

# Empowering Local Agricultural Producers with a Global Trading Identity:

Program Synthesis Report



The Asia Foundation, July 2019

## Executive summary

The one-year project titled “APEC Connect – Empowering Local Agricultural Producers with a Global Trading Identity” was implemented by The Asia Foundation and local partners from October 2017 to July 2019 with funding from the Australian Embassy in Vietnam.

The project aimed at establishing a blockchain-based identity and proof-of-provenance platform that will enhance Vietnam’s recognition as the source of high quality dragon fruit, empower micro, small, and medium sized enterprises (MSMEs), as well as provide consumers with valuable information from point of origin to point of consumption including information related to food safety. Blockchain based technology developed for dragon fruit under this project has the ability to create trust, transparency and empower digital compliance which can be replicated for other agro-products. The project took an agile multi-actor approach with lean and active stakeholder participation. The main focus was to obtain hands-on experience with development and application of the blockchain-based verifiable digital identity platform in tracing the provenance of dragon fruit produced in Vietnam for export markets, as well as insights into perspectives of key stakeholders in the dragon fruit supply chain.

In general, the Project has successfully achieved its objectives and targets:

- It built a working prototype of the blockchain-based app for agricultural (specifically dragon fruit) producers and exporters that can help Vietnamese businesses enhance the

value of their products and improve their access to foreign markets. (<https://admin.ethi.trade> for producers and exporters; <https://app.ethi.trade/home> for consumers)

- It supported the enrolment of two dragon fruit producers/exporters in Vietnam, namely Yasaka Fruit Co., Ltd. and Hoang Phat Fruit Co., Ltd., in the pilot phase of the project, wherein the companies and other stakeholders in their supply chains use the blockchain-based system to track and verify transactions from farmers to exporters (by end of December 2018, 29 user IDs were created and 60 trades/QR codes were uploaded).
- It produced a native application (VietOrigins) that allows smartphones, both Android and IOS, to scan QR codes generated from the working prototype. The app can be downloaded from Google Play and Apple Store.
- It also showcased the platform to an audience of 100 participants including high-level policymakers, businesses and industry associations, development partners, and the media, demonstrating the potential for digital innovation and blockchain to promote inclusive growth and improve the efficiency and transparency of global supply chain.

This report provides a summary of the Project activities, its performance, lessons learned and recommendations. Following the Statement of issue (Section 1), the following sections describing the Project activities, results, and key achievements (Section 2). The assessment of the Project against set out key performance indicators (KPIs) can be found in Section 3. Readers can find lessons

learnt from the Project, recommendations for future engagement, and updates on application upgrading in Section 4. The report also contains an annex which provides a list of publicity (media coverage) on the project and the final stakeholder meeting.

## Statement of issue

Globally, there is a growing demand for accurate information on products as they move from point of origin to point of consumption. People are beginning to ask where their goods come from and who made them. Anything less than 100% of expectations met may result in outrage on social media and have negative impact on the product, brand or business.<sup>1</sup> Similarly, in Vietnam there is a dire need for exact information related to food origins in addition to official rhetoric and proliferation of consumer complaints on which to base the trust relationship between businesses and consumers. Trust and lack of transparency are issues that are common in many industries in the face of increasing demand by consumers for improved and more trustworthy information.

Agriculture is a \$15 billion USD export industry for Vietnam, and dragon fruit is one of Vietnam's key export fruits with export sales worth US\$ 895.7 million in 2016. This accounts for 50.3 per cent of the country's total fresh fruit exports and 36.1 per cent of Vietnam's total fruit and vegetable exports.<sup>2</sup> Australia is among the largest

buyers of Vietnam's farm and aquatic products, with an export growth rate of 8.3% and average revenue of US\$ 450 million per year over a period of 2011-2016. On top of that, Australia and Vietnam, through the ASEAN-Australia-New Zealand free trade area agreement which entered in force in 2010, have agreed on zero import tax, while US and Canada have 8 percent and 20 percent import tax respectively, making Australia a very important and lucrative market for Vietnam's agricultural exports.

Vietnam is exporting dragon fruit to over 40 countries and territories throughout the world. The main markets are China, Thailand, Indonesia, Malaysia, Singapore, the Netherlands, Spain, Germany, the United Kingdom, Canada and the United States. In August 2017, according to the Ministry of Industry and Trade (MoIT), Australia officially approved the import of dragon fruit from Vietnam, making it the first exporting country to gain such approval. Vietnam is also exploring potential market opportunities in New Zealand, India, and Chile. Production of dragon fruit in Vietnam mainly occurs in the southern provinces of Binh Thuan, Long An, Tien Giang, Kien Giang, Binh Phuoc and Tay Ninh. The majority of production is concentrated in Long An, Tien Giang and Binh Thuan. The cultivation area increased steadily from 12,000 hectares to

---

<sup>1</sup> Forbes, Consumers Demand More Visibility Into The Supply Chain - <https://www.forbes.com/sites/jwebb/2015/10/26/consumers-demand-more-visibility-into-the-supply-chain/#90d8b025b703>

<sup>2</sup> Vietnam News, Vietnam Export dragon fruit to Australia - <http://vietnamnews.vn/economy/392836/viet-nam-to-export-dragon-fruit-to-australia.html#WPWB7JkiZJhu0Mw9.97>

25,000 hectares from 2008 to 2013<sup>3</sup> and in 2016 has further expanded to almost 40,000 hectares, yielding about 1 million tons of fruit per year. Recently dragon fruit production has also extended into some of the northern provinces, though most of this crop is for domestic markets.

Meanwhile, consumers are demanding more information and want reassurances that the food they consume is safe and originating from reliable sources. For Vietnamese producers, this means that they must provide accurate and reliable product information to buyers and ultimately consumers. This will not only contribute to Vietnamese agricultural products' brand development but also secure added value and enhance competitive ability for domestic producers. China is known to be the biggest importer of Vietnamese dragon fruit over the past ten years. According to the Ministry of Industry and Trade of Vietnam, 80% of the dragon fruit produced in Vietnam are exported to China while 99% of dragon fruit on the Chinese market are imported from Vietnam. This situation will soon be challenged since China has increased investment in dragon fruit production.<sup>4</sup> Besides, over the years China has imported Vietnamese

dragon fruit for both domestic consumption and re-export. The Ministry of Science and Technology of Vietnam quoted a market survey saying that Chinese traders buy dragon fruit from Vietnam at low prices and re-export at prices 10 times higher as Chinese products without any traceability information.<sup>5</sup> Mr. Nguyen Minh Chau, Chairman of the Southern Horticultural Research Institute (SOFRI) also warned of the possibility that Vietnamese famous dragon fruit brands such as Binh Thuan province, Cho Gao (Tien Giang province), Chau Thanh (Long An province) are being falsely labeled by Chinese exporters.<sup>6</sup>

The Ministry of Agriculture and Rural Development is committed to tightening control over the use of plant protection chemicals while encouraging the use of advanced technology to reduce the need for those substances. This will help minimize not just production expenses, but also food safety risks due to pesticide residue, and contributing to Vietnam's goal of cutting the use of plant protection chemical by half by 2020.<sup>7</sup>

---

<sup>3</sup> Hung, NQ 2016, Overview of fruit production, marketing, and research and development system in Vietnam, Food and Fertilizer Technology Center for the Asian and Pacific Region, [http://www.ffc.agnet.org/library.php?func=view&id=20150804112243&type\\_id=4](http://www.ffc.agnet.org/library.php?func=view&id=20150804112243&type_id=4).

<sup>4</sup> China had only 3,400 hectares of dragon fruit in 2011, but it currently reports an acreage of 40,000 hectares and is forecast to develop 34,000 - 68,000 additional hectares in the coming time, according to China's Southern Daily newspaper. <http://en.vietstock.vn/2018/10/chinas-increased-investment-on-dragon-fruit-production-not-immediate-harm-for-vietnam-970-337268.htm>

<sup>5</sup> Chinese traders buy dragon fruit from farmers in Binh Thuan province at US\$400/ton and sell at US\$4,500/ton to Russia, and at US\$2,500 – 3,000/ton to Japan and South Korea after classification and basic treatment. <https://dantri.com.vn/kinh-doanh/mua-thanh-long-gia-re-cua-viet-nam-trung-quoc-ban-cao-gap-10-lan-20170111104100873.htm>

<sup>6</sup> <https://dantri.com.vn/kinh-doanh/thanh-long-trung-quoc-gianh-thi-truong-xuat-khau-1362362454.htm>

<sup>7</sup> Foodexpo Vietnam, Food safety crucial for Vietnamese produce's reputation abroad - <https://foodexpo.vn/en/Food-safety-crucia-for-Vietnamese-produce-eputation-abroad.html>

By digitally tracking the provenance and movement of products throughout the entire supply chain, suppliers and retailers will have a full access to a variety of information including food safety, and instant quality assurance about the products they receive and sell to customers. With blockchain technology, this information flow can be widely shared to enhance decisions at all levels of the supply chain including individual consumers.

## Project summary

To address these issues, the project aimed to establish a blockchain-based verified digital identity platform for Vietnamese dragon fruit producers and exporters, which they can use to attach unique and authenticable signatures to their crops. Other participants in the value chain, including consumers, retailers, and importers, can use the platform to trace the provenance of the goods they buy, including food safety and other certificates obtained by the producer. The project provides producers with a quick and inexpensive way to demonstrate compliance with increasing requirements from buyers and consumers for information related to the finished goods from point of origin to point of consumption.

---

<sup>8</sup> A quick response (QR) code is two-dimensional code in square shape image, mostly represented by black and white pixels in a binary form. It's mostly used in consumer advertising such as web pages and posters. QR code compared to barcodes have fast readability and better storage capacity. QR codes can be scanned by imaging devices such as smartphone cameras and processed using the Reed-Solomon error correction codes until the image is fully interpreted.

During this pilot project, selected producers already registered with the Government of Vietnam and a reputable industry group were given a unique blockchain-based digital ID. Additionally, their respective certifications or trademarks were registered on the blockchain and tied to their unique ID, and a simple web portal listed the name of each registered producer, its basic information, and its unique blockchain identifier.

