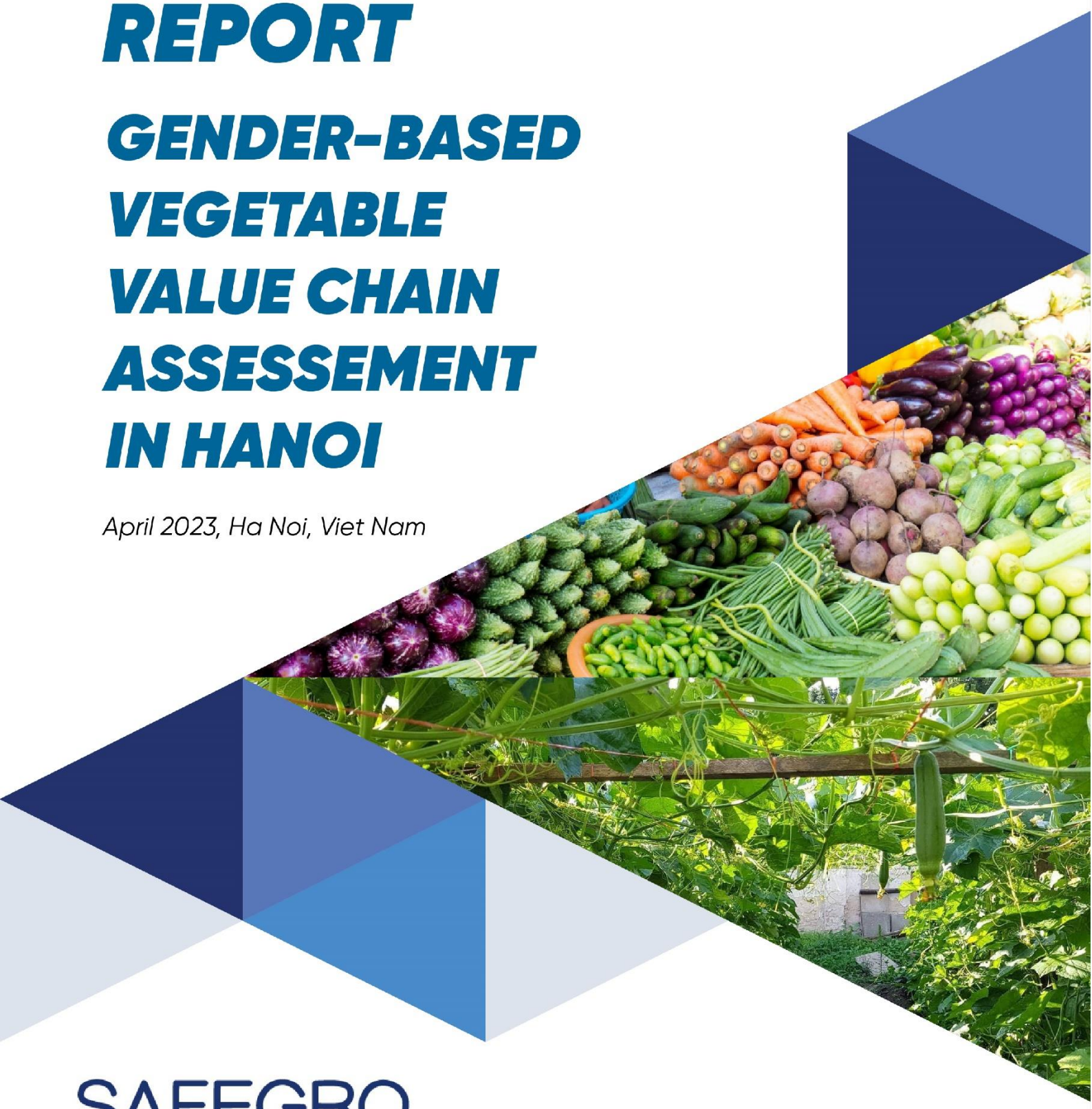
In partnership with Canada

# REPORT

# GENDER-BASED VEGETABLE VALUE CHAIN ASSESSEMENT IN HANOI

*April 2023, Ha Noi, Viet Nam*



SAFEGRO

# About the project

Funded by Global Affairs Canada, our project seeks to enhance the Vietnamese people (Ha Noi & Ho Chi Minh city) access to safe and competitive agri-food products, with an aim to improve the well-being of consumers as well as other agri-food actors. SAFEGRO project is implemented by Alinea International in partnership with the University of Guelph.

FS is a major public health concern. Many people do not trust FS enforcement at informal markets where they buy most of their food. Trade for Vietnam's commodity exports also suffers due to a lack of compliance with international standards.

SAFEGRO project works with national and municipal governments to modernize FS capacity among regulators, thousands of smallholder farmers, cooperatives, processors, retailers and consumers along specific meat and vegetables value chains in Ha Noi and Ho Chi Minh city. SAFEGRO supports Vietnam's Ministry of Agriculture and Rural Development, Ministry of Health and Ministry of Industry and Trade jointly.

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# LIST OF ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| A&RD | Agriculture & Rural Development |
| CC | Climate Change |
| CSA | Climate Smart Agriculture |
| DARD | Department of Agriculture and Rural Development |
| FS | Food Safety |
| FU | Farmer Union |
| GAP | Good Agricultural Practices |
| GBVCA | Gender-based Value Chain Assessment |
| HACCP | Hazards Analysis and Critical Control Points |
| ID | Identification |
| ISO | International Organization for Standardization |
| MARD | Ministry of Agriculture and Rural Development |
| MOH | Ministry of Public Health |
| MOIT | Ministry of Industry and Trade |
| NAFIQAD | National Agro-Forestry-Fisheries Quality Assurance Department |
| OCOP | One Commune One Product Program |
| PPD | Sub-Department of Crop Production and Plant Protection |
| QA | Quality Assurance |
| QC | Quality Control |
| SAFEGRO | Safe Food for Growth Project |
| Sao | 1 Sao = 360 meter square |
| SOP | Standard Operating Procedures |
| VC | Value chain |
| VietGAP | Vietnam Good Agriculture Practice |
| WU | Women Union |

# EXECUTIVE SUMMARY

## Scope

Gender-based value chain assessment (GBVCA) is an activity under Component 2 of the SAFEGRO project. This report aims to assess vegetables value chains (VC) in Hanoi and propose a plan for SAFEGRO to support selected VCs to achieve food safety (food safety) outcomes and provide added value in a sustainable way. Employing key approaches including food safety, GBVCA, climate smart agriculture (CSA), the research team developed VC selection criteria to prioritize 3 kinds of vegetable for VC analysis and risk assessment, a checklist to select cooperatives and VCs for research and intervention, data collection tools (including quantitative, qualitative questionnaires and focus group discussion guideline) to carry out survey, in-depth interviews and focus group discussion with VC actors (input suppliers, 60 farmers, 10 cooperatives, some collectors/traders, supermarkets, collective kitchens) for vegetables VCs of Hanoi. Three cooperatives were selected for in-depth surveys including Bac Hong, Yen My and Van Duc for a broad range of vegetables, and specific vegetables including mustard greens, cucumber, and morning glory which were targeted to undertake quantitative risk assessment.

## Key findings

**Input suppliers (agent) at commune level play an important role in advising farmers on selection and usage of pesticides and fertilizers which pose potential food safety hazards**. Farmers seeking advice from agents for pesticide use is very common (accounting for 70% of surveyed farmers). 65.7% of farmers consult input suppliers about mixing pesticides. However, only 10% of farmers said they asked input suppliers for use of fertilizers.

**Farmers are free to choose vegetables for cultivation following a diversified strategy which evolved through traditional farming practices, personal experience, market demand and labor availability. The cooperatives have not yet set up a comprehensive production management plan with farmers**. There are 24 varieties of vegetable, rotating between short-term and long-term vegetables, planted by farmers year around (average 4-8 kinds of vegetable per household). They have adopted diversified strategy to minimize the risk of pest/disease outbreaks, climate change, and market risk. Farmers select vegetables to plant by their own decision. Cooperatives which they are members of or sell vegetables to have neither influence on this selection process nor development of a common production plan for farmers. This makes cooperatives difficult to ensure a consistent supply of high quality and safe vegetables to meet their buyers requirements.

**Existing farming practices may affect food safety of vegetables**. In some observed cases risky practices include farmers buying pesticides in bulk without knowing the name or unit price of pesticides; mixing different types of pesticides (normally insecticides with fungicides) for one application; periodical spraying to prevent disease outbreak; arbitrarily increasing the number and frequency of sprayings; and alternating pesticides after several crop cycles . Additionally, 20% of surveyed farmers do not know about the list of approved and prohibited pesticides; agents and farmers misunderstand the potency of biopesticides, chemical pesticides and alternative use of pesticides to avoid pest/disease resistance which needs to be addressed. However, use of biopesticides is becoming more popular, although chemical pesticides are still an important part of the vegetable production.

**Certification management and farmers' compliance with the certificate regulations remains an issue**. For example, safe vegetable farming techniques have been reported to be applied uniformly but this has not been verified through auditing and certification by an authorized certification body. With VietGAP, some

farmers reported they could not ascertain whether their vegetable farming areas are already VietGAP certified since their cooperative may be the registered applicant.. This indicates that VietGAP seems to be a "check the box exercise" that a cooperative has to do to be a qualified supplier, rather than oversight and in-the-field validation of good agricultural practices farmers should follow. Certification, verification and validation of GAP to ensure safe vegetables should be a priority for SAFEGRO.

Vegetable appearance and size are the main quality criteria in transactions between farmers and buyers in conventional markets which influences the transaction price. Although modern retailers such as supermarkets/convenience stores, as well as collective kitchens additionally require a quality certificate and lab tests for chemical and biological hazards, physical appearance and size are still a main criteria for buyers. Despite differing markets' demand for quality, 85.4% of interviewed farmers said that their vegetables which reach different markets are cultivated under the same conditions, and farming technique meaning that vegetable quality at farm gate is more or less the same regardless of where vegetables are sold. The differences between markets, if any, are only appearance and size. The lack of effective traceability and links to individual farmers on vegetable quality, undermines the fundamental requirements for VC food safety management. This also dis-incentivizes farmers from following regulations to ensure safety of vegetable and maintains the focus on physical attributes rather than safety.

Modern retailers and supermarkets have the biggest influence on demand for quality characteristics and safety which upstream actors (famers, cooperatives) have to comply with; the cooperatives play central roles in connecting farmers with these final markets and consumers. Regardless, the capacity of cooperatives to facilitate production management planning and to provide quality, safe vegetables remains poor. Without the coordination of comprehensive production plans the linkage between cooperatives and farmers remains arms length in terms of improvements in production efficiencies, quality and safety. Cooperative human resources, information technology (IT) skills, and digital-based tools that could assist to manage inputs, cultivation and harvesting of vegetables more effectively, especially in the context of evolving climate change risks.

Effective digital traceability systems were not yet observed in any surveyed VCs, even among more modern retailers. Farmers reported that they record farming practices as they carry out, however in many cases farmers fill up the farming records by recalling memory; timely farm recordkeeping to support production efficiency, traceability, and GAP seems to be lacking at the farm level.. Meanwhile, traceability is almost non-existent in informal markets. There is an observed lack of knowledge, awareness, and interest on the supply side of the VC of the importance of traceability and labelling to support food safety, especially with smallholders and traditional market traders (as specified in the traceability report).

Integrated quality management along VC is still immature. There is a disconnect between government regulators, certification bodies, labs, cooperatives, retailers, farmers in terms of sharing data that serve for the process of product quality control. Laboratory data are not yet transparently shared among key stakeholders and sent back to farmers for reference. Governmetn agencies such as Hanoi PPD are not receiving regular reports from certification bodies about certified growing areas to facilitate traceability of quality management and safety.

