



Haiti second dry run June 2019

Applying distributed ledger technology to connect Haitian mango, avocado and pineapple producers to foreign markets

Rene Oostewechel, Yves Laurent Régis and Jan Brouwers



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This research project has been carried out by Wageningen Food & Biobased Research commissioned by Haitian Ministry of Commerce & Industry and funded by World Bank (project number 6239139200).

Wageningen Food & Biobased Research
Wageningen, July 2019

Public

Report 1966
ISBN 978-94-6395-040-4

Version: final
Reviewer: Nicole Koenderink
Approved by: Nicole Koenderink
Client: Haitian Ministry of Commerce & Industry
Sponsor: World Bank
Cover photo: Wageningen Food & Biobased Research

This report can be downloaded for free at <https://doi.org/10.18174/496446/> or at www.wur.eu/wfbr (under publications).

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Preface

This report provides the technical results of a Dry Run cold chain test on mango and avocado, analysing data of the cold chain from harvest in Haiti till arrival in the US. The project will also export pineapple, which will be added afterwards in order to give the Logistical Service Provider the chance to start implementation with a fruit they have experience with (mango) and add one that is sourced in the same area they already work in (avocado). For that reason, pineapple was not included in this dry run June 2019.

The cultivation and sales of these fruits is a major contributor to the income of the poorest people of Haiti. However, studies show a lack of competitiveness caused by a (1) poor performance of the supply chain logistics and (2) inefficiency due to lack of structured (micro)orchards established according to an agronomic optimal plan. In particular post-harvest losses and quality decay throughout the supply chain are problems to be tackled to increase the income of the farmers and other stakeholders in this supply chain. To resolve these issues expertise in logistic design, cost analysis, facility design, packaging, and optimal product conditions is required. In the middle- and long run, a more orchard-like approach is advised to increase yields and quality, to manage the trees in a more easy and efficient way, to lower the fruit cost-price, and to enable diversification of varieties that may be required for new target markets. A way to do this while including the many thousands of current smallholders, is to establish mini-orchards. Additional revenues are expected to benefit the participating farmers by exporting their fruit via a Logistical Service Provider making use of block chain technology. Part of these additional revenues could be paid to them in the form of vouchers that can be spent on investments in new trees and production methods.

The Haitian Ministry of Trade and Industry (MCI) through the Business Development and Investment Project (BDI) undertakes activities to support regional development and sustainable economic growth in Haiti. We have had extensive talks with the newest partners in the project: Haiti Mango Consortium, the Local Service Provider (LSP) responsible for logistical handling from tree till the broker in the US, and Agriledger, responsible for the design of the block chain. We are again grateful to the staff of MCI, with leadership of Michel-Ange Pantal, and the staff of the WBG in charge of the BDI project, especially Emiliano Duch and Jean Emmanuel (Jami) Desmornes. They have provided a wealth of information and connected the mission consortium members to each other for team building.

We also would like to thank all stakeholders met during the field mission in Haiti, especially the mango and avocado farmers participating in the trial and the Haiti Mango Consortium for providing their facilities and sharing their ideas about potential improvements of the fruit value chains. Again, we are very grateful to the support staff of the MCI office that assured a seamless logistics during the mission. We thank our reviewers for their comments and suggestions.

This study and report was financed by the Ministry of Economy and Finance of the Republic of Haiti within the framework of a World Bank loan. The advisory work done in this mission, whose results are included in this report, has been conducted independently by specialists of Wageningen Food & Biobased Research (WFBR), part of Wageningen University and Research (WUR), The Netherlands.

All statements and arguments provided by this report are the views of the team members of Wageningen UR. In no way may the WB, MCI, Haiti Mango Consortium, Agriledger or any other partner involved in this study be held accountable for the content of this report. The team has tried to be as complete as possible. Any errors in the text are the responsibility of the team alone and certainly not the responsibility of the people we have met during our mission to Haiti.

Summary

This report provides the technical results of the second dry run transporting mangoes and avocados from Haiti to the US. For both fruits, temperature has been registered from the moment of harvest till arrival at destinations. Also logistical data like planning preparing the test, time needed for each step, and quality of fruits has been analysed, following the procedures as presented in the Standard Operational Procedures for both fruits.

The process was organised together with the two new partners Haiti Mango Consortium and Agriledger, both contracted by MCI for the next phase of exporting fruits to the US.

After an introduction chapter, technical observations and remarks are provided for both mango and avocado in the next two chapters, with a concluding last chapter afterwards that provides overall analysis, lessons learned and recommendations.