When a participating producer harvests or processes a batch of dragon fruit, they initiate the transaction via a simple mobile interface. Each transaction record, from farm, to processor, to distributor, to retailer, and finally to consumer, is stored on the blockchain network. Each step on the chain can only be completed if all information requirements and quality standards are met. This builds trust and quality assurance along the transactional network. Downstream customers who have access to the public key for that chain of transactions, can verify without a doubt where, when, and by whom the product was sourced, shipped, processed, packaged and sold. Quick response code (QR code)<sup>8</sup> was selected over Near Field Communication tag (NFC)<sup>9</sup> as the public key given its popularity – more phones can read QR codes compared to those that can read

<sup>9</sup> Near field communication (NFC) is a short range wireless communication technology which requires bringing two NFC compatible devices within at least 4 cm range of each other. NFC technology enables two users to easily communicate and exchange data simply by touching two mobile phones to each other. This has enabled contactless payments, quick file sharing and electronic identity documents. Due to the touching paradigm, NFC ensures security of data since it's harder to tap or intercept the data within a short distance.

NFC tags. Besides, QR code remains the same once generated while NFC is more variable. Thus, QR codes better suit the project purposes as the project aims to attach one single code to each and every product, which accompanies the product from point of origin to point of consumption.

The proposed platform was structured in a way that is highly amenable to additional integration with systems already put in place by third parties and project partners. In the future, the platform can be integrated into the supply chain management procedures of wholesale exporters and buyers of additional agricultural products such as lychee, cashew, coffee, tea, as well as forest products like certified timber.

## Partners

The Rural Development Center (RUDEC) is a public research agency established under the Institute of Policy and Strategy for Agriculture and Rural Development (IPSARD) – a government think tank in the fields of agriculture and rural development. RUDEC conducts research and provides policy advice focused on challenges that Vietnam faces in the process of country's deepening economic integration and agricultural sector reform. This includes new rural development, sustainable agriculture production system, value chains, quality management, and intellectual property rights. Research areas cover provinces across the country, including remote and disadvantaged areas while the poor and ethnic minorities are

the primary groups benefiting from RUDEC research and development activities.

The Asia Foundation has been conducting research and evidence-based policy advocacy with RUDEC since 2009, supporting effective rural governance, development of rural businesses, and capacity building for rural communities to improve their livelihood for an inclusive and sustainable rural development. The Asia Foundation recently collaborated with RUDEC on research examining the export competitiveness of the fruit and vegetable sector in the context of the EU-VN Free Trade Agreement (FTA), ASEAN Economic Community (AEC), and Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CP-TPP).

Ethical Trade Innovations (ETI) is an enterprise founded by the team of developers from Australia that was awarded first prize at the 2017 APEC App Challenge. The enterprise was founded upon a technology platform developed under the principles of open innovation. The platform is designed to engage millions of developing economy MSMEs in the global online market.

## Purpose of final report

This program synthesis report draws on resources from project documents and reports including a Regulatory Review, Business Process Mapping and Import Market Analysis, and various reference materials on the application of blockchain and other technologies in agricultural products/food traceability. The report, written in an

explanatory format, will summarize the work and results of the one-year long pilot conducted by The Asia Foundation and its partners, and try to answer the following three main questions:

- What are the potential advantages and disadvantages for a Fruit and Vegetable Enterprise (FVE) to use blockchain technology to deal with traceability and transparency?
- What are the requirements for an FVE to use a platform/app, based on blockchain technology, to deal with traceability and transparency? and,
- How can an app or a platform based on blockchain technology affect traceability and transparency from the perspective of an FVE?

The report will also touch on other aspects that answer additional questions, though not a focus, such as:

- To what extent can small farmers profit from enhanced export opportunities, and how can their exports contribute to pro-poor development strategies?
- What should developing-country Governments do to support smallholder participation in global agricultural trade, and how can the donor community play a supportive role?

## Project Narrative Updates

Vietnam, which has the largest production area and output of dragon fruit in Asia and is the leading exporter of dragon fruit in the world, is ideal for assessing opportunities to increase transparency

in dragon fruit and possibly other agricultural supply chains.

Conducting research on dragon fruit and deploying our prototype in tracking and tracing batches of dragon fruit along the supply chain allowed us to understand the current traceability system and quality control of the stakeholders and assess technology applications in dealing with these traceability and transparency problems.

## Activity 1 - Business Processes Mapping and regulatory review

### *Business process mapping*

During the pilot project, The Asia Foundation and the Rural Development Center (RUDEC) of the Ministry of Agriculture and Rural Development (MARD) mapped the business process for dragon fruit, visualizing all activities involved in the dragon fruit supply chain from farmers to exporters. This model traces each step in the process and identifies not only what is being done, but also by whom, where, when, how and even makes it possible to uncover why it was done. The business process mapping's main purpose was to inform prototype design and development. Besides, directors of the two export companies selected to participate in the pilot also used the process mapping to gain more detailed insights into all aspects of operational processes and how each may be impacting company-wide goals and even other factors such as compliance. Overall, process mapping can ultimately help these companies become more effective, efficient, and agile by providing a clear and comprehensive view into any or all workflows and potential issues and challenges.



According to the Ministry of Industry and Trade (MoIT), Australia officially approved the import of dragon fruit from Vietnam on August 24, 2017, after 9 years of negotiation. To guarantee conditions for exporting fresh dragon fruit into Australia, the Vietnam Trade Office in the country has advised Vietnamese exporters to apply for a valid permit issued by Australia's Ministry of Agriculture and Water Resources. Five Vietnamese exporters have gained a valid permit to export dragon fruit to Australia, namely Yasaka Fruit Company Limited (Yasaka), Hoang Phat Fruit Company Limited (Hoang Phat), Goodlife Company Limited, Fine Fruit Asia Company Limited, and most recently Cat Tuong Agricultural Processing and Production Company Limited. Among the four companies that were permitted to export dragon fruit to Australia in October 2017 – the time of the project start, Yasaka (100% foreign investment) and Hoang Phat (100% domestic investment) were selected to participate in the project after having filled in a statement of interest and expressed strong commitment to apply the blockchain-based traceability platform for their dragon fruit export to Australia. Careful steps were taken to conduct the mapping:

- Step 1: Determine the precise process that needs to be mapped (from start to finish) to avoid overlapping with other processes;

- Step 2: Interview all stakeholders (farmers/growers, traders, export companies) in the two selected supply chains (using semi-structured questionnaires) to get additional input;
- Step 3: Sequence each activity within the process, as it occurs; and,
- Step 4: Create the two process maps.



According to the General Department of Vietnam Customs, dragon fruit accounted for 32% of the total export value of Vietnamese vegetables and fruits. The export value of dragon fruit was nearly four times higher than the two fruit exports ranked below it – longan, which had an export value of US\$121 million, and mangos, whose export value stood at US\$104 million. Dragon fruit exports also outperformed the vegetables group, which had an export value of US\$143.8 million, and processed products, at US\$143.6 million.

Source: VOA, <https://english.vov.vn/trade/dragon-fruit-dominates-vietnam-fruit-exports-376661.vov>

**Yasaka** is a 100% foreign direct invested company from Japan, established in 2008. The representative office is situated in Ho Chi Minh City with the factory in Binh Duong. Yasaka processes and exports agricultural products such as mango, coconut, and dragon fruit to various markets like Japan, South Korea, Taiwan, and Australia

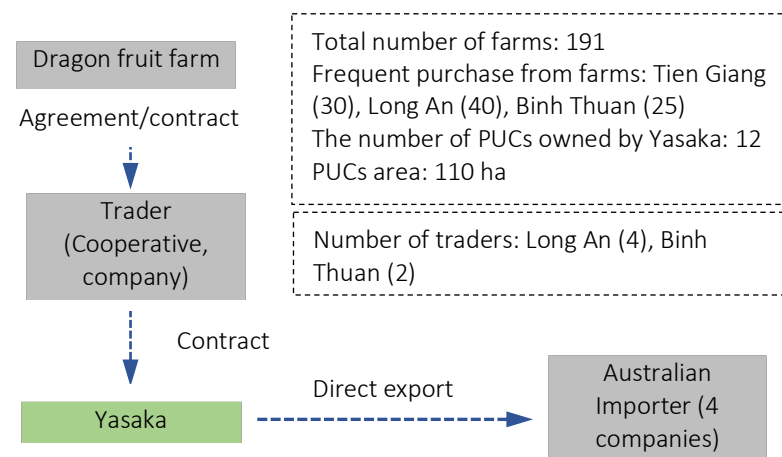


**Photo 1. YASAKA packaging for shipment**

Yasaka does not buy dragon fruit directly from farms but through 6 traders in Long An, Tien Giang and Binh Thuan that it signs contracts

<sup>10</sup> An area eligible for a production code (PUC) should meet the following requirements: The area, which may consist of more than one farm, should be between 6 - 10 hectares, but not exceeding 12 hectares; Farming practices must be VietGap, GlobalGAP or similar; Must be a concentrated area, no residential areas or markets, or breeding livestock in-between; Must cultivate one single type of plant; No cultivation of plants that are host of insects or flies that are under quarantine of importing countries.

with. These traders collect dragon fruit from 191 farms cultivating an area of 110 hectares (equivalent to 12 production areas with codes - PUCs)<sup>10</sup> to supply Yasaka for export. Among the six, two traders were selected for interviews, namely Van Thanh Cooperative and Viet Fruity Taste Co., Ltd both situated in Chau Thanh, Long An. Farms in PUCs follow standard technical production process, similar to VietGap, as instructed by Yasaka and the traders.<sup>11</sup> Yasaka directly exports to four Australian companies.



**Figure 1: Yasaka dragon fruit supply chain to Australia importers.**

<sup>11</sup> There are three widely-applied farming technical processes: i) certified farming practices such as VietGap and GlobalGAP; ii) VietGap-like processes guided by export companies and traders, and iii) free farming technical process, i.e. farmers practice based on their own experience. Dragon fruit from group 1 and 2 are qualified for export to high-end markets while those from group 3 are mostly exported to China.

Hoang Phat is a 100% Vietnamese-owned company established in 2013. The representative office is situated in Ho Chi Minh city with the factory in Long An province. The company has 120 permanent employees and 50 seasonal workers. The company mainly processes and exports mango and dragon fruit.

