successful approach. Consequently, we recommend promotion, continuation, and expansion of the PIF multiplication method at a small local scale through selected farmers.

RESPONSE TO DROUGHT. The long drought periods and the erratic rainfall negatively affected plantain production in the region. AVANSE adapted to this challenge by providing subsidized irrigation pumps, which enabled farmers to provide supplemental irrigation during times of drought. This intervention was combined with the promotion of good agricultural practices such as mulching to conserve soil moisture and field training in soil and water management. All these activities helped to avoid the reduction in the weight and size (and marketability) of the plantain bunches typically results from drought. Our recommendation is to continue promoting subsidized pumps and soil moisture conservation techniques.

VALUE ADDITION TO HARVESTED PLANTAINS. As individual producers' production volumes increased, farmers were organized to aggregate the production from several farms for transport to more distant markets. Test shipments of plantain to the larger processors in Port au Prince, such as AYABOMBE, demonstrated that the cost of assembling a full load and transporting fresh plantain to Port au Prince was too high, especially given the competition from closer suppliers. In response, in-kind grants were made to three local entrepreneurs to produce papita and other plantain products in the North, and the demand this created opened additional markets for Northern plantain producers. Our recommendation is to continue supporting young entrepreneurs and small and medium enterprises working in plantain value addition and facilitating their entry to profitable markets for processed products.

IR 2: WATERSHED STABILITY IMPROVED

AVANSE applied a community-based approach to its natural resource management (NRM) activities. Working with local organizations, AVANSE identified each community's priority needs and prepared detailed soil and water conservation plans for their sub-watersheds. Grants to 11 community-based organizations located in six watersheds helped protect eroded hillsides, through planting trees, reducing erosion, and stabilizing slopes.

MAJOR OUTCOMES AND ACCOMPLISHMENTS

LOCAL SOLUTIONS APPROACH ADOPTED FOR GREATER IMPACT

Using the *konbit*¹ approach, AVANSE solved the issue of the labor force required to make long-term investments on a hillside block. Grants were awarded to local community organizations, who, with the support of the NRM technical team, organized the field work and arranged for the traditional meal. This transferred the technical NRM responsibilities to the local organizations and reinforced community ties.



Figure 3: Gens de Nantes, Northeast Haiti. AVANSE Natural Resources Management and local community-based organization MOPEJ members applying improved soil conservation techniques to hillsides in the Jassa Watershed. 2016-09-22 Photo: Audius Petit Jacques / CBO MOPEJ / AVANSE

¹ A *konbit* is a Haitian tradition, a mechanism of social solidarity found in rural areas where a group agrees to work together to carry out various activities, particularly in agriculture. This tradition had started to disappear until AVANSE's NRM team encouraged farmers to reinstate it and to use it to renovate their eroded hillsides.

AVANSE also supplied the up-front investment required to provide the plant materials needed to replant an eroded hillside with mixed species. As a result, AVANSE achieved the following results:

- A measured 52 percent survival rate (490,377 trees) of trees planted, compared to the more usual 20-30 percent.
- A reinvigoration of the traditional communal workgroup system (*konbit*), which had started to disappear in many regions of Haiti.
- Treatment of a total of 2,918 hectares of hillside farmland (measured by GPS), against the LOP target of 3,000 hectares.
- Training for 6,525 beneficiaries (4,144 men and 1,837 women) in NRM and soil conservation, against a LOP target of 6,000.
- 5,462 beneficiaries observed applied improved technologies and receiving economic benefits from sustainable NRM/conservation.
- A total of 2,766,370 linear meters of biomechanical structures/anti-erosion contour structures installed on eroded hillsides.

SUSTAINABLE LIVELIHOOD APPROACH TO SOIL CONSERVATION—6 MILLION FOOD PLANTS AND FRUIT AND FOREST TREES DISTRIBUTED.² AVANSE centered its soil conservation activities around selecting and planting crops and trees that produce food, and so not only conserved soil and prevented erosion by stabilizing slopes above selected plains but also contributed to household food security, consumption of nutritious products, and an increased income for farmers from sales.

BOX 7: INCREASING YIELDS, MANZÈ ROSE, PERCHES

Before development of the soil conservation activities at Manzè Rose, during periods of intense rainfall, the rice fields downstream of the slopes were often buried under mud because of soil erosion in the upstream areas. Because of the damage this silting process caused, rice yield for farmers downstream was approximately 1.2 MT/ha.

With AVANSE's support, the community installed new bio-physical structures at Manzè Rose, which reduced runoff and soil erosion. After establishment of the renovations, even in periods of intense rains, silting was drastically reduced downstream and the average rice yield more than doubled to approximately 3 MT/ha.

As well as the increased income from their rice, an economic analysis using data collected from landowners in the managed hillside blocks at Manzè Rose suggested that the value of their hillside land had doubled one year after the bio-physical structures were installed, from \$600 to \$1,200 per hectare.

LESSONS LEARNED AND RECOMMENDATIONS

USE OF DROUGHT RESISTANT PLANTS. The use of pineapple plants to reinforce and stabilize the earth berms constructed along the contours across eroded slopes was very popular with farmers. The drought-resistant pineapple plants make an effective barrier to erosion and provide farmers with a

² They include 648,877 fruit and forest trees, 168,557 plantain suckers, 1,447,943 pineapple cuttings, 325,621 yam plants, 1,356,863 elephant grass cuttings, 1,449,066 sugar cane cuttings, 229,000 vetiver seedlings, 6,834 kg of maize seed, 14,655 kg of Congo pea seed, 15,634 kg of pea seed, and 36,841 acacia tree seedlings.

reliable cash crop. We recommend continued promotion and scaling up of the use of pineapples and other climate-resilient species to stabilize hillsides along contour berms.

