

How ICT is empowering women entrepreneurs in Vietnam: a case study of Tu Nhien Cooperative



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Summary

This case study aims to document the use of ICTs in vegetable production and entrepreneurship in Tu Nhien Cooperative in Moc Chau district, Son La province, Vietnam. The cooperative is a women-owned organisation and led by women who are developing ICT services and tools for their members to implement a digital traceability system. The aim of this case study is to understand how and why ICTs are contributing to the entrepreneurial empowerment of women producers in Tu Nhien Cooperative and to share the successes and challenges the cooperative has experienced in the development and adoption of ICT tools and services. These lessons can inspire other women-led and women-majority producer organisations like Tu Nhien Cooperative who are also expanding efforts to empower their women members in their entrepreneurial activities and to increase production efficiency, and who may benefit from employing ICTs in these efforts.

The application of new information and communication technology (ICT) tools in agricultural production and business is believed to help narrow the socioeconomic gap between men and women. In many countries and regions, mobile applications can provide women with tools that not only help them with production recordkeeping, crop management and financial planning, but also ease their multiple burdens such as childcare, household duties and income-generating work.

In Vietnam, vegetable production is a main source of income and contributes to food security for many rural people in the northwest highlands, especially women. This case study examines how Tu Nhien Cooperative (*tu nhien* meaning 'natural' in Vietnamese) is using ICT tools to boost women farmers' economic entrepreneurship, raise awareness of and enable access to markets and marketing means, enhance networking and collaboration, improve accesses to financial services, and improve capacity for decision-making, leading to the improvement of women's organisational processes.

Tu Nhien Cooperative is a collaborative group of women farmers who produce and market 'safe vegetables' (vegetables that contain very low biochemical and pathogen residues) in Dong Sang commune, Moc Chau district, Son La province, Vietnam.¹ The cooperative was first established in 2011 and its organisational structure conforms to the 2012 Law on Cooperatives (see Ministry of Planning and Investment 2022). The cooperative is women-owned and has brought together many experienced vegetable-growing women farmers with a total planting area of 7.5 hectares. Since 2013, it had expanded from 25 to 35 local member households. The co-operative's leadership or its board of management include five women members, including the three founders of the cooperative.

In recent years, Vietnamese consumers have become increasingly concerned about food safety, especially vegetables, leading to a growing domestic demand for safe vegetables. To meet this increasing market demand, Tu Nhien Cooperative has been supported by the Australian Centre for International Agricultural Research (ACIAR) AGB/2021/153 project, Piloting Digital Monitoring of VietGAP Compliance and Quality in Vietnam Vegetable Value Chains.² The project aimed to 'develop and pilot low-cost digital tools to help small and medium holder vegetable farmers and other value chain participants to improve VietGAP compliance and the quality of safe vegetables in northwest Vietnam' (ACIAR). The project had two key implementors: Applied Horticulture Research (ARH) of Australia and the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI) of Vietnam, as well as support from local agricultural extension services.

With the project's support, Tu Nhien Cooperative developed a digital traceability system to support its members' vegetable production and entrepreneurship by applying ICT tools such as QR codes³ and a digital production diary app on mobile phones to record information about its members' safe vegetable production and to ensure product traceability. Tu Nhien Cooperative now has 32 safe vegetable

1 In Vietnam, high levels of food poisoning and food-borne illnesses have led to increased consumer concerns. To ensure food safety, the Vietnamese government promotes 'safe vegetables', the official term to indicate that vegetables are certified as safe (Ngo et al. 2020).

2 The government's Vietnamese Good Agricultural Practices (VietGAP) certification scheme ensures production methods are used to produce clean and safe products, especially fresh fruit and vegetable.

3 A QR code (quick-response code) is a type of barcode, a method of representing data in a visual and machine-readable format. Tu Nhien Cooperative uses a QR-coding system to trace the origins and means of production of safe vegetables produced by its members.

products with VietGAP certification. The cooperative produces speciality vegetables such as H'mong mustard, tomatoes and cabbage with an output of over 1,000 tonnes/year and an average revenue of US\$300,000–350,000. The digital traceability system has meant that the cooperative has improved its supply-chain monitoring processes, and can now better meet market demands and sell their produce to large and high-end supermarkets such as AEON Vietnam, Big C and other modern retailers in Hanoi and other cities in the North of Vietnam, as well as to IC Food in Son La province. Based on the results of these projects funded by ACIAR, Tu Nhien Cooperative has also been supported by the Forest and Farm Facility (FFF) to implement a number of activities to maintain and improve agricultural production, including building organic production models associated with digital diary applications.

The case study used a desk review to gather secondary data about Tu Nhien Cooperative and its development process and also conducted in-depth interviews and a focus group discussion (FGD) to collect primary data from the leaders and members of Tu Nhien Cooperative and other local development actors. The case study findings indicate that appropriate ICT technologies can be developed and their use sustained by rural women if both technical and market-access capacity-building activities are implemented at the same time for rural producer organisations. In addition, external support is also needed from development organisations and local people's organisations to communicate the cooperative's success stories to attract interest from market actors and consumers. Using QR codes and digital production diaries has helped farmers (and especially women, who are the main labour force in vegetable production) to reduce manual workloads, such as the time needed to record the production data required to meet the standards of safe vegetable production. It has also improved market linkages and maintained stable sales at higher prices for their products in higher-value markets. In the case of the Tu Nhien Cooperative, this has led to an increase in income for farmers.

The study has also found that to motivate the cooperative and its members to apply a digital traceability system for vegetable production and entrepreneurship, it is vital to have active leaders with good management and leadership capacity, to enhance members' awareness of the benefits of using ICT services and tools and to ensure that there is a mutual benefit between the cooperative and its members. However, challenges in the application of ICT services and tools remain in terms of updating technical requirements and having sufficient financial resources for future investments in larger-scale production.

The study recommendations include providing more support for women producers to apply ICT tools in agricultural production and entrepreneurship and to help them gain a deeper understanding of how to adopt the appropriate traceability system to achieve the maximum benefits from supply-chain monitoring and to scale up successes. The continuous enhancement of both women producers' capacity as well as an adaptable and affordable traceability system can help to sustain good digital transformation practices. At the same time, it needs participatory market surveys to better understand consumer perceptions and preferences for products that can then be captured using QR codes. This will be very important to develop more simple, friendly and reliable traceability systems. It is also crucial to develop a good mechanism to scale up successful digital traceability systems and supply-chain monitoring technology to improve socioeconomic conditions and the environmental efficiency of vegetable and fruit farming systems in the northwest highlands and other regions in Vietnam.

1 Introduction

This case study aims to document the use of ICTs in vegetable production and entrepreneurship in Tu Nhien Cooperative in Moc Chau district, Son La province, Vietnam. The cooperative is a women-owned organisation and led by women who are developing ICT services and tools for their members to implement a digital traceability system. The aim of this case study is to understand how and why ICTs are contributing to the entrepreneurial empowerment of women producers in Tu Nhien Cooperative and to share the successes and challenges the cooperative has experienced in the development and adoption of ICT tools and services. These lessons can inspire other women-led and women-majority producer organisations like Tu Nhien Cooperative who are also expanding efforts to empower their women members in their entrepreneurial activities and to increase production efficiency, and who may benefit from employing ICTs in these efforts.