Based on the lessons learned the Standard Operation Procedures (SOPs) will be updated. A major change will be that Collection Points will be introduced as transport from tree to truck cannot be controlled by project partners. SOPs will be updated over the coming months June-July 2019.

Abbreviations

BC	Block chain
BDI	Business Development and Investment Project (WB Project in Haiti)
CC / CP	Collection Centre / Collection Point
DC	District of Columbia (Washington DC)
DLT	Distributed ledger technology
DR	Dominican Republic
ESIH	École Supérieure d'Infotronique d'Haïti
HMC	Haiti Mango Consortium
HWT	Hot Water Treatment
KPI	Key Performance Indicator
LSP	Logistical Service Provider
MARNDR	Ministère de l'Agriculture, des Ressources Naturelles et du Développement Rural
MCI	Ministère du Commerce et de l'Industrie
MSME	Micro, Small and Medium-sized Enterprises
NYC	New York City
PauP	Port au Prince
PDAI	Business Development and Investment Project
PPP	Public - Private Partnership
RH%	Relative Humidity percentage
SAE	Service d'appui aux Entreprises
SME	Small and Medium Size Enterprises
SOP	Standard Operational Procedure
SPS	Sanitary and Phyto-sanitary Standards
US	United States
USDA-APHIS	U.S. Department of Agriculture – Animal and Plant Health Inspection Service
WB/WBG	World Bank / World Bank Group
WFBR	Wageningen Food & Biobased Research (part of WUR)
WUR	Wageningen University & Research

1 Introduction

1.1 Introduction to the Haiti fruit export project

The Ministry of Trade and Industry (MCI) through the Business Development and Investment Project (PDAI) is undertaking activities to support regional development and sustainable economic growth in Haiti. This project uses a value chain approach to promote the development of the country by establishing functional linkages between micro, small and medium-sized enterprises (MSMEs), which generates benefits for all producers and end consumers. The MCI intends to use the counterpart funds mechanism of the PDAI project to finance either partially or totally the training, technical assistance or common services that MSMEs currently need to allocate or increase the value of products and, as a result, access markets where they can maximise their profits and thus increase their income.

The cultivation and sale of mangoes, avocados and pineapples is a generator of employment in the poorest areas of the country and contributes to nearly 40% of the income of this category of people. The value chain analysis was carried out by the MCI Business Support Services (SAE) of the MCI established in the regions. It is in this exercise that the SAEs operating in the Artibonite and the Central Plateau and which are working with producers in these areas have concluded that the mango, avocado and pineapple industry needs to be improved so that MSMEs become more competitive and generate more revenue.

Mangoes, avocados and pineapples are perishable products and as such may be damaged and become unfit for consumption due to undesirable variations in temperature, thus exposing producers to considerable losses. And, in order to achieve the reduction of these post-harvest losses and, at the same time, to improve the quality of these fruits, the mango, avocado and pineapple industry in Haiti requires suitable cold chain logistics that enables the control of the process of ripening fruit and to have access to more attractive markets, like the US.

The Haitian government has selected as technical consultant for the project Wageningen Food & Biobased Research (WFBR). WFBR already has concluded a scoping study that includes an analysis of the avocado and mango sector in Haiti (WB report ACS22611; 2017) and a study detailing the technical logistics facilities needed to upgrade the cold chain for mango, avocado and pineapple fruits in Haiti (WFBR 1795; 2017 and WFBR 1804; 2018). In addition, a technical cold chain dry run was conducted in May 2018, applying block chain principles (WFBR 1838; 2018). For mangoes, avocados and pineapple SOP procedures have been determined, which are to be applied by the service provider. These reports provide a basis for the next cold chain dry run scheduled in the second half of 2019, which will provide learnings and recommendations to further operationalise the block chain design for the selected regions in Haiti.

MCI SAEs teams are currently working with a group of mango producers in Artibonite and avocado producers in the Central Plateau that are willing to use cold chain logistics services to access better market opportunities in the US. For the time being, the annual production by these target groups of farmers is estimated at 3.152.000 kg mango and 893.371 kg of avocados. However, beyond the 60 targeted mango smallholders and 56 targeted avocado smallholder producers, there is scope for greater demand for cold chain logistics services in Haiti. Pineapple producers in two other departments are scheduled to become part of the project.