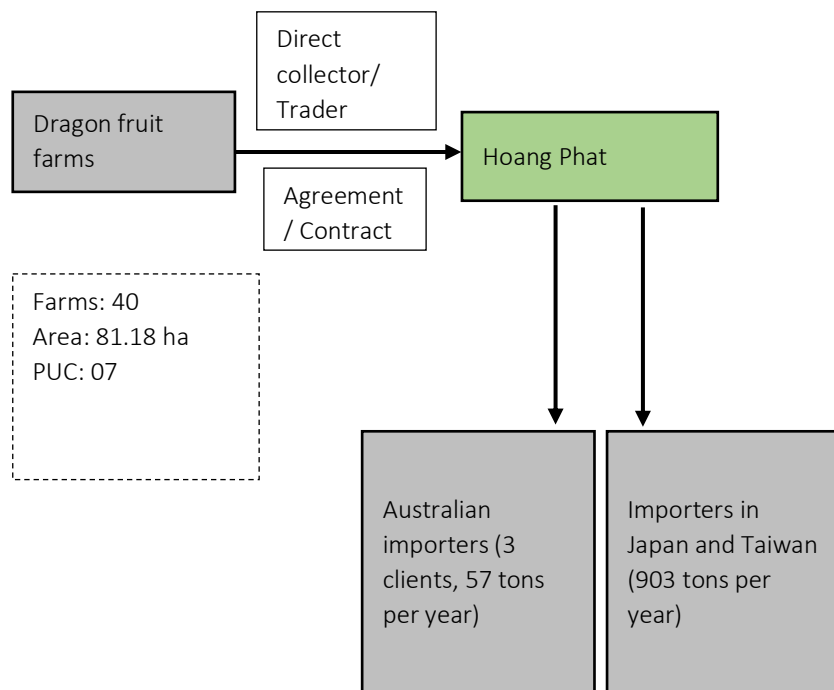


Figure 2: Hoang Phat dragon fruit supply chain

Unlike Yasaka, Hoang Phat signs direct contracts with farms and organizes its procurement system through a network of collectors.

These collectors gather dragon fruit from 40 farms and transport them to their packing house. These 40 farms cultivate an area of 81.18 hectares (equivalent to 7 production areas with codes – PUCs - across 4 communes of Chau Thanh district, Long An province) to supply Hoang Phat for export. Dragon fruit are exported to Australia and other markets such as Japan, South Korea, and Taiwan. Since September 2017, Hoang Phat exported 57 tons of dragon fruit to Australia through contracts with 3 importers.



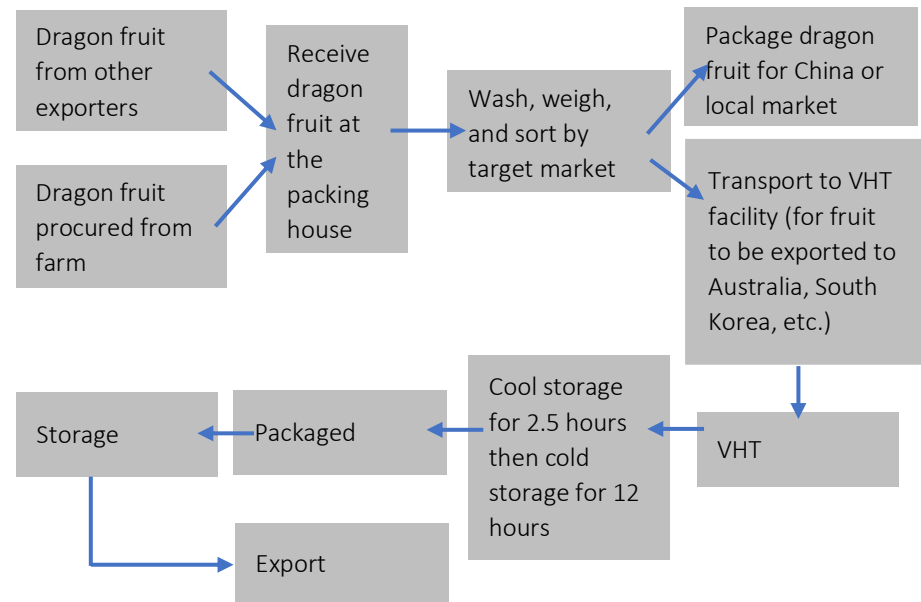
Photo 2: Hoang Phat sorting and grading

Yasaka and Hoang Phat, both of which are among the five companies certified for vapor heat treatment of fruit for export, also provide VHT services to other companies exporting dragon fruit to Australia. The production process at Hoang Phat and Yasaka is pretty much the same and is composed of the following steps:

- fruit receipt
- washing & sorting
- vapor heat treatment
- packaging and storage
- exporting

All information on product as they move through these steps is kept in both hard and soft copy.

There are two dragon fruit seasons. On-season runs from April to September while an off-season runs from October to March. During the off-season, farmers have to light up dragon fruit fields in the evening (from 6pm to 6am the following day) to stimulate flowering. Off-season fields usually bear little disease and have higher yields. Given current technical practices, farms can control flowering and fruition all year around.



**Figure 3: Hoang Phat dragon fruit production process**

Fruit is harvested from 3:00 to 5:00 in the morning to avoid direct contact with sunlight. Fruit is usually received at factories at around 7:00 or 8:00. Workers check fruit quality and arrange fruit boxes in the processing area. If dragon fruit are collected from more than two PUCs or two farms, they are arranged in different areas to avoid mixing. Fruits are then sorted based on size (for both Hoang Phat and Yasaka) and measured for sugar content (for Yasaka only). Prior to being exported, the dragon fruit must be quarantined by the Vietnam Plant Protection Department and issued with a certificate of non-insect control under bio-safety control (quarantine)

conditions. The dragon fruit must be produced in and exported from Vietnam in accordance with the relevant conditions and programs. Depending on requirements from different export markets, dragon fruit will be treated with vapor heat or irradiation or none (in case of China). After vapor heat treatment, fruit must be cool stored (22°C)

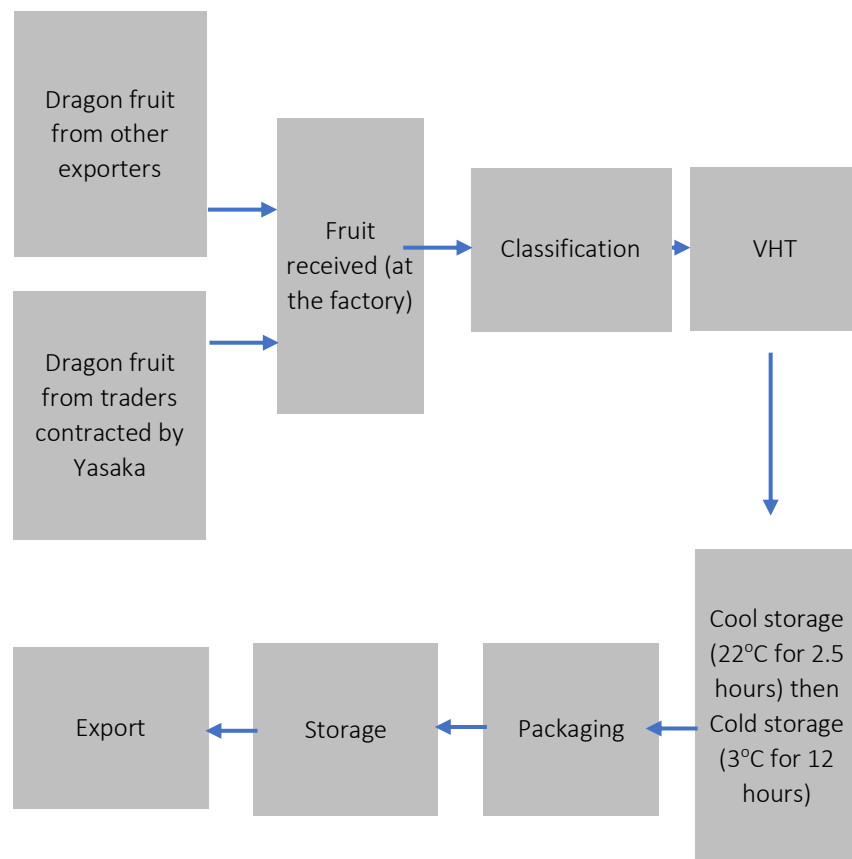


Figure 4: Yasaka dragon fruit production process

for 2.5 hours to allow the core of the fruit to gradually cool off before being cold stored (3°C) for 12 hours. Packaging requirements also differ among markets. As for Australia, packaging materials must be made from synthetic or highly-processed vegetable fiber. Packaging should not include unprocessed vegetable materials such as straw. Individual cartons or packaging must be labeled with a unique identifier to facilitate traceability. In case of US requirements, after irradiation, dragon fruit must be packed in insect-proof boxes and safeguarded to prevent the risk of subsequent pest infestation.

Besides mapping the factories and supply chains of the two companies, the research team also looked for intervention opportunities to improve data transfer. The team compared the data collection methods of two companies, as well as their level of vertical integration, key stakeholders and technology ability. Both used pen and paper to record inputs and outputs of each stage of the respective supply chain with minimal usage of Excel when fulfilling reporting requirements to Government offices, which would be submitted through emails to the Government offices at the moment of export.

There are several initiatives in Vietnam looking to digitalize data captured along the supply chain such as Trace Verified, Eurofins Vietnam, Smart Life, etc. However, few have presented a convincing approach to make data truly interoperable and accessible to all as most are designed to be closed systems with controlled access to the data. One highlight is that every stakeholder in the two supply

chains, from farmer/grower to trader and staff of the two export companies, has a mobile phone. In case a farmer or grower does not have a smart phone, another member of his/her family definitely has. Internet and wi-fi are widely available throughout Vietnam. A mobile phone with a local sim card will allow people to get online and make phone calls.

### *Regulatory review*

The project team conducted a desk review of regulations and standards for dragon fruit processing and export as well as import market analysis (demand for traceability and proof of provenance).