The traditional model of labor division between men and women is still being maintained at all stages of vegetable production in the surveyed areas. Most of the men take on heavy work like land preparation, or hazardous work like spraying pesticides, while women will do various jobs like tending, weeding, planting. Yet women have the most influence in the family regarding selection of food, of seeds/varieties, and production planning and purchase of pesticides, all of which are important for food safety. However, the burden of housework is one of the barriers for women that may limit opportunities for capacity building or equitable participation in the vegetable growing enterprise.

## Recommendations for pilot models

From analysis outputs of the vegetables VC of Hanoi, the team suggests the project launch pilot models to address a range of issues mentioned above, not only to achieve food safety and higher value added all along VCs but also to provide the foundation, evidence for setting up a mechanism for scaling to support VC development and management aligned with international standards. In the first phase, the models would be piloted on VCs of Van Duc and Bac Hong cooperatives, with participation of concerning partners. Some areas of intervention and activities are expected to be demonstrated in the pilot models to deal with assessed challenges as follows:

### IMPROVE MANAGEMENT EFFECTIVENESS AND FOOD SAFETY IN THE VC

#### *Vegetable production management*

Crop production management needs to be reinforced through better control over inputs for vegetable production (such as pesticides, fertilizers) and implementation of Production Unit Code (PUC)[1] together with the national GS1 system. Implementing issuance and management of PUCs and/or GS1 will achieve several purposes: i) Both provide information on geographical location, farming areas, types of crops, farming techniques, production volume, markets which serve for crop production and VC management by state management bodies; ii) assist cooperatives to make common production plan with farmers. (iii) support traceability systems to ensure transparency and trust with consumers, and (iv) help Hanoi PPD to implement PUC issuance and traceability management as required by MARD.

#### *Food safety risk assessment and management*

SAFEGRO will carry out food safety risk assessments in selected VCs to identify food safety risks along VCs. Based on risk assessment results, recommendations on risk management will be developed and used as basis for food safety improvement in the VCs. Trainings on risk assessment, and risk-based food safety management will also be delivered to key VC actors and partners, including state management bodies.

#### *Monitoring, assessing product quality and food safety*

Food safety management and risk assessment normally requires some risk-based sampling for compliance and non-compliance parameters. SAFEGRO support for the national Laboratory Information Management System (LIMS) will permit sharing of food testing data within the inter-ministerial network of food safety laboratories and the designated national reference laboratories, firstly piloting the system in some selected laboratories. Trainings for laboratory staffs in sampling, standard operating procedure (SOPs) and test protocol should be organized. The selected laboratory will involve in sampling and doing test for the pilot models. In addition, the project would promote the application of simplified environmental monitoring and testing to ensure food safety at multiple VC nodes through the application of rapid test kits and technology such as ATP kits, Petrifilm and scanning.

#### *Building up and applying traceability system*

Food traceability is central to food safety management and a tool to add value to food products. SAFEGRO will help to set up a traceability system in the project's pilot models. This system will be aligned with GS1 connected to the National Traceability Portal (VNTP) in collaboration with the National Barcode Center. Specific activities for traceability have been proposed in the accompanying traceability report prepared by SAFEGRO.

[1] PUC is regulated in the Decision 3156/QĐ-BNN-TT date 19/8/2022 on temporary guideline on issuing PUC. Hanoi DARD also issued the plan 84/KH-SNN dated 3/10/2022 to implement PUC.

*Food safety certification*

To assure food safety along VCs, it is essential to standardize all procedures, practices and provide verification and validation of compliance through verifiable, audited certification programs. Current systems for VietGAP and HACCP, for example, lack robust governance and credibility and need to be improved and aligned with international standards. This will also help state management bodies to manage, audit and monitor all actors in VC with standardized procedures. SAFEGRO will focus on upgrading the VietGAP and HACCP certification programs through alignment with international standards, improved governance and transparency through a unified database of registered FBOs.

### Building up Food safety market model

Since a major portion of vegetables are marketed through the wholesale and retail markets of Hanoi, it is essential to improve food safety of these channels. The so-called food safety market model will initially focus on one wholesale markets (preferably Minh Khai) and retail markets (2-3 markets locating in central districts and one in Bac Hong commune). The tentative activities would be: deliver trainings on food safety practices to traders and vendors; re-arrange the business areas; support infrastructure improvement such as lighting system, toilets; support business signage with contact details for some traders; pilot traceability; classify and treat organic waste disposed from markets. Details of specific interventions are provided in an accompanying market food safety management guide.

### VC management guideline in accordance with international standards

It has been 10 years since MARD launched the program for building and developing safe agri-product VCs in 2013 (under Decision 3073/QĐ-BNN-QLCL dated 27/12/2013). However, it is likely that a comprehensive VC management mechanism has not been in place to guide the process. SAFEGRO will help to develop a guideline that illustrates the basic principles of VC development, provides basic instruction on how to build up, manage and develop food VCs assuring food safety and added value. This guideline will be applied to the project's pilot models. By the end of pilot phase, there will be a summary on implementation of the guideline, and the pilot models to finalize this guideline.

### Applying digital transformation in VCs

Digital transformation is the process of using digital technologies to create new or modify existing-business processes, culture, and customer experiences to meet changing business and market requirements, in this case with specific application to improved food safety. Digital transformation will be emphasized in SAFEGRO commune models. Digital transformation can be embedded in different activities such as farm management with eDiaries for farm recordkeeping for inputs, cultivation and harvesting, GS1 and PUC coding for traceability, cooperative business management, improved data management and information sharing among key VC stakeholders and consumers including social media channels, and eLearning..

## IMPROVE CAPACITY OF PRODUCTION AND SUPPLY OF THE VCs

SAFEGRO will develop a training framework that targets specific VC actors (farmers, collectors, cooperatives, wholesalers, retailers, supermarkets, convenient stores, collective kitchens) and partners (management bodies, certification bodies, labs, etc.) in order to improve food safety and production capacity. These trainings will cover a wide range of topics tailored for given actors and partners and will be delivered via face-to-face, online training classes, blended learning and e-learning platform. Traditional farmer field schools (FFS) approaches for IPHM will be adapted to focus on food safety management, CSA and other SAFEGRO priorities.

## INCREASE ABILITY OF MARKET ACCESS AND ADDED VALUE OF PRODUCTS IN THE VCs

SAFEGRO will organize communication campaigns to raise awareness of consumers about food safety and carry out trade promotion programs to advertise VC products to consumers. Developing labelling and brand identity for VC products is also under project's consideration. SAFEGRO agri-business staff will support value chain development with a focus on business outcomes to support sustainable investments in improved foods safety practices to ensure scaling and viability beyond the life of the project.

## GENDER MAINSTREAMING IN THE VCs

Gender equality and women empowerment are among the key operating principles of SAFEGRO. Gender-based activities including enhancing the effective participation of men and women in the pilot models and promoting female leaders and their influence in the pilot models and in cooperatives with a gender-sensitive model will be implemented in the pilot models. SAFEGRO will also consider youth in food safety interventions through schools and education programs that provide extra-curricular activities and, in some cases, enhancement of existing core curriculum with food safety programming in the pilot areas.

# 1 Introduction

**This Gender-based value chain assessment** (GBVCA) is an activity under Component 2 of the Safe Food for Growth (SAFEGRO) project, specifically under *Output 1211: Technical assistance provided to agri-food producers and processors, particularly women, to follow FS regulations, procedures and good agricultural/ manufacturing practices that are environmental sustainability consideration into account*. The report analyzes selected value chain (VCs) in Hanoi[2], one of the two participating provinces of SAFEGRO. It covers the Hanoi VCs of vegetables in general, with focus on mustard greens, morning glory and cucumber for risk assessment in order to identify difficulties and constraints of these VCs, and then proposes potential interventions to upgrade/improve the VCs to achieve the goal of food safety (FS) and add-valued in line with international standards. This report also provides a foundation for development of other related activities of the project and recommendations for interventions in subsequent annual workplans.

The analysis has been carried out by a team composed of SAFEGRO consultants, together with the Hanoi Department of Plant Protection (PPD) and Hanoi Working Group[3] which has assisted in establishing and developing selected sustainable agro-forestry-fishery VCs. This report was discussed with the Hanoi Working Group prior to being presented at consultation workshop with the respective VC's actors and actors, partners as well as other relevant agencies tentatively held in late March 2023.

# 2 The objective

This study has four main objectives, namely:

- To identify key VCs that need to be prioritized for evaluation and support in order to develop into the pilot models on VC development;
- To identify the issues in the VCs for interventions to achieve FS outcomes and provide added value;
- To support FS risk assessments and risk ranking in the selected VCs to prioritize SAFEGRO interventions for optimal impact;
- To propose a plan for SAFEGRO to support selected VCs to achieve FS outcomes and provide added value in a sustainable way, and provide guidance for VCs to align with international standards.

# 3 Approach and methodology

## 3.1 Some concepts

**Value chains (VC):** The VC refers to the entire range of processes, activities, forms of processing or transforming services and inputs into products, from primary production to the final consumer and disposal after use[4,5].

[2] The selection of VCs for Ho Chi Minh has not yet been decided.
[3] Hanoi Working Group consists of 9 members from different departments under Hanoi DARD, officially formed by Decision 1659/QD-SNN dated 7/10/2022 by Hanoi DARD..
[4] R. Kaplinsky, 'Globalization and inequality: what we can learn from the value chain analysis', Development research magazine vol.. 37, vol. 2, 1999, trang. 117-146.
[5] R. Kaplinsky and M. Morris, Manual for value chain research, *Brighton, the UN research development institute*, University of Sussex, 2001.

**Gender** refers to the socially-constructed roles, behaviors, expressions and identities of girls, women, boys, men and gender-diverse people. It influences how people perceive themselves and each other, how they act and interact, the distribution of power and resources in society, and people's social, health and economic outcomes[6].)[7].

**Gender-sensitivity** is the ability to perceive gender issues, especially the ability to recognize differences in perceptions and preferences of women from different social positions and gender roles. Gender sensitivity is considered as the beginning stage of gender awareness. [8]

**Gender-based analysis plus** is the systematic review and analysis of differences in barriers or opportunities for individuals or groups based on their gender identity, status or class[9].

**Climate Smart Agriculture (CSA)** is an approach to transform and reorient agricultural production systems and food VCs towards sustainable development, resilience and food security in the context of Climate Change (CC). CSA has three main objectives: i) sustainable increase in productivity and income; ii) adapt and build resilience to CC and iii) reduce or eliminate greenhouse gas emissions[10]. The CSA approach is seen as a starting point for essential information on how to make agriculture, forestry and fisheries part of the solution to tackle with the negative impacts of CC. In the case of SAFEGRO, food safety is considered in the context of its relationship with CC.

**Food Safety** references the practices, processes and behaviours which assure that food will not cause an adverse health effect for the consumer when it is prepared and/or consumed in accordance with its intended use[11].