PROMOTION OF LOCAL OWNERSHIP AND LOCAL INVESTMENT. There is a long tradition of donor-funded projects imposing external solutions and, in some cases, even paying hillside farmers to change work their own land, all of which discourages ownership and reduces sustainability. AVANSE's approach built the capacity of local non-governmental organizations (NGOs) to work with the farmers themselves to implement solutions. AVANSE worked with the farmers with plots downstream, and those with plots along the slope and engaged them all in activities, providing the plant materials and hiring local woman to prepare a midday meal (part of the traditional *konbit* practice). To facilitate these community actions, we recommend the production of additional plant material for erosion control in local community nurseries. This would not only provide an additional income source but would also help ensure that material was available for transplanting at the optimal time.

STRATEGIC SELECTION OF CROPS FOR BOTH SHORT-TERM AND LONG-TERM ECONOMIC BENEFITS. Rather than focusing on just reconstituting a perennial vegetative cover on eroded slopes, AVANSE distributed a range of plants that included species valued by farmers for their immediate returns, i.e., those that produce food for their families, can be sold on the local market, and are generally fast growing, such as pigeon pea, pineapple, and yams. The project intercropped these species with longer-term perennial species that also had economic value, such as mango, cashews, and timber trees. Farmers received immediate income from the shorter rotation crops while at the same time they could expect to receive income from sales and food for household consumption from the perennial species at a later date. This combination of short- and long-term economic benefits motivated farmers to protect and maintain their tree seedlings. We recommend that future initiatives take a whole of hillside “plot-based” approach, one that encourages adaptive, plot-specific alternatives that consider the social, economic, and ecological conditions at that location, with all the interventions developed with and through beneficiary participation.

IR3: AGRICULTURAL MARKETS STRENGTHENED

AVANSE strengthened the agricultural markets in the Northern Corridor by working with private businesses (big and small) to upgrade their facilities, which enabled them to process larger volumes of quality products, add value to raw agricultural commodities, and sell their products into higher-priced local and international markets. The IR3 team also operated a subsidy program for fertilizer that used electronic vouchers, collaborated with the Ministry of Agriculture to provide farmers and traders with reliable and timely market information, and partnered with suppliers to provide farmers with modern inputs and technologies. These partnerships helped sustain the gains made in agricultural productivity and farmers' income.



Figure 4: Inside CLES's rice processing facility

MAJOR OUTCOMES AND ACCOMPLISHMENTS

Table 1: Indicators, Targets, and LOP Results for IR3

INDICATOR	LOP TARGET	RESULTS	% CHANGE
Percent increase in value of incremental sales by cacao farmers	150%	\$399,061	299%
Percent increase in value of incremental sales by rice farmers	200%	\$3,809,810	1,423%

INDICATOR	LOP TARGET	RESULTS	% CHANGE
Percent increase in value of incremental sales by banana/plantain farmers	200%	\$236,925	-18%
Percent increase in value of agribusiness sales	30%	\$13,556,029	248%
New private sector investment	\$2.5 million	\$2,238,908	-10%
FTE jobs created	150	228	+52%
Farmers receiving market information	26,000	33,384	+28%

UPGRADING EQUIPMENT, PROCESSING TRANSFORMATION

INCREASED DRYING AND PROCESSING CAPACITY IN THE RICE & CACAO VALUE CHAINS

- With AVANSE's support, the CLES rice processing facility was upgraded and it is now able to dry and mill more rice—from 90MT to up to 6,000MT—per rice season. This expansion is projected to contribute up to \$4.5 million in increased agribusiness sales, 40 employees with full time jobs, 20 percent increase in the farm gate purchase price for rice, and additional income for up to 1,300 farmers who will benefit from 10 percent cash redistribution of CLES's business revenue.
- Upgrades to a fermentation center doubled exporter PISA's fermentation capacity, from 5 MT to 10 MT per day, helping PISA and its associated farmers benefit from a higher-priced market segment.
- Haiti's, largest cacao exporter, NOVELLA is now equipped to start producing fermented cacao in 2020, thanks to AVANSE support for remodeling a 700 m² coffee collection depot into a cocoa fermentation and drying center. This new infrastructure will allow NOVELLA and thousands of cacao farmers to benefit from the higher value fermented cacao market. Prior to AVANSE's intervention, NOVELLA was not producing fermented cacao, and their farmers were not receiving the benefit of the increased export prices paid for fermented beans. The new export price could be as high as \$500/MT, against the current price of \$150/MT paid for unfermented low-quality dried cacao.
- FECCANO (a federation of cacao cooperatives), with AVANSE's support, erected four drying tunnels, and received international expert training in how to improve the operation of their members' fermentation facilities, enabling them to produce better quality fermented cacao.

INCREASED TRANSFORMATION CAPACITY IN THE CACAO VALUE CHAINS. A modern “bean-to-bar” chocolate-making facility established with small local business AGROTECH has resulted in another market for local farmers' cacao beans, as well as creating employment, and providing for AGROTECH access to higher-priced markets for local cacao products.

SMALL-SIZED BUSINESSES SUPPORTED/STRENGTHENED.

Eighteen small, local agro-processing businesses, the majority of which were female-owned, and one blind owner of a chocolate business received technical assistance and modern equipment to facilitate the improved transformation of their products. The equipment included cacao roasters, cacao bean cracking machines, small rice mills, and a plantain slicer, in addition to small generators to supply electricity. These grants in kind improved the capacity of these firms to more rapidly transform rice, cacao, and plantain into goods with a higher market value—products like rice flour, plantain chips (papita), chocolate, and cocoa butter, and contributing to increased sales and greater demand for farmers products.

BANANA FARM AT LA CHAPELLE ESTABLISHED.