In international trade, dragon fruit is an important plant product, getting more and more attention given its diverse nutritional composition and its equally diverse range of health benefits. Vietnam exports dragon fruit to about 40 countries and territories in the world. In Vietnam, the quality systems to manage production and distribution of dragon fruit are structured from the central to local level. The Ministry of Agriculture and Rural Development directs policies to support production of dragon fruit under Good Agricultural Practices (GAP) standards including VietGAP and GlobalGAP, applying Integrated Pest Management (IPM) in order to reduce the use of pesticides and inorganic fertilizers, together with the increased use of organic manure. Dragon fruit packing facilities

are encouraged to follow safety procedures under GAP in the stages of purchasing, grading, packaging, storage and transport to the market. By the year 2017, 10,083.5 hectares had been certified for GlobalGAP/VietGAP, of them 9,700 hectares are in Binh Thuan, 310 hectares in Long An and 73.5 hectares in Tien Giang province.<sup>12</sup> There are minimum standards for dragon fruit export.<sup>13</sup> Fruit should be sourced from local growers, hand-harvested, and handled carefully. Fruits should be of good quality (i.e. fresh, firm flesh with no physical damage, stem green and healthy, bract bright green, yellow and red colors without browning or blackening, etc.), be of uniform maturity (red skinned), and of uniform size. The weight of individual fruits currently being accepted for export lies in the range from 350 grams to 700 grams per fruit, depending on different market requirements. Fruit flies are a common concern in major foreign markets as they are major international pests. In order to prevent pests from spreading to restricted areas, dragon fruit exported to different markets are subject to different quarantine treatments. Where treatments such as vapor heat are to be applied, these should be carried out within 2 days of harvest, but preferably within one day.

In 2005 dragon fruit was accepted to the EU markets. Requirements include GlobalGAP and packing house code. In 2008, dragon fruit was accepted to the US market, with requirements of VietGAP, irradiation conducted at an APHIS<sup>14</sup>- certified facility, production

---

<sup>12</sup> DARD of respective provinces, 2017.

<sup>13</sup> <http://sofri.org.vn/NewsDetail.aspx?l=&id=686&cat=15&catdetail=50>

<sup>14</sup> APHIS is abbreviation for Animal and Plant Health Inspection Services under the US Department of Agriculture

code, and packing house code. In 2009, dragon fruit was accepted to Japan and in late 2010 to South Korea, and should be vapor heat treated before export. Most recently in August 2017, Vietnamese dragon fruit was accepted to Australia. Fresh dragon fruit shipped from Vietnam to Australia is subject to heat-vapor treatment for 40 minutes at 46.5C with at least 90 per cent humidity at a processing agency approved by the Plant Protection Department (under MARD). Any shipment without a complete plant quarantine certificate or inconsistent documentation will be retained until the

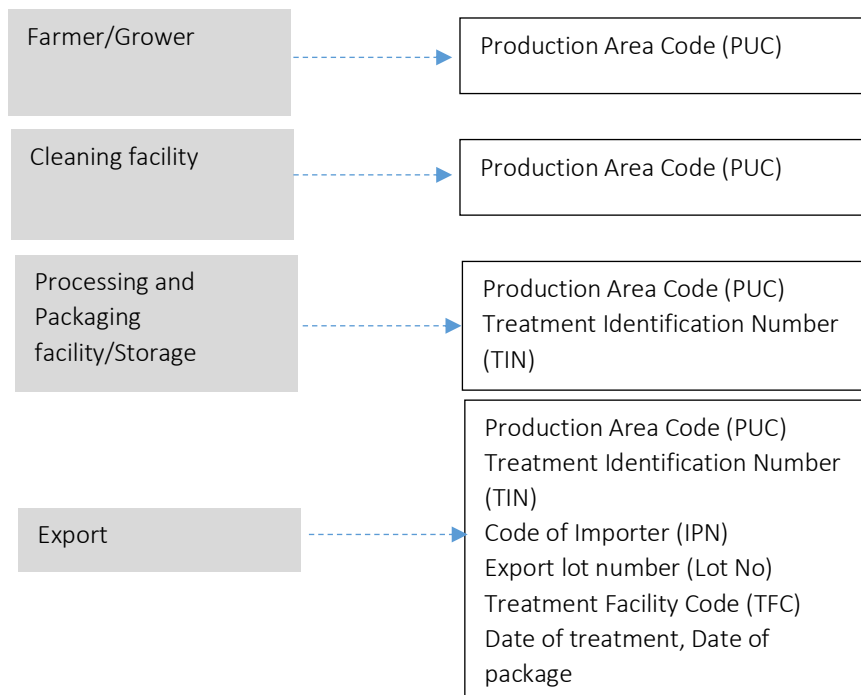


Figure 5: Codes needed in tracing dragon fruit for export

Australian Department of Agriculture has consulted the Plant Protection Department. The Australian Department of Agriculture and Water Resources may sample and quarantine any shipment at the first port of entry. Dragon fruit is not allowed to be transported by air or by road until the consignment is cleared at a biological safety check point. If consignments are found to have live insects posing a bio-safety risk, the consignment must be disposed of or re-exported. The cost of any requested action is to be paid by the importer. In particular, the Australian Department of Agriculture and Water Resources may review import policies at any time after the commencement of trade or when pest and disease control in Vietnam is altered. Among the requirements, the strictest are on traceability of dragon fruit, codes needed from point of origin to point of consumption.

Fruit and Vegetable Exporters (FVEs) seeking a place in the modern world economy must comply with national and international legal requirements and codes of conduct related to sustainability, quality and public health. The United Nations Agenda 2030 was adopted in 2015 in which food insecurity presents an enormous global challenge and several of the sustainable development goals (SDG), including SDG 2 and SDG 12, address food as well as responsible production and consumption. These are important drivers for increased traceability and transparency in the global food system.

Research conducted by Sylvain Charlebois, Brian Sterling, Sanaz Haratifar, and Sandi Kyaw Naing on the “Comparison of Global Food Traceability Regulations and Requirements” ranked OECD countries

that have specific traceability regulations for all commodities, both domestic and imports, as “Progressive”, while countries with less broad or stringent regulations were ranked as “Moderate”, and countries that were still developing mandatory or industry-led traceability requirements were ranked as “Regressive”. In EU law, since 2002 traceability is mandatory for all food operators. Every European citizen has the right to know how the food they consume is produced, processed, packaged, labeled and sold. EU countries received an overall ranking of Progressive. Australia has very strict quarantine requirements for imported food and agricultural products. Import permits and certifications as well as detailed information are required for the majority of food and agricultural products entering the country. In the US, the Bioterrorism Act of 2002 and the recordkeeping requirements contained in the Act represented a step forward in the implementation of a product tracing system for FDA-regulated food products. The US and Australia received an overall ranking of Moderate. China is in the development stage of traceability regulations and is emerging with different food safety regulations to address part of its national traceability requirements. China received an overall ranking of Regressive.

Vietnamese law does not properly mandate food traceability. So far only the newly updated Food Safety Law mentions traceability, though in a very modest way. The new Vietnam Food Safety Law, Decree 15/2018/ND-CP, is a replacement of Decree 38/2012-ND-CP that aims to reduce regulatory burdens and enhance international trade of goods. With the change, the government loosened

regulations by removing various administrative procedures, with the ultimate aim to increase channels of international trade for food products. The new Decree is part of a larger scheme of initiatives, i.e. the new generation FTAs such as EVFTA or CP-TPP, to reduce technical barriers to trade and boost foreign investment. Decree 15 allows the government to adjust the food industry standards alongside international best practice by relaxing its procedural grip. Chapter XI, Tracing Food Origins of Decree 1, notes that “The manufacturer or seller, upon discovery that a food being manufactured or sold is not safe or at the request of a competent authority, shall trace its origin in accordance with Clause 1 and Clause 2 Article 54 of the Law on Food Safety.” It also briefly instructs “Food manufacturers and sellers shall retain information about manufacturers or suppliers of products and buyers (if any) in the form of contracts, logbooks or other methods to serve origin tracing. Information serving origin tracing includes names and categories of the products sold; dates, quantities, and batch numbers of the products sold.” That said, being the only legal document regulating traceability of food so far, Decree 15 only requires food producers and sellers to implement the recordkeeping system for and tracing origins of “unsafe food items”.

The health of the consumers is put at risk when stakeholders along the food chain do not follow good practices of producing, processing, conserving, transporting and selling food. In Vietnam, farmers are reported to produce safe or safer food for their own consumption, while selling unsafe food to the public. There is little



trust among stakeholders, but this is not only the fault of individual farmers and traders.

### Activity 2 – Develop Prototype of Blockchain App

A common response to the concerns over food safety is an attempt to strengthen regulations and ramp up inspections and punishments. Whenever bad things happen, requests for reasons and determination of remedies follow. It is reasonable to require supply chain managers to trace the origins of unsafe food items. It is even more reasonable to require them to trace the origins of safe food items so every consumer has the opportunity to make informed and conscious choices about their food. Besides, reality shows that command-and-control approaches to food safety, which rely mainly on inspection and punishment, are less effective than approaches in which stakeholders are empowered and encouraged to self-regulate, motivated by the realization that this is more profitable in the long term.

The blockchain-based verifiable digital identity platform for Vietnamese dragon fruit is an initiative with the objective of reducing consumer information asymmetry with respect to food safety and building trust and quality assurance along the transactional network by empowering stakeholders in the supply chain and encouraging them to self-regulate.

The initial version of the platform was built during the 2017 APEC App Challenge, a competition organized by The Asia Foundation and supported by Ministry of Industry and Trade, APEC Secretariat and

Google in May 2017. The App Challenge was organized as a means of creating innovative apps and online platforms that can help micro, small, and medium sized enterprises (MSMEs) leverage the internet to begin exporting to foreign markets. The Asia Foundation recruited highly qualified teams from across the Asia Pacific region and provided each team with in-depth background information and research on the challenges faced by MSMEs. At the event, a team of developers from Australia built and demonstrated a working prototype of a platform called APEC Connect, which was ultimately awarded the first prize by a panel of judges headed by Dr. Alan Bollard, Executive Director of the APEC Secretariat.

During the project period, The Asia Foundation worked closely with the winning team from the APEC App Challenge, now organized as Ethical Trade Innovations (ETI), to further develop their solution into an app which allows all stakeholders, including producers, exporters, and consumers full access to a variety of information in the supply chain of dragon fruit including food safety as well as instant quality assurance about the products, i.e. tracing the products provenance from point of origin to point of consumption using blockchain's distributed ledger system.

Blockchain is a secure, encrypted database architecture that logs and links all transactions on a tamper-proof ledger distributed among multiple parties. In effect, a blockchain creates an immutable

record of time-stamped transactions related to any product that can be bought and sold. In the supply chain, blockchain is used as a means to increase transparency, add visibility and improve supply chain economics.