Cooperatives, especially agricultural cooperatives, have a positive impact on Vietnam's socioeconomic development, especially in areas with limited livelihood resources and low access to markets. By the end of 2021, the whole country had 27,342 cooperatives (General Statistics Office 2022). Agricultural cooperatives account for about 66% (19,431) of all cooperatives, with about 3.8 million participating members (Thin 2022). It is estimated that in 2013–2020, the contribution of the collective economy sector (including cooperatives and cooperative associations but excluding individuals and households) to the country's gross domestic product (GDP) on average is about 3.84% per year (General Statistics Office 2022).

There is a common agreement that women producers and entrepreneurs in rural areas of the global South including Vietnam face an uneven playing field (UNDP, Youth Co:Lab, UNICEF 2021). In northwest Vietnam, as in many other places around the world, there may be various challenges and disadvantages that women face in comparison to men. Some of these disadvantages may include having less access to and control over productive resources and lacking access to education, information and technologies. In particular, women have less access to markets and decision-making processes. New information and communication technology (ICT) can help to narrow gap between men and women by boosting women's economic initiatives, raising awareness of and enabling access to markets and marketing means, enhancing networking and collaboration, improving accesses to financial services and improving capacity for decision-making as well as improving women's organisational processes. In many countries and regions, mobile applications can provide women with tools for recordkeeping, crop management and financial planning, and ease their multiple burdens such as childcare, household duties and income generating works.

Vegetable production is a main source of income and contributes to food security for many rural people, especially for women in the northwest highlands of Vietnam. According to information from the Department of Agriculture and Rural Development (DARD), as of October 2023, in Moc Chau district there are 110 agricultural cooperatives, of which about 10 are women-owned cooperatives, including Tu Nhien Cooperative. The cooperative was first established in 2011 and its organisational structure conforms to the 2012 Law on Cooperatives (see Ministry of Planning and Investment 2022). Tu Nhien Cooperative's board of management has five women members including the three founders of the cooperative. The cooperative has brought together many experienced vegetable-growing women farmers with a total planting area of 7.5 hectares. Since 2013, it had expanded from 25 to 35 local member households, five of which are ethnic minority households (Thai, Muong and Tay).⁴ Household representatives participating in the cooperative are mainly women. Although both men and women are actively involved in vegetable production, marketing activities and decision-making, Kinh and Thai women are more likely to maintain leadership and decision-making roles at home.

The cooperative has been transforming from low-tech conventional agricultural production to the application of advanced technology towards achieving a continuous increase in high-quality vegetable production and income for its members. Tu Nhien Cooperative originally received support from the Australian Centre for International Agricultural Research (ACIAR) AGB/2009/053 project and Moc

⁴ Vietnam has 54 recognised ethnic groups and nearly 90% of its population are Kinh (or Viet) people.

Chau's government.⁵ It was then supported by another ACIAR AGB/2014/035 project between 2014–2017, with a technical focus on agricultural production and market engagement (ACIAR 2022).⁶

Since 2021, in the context of digital transformation, international integration and increasing market demands for high-quality and traceable products, Tu Nhien Cooperative partnered again with ACIAR on its AGB/2021/153 project, *Piloting Digital Monitoring of VietGAP Compliance and Quality in Vietnam Vegetable Value Chains*.⁷ In recent years, Vietnamese consumers have become increasingly concerned about food safety, especially vegetables, leading to a growing domestic demand for safe vegetables. To meet this increasing demand, the project aimed to 'develop and pilot low-cost digital tools to help small and medium holder vegetable farmers and other value chain participants to improve VietGAP compliance and the quality of safe vegetables in northwest Vietnam' (ACIAR). The project had two key implementors: Applied Horticulture Research (ARH) of Australia and the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI) of Vietnam, as well as support from local agricultural extension services. It was funded by the Australian Government and administered through the Department of Agriculture, Fisheries and Forestry (DAFF). In addition, Tu Nhien Cooperative has also received additional support from the Aus4Innovation-funded project to build a new cool room, equipped with a CoolBot⁸ refrigeration unit, to ensure optimal temperature control for storing perishable goods.

Tu Nhien Cooperative aims to develop its use of ICT tools to ensure more efficient production for its women members and to target higher-value markets and customers through improved vegetable quality and packaging supported by a digital traceability system by applying ICT tools and apps such as QR codes⁹ and digital production diaries on mobile phones to record information about its members' safe vegetable production and to ensure product traceability. Tu Nhien Cooperative now has 32 safe vegetable products with VietGAP certification. The cooperative produces speciality vegetables such as H'mong mustard, tomatoes and cabbage with an output of over 1,000 tonnes/year and an average revenue of US\$300,000–350,000. The digital traceability system has meant that the cooperative has improved its supply-chain monitoring processes, and can now better meet market demands and sell their produce to large and high-end supermarkets such as AEON Vietnam, Big C and other modern retailers in Hanoi and other cities in the North of Vietnam, as well as to IC Food in Son La province.

The digital diary app on smartphone apps collects vegetable crop production and handling information including the farmer's name, the crop and cultivar, and pesticide applications and planting/harvest dates, which are required for VietGAP certification compliance. Data from the digital diaries is linked to the Hitachi virtual control tower system (see Table 1). The control tower is software that generates a unique QR code for each consignment which links to a concise summary of important details including transport conditions (such as temperature and humidity), location/origin of the product, vegetable harvesting time, warehouse specifics, and crop-specific VietGAP records. The QR codes also allow consumers to view basic information about those particular products, using a standard smartphone with no special software required.

In addition, Tu Nhien Cooperative members have received various technical training on production, digital applications and value chain development, carried out by ACIAR-funded agricultural research for development (R4D) interventions and local extension services. Moc Chau district agricultural extension workers as well as district farmers' and women's unions have also engaged in support activities such as

⁵ For more information about the ACIAR project Improved Market Engagement for Counter-Seasonal Vegetable Producers in North-Western Vietnam (AGB/2009/053), see www.aciar.gov.au/project/agn-2009-053

⁶ For more information about the ACIAR project Improving Livelihoods in Myanmar and Vietnam Through Vegetable Value Chains (AGB/2014/035), see www.aciar.gov.au/project/agn-2014-035

⁷ The government's Vietnamese Good Agricultural Practices (VietGAP) certification scheme ensures production methods are used to produce clean and safe products, especially fresh fruit and vegetable.

⁸ CoolBot is an innovative cooling tech from Australia with low-cost controllers that allow conventional air-conditioning units to be used and achieve temperatures of 5 degree Celsius and this can be used by small scaled vegetables and fruits farmers to store their produce for longer shelf lives and longer distance transport to the retailers (ACIAR 2021).