A modern 50-hectare pilot banana farm aimed at the export market was established in partnership with a land-owning investor (the Bonnefil family), an association of small local farmers (the La Chappelle Farmers Association), and a major exporter from the Dominican Republic (Banamiel). By December 2019, the 50 hectares had been planted, the farm had 30 full-time employees, and weekly harvests were as much as 1,000 bunches, which were being sold on the local market, contributing to increased agricultural sales, nutrition, and food security. **(More details on this sub-project is in the Addendum Report)**

ACCESS TO QUALITY SERVICES

INCREASED ACCESS TO AGRICULTURAL QUALITY SERVICES (INPUTS) THROUGH ELECTRONIC VOUCHERS

SIBA: An incentive system for agricultural inputs (SIBA) that used an electronic voucher system to provide subsidized inputs (at a declining rate) to farmers was piloted in collaboration with local partners, input stores, and the microfinance institutions *Federation Le Levier* and *Service Financier Fonkoze*. The system, highly appreciated by farmers and input stores, contributed to an increased availability of quality inputs for farmers, and also strengthened the capacity of suppliers to import and deliver greater quantities and better quality, non-counterfeit inputs to local farmers.



BOX 8: SUPPORTING FEMALE ENTREPRENEURSHIP

Dapheney Dolce, 23, co-founder and CEO of Choco Kreyol, proudly shows her quality artisanal chocolate produced and packaged with machinery provided by AVANSE. Dolce is now able to produce in one day the same number of chocolate bars that she used to produce in one week.

A pilot voucher program worked with six firms to increase access to plowing services for plantain producers, and the project also facilitated the development of the first rental service for agricultural equipment—by local equipment company HAYTRAC—to affiliated plowing entrepreneurs in the north.

Another series of meetings and workshops assisted key actors such as Ministry of Agriculture, Natural Resources, and Rural Development (MARNDR), other donors, and projects to understand the benefits of the system of e-vouchers developed by AVANSE under SIBA. The project also participated in the development of a national strategy for incentives and subsidies for inputs.

INCREASED ACCESS TO MECHANIZED AGRICULTURAL TOOLS. One hundred eighty-six irrigation pumps, 18 mechanical cultivators, and 21 mechanical threshers, all subsidized at 75 percent, were provided to farmers through a partnership with agricultural equipment supplier (Charles Fequiere). This partnership enabled farmers to increase their productivity through the use of mechanized equipment and enabled a Haitian business to expand its market into the North and generate greater revenues.

INSTITUTIONAL CAPACITY BUILT TO PROVIDE QUALITY EXTENSION SERVICES TO CACAO FARMERS, COOPERATIVES, RESEARCHERS, AND EXPORTERS. The capacity of the UCNH was strengthened to provide, on a fee basis, a wide-range of extension services to farmers and others working across the cacao value chain. With AVANSE's support, UCNH established the "Cacao Center of Excellence," the "go-to" place for agronomists, technicians, cacao growers, processors, and exporters for information on all subjects related to cacao, whether addressing production issues, such as diseases and best practices, or post-harvest activities such as fermentation and improved drying methods. This Cacao Center of Excellence will continue to serve as a repository of technical information and know-how on the technological advances introduced by AVANSE and others, thus helping to ensure the sustainability of AVANSE's interventions.

ACCESS TO RELIABLE MARKET INFORMATION IMPROVED. A mobile-based market information system, SIMA, was developed by AVANSE in collaboration with MARNDR's Department of Statistics, and the Telecommunications Company DIGICEL. It allowed farmers to use voice or text commands to access reliable and timely information on the prices of various agricultural crops in a range of regional markets. AVANSE's farmers are aware of this new system and are able to access market information, including crop prices in different markets. The Ministry continues to collect the market information and is now working with the EU to create a national system that empowers farmers and small-scale traders who would otherwise lack leverage, market awareness, and decision-making power, equipping them to bargain for better prices when selling their products.

AGRICULTURAL HAZARDOUS WASTE MANAGEMENT SECTOR STRENGTHENED. A cost-sharing grant provided waste management firm 509 Sanitation with highly specialized equipment, including an incinerator and ancillary equipment, and the capabilities to safely dispose of toxic agricultural waste (expired pesticides etc.) in compliance with international standards and best practices. This major USAID investment aimed to transform and modernize the waste management sector in Haiti. **(More details on this sub-project is in the Addendum Report.)**

Table 2: Indicators by FY and Life of Project Totals FY 2014-FY 2019 – IR 3

INDICATOR	FY14	FY15	FY16	FY17	FY18	FY19	TOTAL FY14- FY19	LOP TARGETS (FY14- FY19)
Value of agribusiness sales	24,828	44,000	356,115	605,395	5,603,073	6,922,618	13,556,029	11,542,996
Number of public-private partnerships	0	0	1	0	2	0	3	4
Number of full-time equivalent (FTE) jobs	0	0	0	41	78	109	228	200
Number of entities receiving USG organizational development assistance	780	368	32	35	13	37	1,265	1,250

LESSONS LEARNED AND RECOMMENDATIONS

COST EFFECTIVE INTERVENTION PROMOTED. AVANSE distributed 750 cacao-drying tables and 100 tarpaulins to 850 individual cacao farmers who were part of cacao direct sales groups. Drying tables were found to be effective in both drying the cacao and in reducing mold contamination, but their high costs and size limited their potential; the lower-cost tarpaulins represent a more replicable and manageable alternative. Even though drying takes a bit longer with tarpaulins than with tables and the tarpaulins have a shorter lifespan, their cost is 15 times less than a drying table. We therefore recommend the promotion and scaling up of the use of tarpaulins as a cost-effective drying technology.