Production of Francis Mango in Haiti is estimated at about 155,756 ton per year. Production of the total of other varieties is 992,047 ton per year (2014). Francis, the only variety suitable for export to the US as it resists the Hot Water Treatment, is mainly grown in the Artibonite Department (in Gros Morne in particular) where 68,905 MT is harvested, which is 44% of the annual Mango Francis production volume. Recent figures of mango volumes shipped from Haiti to US are 160,568 boxes by end May 2019 (compared to 47,926 boxes last year same period) ref. www.mango.org (boxes from Haiti are 9,9 lbs / 4,5 kg). Export statistics for avocado show only export of 8 MT of avocados to the

USA in 2015. In addition there is an informal export flow to the Dominican Republic that is estimated at 10,000 MT. The tables below provide a summary.

Mango production in ton (2014)

varieties	Haiti	Artibonite/ Gros Morne	
	tons	tons	%
Francis	155,756	68,905	44.24
Other	922,049		
total	1,077,805		

Export to the US

mango	tons	boxes	kg/box
2019	723	160,568	4.5
2018	216	47,926	4.5

avocado	tons
to USA	8
Informal to DR	10,000

Source: mango crop report, may 2019 (https://www.mango.org/wp-content/uploads/PDF/Mango_Crop_Forecast.pdf)

In the mango value chain waste figures up to 70% are reported. Fruits need to be treated within the required time frame to avoid losses (see SOPs). The main problems in Haitian fruit chains are observed in planning capacity and at harvest. The harvest takes too much time (due to the high trees and scattered areas where they grow), de-sapping is not done correctly resulting in stained fruits and generally the fruits are handled too rough, temperatures are high and it takes too long before the fruit enters the process of handling in the packhouse. There is a need for a more tight schedule with a constant flow of produce from the groves/orchards to the collection points (CP), transport to the pack station, processing at the pack station, and transport from pack station to Port au Prince (PauP) and from PauP to Miami. The new cold chain logistics services represent a major opportunity for producers in this sector in their quest to access more promising markets.

Relevant impact of improving the cold chain is a direct job creation. In total, the mango value chain is supported by at least 150,000 economic agents (e.g., producers, intermediaries, transporters, workers, and exporters) [ref 1 Haiti I report]. The number of farm households involved in mango production in Haiti is estimated from 200.000 to 300.000. As for the variety Francis, the number of farms in the main farming areas is estimated at 30.000 to 60.000. It is estimated that approximately 230.000 people are directly involved in mango production for export (WB report ACS22611; 2017).

This present supporting sub-project has started in November 2017 with the technical design of the cold chain (see report WFBR 1804). During this start up mission the idea was born to add a dry run test already during Phase 1, which was done in May 2018 (WFBR report 1838). The tender procedure to identify the Local Service Provider and the blockchain technical design consultant, selecting the winning consortium, contracting the winning consortium and starting up Phase II took place afterwards and contracts have been made (see partner overview below). With all partners a second Dry Run in June 2019, the growing season for both mangoes and avocados, has allowed to test the blockchain design. This was the main purpose of the present mission and reported in this report.

1.2 Overview project partners

By June 2019 both the Block chain/Distributed Ledger solution developers as well as the Logistical Service Providers (LSP) had been contracted by MCI. The project also obtained a two years extension for 2020-2021 (still to be formalised). The overview of all project partners as per mid 2019 is as follows:

Haiti Mango Consortium:

- **Ralph Perry import-export SA**
Mathias Perry + 50928140733
Clercine 12, Route de l'aéroport PauP
Mathias.perry@perryexport.com
perryralphjr@gmail.com
ursula.perry@perryexport.com
- **Tropical Trading SA**
Michel Marchal
KM 11 LIZON BON REPOS, 6113 PauP
michelmarceljr@yahoo.com
- **La Finca S A.**
Jose Pablo SYLVAIN
Santo 14 Croix Des Bouquets PauP
lafinca_haiti@hotmail.com

Three main mango exporting companies have joined the project bringing their experience , capabilities and infrastructure as mango exporters, and Luis Orrantia from Tropical Specialists as the broker located in Miami, with help of Andy Rene who put together this consortium. The Haiti Mango Consortium will play the role of the Logistical Service Provider.

Service d'Appui aux Entreprises (SAE) from the Ministry of Commerce:

These business development services are the ones that have done the diagnostics for the different value chains that the project supports, visiting the international buyers and best practices. They are a mix of Economists, Engineers and Agronomists, that followed a two year training program by the World Bank. They are the interface between the producers and the Logistical Service Provider, acting as well as Controllers of the Service Levels, reporting any deviations to the system. They manage the database that registers all potential users of the services, and the suppliers as well. They are coordinated by Mick Pantal (the BDI project Coordinator) and organized by region. For the present test in June the team involved was be the Centre and Ouest: Centre (Marc Andre Volcy and Regine Dubrema) in organizing the farmers in the field, and Ouest (Vladimir Leveille and Frantz Claude Loiseau) to follow the processes in Port au Prince.