## 3.2 Research approach

This GBVCA approach encompasses a combination of VC analysis and gender-based analysis applied in VC selection, VC analysis and interventions to improve and upgrade VCs as outlined in Table 1:

**Table 1: Aspects of gender analysis in GBVCA**

| Aspects | Analysis content |
|---|---|
| VC selection | Selecting VCs based on potential factors contributing to gender equality and women's empowerment. |
| VC analysis | Designing research, surveying VC with the participation of gender experts.<br>The VC group of experts understand gender and women empowerment.<br>Analyzing gender roles, barriers and gender gaps in VCs.<br>Analyzing opportunities to promote gender equality or contribute to women's empowerment.<br>Disaggregating data by gender and social characteristics of participants. |

[6] Government of Canada. Link website: https://women-gender-equality.canada.ca/gbaplus-course-cours-acsplus/eng/mod01/mod01_02_04.html

[7] Gender terminology (accessed at https://pdf.usaid.gov/pdf_docs/Pnadl089.pdf)

[8] Gender terminology (accessed at https://pdf.usaid.gov/pdf_docs/Pnadl089.pdf)

[9] Source: https://women-gender-equality.canada.ca/gbaplus-course-cours-acsplus/eng/mod03/mod03_02_01.html

[10] FAO, Climate Smart Agriculture Sourcebook, access on 4/1/2023 at https://www.fao.org/climate-smart-agriculture-sourcebook/concept/module-a1-introducing-csa/chapter-a1-2/en/

[11] ISO 22000:2018 Food safety management systems — Requirements for any organization in the food chain.

| Aspects | Analysis content |
|---|---|
| VC improvement, upgradation | Training to improve the understanding on gender and gender integration.<br>Concrete action plan to fill the gender gap.<br>Concrete results towards gender equality, women empowerment.<br>Indicators to measure the gender and women empowerment impacts. |

This study employs a FS approach as the basis for VC selection processes, the assessment as well as providing recommendations. More specifically, it emphasizes the selection criteria related to public health, microbiological pathogens, chemicals (pesticides, heavy metals, nitrate), physical hazards, allergens, buyers' food safety risk score, importance in the food system and diet, and incidence of food-borne illness. The team employed risk ranking metrics developed by FAO (2017) as basis to score against each criteria (Table 2). In designing the survey questionnaires for VC actors, a FS approach was used to examine current actor's practices relating to FS as an initial evaluation of food safety culture.

Table 2: Public health criteria for selection of VC and scoring

| Criteria | Scoring |
|---|---|
| Microbiological pathogens | 1. Very low microbial risk<br>2. Low microbial risk<br>3. Tolerable microbial risk<br>4. High microbial risk<br>5. Very high microbial risk |
| Chemical hazards (pesticides, heavy metals, nitrate) | 1. Very low chemical risk<br>2. Low chemical risk<br>3. Tolerable chemical risk<br>4. High chemical risk<br>5. Very high chemical risk |
| Physicals hazards | 1. Very low physical risk<br>2. Low physical risk<br>3. Tolerable physical risk<br>4. High physical risk<br>5. Very high physical risk |
| Allergens | 1. Containing no allergens<br>2. Containing very low level of allergens, almost no allergic reactions.<br>3. Low incidence of food allergies and/or mild food allergic symptoms.<br>4. Moderate incidence of food allergies, negatively affecting human health.<br>5. High incidence of food allergies, severely affecting human health. |
| Buyers' food safety risk score | 1. Very low buyers' food safety risk score<br>2. Low buyers' food safety risk score<br>3. Tolerable buyers' food safety risk score<br>4. High buyers' food safety risk score<br>5. Very high buyers' food safety risk score |
| Importance in the food system and diet (production volumes in Hanoi) | 1. Growing area < 300 ha<br>2. Growing area from 300 to less than 1,000 ha |

| Criteria | Scoring |
|---|---|
| | 3. Growing area from 1,000 to less than 2,000 ha<br>4. Growing area from 2,000 to 3,000 ha<br>5. Growing area > 3,000 ha |
| Incidence of food-borne illness | 1. No report on food safety issues/incidence within 10 years.<br>2. 1 - 5 reports on safety issues/incidence within 10 years. There have been no cases of human infection.<br>3. 6 - 10 reports on safety issues/incidence within 10 years. There are cases of infection in humans, but the level is mild, not causing serious consequences.<br>4. 6 - 10 reports on safety issues/incidence within 10 years. There are cases of infection in humans, leading to serious consequences but no death.<br>5. > 10 reports on safety issues/incidence within 10 years. There are cases of infection in humans, leading to death. |

CSA will also be used to analyze CC and environmental issues and its impact on ensuring FS in the VC as well as to study strategies and actions to adapt to CC, good agricultural practices (GAP) in the selected VCs; proposing appropriate strategies to adapt and minimize the impact of CC on vegetable production.

## 3.3 Methodology

### 3.3.1 Method to select products for research and support

The Cooperation Plan No. 1048/KH-QLCL-SNNHN-DA to support Hanoi in developing a number of sustainable agro-forestry-fishery VCs signed between the Department of Agro-Forestry-Fisheries Quality Management (NAFIQAD) the Hanoi Department of Agriculture and Rural Development (DARD) and the SAFEGRO project on 15/8/2022 proposes the project will support Hanoi to develop 7-8 VCs. After developing the cooperation plan, the Project organized working sessions between the Project and Hanoi's departments (PPD, Sub-Department of Livestock Production (DLP)) and reached a consensus on prioritizing the selection of vegetable and pork VCs for support. Pork and vegetable are the most consumed foods in daily diet of Vietnamese people and getting big concern of consumers for FS issues[12].

Due to diversity of vegetable groups (vegetables, tubers, fruit, stem, flower, seed) and vegetable species within each group, the study is limited to some three specific vegetables identified as follows:

- Identifying main vegetables: Based on vegetable production areas data provided by Hanoi PPD, the main vegetables of Hanoi have been identified as mustard green, morning glory, cucumber, onion, green onion, beans, cabbage, coriander, and spinach.
- Developing a set of selection criteria: The set of selection criteria is based on governance, public health, potential for social impacts, environmental and CC, business and market models, primary production, knowledge and behavior of key actors, and linkages with other programmes. In each group of criteria, there are specific criteria and different levels of importance, assigned with weights to each group. The two groups that are a higher priority in the project context, governance and FS, are assigned the highest weight compared to the remaining groups.
- Scoring criteria and prioritizing vegetables*:* Secondary documents included scientific reports, research results, evaluation reports of state agencies, articles, journals, results of quality analysis,

[12] Worldbank (2017); Coordination Board for vegetable and meat VC development for Hanoi (2020), Report on summary of coordination program on development of vegetable and meat VCs for Hanoi in the period 2015-2020 issued on 23/10/2020.

results of quality surveillance program for identified vegetables, and consensus among the technical team. Based on the collected documents, the team scored each criterion and calculated the total weighted score for each vegetable (see detailed score result in Annex 2). As a result, three vegetables were prioritized for analysis and support for VC development, in order of priority: **mustard greens, cucumber, and morning glory**[13].

Table 3: Vegetable selection criteria

| Criteria | Weighing factor | Index |
|---|---|---|
| Governance | 20% | Aligned with government priorities and key products. (Export vs. domestic markets) |
| | | Potential impact of improved legislation, coordination, and enforcement. |
| | | Responsible agency (MARD, MOH, MoIT), especially regarding Decree 15. |
| | | Transparency |
| Public Health | 20% | Microbiological pathogens |
| | | Chemicals (pesticides, heavy metals, nitrate) |
| | | Physicals |
| | | Allergens |
| | | Buyers' FS risk score |
| | | Importance in the food system and diet (consumption volumes HCMC vs Hanoi) |
| | | Incidence of Food-borne illness |
| Potential for Social Impact | 15% | Engagement and gender equality |
| | | Women economic empowerment |
| | | Youth empowerment (age under 30) |
| | | Assn for Customers Rights Protection |
| | | Commitment of local govt including enforcement, penalties, and sanctions |
| Environment and CC | 15% | Environment impacts of production (water, air, soil) |
| | | Climate impacts – level of GHG emissions and need for mitigation |
| | | CC vulnerability - need for CC adaptation |
| Business and Market Models | 10% | Market type (domestic market) |
| | | Market type (export market) |
| | | Potential for export |
| | | Presence of market access restrictions |
| | | Postharvest losses |
| | | Potential for processing to increase the value added |

[13] A national monitoring program on pesticide residual on vegetable and fruit from 2008-2012 shows that vegetables have higher risk of pesticide residual than fruity vegetable, in which the highest risk vegetable are vegetables shrinkage, morning glory, mustard greens, and bean (Source: https://www.thiennhien.net/2013/07/15/giam-sat-chat-ton-du-thuoc-bao-ve-thuc-vat-tren-rau-qua/).

| Criteria | Weighing factor | Index |
|---|---|---|
| | | Availability of FS certification system. |
| | | Cost effectiveness (cost: benefit) of adopting certification systems. |
| | | Economic opportunities, especially for small holders and/or women |
| | | Employment opportunities, especially for small holders and/or women |
| | | Market requirement for safer foods. |
| | | Degree of competition in the supply chain |
| | | Large companies and/or cooperatives able to act as change agents. |
| | | Potential for public-private partnerships |
| | | Potential for sustainable and scalable pilots |
| | | Risks of recalls, rejections, and reworks |
| Primary Production | 5% | Number of people involved (sex-disaggregated data) |
| | | Geographic coverage |
| | | Complexity of the production system. |
| | | Prevalence of conflicts in resource use. |
| | | Availability of technical guideline/practices for safer product (VietGAP, Global Gap, etc.,) |
| Knowledge and Behaviors | 10% | Degree of consumer awareness (gendered) |
| | | Availability of FS campaign/education program or training material [informal, non-formal and formal education) |
| Linkages | 5% | Relevant coordination linkages and resources available. |
| | | Other donor projects and gov't programs (WB; VCs; cooperatives etc.) |

Although the project focused on support in the VCs for 3 selected vegetables, the Hanoi PPD suggested this could be problematic based on vegetable production and trading in Hanoi. Specifically, actors in the vegetable VC often cultivate and trade various types of vegetables at the same time, so supporting only a few types of vegetables will be difficult to implement in practice. It was, therefor, agreed that the scope of overall VC research and support be extended to cover all vegetables in general (with one exception being cucumber). However, the more detailed quantitative risk assessments will still be conducted on the above 3 priority vegetables.

### 3.3.2 Method to select the VCs for research and support

VCs, in the broad sense can include the participation of many different actors in the stages of input supply, production, collection and distribution throughout the city. Such VCs consist of many different distribution channels, and each channel has the participation of many different actors, from input providers to final consumers. More narrowly, a VC can refer to a channel with the participation of a number of specific closely linked actors, including a key facilitating actor.

Currently, the VC of safe agricultural products and food in Hanoi, according to Decision 3073/QD-BNN-QLCL dated December 27, 2013 of the Ministry of Agriculture and Rural Development (MARD) adopts a more

narrow concept of the VC. Accordingly, these VCs include the participation of primary production, post-harvest facilities, primary processing and processing establishments, and product sales (ranging from the whole city to a more narrow scope encompassing local supermarkets, shops, and markets), in which the primary producer (e.g., cooperatives) or the primary processing facility is the key actor of the VC. Currently Hanoi has about 141 safe food VCs, of which 58 are vegetable VCs [14].

In response to the NAFIQAD Official Letter 1229/QLCL-CL2 dated September 21, 2022 requesting Hanoi to review and propose VCs, 6 vegetable VCs were proposed:

- Tien Le Agricultural Cooperative (Hoai Duc district),
- Dang Xa Agricultural Service Cooperative (Gia Lam district);
- Van Duc Agricultural Service Cooperative (Gia Lam district);
- Chuc Son Safe Vegetables and Fruits Cooperative (Chuong My district);
- Dai Lan general trade service business Cooperative (Thanh Tri district);
- Cuoi Quy high-tech organic vegetable production and trade Cooperative (Dan Phuong district)

Consideration was also given to consider 4 additional VCs related to four cooperatives, namely: Bac Hong Cooperative (Dong Anh district), Yen My Cooperative (Thanh Tri district), Dong Cao Cooperative (Me Linh district), Phu An Cooperative (Phuc Tho district).