Based on results of the business process mapping conducted in Activity 1, the app was tailored to the needs of the dragon fruit supply chain actors. It is designed to work on both computers and smartphones, even with intermittent internet access. The app is first applied to the dragon fruit supply chain, but will also be applicable to other industries with numerous stakeholders and inputs from multiple producers, potentially including coffee, rice, tea, and rubber, among others.

Figure 6 describes how data is uploaded, stored, and can be verified on the platform. Each actor in the supply chain is issued a unique digital ID or user account. Whenever a supply chain actor (farmer/grower, trader, exporter, etc.) enters data into the system, data and timestamp are simultaneously published onto the blockchain and secured. A timestamp is the real-time record when data is submitted to the system; timestamps are automatically recorded by the system and cannot be changed.

The app utilizes public blockchain technologies, while overcoming all the limitations inherent to public blockchains, by using a technique known as anchoring or timestamping. The technique involves

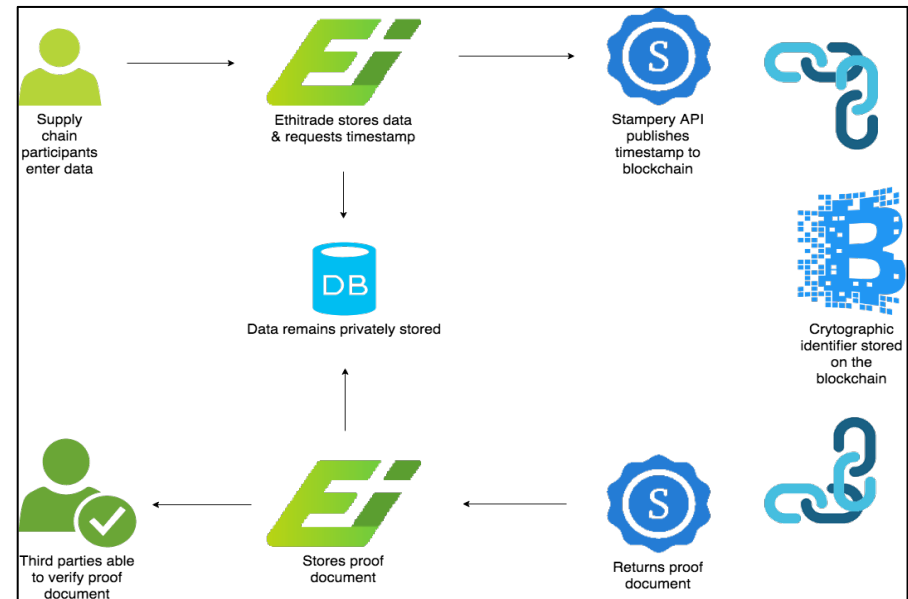


Figure 6: Blockchain-based Platform Architecture

generating a unique hash of the transaction data, and utilizing the Stampery API<sup>15</sup>, an industrial-scale public API, to stamp the hash to both the Bitcoin and Ethereum blockchains. The Stampery API is able to generate and provide a proof document that is everything any independent verifier needs in order to prove that the given dataset was indeed stamped to the blockchain. In other words, the blocks of information are time-stamped so that at any time in the future, we can prove a document was the original one by comparing the hash of the supposed original with what was recorded on the

<sup>15</sup> Application Programming Interface (API)

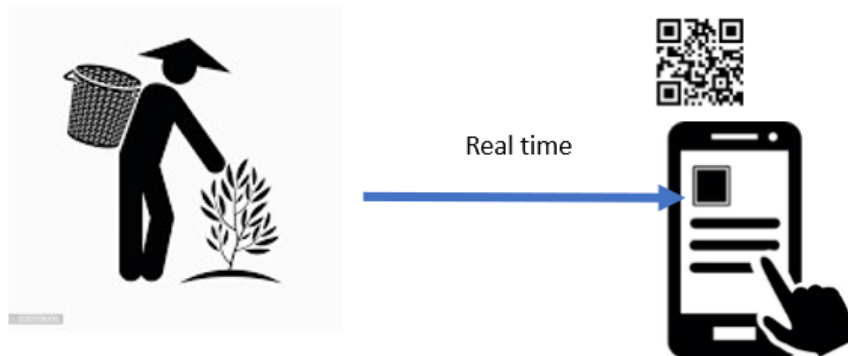
blockchain. This can be considered adding a layer of transparency, attribution, accountability, and auditability to the technological solution.

## How supply chain actors get into the platform?

“This technology is new to everybody. Afraid of difficulties will lead us to nowhere. We will just proceed.”

Said Mr. Nguyen Trong Trung Dung, Development and Management Officer, Yasaka Ltd.

When a specific farmer who already has a user account picks fruit and sells it to a trader, he or she will log onto the platform, using his or her smartphone, and upload real time information on the batch of fruit being transacted. The information of the batch of dragon



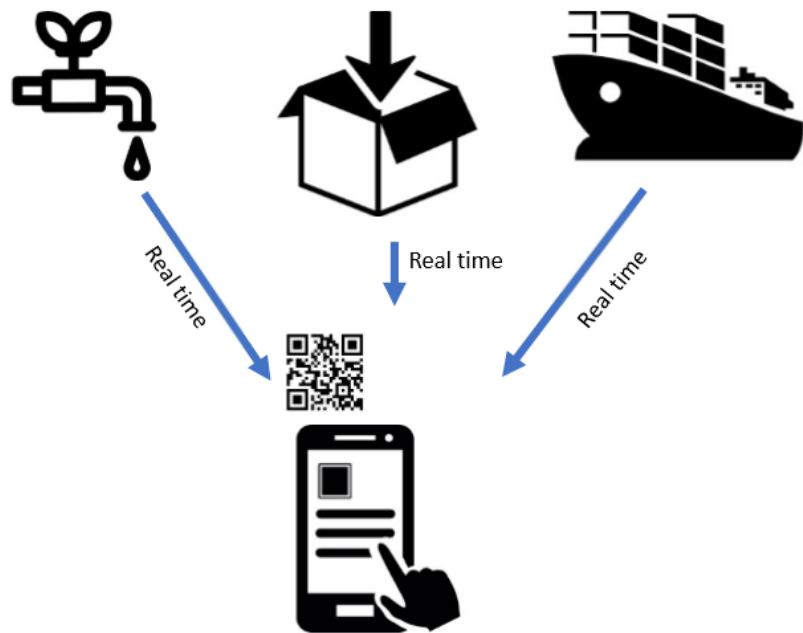
fruit is recorded as a new asset entry on the underlying blockchain

network. A transaction will be generated, then a QR code will be assigned accordingly, which will accompany the batch of fruit until it is up on the supermarket shelf.

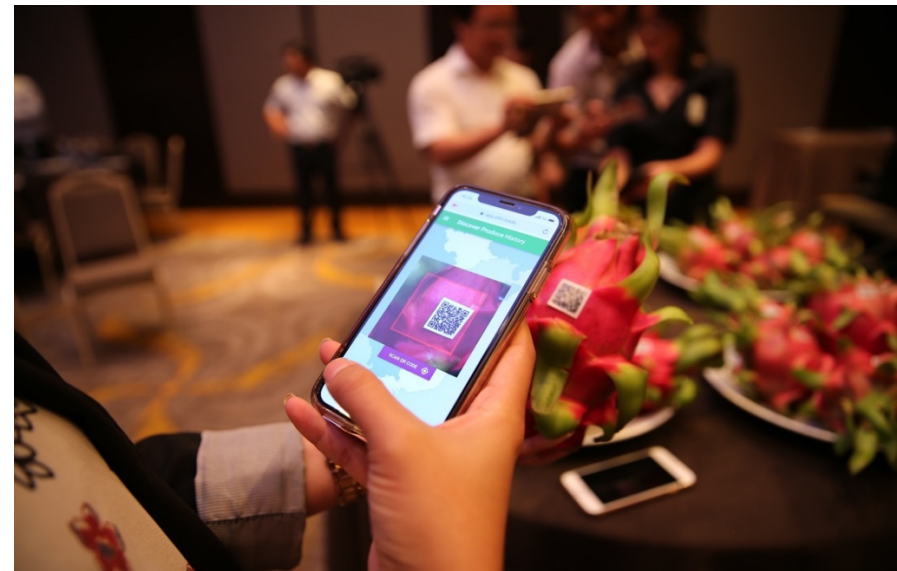
The trader, who also has a user account, will log onto the platform and enter his or her part of the information required to complete the transaction initiated by the farmer in the previous stage. The data uploaded to the blockchain by the farmers is then transferred to the trader/buyer just as the fruit is transferred in real time. The identity of the batch of dragon fruit is immutably stored in a chain of transactions, this being the first, and is matched to the QR code which will allow those within the supply chain to draw up information based on their level of access.



Other stakeholders who do cleaning, packaging and exporting and also have user accounts can log onto the platform and upload their information to previous transactions to accomplish one complete transaction, all in real time.



Customers, domestic and international alike, can use their mobile phones and a dedicated app to trace the supply chain. The read-only application does not require any log-in. Consumers can scan the QR code stamps that are tagged to each and every dragon fruit to trace its journey from farm to their hands, see pictures, and read messages from and information about farmers.



Scanning QR code stamp. Photo taken at the Project's Final Stakeholders Meeting.

*What resources do supply chain actors need to get involved? Or what are the requirements for an FVE to use the platform and app, based on blockchain technology, to deal with traceability and transparency?*

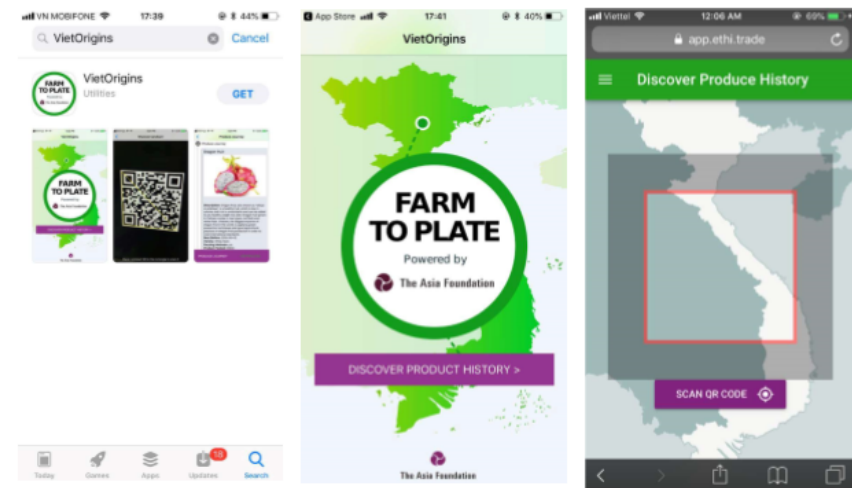
The project provided financial and technical assistance in conducting business process mapping, which is vital to understand a specific supply chain and paves a way for the IT team to design and develop the platform. The project also covered the cost for platform design and development, as well as cost to build the capacity for stakeholders in the supply chains. These are the main costs that a

sector or an individual FVE may need to foresee if it wishes to develop a customized platform for their products.