⁹ A QR code (quick-response code) is a type of barcode, a method of representing data in a visual and machine-readable format. Tu Nhien Cooperative uses a QR-coding system to trace the origins and means of production of safe vegetables produced by its members.

providing technical trainings, communicating success stories and facilitating the collaboration between Tu Nhien Cooperative and its members with development agencies and local authorities to target markets and consumers in Hanoi city and other urban consumers in the North of Vietnam.

Based on the results of these projects funded by ACIAR, Tu Nhien Cooperative has also been supported by the Forest and Farm Facility (FFF) to implement a number of activities to maintain and improve agricultural production, including building organic production models associated with digital diary applications. The FFF's mission is to strengthen forest and farm producer organisations (FFPOs) like Tu Nhien Cooperative that represent smallholders, rural women, forest communities and Indigenous Peoples as the key agents for achieving the Sustainable Development Goals (SDGs) (Forest and Farm Facility 2022).

The case study used a desk review to gather secondary data about Tu Nhien Cooperative and its development process and also conducted in-depth interviews and a focus group discussion (FGD) to collect primary data from the leaders and members of Tu Nhien Cooperative and other local development actors. The secondary data was sourced from existing policies and literature related to agricultural cooperatives, and documents and other information from Tu Nhien Cooperative. Primary data was gathered through in-depth interviews with cooperative leaders, leaders of Moc Chau district's DARD, women's and farmers' unions, and during FGDs with the cooperative's women members. Unstructured observations made during the study at Tu Nhien Cooperative in Dong Sang commune as well as descriptive statistics and content analysis have also been applied for data analysis.

2 About the digital traceability system

2.1 Using QR codes and digital production diaries

Over the years, women members of Tu Nhien Cooperative have been gradually applying technology to vegetable production, from keeping daily handwritten diaries to record information about vegetable production as required by VietGAP standards to using product labels with QR codes¹⁰ associated with digital production diaries. Instead of handwriting records, members use a digital diary app on their mobile phones to record information about their vegetable production and to ensure product traceability from producer to consumer. The digital traceability system is illustrated in Figure 1. In addition, the cooperative received active support from the ACIAR AGB/2021/153 project in terms of engineering and testing different bookkeeping software as well as creating appropriate label designs to meet consumer requirements.

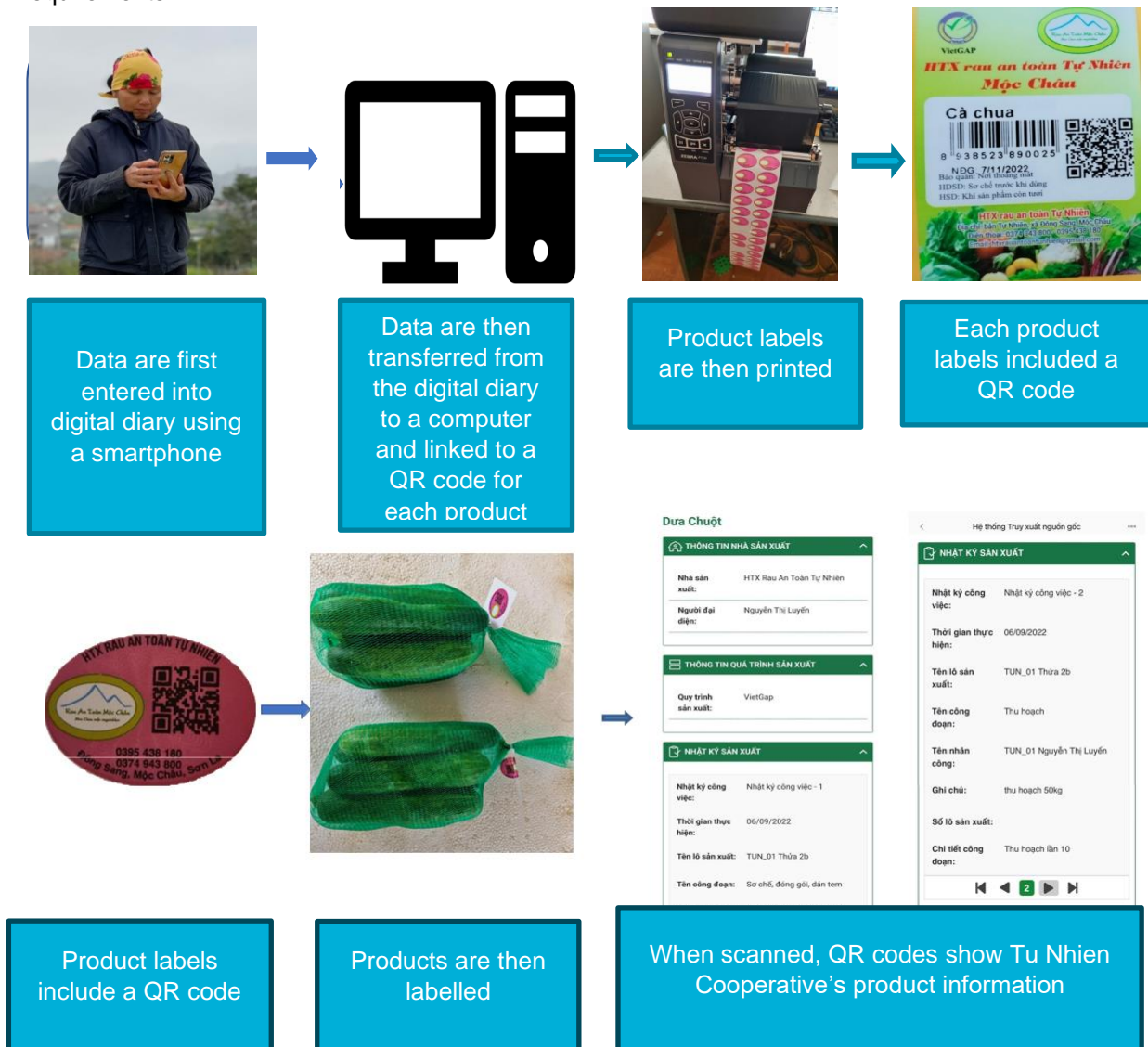


Figure 1. Tu Nhien Cooperative's digital traceability system for vegetable products. Source: ACIAR (2021)

¹⁰ A QR code (quick-response code) is a type of barcode, a method of representing data in a visual and machine-readable format. Tu Nhien Cooperative uses a QR-coding system to trace the origins and means of production of safe vegetables produced by its members.

Basing on the in-depth interviews with cooperative leaders and a review of the ACIAR AGB/2021/153 project, in Table 1 summarises the cooperative's main objectives for using QR codes and digital diaries, and how these digital tools were developed.