CAMPAIGN TO INFORM MORE FARMERS ABOUT MARKET INFORMATION SYSTEM. Asymmetric market information on agricultural value chains in Haiti means that farmers lack negotiating power to bargain with buyers when selling their produce. While AVANSE trained more than 6,000 farmers on usage of SIMA, the mobile-based agricultural market information system, still more farmers in the region can benefit from this project. A radio campaign informing farmers of SIMA's advantages would help remove asymmetric market information, empower more farmers in the region to negotiate with buyers, enabling them to sell their produce at or closer to the market price, and thereby benefitting from increased revenues. Another recommendation is to continue working with Digicel and MARNDP to add weather information to the SIMA platform so that farmers can more easily adapt to climate stresses and shocks.

INFRASTRUCTURE

AVANSE rehabilitated and constructed two irrigation systems (Dubré and Chalopin), providing farmers with increased access to irrigation water. This contributed to redressing years of low to no maintenance of the existing irrigation systems in Northern Haiti, a neglect that had led to the systems being dilapidated, canals blocked by debris, and a higher than usual water loss from leakages from the canals (40-50 percent). Higher yields and, by extension, higher incomes for farmers are expected as a result of these irrigation infrastructure improvements.

MAJOR OUTCOMES AND ACCOMPLISHMENTS



Figure 5: Chalopin Irrigation System seen from above (1. diversion structure, 2. escape canal, 3. sedimentation basin, 4. primary canal) Photo Credit: Eric Auguste for MARNDR

INCREASED ACCESS TO IRRIGATION WATER FOR FARMERS IN DUBRÉ. Intake and distribution systems and 5 kilometers of primary canal in stone masonry were rehabilitated or constructed to allow the irrigation of 135 hectares, permitting 256 rice farmers to increase yields from 3 MT to an estimated 4 MT.

INCREASED ACCESS TO IRRIGATION WATER FOR FARMERS IN CHALOPIN. Intake and distribution systems and 1.2 kilometers of primary canal in stone masonry were rehabilitated or constructed to irrigate 295 hectares, allowing 244 rice farmers to increase yields from 3.5 MT to estimated 5.5 MT.

WATER USERS CAPACITY TO OPERATE AND MAINTAIN IRRIGATION SYSTEM INCREASED. A team of experienced AVANSE community organizers worked with all the irrigation associations across the Northern Plain and the local Ministry of Agriculture staff to provide a variety of capacity-building events and the legal assistance needed to formalize and strengthen them. At Dubré and Chalopin, following the selection of these sites for improvements, an intensive series of additional trainings led to

newly elected committees, management changes, and new operating procedures. These changes prepared the two associations for the management and maintenance of the renovated systems.

Two grants were made directly to the water user associations (WUAs) at the two irrigation subprojects: one for a water treatment facility to serve the Dubré community and provide a source of income for the association and another for the rehabilitation of the WUA's office in Chalopin. These grants helped to improve the effectiveness of the associations and increased community engagement in WUA activities.

WATER BALANCE STUDIES - GROUNDWATER LEVEL MONITORING FOR FUTURE PROJECTS. AVANSE launched a series of diagnostic studies on the availability of water in Haiti's North and North East departments to determine the water balance, which will allow future projects, and the government to estimate the impact of any irrigation system expansions on the overall availability of water and to better evaluate other proposed new or expanded uses of water. In conjunction with the Ministry of Agriculture, the *Bureau de Recherches Géologiques et Minières* (BRGM) and the University of Haiti, AVANSE built a groundwater model of the water balance in the Northern Plain aquifer. The field team regularly collected data and monitored the surface water flows and the groundwater levels in the North and North East to help build the model. This data collection effort was taken over by the USAID Reforestation project, which will allow updating of the model.

AVANSE also performed pumping tests on existing wells in five watersheds in the North and North East. The project identified and mapped approximately 300 individual wells and performed a total of 234 pumping tests, 229 inspections, and 239 base water level and electro-conductivity measurements.

FIRST SOIL LAB IN THE NORTHERN REGION ESTABLISHED. Through a sub-contract with Auburn University (AU) and a grant in-kind to the National University of Haiti (UEH), AVANSE established a soil testing laboratory at the Henri Christophe Campus in Limonade (CHCL). AU provided on-site supervision as the equipment and supplies were installed at the CHCL laboratory, procured an atomic absorption spectrophotometer and other analytical instruments previously unavailable in the North, and provided training to UEH-CHCL staff on soil and water testing methodologies, laboratory management, and administration both on site and in the United States at Auburn University's soil laboratory. AU experts also helped CHCL/UEH develop a program of outreach activities and a proposed fee-for-service schedule for soil and water testing. Farmers in the region can now apply fertilizers at the rates best suited to their crops and soil, conserving their limited resources by not buying unnecessary or inappropriate fertilizers.

LESSONS LEARNED AND RECOMMENDATIONS

IRRIGATION SYSTEM PROCUREMENT. Finding reliable and experienced construction sub-contractors who can build to international standards is a significant challenge in Haiti. In addition, most large firms are Port au Prince-based and unwilling to transfer senior staff to supervise projects in the North. That said, pre-bid conferences combined with mandatory site visits helped potential implementers understand the specific requirements of a USAID-funded project. Consequently, we recommend continued use of these conferences and mandatory site visits for any construction work in the Northern Corridor.

IRRIGATION SYSTEM IMPLEMENTATION. Progress on construction activities was hindered by a variety of issues with local subcontractors. Flexibility and the ability to work collaboratively with the construction

contractors to address difficulties as they arose and make modifications accordingly was essential to the successful and timely completion of the projects. Continual site supervision was critical to ensure that problems were identified and addressed rapidly. We therefore recommend careful selection of contractors with experience building to USAID standards, plus close collaboration with contractors and continual field-based supervision as a way to help mitigate unforeseen macro-level challenges.