Agriledger/ESIH:

This is the Block chain/Distributed Ledger solution partner that assures the traceability and payments. They are working locally with Sogebank and Sogexpress to manage all accounts and payments in Haiti. The Consortium representative is Patrick Attie, Director of the ESIH (IT University in Haiti), based in PauP, and the Project lead is Genevieve Leveille, Agriledger CEO, based in London. The software development was led by Jamiel Sheikh as CTO. They were represented during the test, with two local graduates from ESIH that follow the project locally.

World Bank (WB) team:

Jami Desmornes based in PauP follows the project closely. In addition there is Gloria Ferrer, based in Miami, who support the SAE teams in methodology and technology issues. Keerthana Chandrashekar, based in DC has helped as interface with the block chain solution. Mariana Vijil and Emiliano Duch are the co-Task Team Leaders, based in DC.

Wageningen University and Research (WUR):

WUR is the specialist selected by MCI to design the processes for each fruit product and control the quality of the services. The team is composed by Jan Brouwers, Rene Oosteweche (both based in Holland) and Yves Laurent Régis (based in PauP).

1.3 Purpose and objectives

The overall purpose of the second technical cold chain test was to pre-test the design of the respective block chains for mango and avocado. Objectives were the following:

1. Test and improve the planning procedures for handling mango and avocado harvest, transport to pack station, processing and preparing for export at Port au Prince;
2. Special focus on temperature levels (product and environment) through each step of the value chain as well as duration of each step in the chain;
3. Implement and monitor procedures closely from harvest till transport at Port au Prince of a small sample;
4. Analyse results with project partners and farmers, formulate lessons learned and recommendations;
5. Report on results with specific recommendations for the implementing LSP;
6. Based on the results update the three SOPs and advise on the implementation requirements for block chain.

1.4 Methodology

This report summarises the second concrete field test, analysing what happens when mango and avocado fruits are harvested and exported, while trying to follow technical requirements for an optimal cold chain. The technical cold chain test prepared, implemented, reviewed and reported on the different block chain steps during a small scale test, producing just several carton boxes of mangoes and avocados. To be able to trace the fruits one farmer was selected for mango and four farmers for avocado.

The test included a traceability test by adding QR codes. Fruits were checked on temperature at harvest and a logger is added for the boxes, starting temperature registration as of harvest until arrival at final destination. The aim is to keep fruits under 30C but since sometimes the ambient temperatures result in fruits that are even warmer when still on the tree, the temperature is measured in order to assure that the fruit temperature at least does not increase after it has been picked. Scanning QR codes allows to check on where the fruits were harvested (tracing back to the original farmer) and on temperature during transport.

This was the second test to see what happens when technical cooling prescriptions are respected, while delivering at destination in US. Not all potential technical data that can be uploaded were prepared and applied, but the selected data for the trial gives a good indication if the principles can be applied and see where and how the cold chain can be improved. This dry run was done at the moment the first design of the blockchain had been developed and involved the company that designs the software for this specific blockchain. Also the selected Logistical Service Provider was involved in this second dry run. Thus assumptions that we had at the start, could be checked, confirmed or adapted. This concerns the software, number and type of date registration as well as the practical implementation of the SOPs that had been developed.

1.5 Preparation and organisation technical Dry Run test

The second dry run was prepared by MCI, coordinating with AgriLedger, the Haiti Mango Consortium, WB staff and WUR staff. Haiti Mango Consortium, the LSP in PauP planned to harvest and receive the mangoes as well as avocados and store them in the cooling facility, while waiting for shipment. They allowed access to their facilities at the Perry plant and Tropical Trading, and provided crates and boxes for harvesting and packing material for sending the fruits. Loggers were added to the fruit crates and boxes from harvest till arrival in the US (avocados).

2 Preparatory meetings PauP

On Monday 3 and Tuesday 4 June preparatory meetings were organised in PauP. On Monday a general meeting was organised at the MCI office. On Tuesday two facilities of the LSP were visited (Perry and Tropical Trading).

2.1 Monday 3 June

Meeting at PDAI Office (MCI – BDI Project)

The meeting was called by the coordinator of PDAI to facilitate communication among all actors involved in the project: Ministry of Commerce and Industry SAEs, World Bank Group, Wageningen University & Research, Haiti Mango Consortium and Agriledger. It was also an opportunity to assess readiness and review the plan for the second dry run on mango and avocado.