The team prepared a criteria checklist of 7 groups (including 20 specific criteria -see detailed criteria in Annex 1) including i) production scale and FS conditions of the establishment; ii) production management and FS; iii) infrastructure for vegetable production and trading; iv) product sales organization; v) the possibility of traceability; vi) access to information technology and vii) readiness to participate in the Project. The team (with the participation of staff from the Hanoi PPD) evaluated each cooperative through working sessions, discussions and direct visits to the cooperatives. The results show that the 10 cooperatives evaluated can be divided into 2 groups with the following basic characteristics:

Table 4: Basic characteristics of the 10 evaluated cooperatives

| Cooperative | Scores | Basic characteristics |
|---|---|---|
| GROUP 1<br>Bac Hong<br>Chuc Son<br>Dai Lan<br>Dang Xa<br>Van Duc<br>Cuoi Quy<br>Yen My | <br>42<br>40<br>31<br>31<br>30<br>27<br>23 | • The cooperatives that buy vegetables or organize to buy vegetables from farmers and regularly supply to many different customer groups such as collective kitchens, supermarkets, and one-stop- shops.<br>• The cooperative has signed a principal contract/economic contract with farmers and customers<br>• The cooperative has an active form of controlling the quality of vegetables<br>• The cooperative has a transport car (except Dang Xa, Yen My) |
| GROUP 2<br>Tien Le | <br>14 | • The cooperatives that do not buy vegetables/organize to buy vegetables from farmers. They only act as linkage between the |

[14] Hanoi DARD, Report on agriculture material quality management, food safety of agriculture and fishery products of Hanoi in 2021

| Cooperative | Scores | Basic characteristics |
|---|---|---|
| Dong Cao<br>Phu An | 23<br>26 | buyers (having demand) and farmers. Farmers sell products by themselves.<br>• The cooperative has no channel supply to collective kitchens, supermarkets, and one-stop- shops.<br>• The cooperative has no transport car. |

Group 1 (including 7 cooperatives) was deemed more suitable to support the development of VCs than group 2 (including 3 cooperatives). The team selected 3 VCs of cooperatives for assessment based on the following criteria:

- VCs with diverse consumption markets, in which priority is given to VCs whose consumption encompasses informal markets, collective kitchens, supermarkets, and convenience stores;
- The VCs has different governance structures and levels of development, reflecting the current situation of Hanoi's vegetable VCs;
- The supply of morning glory, cucumber and mustard greens products is large enough to provide a framework for the subsequent risk assessment sampling and assessments;
- Located in different vegetable production areas of Hanoi.

The three VCs included Bac Hong, Van Duc and Yen My which were selected for in-depth analysis and potential SAFEGRO intervention.

### 3.3.3 Sample selection method for survey

The survey sample of each VC included input suppliers, vegetable farmers, cooperative facilities, collectors/traders, supermarkets/convenience stores, collective kitchens. The specific structure of the survey sample is as follows:

**Table 5: Survey sample and data collection method**

| VC | Input supplier | Farmers | Collector/wholesale/ trading company | Supermarkets/ convenience stores | Collective kitchens |
|---|---|---|---|---|---|
| Bac Hong Coop. | 2 | 20 | 2 | Big C | School, industrial zone kitchens |
| Van Duc Coop. | 2 | 20 | 5 | Aeon Mall, Mega Market | School kitchen |
| Yen My Coop. | 2 | 20 | 1 (Davicorp) | - | School kitchen |
| ***Data collection method*** | *Qualitative survey* | *Qualitative (12) + Quantitative surveys (48) + 2 Focus Group Discussion (FGD)* | *Qualitative surveys* | *Qualitative survey* | *Qualitative survey* |

Selection of input suppliers: Selection of 2 agents providing input materials (seeds, fertilizers, pesticides) in the commune where the cooperative's headquarters are located, namely Bac Hong commune (Dong Anh district), Yen My commune (Thanh Tri district) and Van Duc commune (Gia Lam district).

Selection of farmers: Farmers who sell products to cooperatives, can be the shareholders or not, have different sizes of vegetable planting areas, age of farmer heads and gender. Each cooperative made a list of about 40 farmers, from which 20 farmers were randomly selected for qualitative/quantitative interviews and about 7 farmers for group interviews.

Selection of collectors/traders: Located in the same commune with farmers, purchasing vegetables from interviewed farmers.

Selection of supermarkets, convenience stores, collective kitchens: Purchasing vegetables from 3 surveyed cooperatives.

### 3.3.4 Data, information collection method

Secondary information included available statistics related to vegetable production, types of vegetables, cultivated area, distribution of vegetable production areas as a basis for selecting vegetable variety, VCs, vegetable production areas from the Hanoi DARD, and recent research reports on Hanoi vegetable VC as a basis for VC selection.

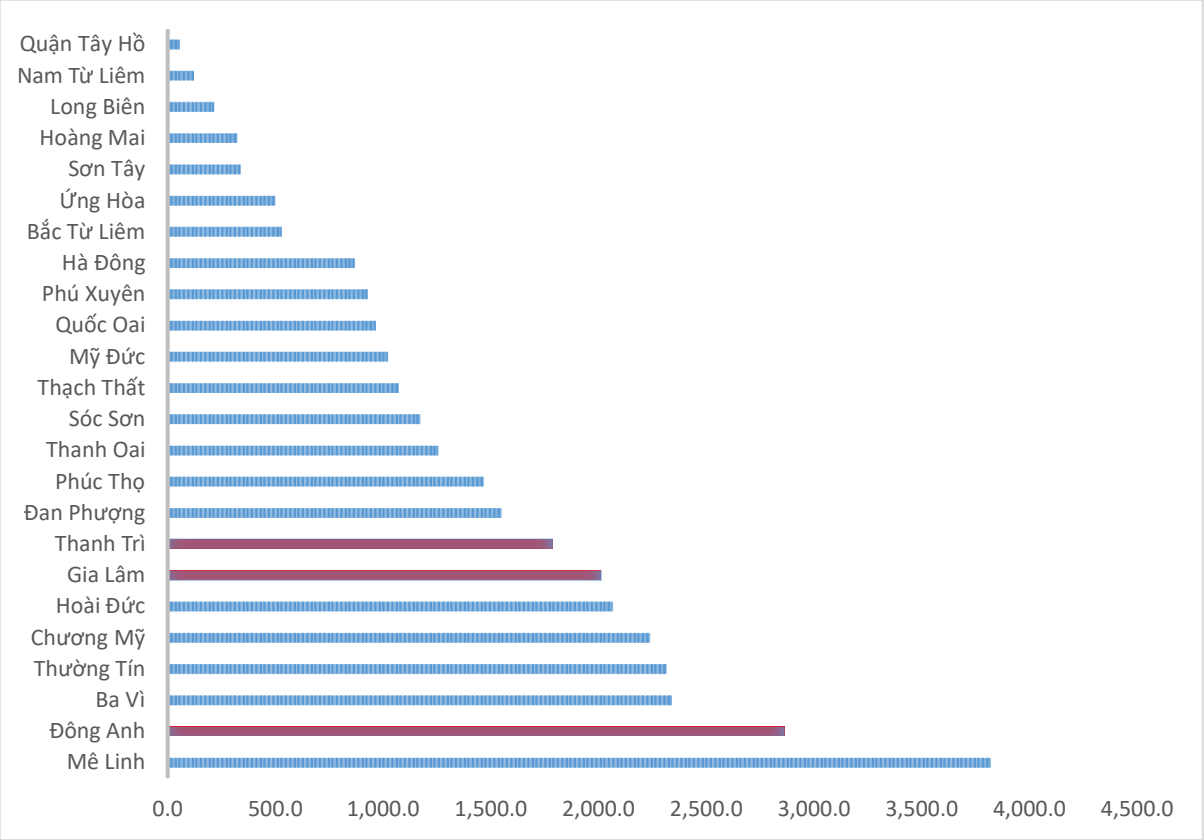
Primary information collection was carried out through a combination of qualitative and quantitative surveys and focus group discussions (FGD) (see Table 5). The quantitative survey questionnaire was designed and implemented using the Kobo toolbox.

# 4 Results

## 4.1 Characteristics of Hanoi vegetable production

The total area of annual crops in Hanoi is estimated at 229,526.3 ha (including rice, corn, vegetables, soybeans, peanuts, and annual flowers), in which the area for growing vegetables of all kinds is 33,331.9 ha (accounting for 14.5% of the total area of annual crops), the average vegetable yield is 216.48 quintals/ha, the output is estimated at 721,577.8 tons. The spring vegetable area reached 9,580.8 ha, yield 217.59 quintals/ha, output estimated at 208,020.5 tons. The area of seasonal vegetables reached 9,785.12 hectares, the yield was 203.7 quintals/ha, the output was estimated at 199,322.3 tons. The area of winter vegetables reached 12,467.6 ha, the yield was estimated at 225 quintals/ha, the output was estimated at 280,507.5 tons (see Figure 1).

Figure 1: Total vegetable production area of Hanoi City




*Source: Hanoi PPD*

Twenty-four of thirty districts of Hanoi produce vegetables. Districts with more than 500 hectares of vegetable growing area per crop include: Me Linh, Dong Anh, Gia Lam, Thanh Oai, Thuong Tin, Ba Vi, Hoai Duc, Dan Phuong, Chuong My, Phuc Tho and Thanh Tri. The districts, towns, with vegetable growing areas over 100 hectares but less than 500 hectares per crop include: Ha Dong, Son Tay, Quoc Oai, Ung Hoa, My Duc, Phu Xuyen, Soc Son, Long Bien, Hoang Mai, Bac Tu Liem, Thach That. District with vegetable growing area of less than 100 hectares per crop, including: Nam Tu Liem and Tay Ho. Vegetable producers in Hanoi are still small-scale farmers, the number of vegetable farming farmers is very large (about 200,000 farmers). There are very few significant large enterprises participating in vegetable production.

Vegetables grown in Hanoi are quite diversified with over 40 varieties, such as the vegetables including: mustard greens, collard greens, cabbage, spinach, bok choy, chrysanthemum, kale, morning glory, spinach, jute, squash, sweet potato, cabbage, and others; group of flowers and fruits vegetable including: tomato, kohlrabi, radish, cucumber, gourd, melon, cauliflower, zucchini, onion, bell pepper...; group of herbs, salad vegetables include: lettuce, scallions, green onion, perilla, marjoram, coriander, basil, hot chili...