WATER USER ASSOCIATION ACTIVITIES. A close working relationship with the local and provincial Ministry of Agriculture officials was key to the successful capacity-building and sustainability of local water user associations. Identifying and electing women into positions of authority was an ongoing challenge. Community grants to the WUAs improved the physical facilities for association activities at Dubré and Chalopin. At Dubré, the installation of a water filtration system also created a source of income for that association. We recommend continued close collaboration with MARNDR officials for any irrigation rehabilitation work, as well as small community grants to WUAs whenever possible.

WATER RESOURCES MANAGEMENT. Collaboration with the BRGM and the University of Haiti led to the production of a water balance model for the Northern Plain and the collection of a body of data that is available for future water resource planning. Unfortunately, in the absence of a source of additional funding for a local organization to continue updating and refining the model, the recruitment of a local organization to take on this role was unsuccessful. A series of discussions with potential organizations and funding sources did not result in a long-term solution. In the short term, data collection is being continued by the USAID Reforestation Project.

CROSS CUTTING

MONITORING AND EVALUATION

MAJOR OUTCOMES AND ACCOMPLISHMENTS

Throughout the life of the project, the monitoring and evaluation (M&E) team cleaned and validated the data provided by the rice, cacao, and plantain technical leads on key indicators. The team also assisted the technical leads to design surveys, collect monitoring data, map project activities, and measure the affected areas using GIS. The M&E team also conducted economic and social impact studies of the NRM, cacao, rice, and plantain and infrastructure activities. For example, in consultation with the international rice specialist, Dr. Erika Styger, the M&E team co-designed a survey to collect data on rice producers' adoption and adaptation of SRI practices.

GIS and Mapping: Throughout the project, AVANSE produced a range of maps that enabled project management and the technical team to better visualize and evaluate the project's impact and reach. For example, all of the organic cacao producers had their individual plots measured and geo-referenced as part of the organic certification process, and the irrigated land parcels in Chalopin and Dubré were mapped to verify ownership, calculate water requirements, and facilitate water management. A range of topographic maps demonstrated the location of geo-referenced activities and measured the actual area of a range of project activities, such as hectares put under improved technologies or NRM hillside improvements.

LESSONS LEARNED AND RECOMMENDATIONS

DIFFICULTIES/FLAWS IN PHS INTERVIEWS. One major deficiency is that the Post Harvest Survey (PHS) was designed based on farmers' recall, not on actual records. Farmers may underestimate their production and overestimate their costs in order to justify continuing assistance. Going forward, we recommend on-site measurement and immediate recording of harvests, perhaps collecting some critical data from a smaller statistically representative subset of the larger sample and using electronic media, such as phones and tablets. This approach will, however, require careful planning and a significant number of skilled enumerators or field agents.

In addition, some beneficiaries selected randomly for the post-harvest survey were not available during the data collection period. Smallholder farmers may have moved to the cities or the Dominican Republic to search for agricultural and/or construction jobs. A random replacement list was used to replace these unreachable farmers. Community and FFS leaders helped enumerators locate producers who had moved, reducing the size of this problem. We recommend continuing these two practices in the future in order to maintain the sample size and replace absent beneficiaries.

ENVIRONMENTAL COMPLIANCE

The environmental compliance team helped to ensure that all of AVANSE's activities created no adverse environmental effects. The team provided proper environmental monitoring of project activities to ensure they were properly conducted per AVANSE's Project Environmental Assessment (PEA) and Reg. 216. They produced training materials and carried out the day-to-day management, ongoing

environmental reviews, on-site due diligence assessments, and staff environmental compliance awareness—as applicable—for all approved AVANSE activities, including the NRM, construction, and agro-processing grants.

MAJOR OUTCOMES AND ACCOMPLISHMENTS

ENVIRONMENTAL MONITORING. The environmental team worked with the technical teams to produce Environmental Mitigation and Monitoring Plans (EMMPs) for all relevant AVANSE project activities, and created an environmental monitoring and reporting system to track compliance with the approved EMMPs. They also provided technical assistance for any environmental screening required by the plantain, rice, cacao, natural resource management, irrigation, and agro-business teams. AVANSE's environmental monitoring and reporting system was highly regarded by USAID.

The environmental compliance (EC) team used the AVANSE Environmental Monitoring & Management Framework to ensure the Pesticide Evaluation Report and Safer Use Action Plan directives were integrated into the AVANSE agricultural production practices. Good agricultural practices for pesticides and pest-specific integrated pest management information and training materials were included in AVANSE's agricultural production activities.

As per the PEA-directed environmental management guidelines, the EC team generated 37 specific EMMPs for all of AVANSE's value chain production, marketing, infrastructure, and grant-related activities.

The EC team conducted a number of environmental compliance trainings for field technicians and value chain, infrastructure, and agribusiness marketing staff, which helped AVANSE staff understand the fundamentals of the EMMP's Environmental Monitoring and Evaluation Tracking Table and assisted them to do the necessary M&E and be in environmental compliance.

AVANSE continuously assessed the specific level of environmental compliance of the project's five main activity-groups: 1) the rice, banana/plantain, and cacao value chains, plus grants focused on agricultural production; 2) watershed soil stabilization grants; 3) the voucher program (SIBA); 4) agro-processing (rice, cacao, and banana) grants; and 5) irrigation and drainage activities, using five separate Environmental Compliance Status Trackers.

Biodiversity Assessment of the Dubré and Chalopin irrigation systems. In 2018, USAID provisionally approved the EMMPs for the Dubré and Chalopin irrigation rehabilitation projects, pending an assessment of the biodiversity. AVANSE conducted a biodiversity assessment of the two irrigation systems' project areas to determine if any endangered and/or threatened species were present. This rapid assessment primarily focused on reptiles and amphibians. Mitigation measures were established and included in the EMMPs for the construction activities.