Table 1. How QR codes and digital diaries support Tu Nhien Cooperative's vegetable production and business

Objectives	<ul style="list-style-type: none"> • Cooperative members and leaders gain an understanding of what is required for compliance with VietGAP certification protocols. • Farmers benefit from having a reliable digital traceability system to verify VietGAP compliance and to monitor and improve cool chain conditions from warehouse to markets.¹¹ • QR codes on labels allow consumers to see basic crop and farmer information and retailers to access the more detailed traceability information required for VietGAP compliance, leading to higher demand and stable prices.
Types and format	<ul style="list-style-type: none"> • QR codes were first used by cooperative members in 2017. However, farmers were still recording product data for VietGAP compliance in handwritten diaries. • Since 2021, with the support of the ACIAR AGB/2021/153 project, farmers have begun using digital diaries on their smartphones. Data for each product from the digital diaries are transferred to a computer and linked to a QR code via the Hitachi control tower software. As the QR codes and associated data for each product are extracted from their digital diaries, farmers no longer have to spend time each day entering handwritten information. In addition, farmers can enter information at their convenience or ask their children to help with data entry. • QR codes printed on labels at the farm are linked to a database of crop production information required for VietGAP compliance, including the product variety, pesticides and fertilisers used, and planting and harvesting dates. • The smartphone-based digital traceability system eliminates the need for manually recording crop data or paper records. It also results in improved product quality at retail and reduced postharvest losses because of the integration of a digital traceability system and a system to monitor cool chain conditions from the warehouse to market. Farmers and retailers both have access to electronic crop records.
Development	<ul style="list-style-type: none"> • A consignment management system was developed using a Hitachi virtual control tower software, which can print unique QR codes for each consignment and allows retailers or consumers to view live consignment data. Consumers and retailers can also access production information via the QR code. The software requires a computer and a printer in the warehouse, with access to data via smartphones. • A smartphone digital diary app was produced by Nong Nghiep So, an IT service cooperative.¹² Farmers use the app to capture crop information required for VietGAP compliance, including their name, type of crop and cultivar being produced, use of pesticide applications, and planting/harvest dates. Farmers' requirements for the digital traceability system were discussed and agreed. The Nong Nghiep So digital diary app was incorporated into the virtual control tower system. • Software was designed to print QR codes specific to each consignment, a smartphone app was designed to read QR codes and link to Global Positioning

¹¹ Cool (or cold) chain products are those that are temperature sensitive/perishable, including vegetables.

¹² Nong Nghiep So (which means 'digital agriculture') is an IT service cooperative providing training services and digital diary accounts.

System (GPS) data for locations and times, and the Hitachi virtual control tower software was adapted for data processing and storage.

- With the support of the Aus4Innovation CoolBot project, the cooperative received a 35m³ cool room equipped with a CoolBot refrigeration unit, to ensure optimal temperature control for storing perishable goods (Figure 2) but this has been a small-scale pilot.
- Software-generated QR codes that are printed on farm and added to product labels can be scanned by consumers with any smartphone to provide basic marketing information about the crop and farmers.
- Cooperative members were given extensive training on digital recordkeeping which equipped them with the necessary skills and understanding to manage their data digitally, promoting efficiency and enhancing data accuracy.
- The ACIAR AGB/2021/153 project researchers in Moc Chau worked closely with farmers at all stages of the project to ensure the digital traceability system met their needs.
- Consultation with five big supermarket retailers (AEON Vietnam, MM Mega Market, Lotte, Big C, Big Green) took place in Hanoi in April 2022. Two retailers were selected for piloting traceability systems (AEON Vietnam, MM Mega Market) to ensure the system delivers what they value.

Access and users

- During the FGD, cooperative members shared that they can enter data for recording in the digital diary app either at the end of the working day or during their work on farms.
- When first using the digital diary app, project staff taught all cooperative member households how to enter information in the digital diary app. However, it is still mainly women cooperative members who update the digital diary app or ask their children to help them. Most cooperative members are Kinh or Thai women, who take on decision-making roles in relation to production and marketing vegetables (such as recordkeeping, post-harvest processes or the use of fertilisers and pesticides) while men are involved more in planting, harvesting, transporting and marketing. The women are also more likely to manage the finances.
- Consumers now have access to a trusted system that can verify the safety of the vegetables they purchase from modern retail stores in Hanoi by checking that product information meets VietGAP requirements or other organic product-quality certification.

Source: Based on ACIAR (2021) and data analysis of project interviews and FGD

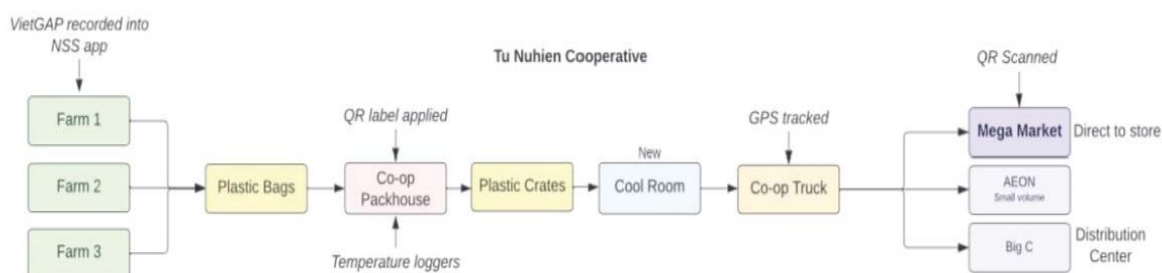


Figure 2. Tu Nuhien Cooperative's vegetable products supply chain with QR-code labelling and temperature loggers. Source: ACIAR (2021)



Figure 3. Some of Tu Nhien Cooperative's vegetable products labelled with QR codes © Nguyen Thi Thu Hien

2.2 Governance, management and organisation

Overall management of the digital traceability system is done by a cooperative woman leader. This includes recording all data entries made by members in their digital diaries, and reminding members to enter daily data on their use of fertiliser or pesticides; and managing, storing and extracting information from the digital traceability system for printing labels and controlling the quantity of QR coded labels being printed.

Cooperative members use their smartphones to enter information about their use of use of fertiliser/pesticide inputs from the beginning to the end of the season. They can select their individual physical plots of land delineated in the digital production diary app divided in the production plan to enter information (for example, types of vegetables grown, weeding, care, use of fertilisers and pesticides). Households can also enter information about different input types, content, quantities and chemicals used. Cooperative leaders regularly check the recorded use of fertilisers and pesticides and to remind households when they forget to update their digital production diaries.



Figure 4. A woman farmer enters product data into a smartphone (Left). Digital data management by Nguyen Thi Thu Hien, vice director of Tu Nhien Cooperative (Left) © Pham Tai Thang

As outlined in Table 1, Nong Nghiep So (which means 'digital agriculture') is an IT service cooperative that provides training services and digital diary accounts for users of the smartphone digital diary app. This unit also helped set up software digitisation and supports technical issues while cooperative members record production diaries on the digital system. Data from the digital diaries is linked to the Hitachi virtual control tower system, also described in Table 1. The control tower is software that generates a unique QR code for each consignment which links to a concise summary of product details.

The control tower is also linked to the Escavox consignment-monitoring system.¹³ GitHub software then links the Nong Nghiep So digital diary app and Escavox GPS trackers (GitHub is a platform that enables ARH and its approved users to run the application on alternative platforms and/or modify, adapt the application for future).