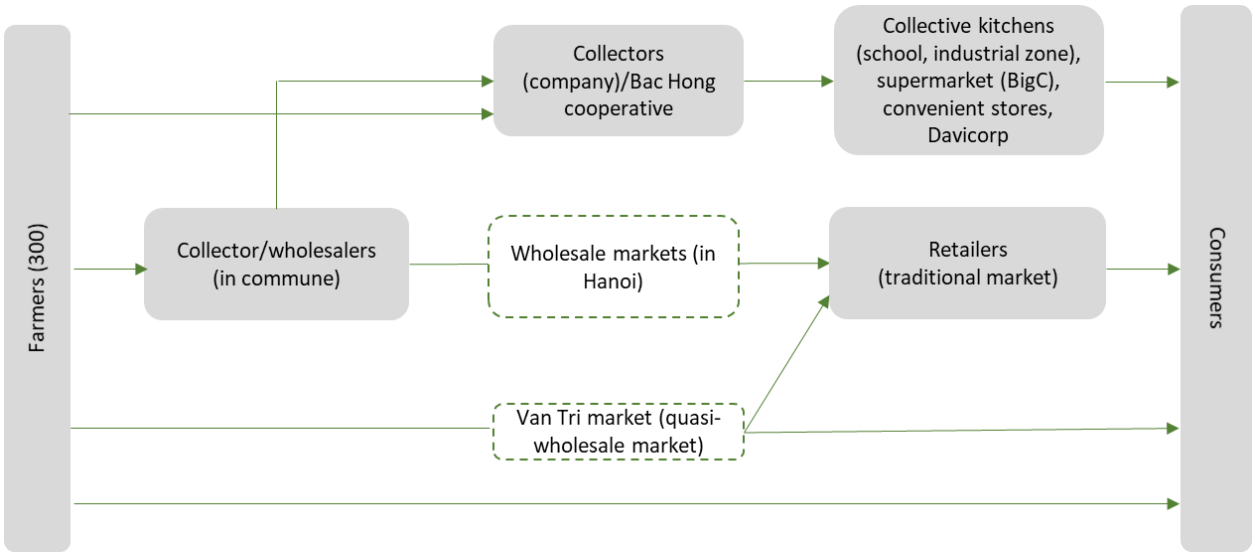
According to a report by the Hanoi DARD[15], the city has more than 50 high-tech models in vegetable production covering 504,4 ha. There are 27.04 ha of net houses accounting for 4.9% of high-tech vegetable production areas which apply VietGAP, organic systems, and GlobalGAP. The popular technologies used in vegetables production are new varieties, probiotics, compost, biopesticides, drip irrigation, shower irrigation, automatic and semi-auto irrigation, hydroponic, passlite cover, and more.

[15] Report No 387/BC-SNN dated 13/12/2022 by Hanoi DARD on performance result of 2022, tasks and solutions for 2023.

Hanoi's goal is to expand the area of safe vegetables[16] to about 8,000 - 9,000 ha, and the area of organic vegetable production to reach about 400 - 500 ha. The area of vegetables with high technology greenhouses and net houses is about 300 - 500 ha. Hanoi is also promoting the development of specialized farming areas with each group of vegetables, applying high technology, good agriculture production (GAP) procedures, organic production, ensuring FS associated with preliminary processing and processing facilities. The organization, management and guidance of non-specialized vegetable production areas, small, fragmented vegetable production areas are managed in accordance with the safe production procedures; to control pesticide residues below the prescribed threshold for 90% of the safe vegetable production area in Hanoi.

## 4.2 Mapping of selected vegetable VCs

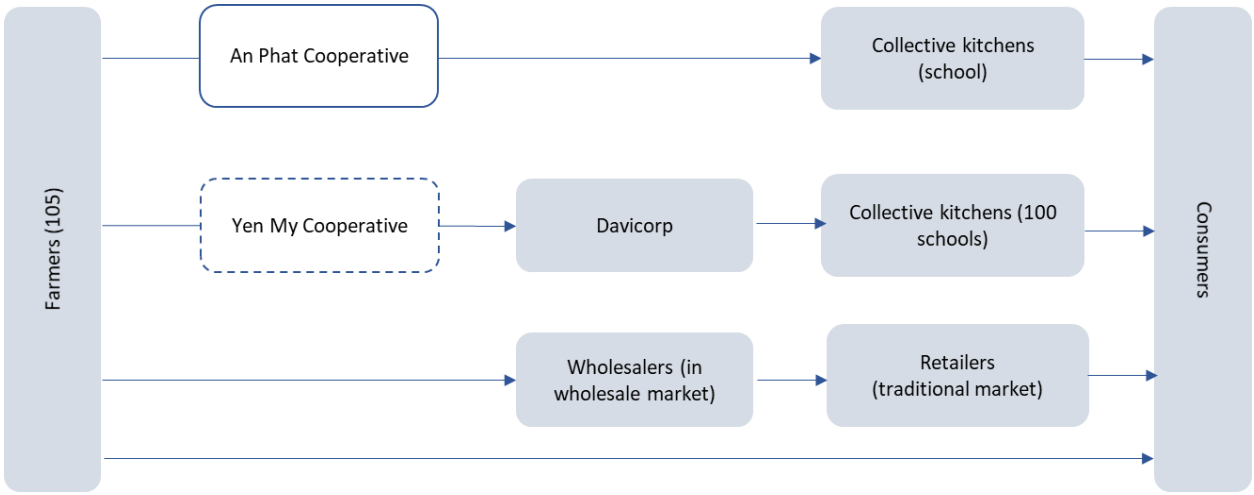
Figure 2: Mapping of Bac Hong vegetable VC




*Source: Survey results, 2022*

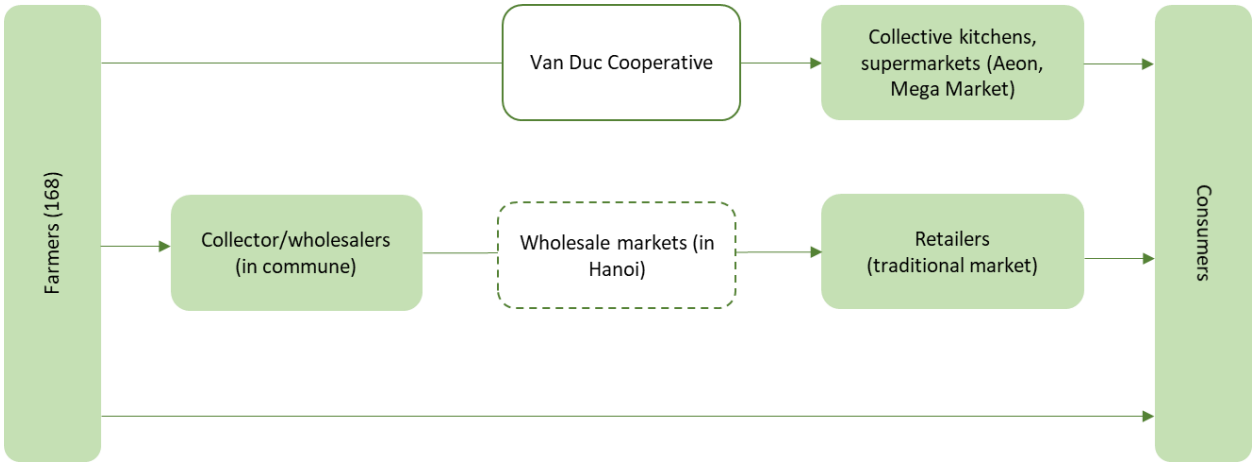
[16] According to Circular 59/2012/TT-BNNPTNT dated 9/11/2012, safe vegetables, fruits are the fresh vegetables, fruits which are produced, preliminarily processed, processed in accordance with national technical regulations of the conditions to ensure food safety or in accordance with the process of technique of production and preliminary processing of safe vegetables, fruits approved by the Department of Agriculture and Rural Development or in accordance with the regulations relating to food safety assurance included in the process of good agricultural practices for fresh vegetables and fruits VietGAP, other GAP standards and typical patterns achieving food safety indicators as prescribed.

Figure 3: Mapping of Yen My vegetable VC




*Source: Survey results, 2022*

Figure 4: Mapping of Van Duc vegetable VC




*Source: Survey results, 2022*

## 4.3 Characteristics of nodes and actors in the VCs

This section details the findings collected during field visits to actors at different nodes of the three selected VCs. This captures current operational characteristics of actors as well as summarizes key issues that are critical to FS and VC management, development.

### 4.3.1 Input supply and primary production

Input supply and primary production node includes three actors: input suppliers, farmers and cooperatives. This section discusses the key findings withdrawn from qualitative and quantitative surveys of these actors.

#### 4.3.1.1 Input suppliers

The surveyed input suppliers (n=6) are agents located in the same commune with 3 cooperatives, supplying fertilizers and pesticides, some supplying both vegetable seeds and agricultural tools. Among these, there are two agents starting business from 2020, two agents operating since 2007, 2008 and one agent starting

from 1994. Regarding qualifications, two agent owners completed middle school, two people completed high school and one has a vocational training diploma.

Biopesticides are widely used in vegetable production recently with approximately 60% of farmers in safe vegetable production areas using biopesticides on vegetables[17]. Among surveyed input suppliers, on average, each agent sells 10 or more pesticides, of which biopesticides account for about half.

From the survey, it is widely understood by the agent that chemical pesticides are usually more potent and have longer protective effects and preharvest interval (PHI)[18] (usually 7 days) while biopesticides is less potent with shorter PHI (averagely 2-3 days; many biopesticides require one day PHI).

In addition to the protective effect and PHI, according to the agents, reasons for using both chemical pesticides and biopesticides are due to resistance issues, production cost and farmer's health concerns. Agents have perception that using only biopesticides or chemical pesticides will lead to pest/disease resistance, therefore alternating use of chemical pesticides and biopesticides is necessary. The price of biopesticides is often more expensive than chemical pesticides[19] leading to increase of production costs. Therefore, vegetable farmers normally use chemical pesticides in the early stages of vegetable's development and biopesticides when vegetables are close to harvest time (among 48 surveyed farmers, 47 said that they use biopesticides in vegetable production). In addition, vegetable farmers are concerned for their health and prefer biopesticides over chemical pesticides.

Figure 5: An input supplying agent at Yen My commune

The surveyed agents also advise farmers to change pesticide after each or several crop cycles to avoid pest/disease resistance[20]. This is a common practice in vegetable cultivation by farmers in all 3 surveyed

[17] https://hanoi.gov.vn/tintuc_sukien/-/hn/ZVOm7e3VDMRM/2845249/san-xuat-va-tieu-thu-rau-an-toan-tao-buoc-nhay-vot-trong-nong-nghiep/print;jsessionid=LRlKPzWW2Dz9oS36N+x3RXbB.app2

[18] The preharvest interval (PHI) is the minimum amount of time between the last application of a pesticide and when the crop can be harvested. Harvest is the cutting of the crop or removal of the produce from the plant.

[19] https://nhandan.vn/go-kho-cho-san-xuat-va-su-dung-thuoc-bao-ve-thuc-vat-sinh-hoc-post666607.html, https://nongnghiep.vn/thoi-cua-thuoc-bao-ve-sinh-hoc-d305995.html

[20] According to item 2d, Article 64 of the Law on Plan Protection and Quarantine, pesticide dealers are responsible for guiding buyers on use of pesticides following content on package. According to Article 4, Decree 123/2018/NĐ-CP dated 17/9/2018 on amending Decree on investment and

production areas. Accordingly, even the current pesticide is still effective against a certain type of pest, the agent still recommends farmers to switch to another pesticide after 1-2 crop cycles. This widely-applied practice in the surveyed areas seems to meet both the agent's business interests and technical aspects relating to pest/disease resistance[21].

> *"I don't know well the price differences of chemical and biopesticidees as I buy in bulk"*
>
> *(Source: vegetable farmers in Bac Hong)*

Agents still play an important role in advising farmers on the use of pesticides, including the use of combinations of pesticides. This situation is reflected in the way farmers buy and use pesticides and fertilizers. Agents advise farmers on the type of pesticide to spray based on the description and severity of the pest or disease. Farmers sometimes bring diseased vegetable leaves as sample to the agents for diagnosing and selling pesticides. In some cases farmers buy pesticides in bulk (usually by bottle) without caring about pesticide name and price per unit. This shows that these farmers are heavily dependent on the agent's advice on selection of pesticides.

Although counseling is common, agents have no responsibility or do not monitor the farmers use of pesticides or fertilizers as advised. Based on their experience and observations, the interviewed agents assume that farmers are compliant with the principle of "4 Rights"[22] in the use of pesticides and fertilizers. When asked if there is room for improvement in farmers' practice of using pesticides and fertilizers, agents said that the principle of right time is very important. That is, early detection of pests as soon as they appear and spraying at the right time will increase effectiveness of pesticide killing. If pests are detected late, farmers will increase the number of sprays and spray frequency (e.g., spraying two times instead of one time, spray in consecutive days instead of once every several days) both increasing costs, and risk of chemical residues on vegetables.