509 Sanitation. The environmental team worked with 509 Sanitation to procure specialized hazardous waste management equipment through a grant to the company that was designed to modernize and transform Haiti's hazardous waste sector. Upon completion of this activity, Haiti will have a modern facility, equipped with state-of-the-art machinery, for the safe management and disposal of a range of hazardous wastes. (For more details, see the addendum to final report)

COMMUNICATIONS

Over the life of the project, the communications team worked to achieve two main objectives:

- Inform stakeholders about the progress and notable achievements of the project.
- Strengthen knowledge transfer regarding new and improved technologies.

The first objective was achieved through publication of periodic reports, newsletters, success stories, and fact sheets, and hosting of inaugural events and exhibitions. Through these mediums, AVANSE informed the client (USAID) and state, institutional, and private actors and local communities on the project's accomplishments. The second objective was achieved through technical publications, guidebooks, and training materials that AVANSE used to transfer knowledge on improved agricultural technologies to its beneficiaries (farmers, agronomy students, and farmers associations) and its key partner (MARDNR). The communications team working with the technical staff also provided local actors with specific information on AVANSE interventions through a regular radio program.

MAJOR OUTCOMES AND ACCOMPLISHMENTS

Over the life of the project, AVANSE's communications team:

- Produced periodic reports including quarterly reports, success stories, and newsletters for the client and relevant stakeholders.
- Worked with technical teams to produce Creole training materials in order to disseminate improved practices in an easily understood manner.
- Planned and organized an inaugural ceremony for the project-financed soil testing laboratory at Universite d'Etat d'Haiti, Campus Henry Christophe Limonade, CLES, NOVELLA, and at the two irrigation system sites. More than 150 individuals attended the event.
- Held agricultural fairs in Cap Haitien, Limonade, and elsewhere showcasing modern agricultural equipment, including rice threshers, irrigation pumps, and mechanical cultivators.
- Ran a weekly outreach radio program to familiarize farmers and other beneficiaries with the objectives and purpose of the AVANSE project and the various activities it undertook.
- Assisted with quarterly and annual reports of project activities.
- Produced videos highlighting the project's achievements.
 - Cacao video- <https://www.youtube.com/watch?v=BLBI1fRj9o>
 - UPBH video
https://drive.google.com/file/d/1iplvNjD3wyiXRxBhWp8Q9iGjj_wDLvHV/view?usp=sharing
 - Plantain Video
<https://www.youtube.com/watch?v=sPUcH3KbXRO&t=13s>

- Organized field events, including draft fact sheets and remarks, and ribbon cuttings attended by high-ranking individuals including representatives of the U.S. government and senior Haitian government officials.

YOUTH AND WOMEN'S EMPOWERMENT

AVANSE mainstreamed youth and women in all its activities. A designated female empowerment specialist supervised and enforced gender and youth mainstreaming in AVANSE's activities. Youth entrepreneurship and female empowerment were prioritized to reinforce the sustainability of AVANSE's interventions. AVANSE worked to strengthen the skills and knowledge of youth in improved plantain technology, allowing 1,207 youths who were formerly unemployed or underemployed to gainfully profit from their plantain production activities. Hundreds of young agronomy students received in-class and field training on improved rice production methodology.

Overall, across the life of the project, 51,455 people applied improved technologies or management practices, 13,575 (26 percent) of whom were women.

In the cacao value chain, AVANSE supported the female-led cacao cooperative CPCN, consisting of 400 female and 227 male farmers dispersed throughout seven communes, to help their members obtain organic certification and strengthen their internal organizational capacity for good governance and effective financial management. As part of its market-strengthening activities, AVANSE allocated more than 50 percent of the APS agro-processing grant fund (\$134,334) to female-led small and medium-sized private businesses in order to upgrade their productivity, sales, and incomes. As part of its water user association activities, AVANSE made association members aware of the social and economic benefits of increasing the participation of women and helped expand the participation of women in leadership. The Dubré and Chalopin WUAs, which had previously never had any female leadership, now have three women in leadership roles, ensuring women's voices are heard in the management and use of the scheme.

Under the plantain program, Madam Saras—the female food traders who are often neglected by agricultural development projects—were trained in strategic marketing and post-harvest handling techniques so that they could strengthen their agribusiness and entrepreneurship skills, increase their profits, and better satisfy their buyers. These Madam Saras also received training on how to use SIMA, the AVANSE-supported market system information system. In 2019, 13 female-owned for-profit centers producing clean and improved quality plantain plantlets were established with AVANSE support.

ADDENDUM TO FINAL REPORT



Figure 6: Commercial banana farm established with AVANSE support

The AVANSE project sought to achieve a number of ambitious goals, which promised to contribute significantly to the development of Haiti. The establishment of the 50-hectare commercial banana farm for the export market at La Chapelle under the Union des Producteurs de Banane d'Haiti (UPBH) grant, and that of a modern hazardous waste management facility under the 509 Sanitation grants were two of these ambitious goals. Due to the complex nature of these grants, their implementation was delayed and additional time, beyond the contract end date of December 2019, was needed for their completion. Therefore, in November 2019, AVANSE requested and received a contract modification to extend AVANSE's period of performance by 3 months to complete the implementation of the UPBH grant and the 509 Sanitation grant. During the three-month extension period, work at La Chapelle continued on establishing the staffing and systems that would allow the production of container loads of export quality bananas by late 2020. By the end of the extension period, while all the equipment for the 509 Sanitation grant had been procured and delivered to the grantee, neither the facility upgrades, equipment installation or the major training program that had been envisaged had occurred, so AVANSE failed to achieve the full purpose of the extension period, as originally conceived.. Nevertheless, AVANSE's efforts provided several lessons regarding the challenges of leveraging private-sector investment to achieve complex development outcomes in Haiti.