With support from the ACIAR AGB/2021/153 project, Tu Nhien Cooperative and its members have signed production contracts with the private company GreenFarm in Van Ho and Moc Chau. Together with GreenFarm, Tu Nhien Cooperative is piloting the digital traceability system with AEON Vietnam and Mega Market supermarkets in Hanoi. GreenFarm has provided extensive training on digital recordkeeping which has equipped Tu Nhien Cooperative's members with the necessary skills and understanding to manage their data digitally, which has promoted efficiency, and enhanced data accuracy. The project staff in Moc Chau have also worked closely with farmers at all stages of the project to ensure it meets their needs. Now, the cooperative members not only have the skills and tools to use the digital traceability system and supply chain monitoring to their advantage but also a social network of other farmers exchanging production, technical and market information to ensure a stable supply to buyers.

2.3 Sustainability and risk management

Despite the benefits, there have been some challenges. Using the digital diary app requires farmers to know how to use smartphones and that groups of households having computers and printers. In particular, older members who are unfamiliar with digital technologies find the app difficult to use.

Also, as identified by the research for this case study, the existing Nong Nghiep So digital diary app still lacks the functionality to record details of certain content, such as the use of composted organic fertilisers, some types of chemical fertilisers, and new seeds. In addition, some entries still have to be manually entered by farmers (such as the names, rates of use and active ingredients of pesticides). The system needs to be modified to make it easier to use. In addition, farmers also require a digital traceability system that links well to other digital traceability software for value chains and to a national traceability system to scan and access product information so that farmers, especially ethnic minority women, can master the process of linking to a national digital traceability system.

Other challenges include increases in digital technology costs and farmers' time inputs, the unwillingness of producers who have limited knowledge of smartphones to use the app, and slow internet speeds. QR-coded labels can also be damaged or difficult to scan. For the consumer, older people often do not have smartphones and for others, scanning QR codes can be inconvenient, according to feedback received by the cooperative.

In addition, scaling out successful ICT tools for agricultural production not only needs financial and human resources but also much greater support in terms of communicating the benefits of the digital traceability system to farmers, and connecting the cooperative with other cooperatives and market actors. In particular, more support is needed from local agricultural extension services and people's organisations such as women's and farmers' unions at different management levels to form and promote local development programmes for ICT application in agricultural production.

¹³ Escavox is a supply-chain monitoring software that uses trackers to continuously monitor time, temperature, light, humidity and location as food travels from its point of origin to destination. This enhances product quality, maintains freshness, lowers costs and reduces waste. See www.escavox.com.

3 Outcomes, learning and impact

3.1 Building technical and market capacity and social development

The findings from the in-depth interviews clearly indicate the benefits of establishing a digital traceability system that aids quality-management control so that farmers and businesses improve their compliance with the VietGAP process and meet the increasing market demand for product traceability and high quality. The cooperative has received many certificates of merit and awards from ministries, provinces and social organisations.

First, thanks to AGB/2021/153, its implementers ARH and NOMAFSI, and Moc Chau's DARD, the members of Tu Nhien Cooperative are now empowered with new digital skills and technology to target higher-value markets and customers by improving vegetable quality and packaging supported by the digital traceability system.



Figure 5. Tu Nhien Cooperative has won awards for promoting women's economic empowerment from ministries, Son La province and development organisations © Ms Hien, Tu Nhien cooperative vice-director

Second, Tu Nhien Cooperative supplies its VietGAP-certified products to large supermarkets in Hanoi and Hai Phong, including WinMart, Big C and AEON Vietnam, as well as to schools and businesses in Moc Chau district and Hanoi city (Voice of Vietnam 2019). The digital traceability system, marketing strategies and connections with farmers have led to significant improvements in vegetable supply chains. After a successful visit by Australian Senators to AEON Vietnam's Mall Long Bien fresh-produce market in April 2023, Tu Nhien Cooperative has become a trusted vegetable supplier to AEON Vietnam supermarkets in Hanoi. In addition, other major retailers in Hanoi such as MM Mega Market, Lotte, Big Green and BacTom are now potential retail partners for the cooperative.

Third, using digital tools that assist with VietGAP compliance and supply-chain monitoring is an effective way to communicate the production input information required to meet food safety standards. Consumers value the assurance provided by VietGAP certification and by QR-code labelling which offers digital traceability data from production to markets. This results in a higher willingness to pay for vegetables produced by Tu Nhien Cooperative. Due to the guaranteed quality of its vegetables and the digital traceability system, the cooperative has signed contracts with large retailers in Hanoi and Son La province and has become more proactive in production.

Fourth, thanks to the digital traceability system, since 2022 the cooperative now has a contract to sell its produce to ICFood in Van Ho, enabling it to sell both summer (off season) and winter (main season) vegetables. This helps the co-op to gain a stable sale of vegetables throughout the year. In winter, vegetable prices are often low, so the cooperative now sells its winter vegetables to ICFood's food-processing factory (mainly cabbage for kimchi, dried cabbage, pickled H'mong mustard, and green onions). In 2022 and 2023, the cooperative produced 150 tonnes of winter cabbage, 100 tonnes of which was sold to ICFood. The cooperative's strategy is to improve its production technologies and to maintain its digital traceability system to produce both offseason and main-season vegetables. Offseason vegetables are prioritised for sale to Hanoi and external markets (when prices are higher) while the main (winter) season vegetables are mainly sold to ICFood Van Ho for processing in the local province.



Figure 6. Australian Senate committee and Moc Chau farmers at an AEON Vietnam in-store promotion event, April 2023 © ACIAR (2021)

Fifth, the cooperative leader and the management board find that using the digital diary app linked to QR codes is a convenient way to supervise production members and check that they are recording their digital diary entries. It also means that the cooperative's female leaders know what crops have been planted and when harvest time is approaching. This is very useful for arranging orders and forecasting output, and adjusting production plans. Women members can also use social media tools such as Zalo (a messaging app) and Facebook to communicate quickly with their cooperative leaders about issues relating to the digital diary app, production planning and market information, as well as other technical issues during the production process. During the FGD, the women farmers said that they are confident in using the digital diary app on their smartphones. This has helped to enhance local social networking in terms of their vegetable production and marketing. In addition, the (external) inspection unit can easily see the entire production process of members using the group's common digital diary apps developed by *Nong nghiep so* and also the Hitachi control tower software based QR code systems.

3.2 Economic outcomes and impacts

Greater traceability and transparency in VietGAP-certified value chains from Son La to Hanoi has helped farmers to sell their products in higher quantities at higher prices. Tu Nhien Cooperative's QR-coded higher-value products receive a 40% price premium in the offseason compared with wholesale markets in Son La or Hanoi because they receive higher farm-gate prices from modern retailers. Vice director Nguyen Thi Thu Hien estimates that about 60% of sales is unprocessed vegetables sold to supermarket chains such as MM Mega Market, Big C and AEON Vietnam at the beginning of the year and in the offseason. During in the main season in winter–spring, 10% is sold for processing and about 10% is sold online and to convenience stores with small orders, but to a large number of buyers. This is a dream for many female farmers in rural mountainous regions. They all want to access a large market like Hanoi and diversify their income from both offseason and main-season vegetables and from both online and offline vegetable marketing channels to maintain a stable and higher income.