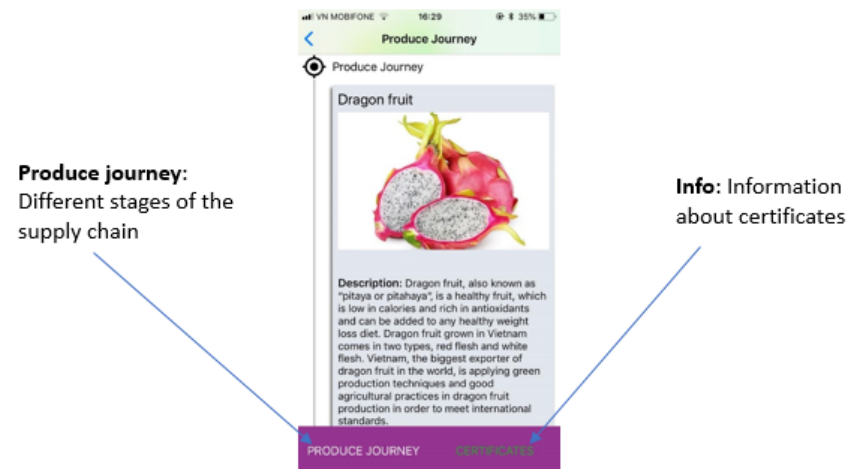
Thanks to project support, export companies only had to pay for additional management costs in sorting dragon fruit at all stages of the supply chain, which is minimal compared to the costs for business process mapping and platform development. The companies also needed to buy printers to print QR code stamps. As for an individual stakeholders in the supply chains (like farmer/grower, trader/buyer, or staff of export companies), he or she just needs a smartphone with a wi-fi internet connection or a desktop computer.

### *How do I scan the QR code?*

The project IT team developed a web-based mobile app and a native app for consumers to use to scan the QR codes. For the web-based mobile app, consumers just have to visit <http://app.ethi.trade>. While for the native app, consumers can download the app named VietOrigins from the Apple Store or Google Play. Besides, consumers can also download any other existing QR code reader such as VietCheck, Quick Scan, QR Code Reader, etc. to scan the QR code stamps created under the project. iPhone users can simply use their native camera app as long as they have installed an operating system equivalent to or newer than IOS 9.0.

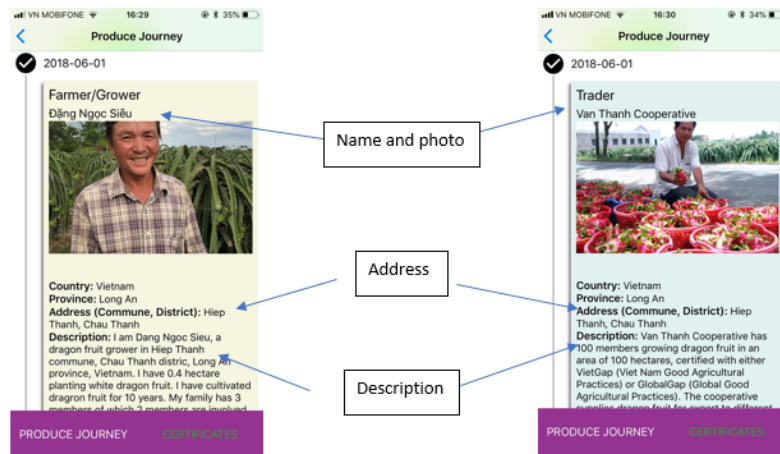


Consumers will be able to access both the produce journey and information on certificates provided by supply chain participants.



**Produce journey** provides an introduction about the fruit (description of fruit, expiry date, variety: white flesh vs. red flesh, fruit size, packaging method, and production area where the fruit was harvested), and about all stakeholders involved in the supply chain from farmer/grower, trader/buyer, fruit cleaning and packaging facility, to storage and exporter.

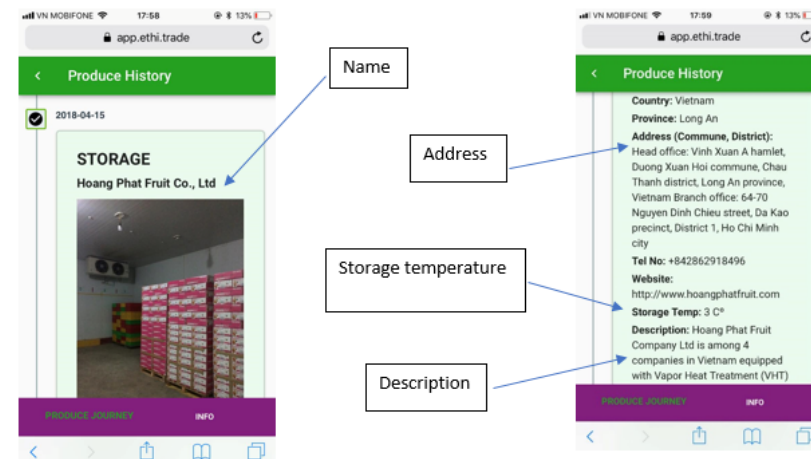
**Farmer/Grower and Trader** provides an introduction to a farmer/grower or a trader/buyer (their name and photo, their address, and a short bio).



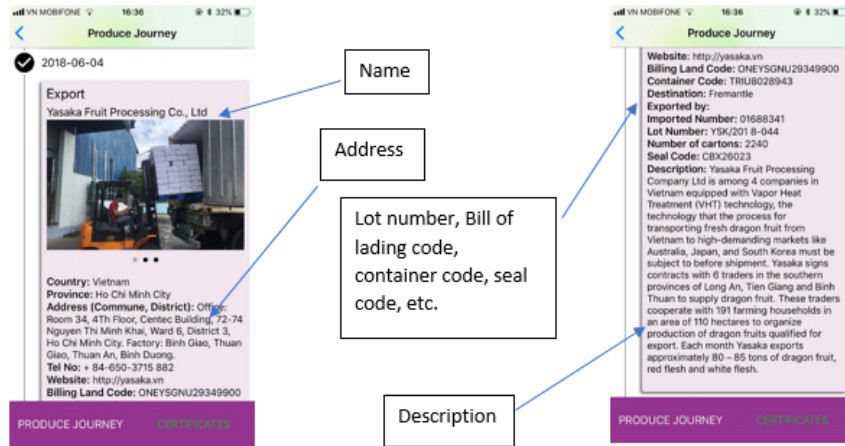
**Fruit Cleaning & Packaging** provides an introduction of the fruit cleaning & packaging facility (name, address, short bio, and relevant certificate numbers or codes such as the Treatment Facility Code, Treatment Identification Number, Packing House Code, Phytosanitary Number, etc.)



**Storage** provides an introduction to the storage facility (name, address, short bio, and temperature of storage).



**Export** provides an introduction to the exporter (name, address, short bio, and relevant certificate numbers/codes such as lot number, bill of lading code, container code, seal code, etc.).



The **Certificates** button is linked to soft copies of VietGap/Global certificate, Vapor Heat Treatment (VHT) certificate, phytosanitary certificate, and any other certificate possessed by the stakeholders.



## Coaching

During the project timeline, The Asia Foundation worked closely with the software developers and RUDEC to provide three coaching sessions in March and August 2018 for the two exporting companies engaged in Activity 1 and their supply chains in Binh Duong, Long An, and Tien Giang on how to use the app to upload data. Fifty-six (56) persons benefited from the coaching in total, including staff of the two export companies, two traders, and 50 farmers/growers in the two supply chains.

“Since now people have to strictly follow the production standards given that everything is recorded online, fraud or unethical practices will destroy us all!”

Said Ms. Nguyen Thi Be, a dragon fruit grower in Hiep Thanh commune, Chau Thanh district, Long An province, Vietnam. She has 0.6 hectare planting red dragon fruit. Dragon fruit is her family’s main source of income. She has cultivated dragon fruit for 6 years. There are 5 members in her family, of which 2 members are involved in dragon fruit production.

The coaching content not only involved introduction to the app but also provided basic information on digital literacy such as the fundamentals of computing (for company staff), how to make the best use of the Internet (how to connect to the Internet, browse Web pages, navigate Web sites, use search engines, create email accounts and exchange emails with others), how to protect one’s privacy and security, and most importantly, how to immerse into the

new digital lifestyle using a smartphone through new digital technologies such as digital audio, digital video, and digital photography.

People attending the coaching sessions reported that they had been inspired by the huge amount of information delivered and the opportunities the app can bring, and managed to improve their workplace skills, besides all the obvious benefits related to transparency encouragement and building trust.

### Activity 3 – Document Pilot and Stakeholder Meeting:

Each step of the pilot was documented and compiled into a short documentary premiered at the project’s final dissemination workshop and posted on a YouTube Channel for further outreach. The video can be accessed using the below link:

<https://www.youtube.com/watch?v=k6mcSNH18-E>

The video featured images along the dragon fruit supply chain from farming to vapor heat treatment, packaging, and export. The video conducted various interviews with Mr. Justin Baguley (Counselor of the Economic and Development Cooperation, Australian Embassy in Vietnam), Dr. Tran Cong Thang (Deputy Director of the Institute of Policy and Strategy for Agriculture and Rural Development, Ministry of Agriculture and Rural Development), blockchain experts, and stakeholders in the two supply chains. It delivered a message that “Blockchain technology has a potential to increase food safety, consumer protection, and traceability. It can also empower micro, small and medium agri-businesses in the region to participate in



global supply chains. And it has a potential to revolutionize all sectors.”