This addendum to the final report presents an overview of the original objectives of the UPBH and 509 Sanitation grants. It then presents AVANSE's achievements in the execution of these grants. A section on the specific problems AVANSE encountered and the resulting mitigation measures established follows. A final section provides specific recommendations to USAID and other projects for building on the work started by AVANSE to increase engagement with the private sector in order to crowd in more investments from various actors to complete and expand on the work AVANSE started.

ORIGINAL OBJECTIVE

The objective of the UPBH grant was to work with the private sector and the local community to establish a modern commercial banana plantation and packing facility on a 50-hectare pilot in order to generate export quality bananas for the European market. This investment, made through a public-private partnership model between USAID/AVANSE, private investor/landowner Reynold Bonnefil, and Dominican exporter Grupo Banamiel aimed to create jobs, increase net farm revenue, and contribute to community development. This model increases the agricultural productivity on 50 hectares of land, shares the project benefits with local farmers, creates various opportunities for the local community, and provides a model of a successful partnership between landowners and land users that will hopefully encourage investment by the Haitian private sector into modern agricultural production.

MAJOR OUTCOMES AND ACCOMPLISHMENTS TO DATE

For the last four years, AVANSE worked with the private sector, sharing the investment costs of establishing a modern banana plantation using imported meristems, installing a modern irrigation system, recruiting and training a labor force, and constructing and equipping a state-of-the-art modern banana packing house at Ferme RB La Chapelle. AVANSE also formed a local farmers' association with former squatters, the La Chapelle Banana Producers' Association, and has prepared them to obtain fair trade certification. The grant was awarded to Union des Producteurs de Banane d'Haiti and in 2017 its management was assigned to a committee that includes the landowners, the La Chapelle Farmers' Association/*Association des Producteurs de la Ferme La Chapelle* (APFL), and a representative of UPBH. The major achievements of this partnership include:

- 50 hectares of high yielding bananas meristems have been planted.
- A modern sprinkler irrigation system installed, and a farm drainage system built.
- 50 full-time and 30 part-time jobs have been created to date.
- A modern packing house built and fully equipped with state-of-the-art methods for handling bananas, including a cable way system for mechanized transport after harvesting as well as cleaning, sorting, grading, packaging, and storage facilities.
- The La Chapelle Farmers' Association is registered, has received capacity building, and has applied for Fair Trade Certification.
- Despite the long series of delays in planting and infrastructure implementation and the failure to achieve export quality volumes for 2020, good working relations between exporter Grupo Banamiel and the project were maintained through regular phone updates and visits. Post project, the Ferme RB La Chapelle continues to be in touch with Grupo Banamiel and is currently making the staff and protocol changes needed and planning to negotiate an export contract in late 2020 for their 2021 production.
- In 2020, before the 50 hectares start to produce export quality volumes, and fair trade certification is received, increasing volumes of fresh banana (currently 75MT) are being sold each month on the local market to Madame Saras and via a contract with a local supplier, contributing to increased agricultural sales, nutrition, and food security.

- The landowner collaborated with the local authority and area residents to solve their community development challenges, including stopping recurrent floods through channel deepening, bank protection, and river erosion control, and donation of land for a health clinic and courthouse.
- Activities in the extension period included planning for specific 2020 goals such as medium-term sales contracts for the 2020 production, finalizing the audit and receiving fair trade certification and signing a contract with Banamiel for 2021.
- During the first three months of 2020, work continued on a Ferme RB La Chapelle business plan, improvements in staffing and systems at the farm and a review of all the protocols.

CONSTRAINTS AND MITIGATION MEASURES

The failure of the grantee (UPBH) to negotiate an agreement with the existing land users, delays in planting and establishing the farm caused by severe flooding that required significant unplanned for flood protection work, and the illness and subsequent death of Mr. Bonnefil, the land owner, combined with drought and political uncertainty, caused a series of significant delays that required the extension of this grant from 15 to 48 months. These were resolved by significant investment from the Bonnefil family into river protection, a delegation of the day-to-day management of the grant from UPBH to APFL, additional AVANSE oversight, and the replacement of Mr. Bonnefil by his son, Patrick Bonnefil.

By the end of the project, the main objective of the partnership— a contract for banana exports signed with Banamiel, was not achieved. Export of the first trial container to the European market was originally scheduled for August 2019, but a failure to keep up the necessary planting schedule, and continuing problems with the irrigation system, combined with other factors, such as the reduced cash flow on the farm caused by the failure to plant enough area in 2018, and the general reduction in Haytham's economic activities, in combination with the political unrest, resulted in a failure to recruit and bring on board in a timely manner the short and long term international staff needed to bring the farm to export quality production. Other contributing factors included intermittent drought, equipment breakdowns, and the sub-optimal use of fertilizer and fungicide caused by the reduced cash flow lead directly to a marked reduction in the quality and also the quantity of the expected production. Market specifications in terms of size and shape and volume of bananas were not met by August 2019, and so Banamiel did not contract to buy bananas for export on a long-term contract during 2020.

From January 2020 to March 2020, the Bonnefil family continued to work on managing the pilot and AVANSE continued to work with them on a business plan, including arranging meetings with investors and attending some of these meetings.