The objective of the dry run was confirmed: test the components of the commercialization of fresh fruit (in this week mango and avocado) toward new and promising markets for all parties involved in fresh fruit value chains from producers, service provider to block chain technology solutions developers.

Members of MCI deployed SAE team are providing technical services to producers particularly to register them in a database where their identity is protected. They are key to ensure the planning at farm level.

Agriledger presented a series of tools and procedures to collect information from all actors along the value chain to establish digital identity ensure traceability and deliver financial services on a timely basis. Agriledger is currently developing an application to be used as a platform to input information for service request, producers, assets containers, driver, trucks, logistic service provider, packinghouse and broker. The information will be entered from tablets to be provided by Agriledger. The application will be improved from lessons learned during the present dry run.

Haiti Mango Consortium

Representatives of the Consortium are looking forward to start the project based on their installed capacity while they are learning from the other participants. The Consortium expressed their priorities in term of information sharing early in the process to allow time for planning the season, assess production areas, procure crates and other materials and organize human resources from farm to packinghouse. The Consortium expects the development of new solutions will build on existing system aligning with USDA requirements. As the current mango season has six weeks left, the remaining period may be used for planning purpose and acquisition of materials to start the next season.

World Bank Group

WBG is looking toward the success of the project and remain committed to support both the Haiti Mango Consortium and Agriledger. The project goal is to ensure universal access to fresh fruit logistic service. Based on that, WBG encourages the Haiti Mango Consortium to organize collection in a way to process all requests for services. The WBG is waiting for the Consortium to submit a plan to upgrade their facilities in order to disburse an advance to the LSP. WUR will review the plan before approval by WBG and MCI.

Wageningen University & Research (WUR) is providing technical support to the process developing Standard Operating Procedures. Temperature loggers were made available by WUR for the dry run.

2.2 Tuesday 4 June

Morning: visit Ralph Perry Import – Export SA (Perry)

Perry exports mangoes and is the only Haitian exporter of organic mangoes, which requires very strict traceability measures. Perry has established a training package for mango farmers consisting of six modules. These modules train mango producers off season between September and February on professional mango production and harvesting procedures. Perry corroborates the importance that USDA procedures are to be followed strictly. The inspector has his own office within the plant and is independent in terms of checking procedures. After checking, reefers are loaded directly from the cool chamber, sealed and shipped.

Picture 1: Reefers attached directly to cool chamber at Perry



Photo: WFBR

During discussion it is found that block chain requires traceability but adds ownership of the fruits by farmers till the last step (selling to consumer and all payments are made) as well as new payment procedures. It would be good for the Haitian case if the farmers can obtain an advance, as they face various financial requirements during the harvest season, like paying school uniforms and books. Most farmers have bank accounts and online banking is possible in Haiti. The BC system can also add other benefits by linking producers to the Sogebank like saving and having an online track record as proven in former seasons registered by the BC. Shipping of a reefer from PauP to Miami costs about 4.000 USD whereas shipping the same reefer from Santo Domingo costs less than half that price, due to port handling efficiency and security. Haitian exporters have to face these types of additional challenges. They also have to safeguard the image of the Haitian sector: if one of the exporters is exporting bad quality it will impact on the image of the whole sector.

Pineapple and avocado are interesting new products for farmers as well as for exporters as they can provide off-season business before/after the mango season.

Afternoon: visit Michel Marcel, CEO of Tropical trading SA

Mr. Marcel operates with bins, large crates (see picture 2).

Picture 2: Large crates used at Tropical Trading SA



Photo: WFBR

These large crates/bins are mainly used for transport in trucks as of CP.

Michel Marcel exports to the US, Canada and also the EU (Spain and France). A large client in the US is Aldi, a chain with [1,600 stores across 35 states](#), which requires already ripening mangoes. He also serves the Haitian diaspora in Miami and NY with ripening mangoes. This is not the procedure to be followed in the current project as there will be no consignments. Brokers, selected by the LSP, will be checked by the project. There will be in principle only one broker.

Discussion: Again, the Haiti mango preclearance program through the APHIS-approved method was confirmed. USDA APHIS decides on the season, which will close for Haiti often by mid or end of August. Avocado and pineapple can provide a good off season alternative.

3 Mango test

3.1 Execution of the test

On Wednesday 5 June the mangos were collected from one mango producer in the Central Plateau, about 8 km Northeast of Hinche in the left bank of the 4th communal section Aguahedionde. The 469.5 acres¹ Ceramond farm is owned by Jean Claude François. A smaller portion of the farm (111.5 acres²) is used to establish a mango orchard with the Francis variety. The farm operator or manager Gael Cherestil facilitated access to the farm. Four local pickers, Rene Emmanuel, Joseph Joachin, Mèlès Jean and Odalus Cherenfant, were identified on site and briefed on the harvesting process. SAE team members based in the Central Plateau, Marc-André Volcy and Regine Dubrema, and from the main office in Port-au-Prince as well as from other departments participated also in the Dry Run.