Cooperative members participating in a focus group discussion also shared that when recording their digital diaries, the quantity and price of vegetables sold are now more stable because their produce is becoming increasingly attractive to customers and can be sold at higher and stable prices throughout the year, especially highly seasonal products. For example, QR-coded strawberry products sell at a 20–30% higher price compared with other products on the market. As the leader of Chau district's farmers' union said,

The biggest change among ethnic minority women is in awareness and thinking. For example, H'mong women now know how to use smartphones for vegetable production, thereby creating more jobs and stable income. H'mong women in many areas in the district, including the area of Tu Nhien Cooperative, know how to ride motorbikes and access the market, pay attention to digital diary recording for making production more profitable.

Since 2021, the digital traceability system has meant that annual product sales and income have increased by 5–10% annually. Farmers have reinvested in building fruit and vegetable warehouses and greenhouses along with installing automatic sprinkler and drip-irrigation systems to improve the quality of off-season vegetable products and reduce the use of water and fertilisers.

The FGD results with female cooperative members show that vegetable production is very suitable for women producers as it does not require heavy or full-time work. It has a quick production cycle and vegetable can be grown all year round, bringing very high economic efficiency and reducing production risks. In the past, Tu Nhien Cooperative's members mainly grew corn at a profit of US\$500–1,000/ha. On the same farms now, vegetable production has brought in about US\$20,000–25,000/year and profits of more than US\$10,000/ha for farmers. By improving vegetable quality and developing branding together with a realisable digital traceability system, Tu Nhien Cooperative can command higher prices compared with other locally produced vegetables. Its female members have improved their incomes and six new regular jobs have been created for local workers with wages of about 5 million Vietnamese dong per person per month.¹⁴

3.3 Increased women's empowerment

Farmers, and in particular women, have become more confident as they are now skilled at using the digital traceability system required for VietGAP compliance. For example, one female cooperative member shared that,

I just started keeping a digital diary, I'm not used to the operation and find it difficult, but after a while I get used to it and it's not difficult at all. Now I can add information at any time, and it only takes 1–2 minutes. I can also review information recorded from previous crops to adjust input usage levels for more efficient vegetable production.

This member was also invited to the Vietnam Farmers' Union (VNFU) to train other households to record digital diaries under its Farmer Field School (FFS) programme in early 2023. This shows how women have been empowered through digital transformation for production and business. The system has helped farmers, especially women, to reduce their workload as they no longer have to manually record information to comply with VietGAP certification can maintain stable sales at higher prices all year round, which means vegetable production has also become less risky. In addition, the system has led to better production planning. When a growing season ends, the cooperative leaders can change the plot use on the app (change what products grown on that plot) to better regulate production among members of the cooperative.

The women participating in the FGD all said that to grow higher-quality and higher-priced vegetables under a well-known brand, farmers must keep honest digital diaries. Keeping a digital diary helps the cooperative leaders check the type of fertiliser used and the quarantine period after spraying pesticides for each field. The participants also thought that older members who are less familiar with the technology can ask their children and grandchildren to update their digital diaries. As shared by a women leader of Tu Nhien Cooperative,

Women have improved much their awareness. The application of the traceability system comes from benefits for households. When people see the benefits of cooperative production compared to free production, they will actively participate in the cooperatives.

While all cooperative members are obliged to use the digital traceability system with the support from cooperative leaders, they are also happy to keep their digital diaries as it is a convenient way to meet VietGAP requirements. Updating the digital diaries is also a prerequisite for selling produce through the cooperative to higher-price markets and the ICFood food-processing factory. Furthermore, their

¹⁴ According to Statista, in Vietnam in 2021 the average monthly salary for unqualified workers was about 5.5 million Vietnamese dong. See www.statista.com/statistics/1070836/vietnam-average-monthly-salary-by-qualification

vegetable products are purchased at higher-than-market prices. Buyers are not only interested in quality but also product design, product origin and brand of the cooperative/producer.



Figure 7. Tu Nhlen Cooperative's leaders and members processing and labelling products for external markets © Nguyen Huu Nhuan

According to the vice chairperson of Moc Chau district's women union, uncertified conventional agricultural producers now face many difficulties due to the lack of production information provided to final customers. She emphasised that:

Cooperatives often learn from each other very quickly. If the cooperative directors' awareness is very good about the importance of product quality, labels, QR codes, and traceability, marketing and trade promotion activities will be very fast. Tu Nhlen Vegetable Cooperative is a typical case of women's production organisation including ethnic minority women, led by women and boldly applying ICT in production and consumption.

Through interviews with leaders and group discussions with members of Tu Nhlen Cooperative, we also see that there has been a shift in the leadership role of the cooperative from Nguyen Thi Luyen (the nearly 70-year-old founder of the cooperative) to Nguyen Thi Thu Hien, who is now the main coordinator with ACIAR AGB/2021/153 project partners and the local agricultural extension system to build, test and operate the digital traceability system. Nguyen Thi Thu Hien is also an active woman who is ready for change. She has left a permanent position as a local government officer to run the cooperative, support the original management board and to motivate all cooperative members to work together to improve production and income. This sends a positive signal to other women in the northwest highlands who want to engage in digital transformation. It also highlights the potential for ICT strategies and new technology-related jobs to counter rural outmigration and entice young people back to rural areas.

3.4 Better environmental protection

The strict adherence to requirements for VietGAP and organic production, as well as ecotourism, by cooperatives in recent years has resulted in the use of fewer pesticides and the more efficient use of inputs used by farmers. This has contributed to improving both the environment and the health of women engaged in vegetable production.

Thanks to its growing reputation for environmentally friendly production methods and products, Tu Nhlen Cooperative has developed additional agricultural tourism services. This has attracted consumers from big cities such Hanoi. From October to April the cooperative serves groups of tourists and students who are interested in learning more about how their agricultural production processes. Visitors are mainly from farmer associations, youth unions and women's associations in other localities. Tu Nhlen Cooperative is also supported by the Moc Chau Tourism Management Board to connect with

families from the city who come for a vacation and participate in agricultural production experiences. Women members are the main service providers for ecotourism activities, providing an additional income-generating activity for them and their families. The cooperative charges a fee of US\$0.90 per person per visit. The number of family visitors at the end of the year increase to 4–5 groups per day, with a peak of about 50 people per day.

3.5 Challenges

One key challenge for Tu Nhien Cooperative is the need to expand its production area to ensure a stable supply of produce for its larger buyers. In recent years, due to high land prices, many households have sold agricultural land, so the land area for vegetable production is gradually shrinking. Some households have converted land for other purposes such as tourism services.