AVANSE worked closely with Ferme RB La Chapelle to find new staff with experience in large-scale banana production and marketing for the export market. A number of new management options were identified, but the overall Haitian economy and reduced cash flow meant that recruitment of new staff has been postponed. During the extension period, the Ferme RB La Chapelle targeted four main areas for improvement and investment. They included: bringing the infrastructure at the farm up to international standards, expanding the security at the farm to prevent larceny and to ensure bio-security and disease control, improving the fertilizer and sigatoka control regimes, and identifying new market possibilities for 2020. The farm signed a contract for weekly supply to the domestic market and started

to explore the possibilities for export into regional markets. Discussion with the Ambassador of the Bahamas and business people from Turks and Caicos indicated potential interest in Haitian bananas, and air cargo space is available from Cap Haitien for these markets. Export of bananas to either these islands or to Europe via Jamaica on consignment with Banamiel could begin as production volumes of export quality fruit improve, starting as early as August/September 2020. PARTNERS NETWORK, a global distributor that imports food into Haiti, has also expressed interest in signing a MOU with the farm to supply bananas to their existing clients. These sales will start to create the cash flow needed to bring in the necessary new staff and to fund an expansion in area. Lastly, the continuing discussions with Banamiel suggest that the original buyer, WINFRESH, is still very interested and that exports of Haitian bananas to the fair-trade Europe market can, all things remaining constant, begin in January 2021.

RECOMMENDATIONS

AVANSE has, from initial conception to current operations, developed and tested a challenging model of community development that incorporates a private-sector land owner and the squatters that had been using their land, by forming them into a local farmers' organization and helping them to collaborate to increase productivity, generate agricultural revenues, create employment, and boost the local economy through direct and indirect impacts on employment and via the generation of fair trade premiums to fund sustainable community development projects. Moreover, the overall larger program is still to be established; the available land for potential expansion of banana production in the immediate area is at least 1,000 hectares. The long-term potential for sustainable, locally led economic development is tremendous. Future USAID projects can build on and scale up AVANSE's groundbreaking efforts by working to attract expertise and support and accelerate the additional investment needed to enlarge the program and make this pilot sustainable by:

- Supporting the Ferme RB La Chapelle to strengthen existing and establish appropriate new management systems and acquire any additional monitoring equipment needed, including software.
- Identifying and hiring qualified personnel to operate these systems.
- Providing technical support to assist the APFL committee and its members to determine equitable ways to prorate profit among participants in the expanded program and to share revenues from fair trade premiums among the community participants.
- Supporting the Ferme RB La Chapelle to obtain the maximum benefits from the Haitian Investment Code for tax and custom privileges and from any other appropriate programs for its expansion program.

509 SANITATION

ORIGINAL OBJECTIVE

The objective of the 509 Sanitation grants was to support a waste management company (509 Sanitation) in upgrading its capacity to safely manage and dispose of a range of hazardous wastes, including expired agricultural chemicals. This was to be accomplished by providing the company with modern, specialized equipment including an incinerator and ancillary equipment with the capabilities to

safely dispose of toxic waste in compliance with international standards and best practices. The grant was also intended to support various Government of Haiti (GOH) ministries with respect to proper legal and institutional oversight (and associated training) needed to establish the administrative and operational rules in order to ensure the effectiveness and sustainability of the hazardous waste management sector. Ultimately, the 509 Sanitation grants set out to transform and modernize Haiti's waste management sector. The genesis of the 509 Sanitation grants concept was safe disposal of expired pesticides that AVANSE had purchased early in the project, that were not utilized and had expired. The grants were conceived of as an environmental impact mitigation measure, which would also create a resource that does not currently exist in Haiti; unfortunately, neither was realized.

MAJOR OUTCOMES AND ACCOMPLISHMENTS TO DATE

From January to March 2020, AVANSE was able to complete the overseas procurement and delivery of the state-of-the-art, modern incinerator system, which included an incinerator, muffle furnace, autoclave, boiler, and associated safety equipment. The incinerator is capable of attaining the required temperature (1000-1700°C) to safely dispose of hazardous waste. This equipment, along with materials for a hazardous waste storage and processing system, were delivered to 509 Sanitation. The upgrades that had been planned for the infrastructure at the site did not occur in time and so AVANSE also provided support to the grantee to develop their own preliminary design and plan for the physical and electrical upgrades to its facilities that will be needed for installation and operation of the incinerator and associated equipment. In the absence of a functioning facility, the training program planned for the extension period was not able to be implemented.

CONSTRAINTS AND MITIGATION MEASURES

Time was the biggest constraint AVANSE faced in the execution of the 509 Sanitation grant. Fuel shortages, political instability, and civil disturbances, which led to road blockages and extreme difficulties regarding the movement of people, goods, and services, delayed construction procurement by three months, as bidders were unable to visit the 509 Sanitation facilities to understand the scope of what they were bidding on.

In addition, and perhaps more importantly, the procurement and installation of specialized equipment and associated facility upgrades required extreme caution and vetting from both the field office and home office engineers to ensure proposed upgrades met international standards and specifications. Moreover, home office due diligence processes uncovered a number of risks to both the project and USAID that had not been sufficiently considered. As a result, the original time planned for completing the grants was significantly surpassed. In short, it was estimated that an additional 9-12 months would be needed to complete the remaining, planned grants activities.

RECOMMENDATIONS

Completion of the 509 Sanitation grants represents an important step for Haiti's journey to self-reliance as it has the potential to transform Haiti's hazardous waste management sector (and reduce environmental impacts) on multiple levels: operationally, technically, and from an institutional perspective. It also holds the potential to make a positive contribution to the sustainable development of multiple sectors such as agriculture, health, and governance. To capitalize on this opportunity, USAID could continue to develop grantee capacity to install and use the procured equipment. This would

include the proposed physical and electrical upgrades to 509 Sanitation's facilities. Several ongoing USAID/Haiti projects could implement the remaining tasks, including the Water and Sanitation project or the USAID A&E support contract implemented by AECOM.

ANNEX I: IPTT

(Sent separately, included in PDF)