Agents capture information on the list of pesticides that are allowed and not allowed to be used through regular training courses of the district PPD or Hanoi PPD. Information from these agencies is still the agent's official access to the above information, besides other channels such as the internet. Agents also claim that regulations on pesticide business are followed. Their activities are also regularly inspected by authorities, mainly through interdisciplinary inspection teams including commune authorities.

There seems to be concerns about the quality of pesticides and fertilizers between agents and farmers. Farmers said that if they buy fake, poor quality pesticides and fertilizers and report back to the agents, no form of compensation will occur. Agents even responded that they are just traders and not sure about the quality of pesticides and fertilizers until they are users themselves. Farmers also reported that agents possibly sell unknown origin pesticides which are not publicly displayed but hidden in a more discreet place.

#### 4.3.1.2 Farmers

*Demographic characteristics of vegetable farmers*

The average age of the surveyed group of farmers is 56 years old, in which the male is 58 years old and the female is 55 years old. The average age of farmers in Yen My is 51 years while in Van Duc and Bac Hong it is 58 years old. Most of the farmers surveyed have had a long experience of growing vegetables with an average of 32 years.

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business requirements in the agriculture sector, pesticides sellers must have an intermediate or higher degree in one of the majors in plant protection, cultivation, chemistry, biology, or agronomy, or have a professional training certificate on pesticides.

[21] Longer use of a single chemical class will enhance the chance of resistance since the survivors of the first generation and the next will most likely be tolerant to that class. Rotating through many chemical classes in successive generations will help maintain efficacy (Wilen CA, Koike ST, Ploeg AT, Tjosvold SA, Bethke JA, Mathews DM, Stapleton JJ., n.d.) .

[22] "4 Rights principle" in pesticide application incudes right pesticide, right concentration and dose, right way, right time.

The surveyed farmers consisted mainly of secondary school graduates, accounting for 68.7% of the total respondents. 25% of them finished high school and 4.1% had vocational training degrees.

Table 6: Some economic indicators of vegetable growing farmer in surveyed communes

| Commune | Average income per farmer per year from vegetable growing (Mil. VND) | Profit/revenue rate from vegetable growing (%) | Percentage of income from vegetable growing related to total income of the family (%) |
|---|---|---|---|
| Van Duc | 97.9 | 53.3 | 74.4 |
| Yen My | 95.0 | 52.3 | 76.2 |
| Bac Hong | 237.3 | 50.4 | 62.3 |

*Source: Surveyed results, 2022*

*Land sizes of vegetable growing*

The average vegetable land area of all surveyed farmers is about 3,041 $m^2$ (equivalent to 8.4 sao or 8.4*360$m^2$ in the North). However, excluding the 3 farmers with vegetable growing areas ranging between 10,800-21,600 $m^2$ in Bac Hong commune (due to renting land), the average growing area of farmers in the 3 communes is about 2,204 $m^2$ and there is not much difference between the communes in terms of vegetable growing land sizes.

Table 7: Average vegetable production land area/farmer in surveyed communes

| Name of commune | Average vegetable area/Household ($m^2$) | Minimum vegetable area ($m^2$) | Maximum vegetable area ($m^2$) |
|---|---|---|---|
| Van Duc | 2.334 | 720 | 5.400 |
| Yen My | 1.999 | 1.200 | 3.600 |
| Bac Hong | 4.770 | 1.440 | 21.600 |

*Source: Surveyed results, 2022*

Among 3 types of morning glory, mustard greens and cucumber, mustard greens is grown on the largest area in the surveyed farmers. On average, each farmer grows about 564 $m^2$, about 2.8 crop cycles per year. Meanwhile, morning glory has an average cultivation area of about 406 $m^2$ with 3 crop cycles per year while cucumber is grown on the average scale/smallest farmer, about 211 $m^2$ with 1.4 crop cycles per year.

Table 8: Area, number of crops and average productivity of cucumber, morning glory and mustard greens

| Type of vegetable | Cultivation area per crop cycle ($m^2$) | No. of crop cycles per year | Average volume per sao per year (kg) |
|---|---|---|---|
| Cucumber | 211 | 1.43 | 660 |
| Morning glory | 406 | 3.05 | 400 |
| Mustard greens | 564 | 2.83 | 495 |

*Source: Surveyed results in 2022*

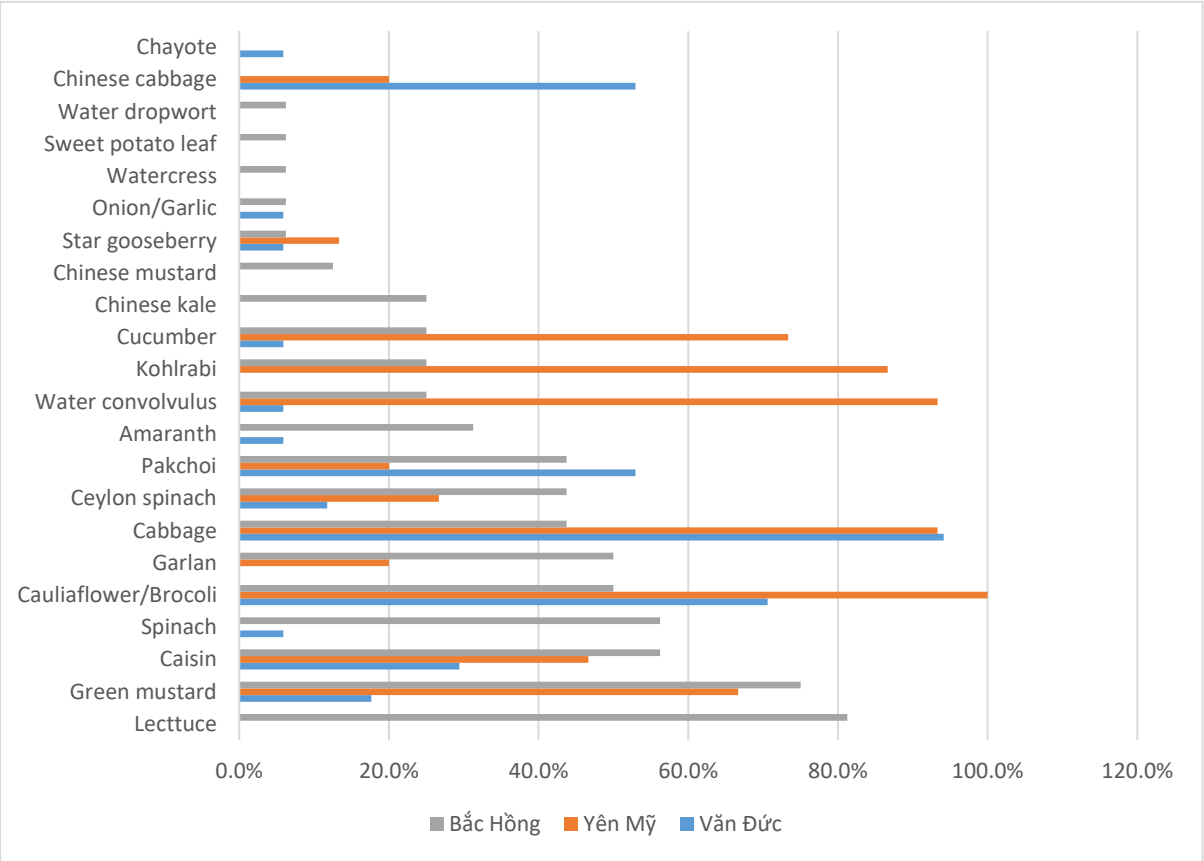
*Types of vegetables*

Farmers in all three communes grow various kinds of vegetables throughout the year, although there are certain differences between communes. The number of varieties of vegetables being grown in all 3 communes is about 24 types. On average, each farmer grows 6.3 different types of vegetables. Farmers in Van Duc tend to focus on certain types of vegetables, averaging 4.5 types of vegetables/farmer. Farmers in Yen My and Bac Hong grow more diversified with an average of 7.4 and 7.2 types of vegetables/farmer per year.

Figure 6 shows the percentage of farmers that grow vegetables in each surveyed commune. The most popular vegetables (in order from highest to lowest) grown in each commune are as follows:

- In Van Duc: cabbage, cauliflower, kohlrabi, cabbage, mustard greens
- In Yen My: cauliflower, cabbage, morning glory, kohlrabi, cucumber, mustard greens, spinach
- In Bac Hong: lettuce, mustard greens, cabbage, spinach, cauliflower, chrysanthemum, collard greens, amaranth, morning glory, kohlrabi.

Figure 6: Types of vegetables grown in the surveyed communes




*Source: Survey results, 2022*

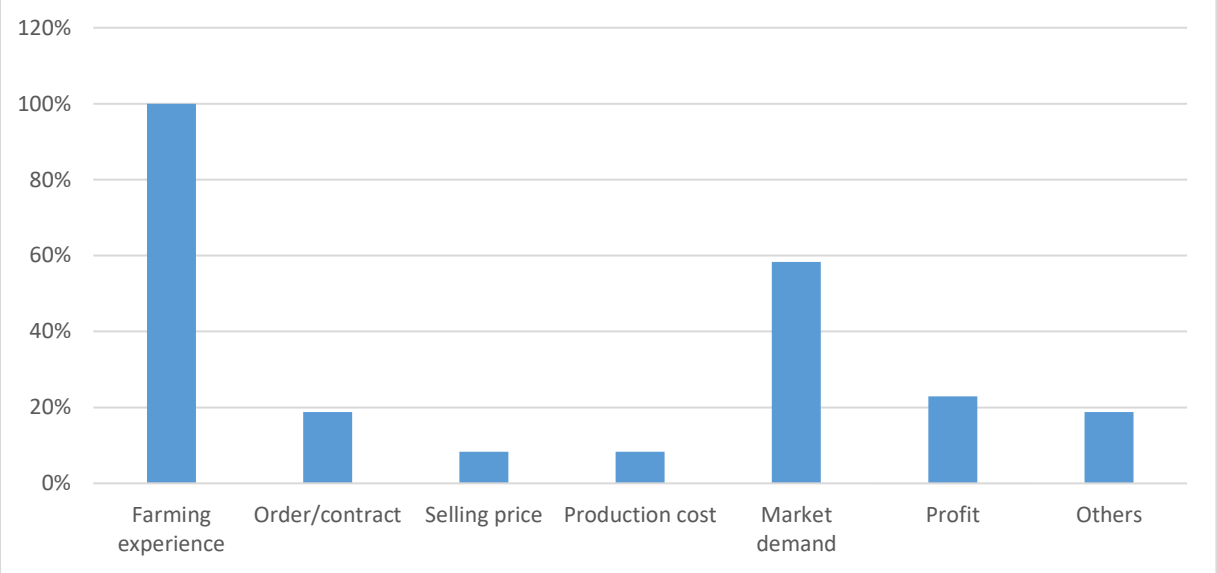
The selection of vegetables for cultivation is affected by many factors, mainly due to the long-standing farming habits of farmers in each region, market demand, profits, experience and labor availability. This means that farmers in an area are more likely to choose vegetables they have grown for many years, already know about farming techniques and are therefore generally less risky. This in another aspect also shows that it will not be easy for farmers to switch to another vegetable and the necessary condition is

technical training. Farmers also choose vegetables to grow based on market demand, but not too common (58% of respondents), besides based on profit calculation (Figure 7). They also tend to combine growing short-term vegetables (about 30-40 days) and longer-term vegetables (about 70 days) both to spread risks in both markets and pests, and to earn income continuously from short-term vegetables. Farmers having fewer labor often focus on long-term vegetables that require less care, while farmers with more available labor prefer shorter-term vegetables.