Another challenge is that the high cost of the digital traceability system, which affects the income of vegetable producers and traders. Tu Nhien Cooperative has been supported by the ACIAR AGB 2021/153 project with funds to buy computers and printers, and for buying and managing apps. The cooperative is the unit that manages, stores and extracts information, and prints QR-coded labels. However, when reinvestment for equipment is needed, it may be difficult because currently the cooperative does not have a common accounting mechanism to build a development fund or welfare fund for its members. At present, all profits from vegetable production are paid directly to individual cooperative member households. The cooperative only plays the main role of finding partners, coordinating seasonal production plans, and connecting producers to stable markets. Women may face more difficulties when having to invest themselves in traceability costs while they still have small-scale production and lack necessary computer skills.

3.6 Lessons learnt

From the study, the following lessons can be drawn. First, the digital traceability system – including the use of digital production diaries – helps to reduce manual workloads and time for women, who are the main labour force in vegetable production. However, implementing the system requires a leader and an interest group/cooperative with sufficient computer and planning skills to set up the digital diary system for its members and to provide them with regular motivation to maintain the use of the system. Because Tu Nhien Cooperative is a cooperative of women with a management board of women, women have been more active in production planning and learning and using digital diaries.

Second, while infrastructure in rural and mountainous areas of Vietnam has improved, farmers (especially women farmers) still face challenges in using digital technology to develop their vegetable production and business due to farmers' low digital capacity and unstable access to the internet in remote areas. Local women often have a lower capacity for using smart devices and accessing market information than men. Applying a digital traceability system requires easy access to the Internet, sufficient digital devices and the necessary skills to use them, and good connections with other digital platforms. In addition, the digital traceability system currently used by Tu Nhien Cooperatives is not well connected with the digital management systems of other actors in the supply chain.

Third, the vegetable production cooperative model helps women farmers to improve their decision-making capacity and mobilise community resources for commodity production. However, to make digital transformation a reality, cooperative leaders must be pioneers and have the skills to gather cooperative members to work together and to communicate well with development organisations, local authorities and agricultural extension agencies.

Fourth, to maintain the application of ICT tools in vegetable production and business, more support should be provided to Tu Nhien Cooperative so that its leaders and farmers better understand how a digital traceability system works and to gain the maximum benefit from the supply chain monitoring functionality. This will provide the incentive to invest in their own digital traceability systems in the future. Also, young women should be actively engaged in training and in piloting a digital traceability system to enhance their capacity for digital transformation.

Finally, the digital traceability and supply chain monitoring technology can be further scaled out to other vegetable and fruit farmers, especially ethnic minority women to target more stable and profitable markets, including large urban and niche markets, schools and factory kitchens. This will help not only to sustain the use of ICT tools such as QR codes and digital production diary apps for vegetable production and business at small scale, but also form more collective organisations such as cooperatives so that small-scale female producers can improve their livelihoods.

4 Concluding findings

- The application of digital tools such QR code stamps and digital production diaries has helped Tu Nhien Cooperative to enhance its capacity for digitally monitoring VietGAP compliance and improving product quality in vegetable value chains.
- Agricultural cooperatives are a good production model for small-scale producers as well as for women. Established cooperatives can achieve better economic empowerment for women, by piloting the use of ICT tools and services and ensuring members have both the skills and technology to use these tools in their vegetable production businesses. Women's awareness of the importance of using the digital traceability system has led to more market opportunities, employment and income generation.
- The female leadership and membership of the cooperative has remained stable and there has also been a shift in leadership roles towards sustainable growth. Future investments should focus on not only improving the digital traceability system (by adding more data options such as adding composting organic fertilisers, chemical fertilisers, new seeds, and the names, rates and active ingredients of pesticides). It is also important to develop a digital traceability system that is simpler and more user-friendly for women farmers, especially ethnic minority women, so that they can master the process.
- Conducting further participatory market research will also be important to better understand consumer perceptions and preferences to inform the use of QR codes.
- Cooperatives are an effective model for women to work together in production and towards digital transformation, helping to improve economic efficiency in agricultural production. However, in Moc Chau district, only about 10% of cooperatives are owned by women. Therefore, it is necessary to continue mobilising resources to support the development and replication of models such as Tu Nhien Cooperative to enhance the economic empowerment of rural women in poor regions like northwest Vietnam.
- The higher level of traceability and transparency in VietGAP value chains developed by the Tu Nhien Cooperative can be scaled out or replicated by other fruit and vegetable value chains, with adequate consideration of resources. For the Tu Nhien Cooperative, although local farm household incomes have improved, women farmers have identified continuing, such as difficulties in accessing the financial resources to purchase or register to use new updated technologies to continue using their digital traceability system in future. The cooperative lacks common assets to invest in its future ICT needs and still relies on investment from projects.

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Appendix 1. Interview questions for Tu Nhien Cooperative leadersⁱ

General information

Full name of interviewee:

Age:

Gender:

Ethnicity:

Position:

Organisation:

Objectives

The in-depth interviews with cooperative leaders aimed to achieve the following objectives:

- To learn about the formation and development process of Tu Nhien Cooperative and its development and application of ICT services/tools in vegetable production and entrepreneurship, especially for women's entrepreneurial empowerment.
- To understand the current use of ICT services/tools in vegetable production and entrepreneurship of Tu Nhien Cooperative and to assess how ICT impacts on local women's employment opportunities and livelihoods.
- To identify advantages and disadvantages of using ICT services/tools and any challenges faced by women in using them for vegetable production and entrepreneurship.
- To provide suggestions for improving efficiency of ICT services/tools and sustaining their application for vegetable production and entrepreneurial services.

Key questions

1. General information about the cooperative: name, address, year of establishment, the total number of members (formal, informal), board of directors, board of supervisors, types of cooperative and production and entrepreneurial services.
2. What have been the biggest changes in the cooperative's vegetable production and entrepreneurship over the past five years (such as trends/changes in crops, linkages in production, ethnic women's empowerment, the application of ICT services/tools)? How and why have these changes happened, and have they been positive or negative? Is there is a change in women's leadership or women's economic empowerment?
3. What ICT services/tools have been applied by the cooperative and its members in vegetable production and entrepreneurship, and when, how and why? What objectives are these ICT services/tools trying to achieve and target (for example, promoting entrepreneurial or organisational development and innovation)?
4. Please describe the governance, management and organisation of ICT services/tools, the roles of those involved, and the main goals and target beneficiaries (particularly women). What are the necessary resources (material, institutional, financial) to establish and sustain these ICT services/tools? Has the adoption of ICT services/tool helped empower the cooperatives women members? Does the cooperative receive external support in the provision of these services/tools?