Upon completion of the project in September 2018, The Asia Foundation, in cooperation with The Rural Development Center (IPSARD/MARD), organized a final stakeholder meeting to share results of the project. The workshop brought together around 100 participants from line ministries and agencies, businesses and industry associations, development partners, and the media. The workshop discussed the growing demand by consumers and governments for more transparency from supply chains, showcased demo of the blockchain-based digital identity prototype for dragon fruit producers and exporters, discussed potential benefits for businesses, and galvanized support for scaling up to additional agricultural exports.

At the workshop, various participants concurred that food safety is nowadays consumers’ biggest concern, and that blockchain helps attract more consumers because they can see the supply chain clearly. Representatives from export companies said blockchain is helpful to producers and suppliers because it helps cut management costs and unnecessary steps in the supply chain. Mr. Robin Bednall, First Secretary, the Australian Embassy in Hanoi, said that Australian consumers now require organic products and traceable products;

and by applying blockchain, Vietnam is able to bring their farm products to Australia, a market with high demand for transparency but also the one promising high returns on investments. He also expects that blockchain will be utilized to simplify the administrative procedures related to Certificates of Origin (C/O). The workshop received considerable amount of press coverage, being quoted on various newspapers and TV. (A list of press coverage is provided in Annex A).

## TRANSPARENCY

During the business process mapping, researchers asked stakeholders of the two selected dragon fruit supply chain whether they want to attach the QR code stamps on boxes of dragon fruit or on the fruits themselves. Everyone consented on the latter. “We prefer sticking the QR code stamps on dragon fruit rather than on boxes. That way dragon fruit from different farms will not be mixed up.”

Said Mr. Nguyen Huu Danh, a dragon fruit grower in Hiep Thanh commune, Chau Thanh district, Long An province, Vietnam. Mr. Danh has 0.35 hectare planting red dragon fruit and has cultivated dragon fruit for 7 years. There are 3 members in his family, all of them are involved in dragon fruit production.

THE ASIA FOUNDATION

# Key Performance Indicators

It is a long road, but totally worth it.



## The app developed

• Built a working prototype of the blockchain-based app for agricultural (specifically dragon fruit) producers and exporters that can help Vietnamese businesses enhance the value of their products and improve their access to foreign markets.



## The app raised interest

Two dragon fruit producers/exporters in Vietnam, namely Yasaka Fruit Co., Ltd. and Hoang Phat Fruit Co., Ltd., expressed interest and got involved in the pilot phase of the project.



## The app for training

Three coaching sessions were conducted in March and August 2018 for the two export companies and their supply chains in Binh Duong, Long An, and Tien Giang on how to use the app to upload data. Fifty-six (56) persons benefited from the coaching in total, including staff of the two export companies, two traders, and 50 farmers/growers in the two supply chains.



## The app put in use

The companies and other stakeholders in their supply chains use the blockchain-based system to track and verify transactions from farmers to exporters. By end of December 2018, 29 user IDs were created and 60 transactions uploaded.



## The app showcased

At the final stakeholders workshop, the app was showcased to an audience of 100 participants including high-level policymakers, businesses and industry associations, development partners, and the media, demonstrating the potential for digital innovation and blockchain to promote inclusive growth and improve the efficiency and transparency of global supply chain.



## The app specialties

The app ensures data integrity thanks to:

- Permanent record stamped on the blockchain
- Record cannot be altered once stamped ... and data transparency because:
- Publicly verifiable by a third party
- Point in time validation



## Key learnings for future development

- Variation: Even with just two exporters, the supply chains were significantly different
- Feasibility: Need to balance ensuring traceability and minimizing the business impact
- Reporting: Interest from supply chain participants in how the platform can support other business processes (such as VietGap or GlobalGap certification)
- Analysis: Current processes are largely paper based, limited opportunities for analysis or business insights

### <sources>

- <https://www.youtube.com/watch?v=k6mcSNH18-E> for a video on dragon fruits traceability using blockchain-based platform
- <http://rudec.gov.vn/tin-tuc/Tin-tuc-trung-tam/Hoi-thao-ung-dung-cong-nghe-blockchain-trong-truy-xuat-nguon-goc-nong-san.html> for documents disseminated in the project final stakeholders workshop

</visit <https://asiafoundation.org>>

### *The app – its limitations and added values*

There are several limitations regarding this pilot app/working prototype, both in terms of content and technology.

Linus U. Opara in his research title “Traceability in agriculture and food supply chain: A review of basic concepts, technological implications, and future prospects” wrote that there are six important elements of traceability which, put together, constitute an integrated agricultural and food supply chain traceability system. They are:

- **Product traceability** – which determines the physical location of a product at any stage in the supply chain to facilitate logistics and inventory management, product recall and dissemination of information to consumers and other stakeholders;
- **Process traceability** – which ascertains the type and sequence of activities that have affected the product during the growing and postharvest operations (what happened, where, and when). These include interactions between the product and physical/mechanical, chemical, environmental & atmospheric factors which result in the transformation of the raw material into value-added products; and the absence or presence of contaminants.
- **Genetic traceability** - which determines the genetic constitution of the product. This includes information on the type and origin (source, supplier) of genetically modified organisms/materials or ingredients as well as information on planting materials (such

seeds, stem cuttings, tuber, sperm, embryo) used to create the raw product.

- **Inputs traceability** - which determines type and origin (source, supplier) of inputs such as fertilizer, chemical sprays, irrigation water, livestock, feed, and the presence of additives and chemicals used for the preservation and/or transformation of the basic raw food material into processed (reconstituted or new) food products.
- **Disease and pest traceability** - which traces the epidemiology of pests, and biotic hazards such as bacteria, viruses and other emerging pathogens that may contaminate food and other ingested biological products derived from agricultural raw materials. And,
- **Measurement traceability** - which relates individual measurement results through an unbroken chain of calibrations to accepted reference national and international standards.

---

“This app is great. So far whenever we sell dragon fruit, we have to record in a notebook. Using this app we only have to key in information once, very easy, and then the information is recorded online. This is an improvement, much better. We have no objection.”

Mr. Dinh Van Tam, a dragon fruit grower in Hiep Thanh commune, Chau Thanh district, Long An province, Vietnam. He has 0.3 hectare planting white dragon fruit and has cultivated dragon fruit for 7 years.

---

Unlike various existing platforms in Vietnam which only provide brand traceability<sup>16</sup>, this app traces physical location of products and the sequence of activities that may affect the products from farmers to consumers. It also displays all national and international standards that stakeholders in the supply chain may have acquired. However, it only satisfies three out of six elements mentioned above, namely product traceability, process traceability, and measurement traceability. Hence, the amount of data and information that is shared is still limited.

In terms of technology, for the sake of simplicity and in order to introduce the value of transparency to all stakeholders involved, the app developers did not segment the system, i.e. all stakeholders in one supply chain are still able to upload information related to their transactions and have access to all data of stakeholders in theirs and the other supply chain. In the future, user permissions will be restricted so that stakeholders will only be able to see parts of information that is relevant to them in order to maintain business confidentiality.

The value of the app is, however, promisingly huge. Blockchain as applied in this platform helps check conditions at production facilities, track fruit volumes in the supply chain, and give each batch a unique identifier. From a consumer perspective, the app helps to build trust, peace of mind, and increase confidence in the food

system. For the grower, trader, and exporter, the app plays a role as part of an overall cost-effective quality management system that can also assist in continuous improvement and minimization of the impact of safety hazards through rapid determination and isolation of sources of hazard. It also facilitates rapid and effective recall of products, and the determination and settlement of liabilities. Finally, it helps build brand.

The case below will explain the added value of the app, and thus, answer the questions “How can an app/a platform based on the blockchain technology affect traceability and transparency from the perspective of an FVE?”

---

<sup>16</sup> Brand traceability: meaning when you scan a barcode or a QR code attached to a specific product, you are linked to the company’s website with basic information on the product.

### *Tracking dragon fruit from farmer Le Van Chung to Australia*

To prove the added value of using blockchain technology in dragon fruit export, this project presents a simple case around the certification and provenance of dragon fruit from Vietnam to Australia.

**The goal** of this case is to show and further explore the added value of using blockchain in fruit traceability management. This case should address the following functions:

- **Provenance:** Using the blockchain allows stakeholders to track the provenance of products from the consumer all the way back to the farmer/grower in much shorter time.
- **Issuing and validation of certificates:** Certification authorities can issue certificates to farmers and processing factories/companies. These should be registered on the blockchain platform so it will be possible for all stakeholders of the blockchain platform to verify the validity and issuer of a certificate. By granting certificates to farmers/companies, the certification authorities authorize farmers/companies to issue certificates on their behalf (for example, once a farm is certified as organic or VietGap or GlobalGap, it can certify its own dragon fruit as organic/VietGap/GlobalGap on behalf of the certifying authority). Certifying authorities can also revoke certificates issued by them or on their behalf.
- **Audit of certificates:** Auditing organizations can revoke certificates, or bar a certifying organization from issuing certificates in case of

fraud or any other unethical behavior. Results of audits should also be visible on the blockchain.

**The case** is focused around the red flesh dragon fruit supply chain, which are grown on a farm in Long An province of Vietnam and exported to Australia. This farm, owned by Mr. Le Van Chung, produces dragon fruit following a farming technical process under VietGap with instructions from Yasaka, a company which collects, processes and exports dragon fruit to Australia. In order to sell dragon fruit to Van Thanh Cooperative, a trader contracted by Yasaka, the farm must be in a production area with a code (Code of Production Area - PUC) granted by the Plant Protection Department under Ministry of Agriculture and Rural Development. Farms with a PUC and practicing production process as instructed by Yasaka can sell dragon fruit to traders at VND 3,000 – 5,000 per kilo higher than those farms that are not following any standard production process.

Yasaka signs a one-year contract with Van Thanh Cooperative (renewed on annual basis). Van Thanh bases its work on the purchasing plan that Yasaka sends every week to collect dragon fruit from farms with PUCs.

Unlike Japanese importers, Australian importers only request dragon fruit to be able to be traced back to a PUC rather than a household (farmer/grower). Yasaka confirms that they want to apply the standards across the board, so they assigned every single household/farmer a household code, which makes the deployment of the blockchain project even more convenient.