Very important in the mango test was the selection of fruits in their right moment of development. Mature but not ripe. One of the main ways to determine the ripeness is through a colour scheme as follows (see picture ripening process in Francis mango)

Picture 3: Colour scheme showing ripeness in Francis mango

Internal flesh colour development of Francisque mangoes



Source: WFBR

For export in an optimized temperature chain, preferably fruits with colour of 2 or 3 are harvested. Too early gives a risk that the fruit keeps well but develops less taste when ripening later. Too late, gives good taste but shortens shelf life (increased disorders).

In order to have good quality fruit, mango trees need to be well maintained to control fruit flies infestation and anthracnose. High humidity and frequent rains are favourable conditions for anthracnose. Visible signs of diseases are an important criteria to consider when harvesting mango. The presence of pests and diseases on a plot (orchard) can reduce income significantly. Best management practices are very important to ensure good quality products at harvest time. As the typical farmer relies on a few trees, fruit quality means a lot, not only from the program perspective but also for him/her and his/her family.

For the purpose of the dry run, instructions were given to pickers to collect only eligible fruits and place them very quickly in de-sapping racks for 20-30 minutes. Following shaded de-sapping, a second quality screening was done on site before placing selected fruits in the crates to simulate their transportation to the mango processing and packing facility.

¹ 190 hectares (ha) or 148 carreaux (cx)

² 45.15 hectares or 35 carreaux

Picture 4: Image of mango harvest trial, harvesting from medium sized tree. In shade: de-sapping crates



Photo: WCDI

3.2 Observations

In total 103 fruits were picked and de-sapped. With the LSP these were checked, resulting in 35 rejected fruits (34%). Approved fruits were transported to PauP but rejected for further processing for export as the selected area was not covered under the current fruit fly trapping system (see annex 2).

Harvesting teams should prepare by arranging crates in the field and installing the de-sapping device prior to the harvest moment. These devices can be easily made from bamboo, see picture.

Picture 5: De-sapping device for mangoes made from bamboo



Photo: WCDI

For picking the fruits it is recommended that clippers are used to limit the sapping and staining of the fruits.

4 Avocado test

4.1 Execution of the test

On Thursday morning 6 June the mangoes were harvested in Lascahobas from four farmers, Lefils Exumé, Rony Jean, Tavilien Cenatus in the locality of Quimpe and Calixte Issalem in Roche Pable.

With the first farmer the procedure to check for proper picking of fruits was done. It is key that mature but yet ripe fruits are being harvested. A range of different stages of maturity – ripeness was made with a set of fruits, and explained to the harvesting team.

Picture 7: Maturity and ripening test at start of avocado harvest



Photo: WFBR

4.2 Observations

Cooling procedures were followed by the cooled truck, but were not respected in PauP, resulting in a ripening process which started already in PauP in the packhouse and at DHL. Fruit temperature measured at packhouse and on shipping day was already 94.1°F. On Friday, June 7th, fruits from each farmer were placed in boxes used for mango export (dimensions of boxes: Exterior - L: 12^{7/8}" X I: 11^{7/8}"; X h: 4" and Interior - L: 11^{1/4}" X I: 10^{1/4}"; X h: 4"). The green-skinned long neck avocado fruits were placed together and the green-skinned oval shape avocados were separated by farmer. Individual fruits ranging from 395 to 565 grams have been placed by size and shape in cardboard boxes containing between 7 to 12 fruits. Each box and fruit were labelled with a printed sticker and/or a QR code containing farmer information and/or commodity origin.

The boxes could not make it to DHL on Friday June 7th. They were stored at room temperature overnight.

On June 8th, the boxes were picked up at the packinghouse at 9:00am to register them at DHL. In total 15 boxes were sent by DHL to Miami with a total weight of 125lbs. DHL grouped the avocado boxes in non-ventilated cardboard shipping boxes making 5 pieces in total weighting 25 lbs/piece. The cargo plane left on June 8th by 15:23pm en route to Miami. The pieces were delivered to the warehouse in Miami on June 10th at 8:53am. The broker observed that the quality was not appropriate to proceed for further shipping.