Thus, the farmers are free to choose vegetables by their owned decision. The cooperative does not develop a common production and supplying plan among farmers that sell vegetables to the cooperative. This creates a certain obstacle for interventions to develop a common production plan to meet the needs of the variety, yield and delivery time of vegetables ordered by the customers.

> *"In lacking of money to invest and make cover/arches (costing 3 million VND per Sao unit), I mainly grow seasonal vegetables and vegetables that do not require arches. Those households that have covers/arches can grow more kinds of vegetables all the year round".*
>
> *(Source: Farmer in Bac Hong commune)*

**Figure 7: Factors influencing the selection of vegetable cultivated by farmers**




*Source: Survey results 2022*

### *Quality certificate*

In 2021, Hanoi had 5,044 ha of vegetable with Certificate of FS Eligibility (Giay chung nhan du dieu kien an toan thuc pham), 521.6 ha with VietGAP certificate and 50 ha with organic certificate23. At the surveyed cooperatives, the area of VietGAP certified vegetables as reported by the cooperative accounts for a small proportion of the vegetable cultivation area, of which Van Duc cooperative is 25 of 200 ha (12.5%), Bac Hong cooperative is 5 of 200 ha (2.5%), except for Yen My Cooperative which has a fairly large VietGAP certification rate of 58.6 ha of 87 ha (67.3%). Beside VietGAP, farmers also widely apply safe vegetable farming technique [24] (Table 9). However, farmers' compliance with the safe vegetable farming technique is not really clear because it is not controlled and certified by a certification body operating under State

[23] https://hanoi.gov.vn/tintuc_sukien/-/hn/ZVOm7e3VDMRM/2845249/san-xuat-va-tieu-thu-rau-an-toan-tao-buoc-nhay-vot-trong-nong-nghiep/print;jsessionid=LRlKPzWW2Dz9oS36N+x3RXbB.app2

[24] The farming technique for growing safe vegetable was officially issued in the Decision No. 2993/QĐ-SNN date 30/12/2016 by Hanoi DARD.

regulations. Therefore, farmers can claim to be applying the safe vegetable farming, it is not certain whether they actually follow the system.

Table 9: Application of safe vegetable production practices by kinds of vegetables

| Vegetables | Safe vegetable farming (%) | Organic (%) | VietGAP (%) | GlobalGAP (%) |
|---|---|---|---|---|
| Cucumber | 31.3 | | 25.0 | |
| Morning glory | 29.2 | | 27.1 | |
| Mustard green | 45.8 | 2.1 | 27.1 | 2.1 |
| Others | 47.9 | | 6.3 | |

*Source: Surveyed results, 2022*

Although applying a certificate of safe vegetable production like VietGAP is completely voluntary, granting and renewal of VietGAP certificate only works when government provide subsidies (Worldbank, 2017, p. xi). In fact, Hanoi DARD has provided strong support of VietGAP certificate for agricultural production establishments annually[25]. This support promotes expansion of safe vegetable production areas, raises farmers' awareness about safe vegetable production through regular trainings organized by Hanoi PPD, and extension centers.

### *Vegetable farming practices*

**Seed used:** 100% of the farmers surveyed bought seeds from agents in the commune. In addition, farmers also bought seeds from the cooperative (in the case of Yen My cooperative).

### Water sources

Water plays a major and fundamental role in the safety of food production. In food production processes, water quality and its impact on products and operations are generally underestimated (Bhagwat, 2019).

The three main sources of water that farmers in the surveyed areas are using for watering vegetables are well water (accounting for nearly 73% of the farmers), water from irrigation canals (accounting for 46%) and river water (accounting for 39%). In Bac Hong and Van Duc, farmers mainly use water from bore wells and irrigation canals to water vegetables. In Yen My, river water is used by farmers as the main source to water vegetables.

68% of farmers surveyed said that the water source for vegetable irrigation was sampled for analysis, mainly by state management agencies and cooperatives. Sampling can be done either periodically, unexpectedly or only during the certification registration process. Similarly, farmers also reported that soil for planting vegetable was also sampled for analysis (accounting for 79% of respondents) by government agencies and cooperatives.

### Pests and diseases on vegetables

The quantitative farmer survey shows some popular pests and diseases on cucumber, morning glory and mustard greens (Table 10):

Table 10: Popular pests and diseases on cucumber, morning glory and mustard greens

| Vegetable | Pest | Disease |
|---|---|---|
| Cucumber | Charm worms, chalk beetles and fruit borers | Root rot, late blight |

[25] According to the report No. 04/BC-SNN dated 9/1/2023 by Hanoi DARD, it supported 60 establishments to get VietGAP certificate, of which 22 VietGAP certificate for crops (for 135 ha), 10 for aquaculture, 10 for livestock. 5 establishments were also supported to get HACCP certificate.

| | | |
|---|---|---|
| Morning glory | Deep cavity, gray worm | Late blight, rust |
| Mustard green | Green caterpillars, silkworms, jumping beetles and aphids | Late blight, leaf curl |

*Source: Survey results, 2022*

### Application of pesticides

Pesticide agents are still the most important source of counselling on pesticides and how to use them in the surveyed communes although farmers have also become more active in the selection process. Among the surveyed farmers, 70% (n=32) said that they need advice from pesticide agents on purchasing and using pesticides. 63% (n=29) of them said that they choose and buy pesticides based on the effectiveness of their previous use. Nearly half of the farmers surveyed also partly consulted technical staff of the district PPD or Hanoi PPD through training courses.

Farmers often buy pesticide when they need it (91% of farmers said), only about 19% have pesticides stored at their home warehouse. This shows that farmers always have discussions and consultations on pesticide with agents right before they use.

Table 11: How farmers decide to buy pesticides

| Consultation resources | Percentage of response (%) |
|---|---|
| By themselves | 63.0 |
| Requested by cooperative/customers | 13.0 |
| Consulted by agents | 69.6 |
| Consulted by technical staff | 47.8 |
| Consulted by pesticide companies | 2.2 |
| Other (detailed) | 4.3 |

*Source: Survey results, 2022*

**Mixing pesticides (normally insecticides with fungicides) for spraying is a common practice by the surveyed farmers.** 52% of farmers surveyed said that they also do the mixing sometimes, 21% of farmers do regularly and only 27% do not mix. The main reason for mixing pesticides is to save labor[26]. Farmers know quite well the mixing technique mainly from personal experience (69% of interviewed farmers), or from the advice of a pesticide agent (66% of interviewed farmers). A smaller number of farmers also learn from each other (26%) or refer to the instructions on the pesticide label (23%).

Table 12: Reference sources for farmers to mix pesticides

| How farmers make decisions to mix | Percentage of response (%) |
|---|---|
| By personal experience | 68.6 |
| Learning from other farmers | 25.7 |

[26] A research carried out by (Thanh Mai Nguyen, Nga Thi Thanh Le, Jouni HaVukaiNeN and David B. HaNNaway, 2018) on 128 vegetable farmers in Lam Dong shows that 98% of farmers applied pesticides in mixtures. 62% reasoned that mixtures would result in higher effectiveness of pests control, 34% reported a stratagem of eliminating multiple pests simultaneously, and 4% reported a potential for reduced labor cost or spraying time.

| | |
|---|---|
| Advised by supply agent | 65.7 |
| Referring to the instructions on the package | 22.9 |
| Guided by agriculture extension staff | 22.9 |
| Guided by pesticide production company | 8.6 |
| Others | 5.7 |

*Source: Survey results, 2022*

The dosage of pesticides used depends on many factors, including weather, pest affection. Farmers said they follow the mixing instruction recommended by the manufacturer on the packaging. However, when the infestation of pests and diseases get worse, they will increase the spraying frequency (spraying for several days continuously) although farmers still follow instructed concentration and dose (farmers are aware that strong dose could make plants die, and waste pesticides). In case of high humidity, they need to spray more frequently. Increasing pesticide application leads to higher risk of chemical residues on the vegetable, financial loss and directly affects the health of the producers.

> *"The vegetables such as mustard green, master green need to be sprayed against jumping bugs, every 3-4 days otherwise they can't be harvested. If it is cold, reduce the spraying frequency (once a week) and increase the frequency when it is warmer.*
>
> *Cabbage needs to be sprayed the most regularly otherwise it will be crushed inside. In general, the leafy vegetable needs to be sprayed most except for lettuce and spinach"*
>
> (*Source: Vegetable farmers in Bac Hong commune*)

The farmer survey also shows that most farmers wear gloves, masks and boots when spraying. Farmers also wear raincoats and protective hat, and about half of the farmers interviewed wear specialized protective clothing. In addition, about 17% of them use other protective equipment such as safe pumping bottles, anti-poison masks, glasses (Table 13).

Table 13: Personal protective equipment used by farmers when spraying pesticides

| Protective wear | Percentage of response (%) |
|---|---|
| Specialized protective clothing | 52.1 |
| Anti-poison full face mask | 8.3 |
| Boot | 97.9 |
| Gloves | 100.0 |
| Rain coat | 66.7 |
| Mask | 97.9 |
| Protective hat | 50.0 |
| Others (detailed) | 16.7 |

*Source: Survey results, 2022*

The use of biopesticides has become very popular in all three surveyed communes where 97.9% of farmers report that they use biopesticides in vegetable production. As mentioned, farmers use both chemical

pesticides and biopesticides in different stages of vegetable development. Farmers' explained the reasons for wide use of biopesticides as being less toxic, less harmful for producers' and consumers' health, and short PHI (most biopesticides require PHI of 1- 2 days). However, chemical pesticides are still used because they have a stronger and longer protective effect than biopesticides[27]. They are applied far from the date of harvesting which farmers think that it helps reducing the risk of chemical residues. Farmers also said that they strictly follow the withdrawal period recommended by the manufacturer, even longer than recommended for which there is no evidence.

Table 14: A comparison between biopesticide and chemical pesticides

| Biopesticides | Conventional agrochemicals |
|---|---|
| • Often less toxic than conventional pesticides<br>• Very specific to the target pest<br>• Effective in small quantities, resulting in lower operator exposure<br>• Decompose quickly<br>• Less likely to have resistance issues | • Quicker kill, highly effective in controlling target pest populations<br>• Longer residuals activity, providing greater persistent control under field conditions |

*Source: https://inside.battelle.org/blog-details/biopesticides-vs.-conventional-pesticides*

In general, most farmers know the list of approved and prohibited pesticides (answered by over 80% of the respondents). However, this also means that there is a part of farmers who do not know this list. The main source of information is still from the government departments (mainly from the district PPD or Hanoi PPD) who provide information during the training classes. About one third of farmers still relies on agents for getting information on the list (Table 15). This suggests that PPD is an important source of official information for farmer's reference.

Table 15: How to access to information on the list of approved and prohibited pesticides

| Source of information | Percentage of response (%) |
|---|---|
| Government departments (PPD) | 85.7 |
| Television, radio | 21.4 |
| Internet | 4.8 |
| Input suppliers | 35.7 |
| Other farmers | 19.0 |
| Pesticide production company | 0.0 |
| Others | 4.8 |

*Source: Survey results, 2022*

[27] Biopesticides offer a lot of advantages, but they aren't a panacea. Because they are not commonly used and have very specific application requirements, growers need training to use biopesticides effectively. Since they are highly targeted, growers will need different products to control different kinds of pests and pathogens. And biologicals aren't available for all kinds of pests—in some cases, a synthetic agrochemical is the only option (Source: https://inside.battelle.org/blog-details/biopesticides-vs.-conventional-pesticides).