5. What types of hardware, software and other technical resources are required to run the ICT services/tools effectively? What is required to access the services/tools? And what support do the women producers/entrepreneurs need to access and use ICT service/tools (for example, training and hardware)?
6. How do you guarantee that the ICT services/tools continue to operate? Are there any risk-management strategies in place? How are ICT users' data managed and protected?
7. Have the ICT services/tools helped your women members overcome challenges in entrepreneurial and/or organisational development and if yes, in what ways? Please give an example. What are the key successes? How do women users experience the ICT services/tools?
8. What factors enable or hinder the cooperative and its members, especially the poor and women, to develop/access ICT services/tools in vegetable production and entrepreneurship?
9. What are the lessons learnt from the application of ICT services/tools in vegetable production and entrepreneurship? Which challenges exist in delivering and sustaining the service/tool? What are the potential solutions to these challenges?
10. What suggestions do you have for improving the efficiency of the ICT services/tools in terms of the cooperative's production and entrepreneurial services? How does the cooperative's intend to continue using and further develop the ICT services/tools? Can these ICT services/tools be scaled up and connect to other ICT services/tools? What type of future support would be needed to sustain these ICT services/tools?
11. What are your recommendations for other FFPOs who would like to replicate these ICT services/tools and for those that seek to support them? What problems might other FFPOs encounter and what would be your advice?

Thank you very much!

Appendix 2. Interview questions for other local leaders

This survey was used to interview local leaders and their staff/extension workers from the Moc Chau district farmers' and women's unions and the district Department of Agriculture and Rural Development.

General information

Full name of interviewee:

Age:

Gender:

Ethnicity:

Position:

Organisation:

Interview objectives

These in-depth interviews aimed to achieve the following objectives:

- To understand the local district context in relation to digital transformation in agriculture as well as in agricultural cooperatives; and the formation and development process and application of ICT services/tools in vegetable production and entrepreneurship for women in Tu Nhien Cooperative.
- To understand the roles of local extension services and organisations such as farmers' unions, women's unions and cooperatives involved in establishing and providing support to sustain and scale up ICT services/tools in vegetable production and entrepreneurship of Tu Nhien Cooperative.
- To identify strengths, weakness, opportunities and threats in relation to agricultural cooperatives such as Tu Nhien Cooperative to enhance ICT services/tools in vegetable production and entrepreneurship. What challenges are faced by local women producers in the application of ICT services/tools for vegetable production and entrepreneurship?
- To make recommendations for the cooperatives and their members on how to sustain successful models of ICT services/tools in their agricultural production and entrepreneurship.

Key questions

1. Please provide an overview of local district/commune social economic development, agricultural extension programmes and policies to develop the livelihoods of local communities (and especially women).
2. What agricultural and rural development strategies and programmes implemented by local government, development organisations and non-governmental organisations (NGOs) support the development and application of ICT services/tools for women's entrepreneurial empowerment, especially for Tu Nhien Cooperative?
3. What are the roles of local extension services and people's organisation such as farmers' and women's unions and cooperatives in establishing and providing support to sustain and scale up ICT services/tools in vegetable production and entrepreneurship of Tu Nhien Cooperative?

4. What are strengths, weakness, opportunities and threats to agricultural cooperatives such as Tu Nhien Cooperative in relation to enhancing the use of ICT services/tools to empower women in agricultural production and entrepreneurship?
5. How are the processes, outputs and outcomes of ICT services/tools initiatives communicated to cooperative members by local government and extension services? What mechanisms are in place to enhance partnerships between farmers, especially women, cooperative members, local authorities and agricultural researchers and development workers from NGOs?
6. Which challenges exist in delivering and sustaining successful ICT services/tools? What are the potential solutions to these challenges?
7. What development policies or programmes are planned to enhance the application of ICT services/tools for developing and scaling up successful models of ICT services/tools in agricultural production and entrepreneurship?

Thank you very much!

Appendix 3. Guidelines for FGDs with Tu Nhien Cooperative members

These guidelines were used during the focus group discussion with six members of Tu Nhien Cooperative.

General information

No. of participants for this FGD (fill in the exact number):

	Full name	Age	Gender	Ethnicity	Years of being a cooperative member
1	Nguyen. T.M	51	Female	Kinh	2013
2	Lê T.T	62	Female	Kinh	2013
3	Vu T.B	48	Female	Kinh	2015
4	Nguyen T.M	50	Female	Kinh	2013
5	Tran T.H	55	Female	Kinh	2013
6	Ha T.A	42	Female	Kinh	2013

Objectives

The study organised a focus group discussion (FGD) with 6–8 cooperative members (mixed ethnicity, gender and age) at the research site. The FGDs aimed to achieve the following objectives:

- To learn about the formation and development of Tu Nhien Cooperative and its development and application of ICT services/tools in vegetable production and entrepreneurship, especially for women's entrepreneurial empowerment.
- To understand the current use of ICT services/tools in vegetable production and entrepreneurship of Tu Nhien Cooperative and to assess how ICT services/tools have impacted on local women's employment opportunities and livelihoods.
- To identify advantages and disadvantages of ICT services/tools development and application and challenges faced by local women producers in using these ICT services/tools for vegetable production and entrepreneurship.
- To provide suggestions for improving the efficiency and sustainability of ICT services/tools in the cooperative's vegetable production and entrepreneurial services.

Key discussion issues

1. What ICT services/tools have been applied by the cooperative and its members in vegetable production and entrepreneurship, and when, how and why? What objectives are the ICT services/tools trying to achieve and target (for example, entrepreneurial or organisational development and innovation)? Do the cooperative members receive external support in the provision of ICT service/tools?
2. What have been the biggest changes in the cooperative's vegetable production and entrepreneurship over the past five years (such as trends/changes in crops, linkages in production, ethnic women's empowerment, the application of ICT services/tools)? How and why have these changes happened, and have they been positive or negative? Is there is a change in women's leadership or women's economic empowerment?
3. Please describe the governance, management and organisation of ICT services/tools, the roles of those involved, and the main goals and target beneficiaries (particularly women). What are the

necessary resources (material, institutional, financial) to establish and sustain these ICT services/tools? Have women been prioritised and/or received any additional support?

4. What are the outcomes of using ICT services/tools? Have there been any unintended positive or negative outcomes? Have the ICT service/tools helped women members to overcome challenges in entrepreneurial and/or organisational development and if yes, in what ways? What are the key successes? How do women users experience the ICT services/tools?
5. What are the most important knowledge and skills farmers/members have gained from becoming members of the cooperative and using its ICT services/tool in production and entrepreneurial activities?
6. Have cooperative members (especially women) introduced any innovations or initiatives in the application of ICT services/tools for the cooperative's vegetable production and entrepreneurship? If yes, what are positive outcomes of these innovations/initiatives. How can they be scaled up?
7. What are the strengths, weakness, opportunities and threats to farmers (especially women) in Tu Nhien Cooperative in relation to applying and enhancing the use of ICT services/tools in their vegetable production and entrepreneurship? What are lessons learnt from developing, using and sustaining the ICT services/tools?
8. What suggestions do you have for improving efficiency of ICT services/tools in relation to the cooperative's production and entrepreneurial services? What are the cooperative's main aims in terms of the continuity and future development of the ICT services/tools? How these services/tools be scaled up and connect to other services/tools? What types of future support would be needed to sustain the use of these ICT services/tools?
9. What recommendations do you have for other FFPOs and their members who would like to replicate these ICT services/tools? What problems might other FFPOs encounter and what would be your advice?

Thank you very much!

ⁱ The cooperative leaders are the five members of the board of management.