5 Analysis and conclusions

Logistical capability and quality of SAE team

Like with the first dry run in May 2018 it was observed that the SAE team could not implement a planning that results in a reasonable volume of fruits and that can be uploaded in a truck within a few hours. The project farmers selected in the test were beyond 2 km from the road (for mango) or a large walking distance from the road in steep terrain, sometimes wading through rivers (avocado). A service provider needs volume (at least 2.000 – 3.000 pound) and certainty of being able to upload the fruits at the agreed timing.

Recommendations:

- In order to assure regular logistical procedures the SAE teams should make a mayor reorganisation in assuring that procedures are at standard. This is probably the most critical factor at this point in the project.
- Associating with a grove planner from the LSP is recommended as well for the next steps.

Need to organise collection centres (collection points) and crate management

Given the terrain and the results of the tests, the only way to organise feasible and efficient logistics with the LSP is by working through collection centres (CC). Locations of the CC should be decided upon together with the LSP, associate a considerable number of farmers/trees that can guarantee volume and quality, and supported by a training component in which all requirements for harvesting and transport to collection centre are operated according to procedures.

Mobile CCs can be an option and the LSP has experience with mobile CCs. Transport from tree to CC cannot be controlled by the project partners, but farmers should be trained and made aware that there will be random checks and if they do not respect procedures penalties will be implied. Repeated non-respect leads to exclusion from the pilot group. This has to be updated in the SOP.

As part of SOP, crate management needs to be further clarified (type of crate, number of crates, handling of crates between farmers and CC, storage at CC). In conjunction with the LSP, crates will be purchased that farmers can use for transport from tree till CC and storage at the CC. Crates should be useable for all three types of fruits.

Recommendations:

- Have a review of the project area and select only those farmers that comply with requirements of being within 2 Km from CC and have a reasonable number of trees.
- Decide with LSP on choice of CCs, if needed also include mobile CCs
- Update the SOP accordingly asap with CC as collection points for collecting beforehand and truck uploading (done by end July).
- Decide with LSP on type of crates, purchase for all project farmers (in Haiti or DR), add Agriledger codes to crates, and distribute amongst project farmers
- Train farmers on proper harvesting and transporting to CC. This includes awareness on the importance that produce should be at ambient temperature or lower (shaded, not in the sun) and proper time management has to be applied from harvesting to drop at CC according to SOPs

Need for team building

We observe that now two main partners have joined the project: Agriledger and the Haiti Mango Consortium. Contracting took more time than expected. We observe that investment in team building will benefit the project. After returning to PauP a productive meeting was held at Perry during which we talked about block chain, the role of a service provider (a new business model compared to the present model of trader) and the interest of the whole sector to organise the chain via a system of local collection centres. The WUR team observed that the initial fear of the LSP has been taken away and that we can update SOPs together.

Recommendations:

- WUR to start updating SOPs before end June, check draft SOP with LSP and other project partners and finalise SOP by mid-July (done).
- Organise an avocado transport with substantial volume by second week of September (9-19 September), prepared by LSP, SAE, Agriledger and WUR.

Literature

Haiti mango crop information: statistics provided at www.mango.org

Oostewechel, R.; Y.L. Régis; J. Brouwers (2017) Technical and financial evaluation for a logistics service for the control of the cold chain in the export of fresh products between Haiti and the United States. WFBR report 1795

Oostewechel, R.; Y.L. Régis; J. Brouwers (2018) Technical design proposal report. Outline for tendering the Haitian fruit logistics cold chain design. WFBR report 1804

Oostewechel, R.; Y.L. Régis; J. Brouwers (2018) Report Technical Cold Chain Dry Run. Applying distributed ledger technology to connect Haitian mango and avocado producers to foreign markets. WFBR report 1838

WB Report No: ACS22611 (2017) Republic of Haiti DTIS Implementation. Design of a Fresh Logistics Center and Fisheries Processing Facility in Haiti. GTC04 Latin America and Caribbean

Annex 1 Programme second technical Dry Run

Sunday 2 June

Arrival Rene Oostewechel and Jan Brouwers with AF0618 at 18.20

MCI Mrs Islande Mercier will pick up mission members and transport to hotel Montana

Evening: Last check on logistics: transport mission and transport refrigerated truck

Hotel Montana: <http://www.hotelmontanahaiti.com/default-en.html>

RUE FRANK CARDOZO - 6119 Port-au-Prince Haiti Tel: (509)2940-0584

Monday 3 June

Morning:

08.00 Breakfast YLR-RO-JB

Preparing second dry run, updates, preparing logistics

Afternoon:

13.30.45 Pick up by MCI driver

14.00 Briefing and last checks at MCI. Meeting with MCI, WB, LSP and Agriledger

11.00 Meeting at Perry Import – Export. Check on logistics, timing and procedures.

14.00 Check with SAE Centre team on procedures, material, timing and preparing harvesting Tuesday morning.

Hotel: Montana, dinner with WB and Agriledger

Tuesday 4 June

Breakfast with WB

10.00 Meeting at Perry Import – Export, visit plant

15.00 Meeting with Michel Marcel company, visit plant

Hotel: Montana, dinner with WB and Agriledger

Wednesday 5 June

Morning:

Travel to Hinche

11.00 First steps mango harvesting, processing and transport.

14.30 Travel to Mirabalais

Truck travels to PaP

Evening preparation avocado trial

Hotel Wozo Mirabalais

Thursday 6 June

Morning:

First steps avocado harvesting, processing and transport in Lascahobas with 4 farmers.

Afternoon:

13.00 Refrigerated truck with avocado travels to PaP and avocados are placed in cool store

16.00 Meeting at Perry to discuss SOP and prepare next steps

Evening Hotel Montana; dinner with Jamiel Sheikh / Agriledger

Friday 7 June

Breakfast with Jamiel Sheikh / Agriledger

Travelling back Rene Oostewechel and Jan Brouwers, start reporting

Placing loggers in boxes and checking temperature for shipment, preparing for shipping

Preparing avocado transport as per DHL shipping schedule to broker in Miami

Saturday 8 June

DHL transport to broker in Miami

Arrival Rene Oostewechel and Jan Brouwers

Annex 2 Zones infected by fruit fly not to be used for export to US

REPUBLIQUE D'HAÏTI
MINISTÈRE DE L'AGRICULTURE, DES RESSOURCES
NATURELLES ET DU DÉVELOPPEMENT RURAL
(MARNDR)

DIRECTION DE LA PROTECTION DES VÉGÉTAUX (DPV)

Programme National de Détection et de Contrôle de la Mouche des Fruits

(PNDCMF)

ZONE I

DÉPARTEMENT DE L'OUEST

CABARET 1001@1040P

ARCAHAÏE 1041@1085P

MONTROUIS 1086@1100P

LA PLAINE 1101@1310P

LÉOGANE 1311@1470P

GRAND GOAVE 1470@1529

PETIT GOAVE 1530@1599

ZONE II

HAUT ARTIBONITE I

GROS MORNE 2001 @ 2380P

TERRE NEUVE 2381 @ 2550P

JEAN RABEL 2600 @ 2850P

ZONE III

HAUT ARTIBONITE II

GONAIVES 3001@3330P

ENNERY 3331@3660P

SAINT MICHEL 3661@3870P

ZONE IV

DÉPARTEMENT DU SUD'EST

JACMEL/CAYES-JACMEL 4001@4125P

MARIGOT 4126@4220P

ZONE V

DEPARTEMENT DU SUD ET LES NIPPES

NIPPES/ ANSE À VEAU 5001@5265

L'ASILE 5306@5350

AQUIN 5351@5470P

CAMP PERRIN 5471@5620P

STJEAN 5621@5650P

**N.B. : N'acceptez pas de mangues en provenance des « kilomètres carres
« situés en zones rouges...MERCI**

ZONE VI & VII

BAS / PLATEAU CENTRAL & ARTIBONITE

BOUCAN CARRÉ 6811@6920P

SAUT D'EAU 6701@6810 P

MIREBALAIS 6491@6700P

LASCAHOBAS 6361@6490P

VERETTES 6961@7089P

PETITE-RIVIÈRE 6271@6360&6925@6960P

MARCHAND 6001@6270P

GRANDE PLACE 7090@7224

THOMONDE/MARMONT 7350@7459P

MAÏSSADE 7460@7540P

La CHAPELLE 7225@7299P

Préparé par : FLEURY Marie Yvane

Responsable des Données du PNDCMF

Approuvé par : Ing.-Agr LAUORE Pierre Guito

Coordonnateur du PNDCMF

To explore
the potential
of nature to
improve the
quality of life



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Report 1966
ISBN 978-94-6395-040-4

The mission of Wageningen University and Research is "To explore the potential of nature to improve the quality of life". Under the banner Wageningen University & Research, Wageningen University and the specialised research institutes of the Wageningen Research Foundation have joined forces in contributing to finding solutions to important questions in the domain of healthy food and living environment. With its roughly 30 branches, 5,000 employees and 10,000 students, Wageningen University & Research is one of the leading organisations in its domain. The unique Wageningen approach lies in its integrated approach to issues and the collaboration between different disciplines.