Yasaka covers cleaning & packaging, storage, and exporting - all three roles at the same time. It possesses a vapor heat treatment machine and is one of the five companies with a permit to export dragon fruit to Australia. Like the other four, Yasaka is granted a Treatment Facility Code (TFC) certificate by the Ministry of Agriculture of Australia and the Plant Protection Department under Ministry of Agriculture and Rural Development of Vietnam (PPD), which enables Yasaka to certify every batch of dragon fruit it exports to Australia with VHT.

In order to export dragon fruit to Australia, Yasaka, or any other export company in the South, has to seek quarantine checking service from the Plant Quarantine Service 2 (PQS). PQS assigns an officer to its factory to check dragon fruit quality, then signs on the record of plant quarantine and sampling of plant quarantine materials. Yasaka then submits a request to the Plant Quarantine Regional Department 2 (under PPD) for issuance of Phytosanitary Certificate. The request is supported by sufficient documents including the record of plant quarantine and sampling of the plant quarantine materials (signed by a PQS officer) and the VHT certificate. If Yasaka meets all the requirements, the Phytosanitary Certificate is issued, allowing Yasaka to proceed with the export. Before the blockchain based app, all information related to the production and treatment process (i.e. PUC, household code, TFC, VHT certificate, Phytosanitary certificate, etc.) were printed on the boxes of dragon fruit, recorded as a hardcopy, and even softcopy on individual computers which is very difficult to trace back given time

constraints. The blockchain project, or the app specifically, comes at the right time as it offers data to be stored using blockchain technology in an immutable, decentralized, globally-auditable format which protects identities by default, allowing for secure data verification. Once the project is implemented, the mentioned information are recorded on the blockchain so anybody validating the codes will be able to see them. Every single dragon fruit is identified using a unique identification number (a QR code). After certifying these dragon fruit, they are shipped to an importer in Australia, where they are sold to a supermarket and eventually to a customer. All the parties involved in this chain should be able to verify the validity of the issued certificates. Also, when the dragon fruit change ownership, this should be recorded in the blockchain as well (except of course for the end-consumer), this would enable anyone to check the provenance chain of the dragon fruit: How did they end up in the supermarket?

When it turns out that a farm has used some kind of an unauthorized pesticide, or a company/exporter do not follow the standard production (VHT for example) process, and this is discovered during an audit, the auditor should be able to revoke any certificate issued to the farm/company. This should be recorded on the blockchain, too, so anybody validating the certificate will be able to see this change.

After certifying these dragon fruit, they are shipped to an importer in Australia, where they are sold to a supermarket and eventually to a customer. All the parties involved in this chain should be able to

verify the validity of the issued certificates. Also, when the dragon fruit change ownership, this should be recorded in the blockchain as well (except of course for the end-consumer), this would enable anyone to check the provenance chain of the dragon fruit: How did they end up in the supermarket?

When it turns out that a farm has used some kind of an unauthorized pesticide, or a company/exporter do not follow the standard production (VHT for example) process, and this is discovered during an audit, the auditor should be able to revoke any certificate issued to the farm/company. This should be recorded on the blockchain, too, so anybody validating the certificate will be able to see this change.

## Lessons learned

Based on the experience of the APEC Connect Project, the following lessons are drawn:

- Business process mapping is crucial to inform the platform design and development process. Even with just two exporters, the supply chains were different. Understanding the supply chains helped the project design a platform with utilities that best fit the stakeholders' practice and desire.
- The project understands that most blockchain implementations are relatively new. Somehow stakeholders will have to make changes to their systems to adopt it and there was some anxiety over sharing data. The platform, thus, was designed to balance it, ensuring traceability and minimising business impacts.
- The project spent considerable amount of time to explain costs and benefits of applying blockchain-based traceability platform to the stakeholders to gauge/draw their interests as well as to make sure every stakeholder on the blockchain network benefits from it.
- The project chose to work with motivated and committed partners who recognize the need to improve and to become more professional and efficient businesses as the markets are becoming more sophisticated and demanding. That was why out of five export companies (supply chains) certified for dragon fruit export to Australia, only two were selected for the pilot.
- Dragon fruit export companies are quite advanced in their investment in fruit processing machines and international

market approach, however other stakeholders in the supply chains are still in their infancy in terms of resources and capacity. Coaching was built in to enhance capacity for these stakeholders. The coaching was also a good chance to understand other needs from the stakeholders to inform further revision of the app. For example, supply chain participants are interested in how the platform can support other business processes such as verification of VietGap or Global Gap certification or opportunities for analysis of business insights based on data collected. Data here involves not only data that has been uploaded by the stakeholders in the supply chain. In a more advanced scenario, when a consumer touches his/her phone to a smart label (a QR code stamp), the export company also has an opportunity to learn about the consumer, where and when he or she is engaging, and develop insights around customers' habits.



## Recommendations for further engagement

After reviewing the Project's activities, its successes and the lessons learnt, we recommend the following should further engagement be warranted:

There are improvements that can be made to the platform:

- An integrated agricultural and food supply chain traceability system, meaning the app will be able to satisfy all six important elements of traceability including product traceability, process traceability, genetic traceability, inputs traceability, disease and pest traceability, and measurement traceability.
- User permissions: segmenting the system so users can only see the parts relevant to them.
- Reporting and benchmarking: comparisons with industry averages and analysis of big data/market research.
- Certification: capture and reporting of information for certifications (e.g. VietGap, GlobalGap).
- Smart contracts: based on possible requirements from businesses, the platform may also integrate smart contracts. An example of a contract that the platform might implement could be automatically taking payment(s) when a transaction occurs between supply chain participants, or automatically issuing a certificate when a supply chain participant meets certain requirements.

- Digitalize not only data storage and verification process but also the data exchange among stakeholders. Before the app, all transactions were recorded on paper and minimal usage of Excel. The app has designed a mobile-friendly interface for stakeholders to key in transaction information (such as quantity exchanged, stakeholders involved, etc.) whenever a batch of dragon fruit is delivered from one stakeholder to another. This may take several minutes per transaction. The idea for further development is to minimize the amount of information stakeholders will have to upload just by putting the two stakeholders' smartphones near each other and allowing information to be automatically scanned. This may take only several seconds per transaction.

In terms of regulations, regulators all around the world are making strides to improve food safety measures and create favorable digital environments for digital technology development projects. The Project in the first phase made an effort to discuss potential benefits of the app for businesses, and galvanized support for scaling up to additional agricultural exports. In the next phase, the Project should disseminate the project results/introduce the app to broader audiences through various channels, and build stronger networks of concerned businesses and policy-makers to harvest synergies and collective power in advocating for favorable policies and government support for projects that involve digital technology development.

## Application Upgrading in Progress<sup>17</sup>

Within the last three months of the pilot project, from September to December 2018, the platform was tested and put in full operation with 29 user IDs created and 60 trades/QR codes uploaded by stakeholders in the two dragon fruit exporters' supply chains. Since then, the platform has attracted huge interest from both business and donor communities. However, there are still several aspects that need to be improved to make the platform more user-friendly and ensure business confidentiality, which has been the biggest concern raised by businesses participating in the pilot and in the stakeholder's workshop organized in September 2018.

Since January 2019, the research and IT team has started working on upgrading the application to a new version without loss of availability, i.e. we are carefully managing the old version so that users are still able to complete their tasks/updates on the app without interruption while developing a new staging version. The new version has been developed with add-on functions as below:

- Set-up and on-board new supply chains for other types of products;
- User profiles (each stakeholder, especially enterprise, only needs to enter their information into the system once, including

relevant information on roles they perform within the supply chain); and,

- User permissions and views: a supply chain stakeholder now only has access to trades that they are a part of, trades in their own supply chain.

The new staging version is under peer review and still needs some minor revisions before going live with re-training for stakeholders and roll-out plans.

---

<sup>17</sup> This section is added into the revised version of this report as an acknowledgement of the project team's endless efforts to improve the platform.

## Annex A: List of Publicity (Media Coverage)

<http://www.dangcongsan.vn/video/id/1169604.html>

<https://www.youtube.com/watch?v=l6NrMfR26EI>

<https://vietnambiz.vn/lan-dau-tien-truy-ly-lich-thanh-long-viet-nam-bang-blockchain-82572.html>

<https://baomoi.com/truy-xuat-nguon-goc-thanh-long-bang-cong-nghe-blockchain/c/27663779.epi>

<https://bnews.vn/ung-dung-cong-nghe-blockchain-trong-truy-xuat-nguon-goc-nong-san/95608.html>

<http://www.cpv.org.vn/preview/newid/496744.html>

<http://khoahocphattrien.vn/thoi-su-trong-nuoc/truy-xuat-nguon-goc-thanh-long-bang-cong-nghe-blockchain/20180907032859198p882c918.htm>

<http://thuonghieuvaphapluat.vn/truy-xuat-nguon-goc-thanh-long-bang-cong-nghe-blockchain-d3029.html>

<https://vietnamnews.vn/society/465333/blockchain-to-promote-trading-identity-of-vn-exports.html#wh4ajivs9TmoPvJO.97>

<https://www.talkvietnam.com/2018/09/blockchain-to-promote-trading-identity-of-vn-exports/>

<http://vietnamtimes.org.vn/Australia-to-help-Vietnams-agriculture-by-piloting-block-chain-technology-03-22987.html>

<https://www.vir.com.vn/local-firms-and-farmers-must-meet-traceability-requirements-in-foreign-markets-62915.html>

<https://en.thesaigontimes.vn/tinbaichitiet/63161/>

<http://cafebiz.vn/lan-dau-tien-truy-ly-lich-thanh-long-viet-nam-bang-blockchain-20180909074211923.chn>

<http://www.sggp.org.vn/xay-dung-thuong-hieu-nong-san-viet-nam-ra-toan-cau-544678.html>

<https://www.pressreader.com/viet-nam/viet-nam-news/20181006/281749860302114>

<https://www.lecourrier.vn/la-blockchain-pour-la-tracabilite-des-pitayas-dexportation-vers-laustralie/519467.html>

<https://laodongtre.laodong.vn/thuc-pham/ung-dung-blockchain-trong-truy-xuat-nguon-goc-nong-san-629696.lido>

<https://www.most.gov.vn/vn/Pages/chitiettin.aspx?IDNews=14834>

<https://m.nongnghiep.vn/ung-dung-cong-nghe-blockchain-trong-truy-xuat-nguon-goc-nong-san-post226245.html>

<https://english.vietnamnet.vn/fms/business/213316/vietnam-s-exporters-sell-more-fruit-thanks-to-blockchain-apps.html>