Environmentally friendly management measures are practiced, such as biological traps, hand catching, insect light trap rather than pesticide application, and 71% of the farmers surveyed apply at least one measure such as hand catching, luring traps, insect light trap, bait trap, or soil preparation (soaking or sprinkling with lime flour, soaking probiotics, regularly clearing the field). Among the measures, the use of yellow bait traps is quite simple (5-10 pieces per sao), the price is not high (8 thousand VND /piece) but it is not applied in all surveyed communes. For example, in Yen My, farmers do not use it because if only a few farmers use it, it will not be effective because insects can still come from other fields. To be effective, it needs to be used on a large scale.

Table 16: Other plant protection measures applied by the farmers

| Measures | Percentage of response (%) |
|---|---|
| Biological trap | 52.9 |
| Insect light trap | 8.8 |
| Hand catching | 47.1 |
| Natural enemy | 0.0 |
| Others | 26.5 |

*Source: Survey results, 2022*

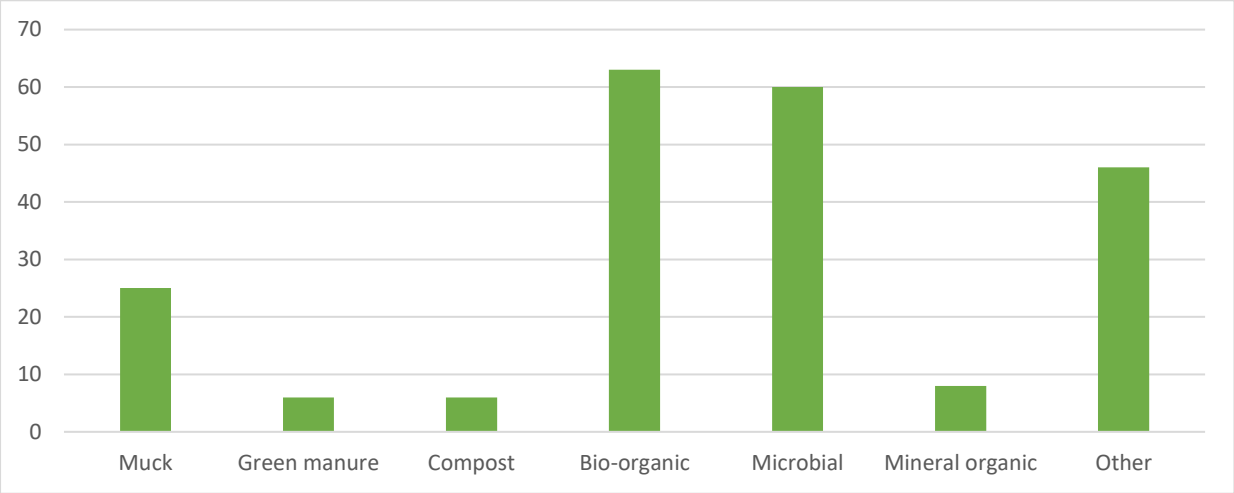
Figure 8: Yellow bait traps used in vegetable production

## Using fertilizers

Farmers use synthetic fertilizer (such as NPK) which is more popular than single fertilizers. Bio-organic and microbial composts are also widely used by farmers (the number of surveyed farmers using these fertilizers is 63%, 60%, respectively). Other fertilizers used in these areas include chicken manure, quail manure and Que Lam organic fertilizer. Farmers in Yen My also use rice straw ash to fertilize vegetables. This is different

from other communes. Farmers usually buy these composts from the market rather than producing it themselves.

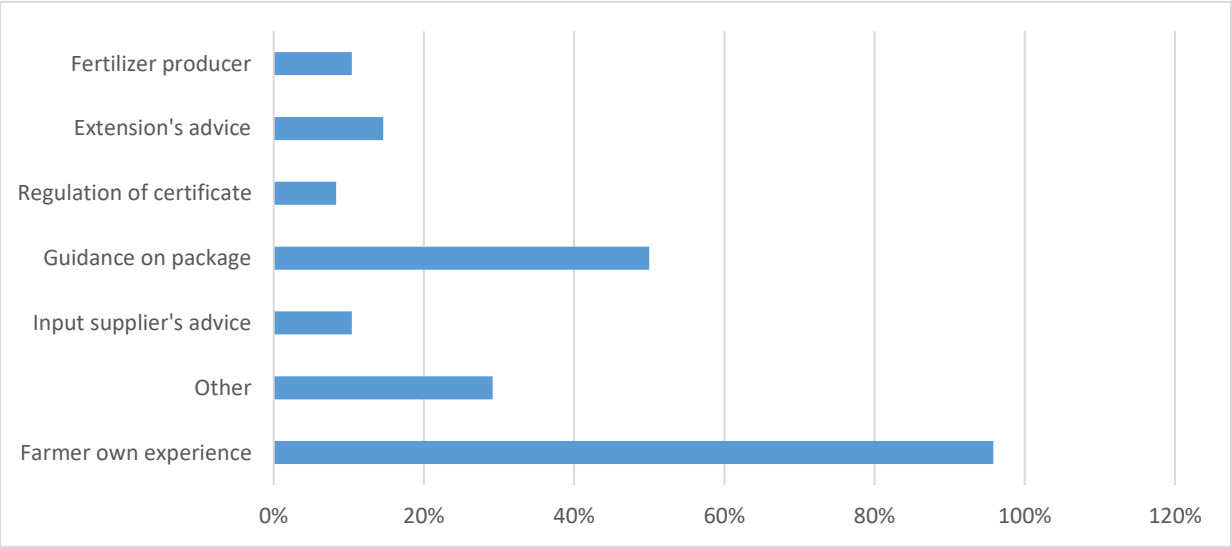
Figure 9: Proportion of farmers using compost in vegetable farming




*Source: Survey results, 2022*

Farmers use fertilizers mainly with personal experience and following instructions on the package, with 96% of interviewed farmers relying on their own experience and 50% of them refer to the package before selection. This is dissimilar from pesticides for which farmers rely on the agent's advice; only 10% of interviewed farmers said they consult agents about purchasing and using fertilizers. It is reported that 62.5% of farmers follow package directions for application volumes, 25% using more than recommended amount and 12.5% used less, indicating significant variation in fertilizer use among farmers.

Figure 10: Reference source for fertiliser use for vegetable farmers




*Source: Survey results, 2022*

*Primary processing and harvesting*

**Farmers perform minimal processing activities other than pruning and sorting, and 20% of the interviewed farmers sell vegetable immediately after harvesting without preliminary processing**[28]. Even the vegetables are not washed, but sent directly to the processing house of the purchasing companies. If primary processing is carried out, 79% of farmers said that they do so in the field (without washing because washing could make vegetable difficult to preserve); 23% do so at home in a separate place; using well water (36%) and domestic water (31%). Some food safety risks identified include poor condition for processing in the field, unhygienic transportation vehicles without cold preservation, which can contribute to higher risk of vegetable contamination.

Table 17: Post-harvest activities

| Post-harvest activities | Percentage of response (%) |
|---|---|
| Selling right after harvesting without processing | 22.9 |
| Pruning | 89.6 |
| Washing | 20.8 |
| Drying | 2.1 |
| Sorting | 35.4 |
| Packing | 16.7 |
| Keeping in cool environment | 4.2 |
| Others | 4.2 |

*Source: Survey results, 2022*

**Depending on the market, there is variation in the time from harvesting to selling vegetables, but usually within only less than 7 hours.** For farmers who sell vegetables to cooperatives, farmers usually deliver vegetables directly to the processing unit of the cooperative/enterprise which is usually located in the same commune, so it is usually in he range of hours from harvesting to selling vegetables (50% of interviewed farmers). For farmers who bring their own vegetables to sell, it is longer from harvesting to selling vegetables (up to 7 hours).

Table 18: Average duration from harvesting to selling vegetables

| Duration | Percentage of response (%) |
|---|---|
| Under 1 hour | 10.4 |
| From 1-3 hours | 50.0 |
| From 3-5 hours | 16.7 |
| From 5-7 hours | 22.9 |

*Source: Survey results, 2022*

[28] According to Article 2 of the Law on Food Safety, preliminary processing of food means the treatment of cultivated, reared, collected, harvested, fished or exploited products in order to make ready-to-eat fresh and raw food or a food material or semi-finished products for the food processing stage.; Food processing means a process of preparing preliminarily processed food or fresh and raw food by an industrial or manual method to create food materials or food products.

*Market and trading*

The vegetable market of farmers is quite diverse and there are differences between communes and farmers. Farmers have 4 main options for vegetable consumption: i) selling to collectors/traders in the commune; ii) selling to cooperatives; iii) selling to wholesalers at wholesale markets; iv) selling to retail consumers.

In Van Duc commune, surveyed farmers mainly sell vegetable to collectors in communes and cooperatives, among 15 farmers 78.8% of their production on average is sold to collectors. There are 14 farmers selling vegetables to the cooperative with an average yield of 24.3%. Farmers in Van Duc often do not directly bring vegetables to retail markets like farmers in the other 2 communes.

Yen My has a quite different feature from the other 2 communes. There are very few collectors to buy vegetables from farmers in the commune. Many interviewed farmers bring their own vegetables to local green markets, where they can either be wholesale or retail. Among 11 farmers who sell vegetable to cooperatives, the average percentage of output sold to cooperatives is nearly 30%.

In Bac Hong, a high percentage of interviewed farmers sell vegetables to cooperatives, accounting for nearly 80% of output, of which 4 farmers sell all vegetables to cooperatives. Farmers in Bac Hong also often bring their own vegetables to Van Tri wholesale market (bordering Bac Hong commune) or can retail at the local green markets in the commune.

Table 19: Average output sold to different actors by the surveyed farmers (Unit: %)

| Actors | Van Duc | Yen My | Bac Hong |
|---|---|---|---|
| Vegetable collectors in the commune | 78.8 | - | - |
| Cooperative | 24.3 | 29.5 | 79.6 |
| Wholesaler (wholesale market) | - | 52.3 | 55.8 |
| Retailer (traditional green market) | - | 26.9 | - |
| Collective kitchen | - | - | 20.0 |
| Final user (direct buyer) | - | 30.0 | 10.0 |

*Source: Survey results, 2022*

Farmers prefer to be paid in cash when selling vegetable. The most popular payment method is still cash (accounting for 95.8% of the respondents). Banking transactions are not common. Proportion of cash-on-delivery payment is lower than that of deferred payments. However, deferred payment is a common practice between cooperatives and farmers but the deferred payment is one of the reasons why farmers do not want to sell vegetables to cooperatives.

Table 20: Payment methods

| Methods | | Percentage of response (%) |
|---|---|---|
| Method of payment | Transfer | 6.3 |
| | Cash | 95.8 |
| Time of payment | Cash on delivery | 45.8 |
| | Deferred payment | 58.3 |
| | Aggregated payment | 50.0 |

*Source: Survey results, 2022*

85% of interviewed farmers said that their vegetables which reach different markets are cultivated under the same conditions, and farming technique. It means that vegetable quality at farm gate is more or less the same regardless of where vegetables are going to be sold. 15% of farmers said there is actually different in quality between markets which require different vegetable appearance and size.

Nearly 40% of farmers said that the selling price for different actors (who will sell to different markets with different requirements) is similar. Nearly 60% said there is a difference in price, but not much.

The transaction price is determined based on the daily market price if farmers sell at free markets, or a time-based fixed price (normally one week or one month) if selling to the cooperatives, regardless of the market price fluctuation. The weekly fixed price mechanism can be a good suggestion for business cooperation between farmers, cooperatives and buyers because it is flexible enough for relating parties to adjust production, supplying plans and business plan.

**Key issues:**

The high average age of vegetable farmers could be relevant to introduce information and advanced technologies to this population.

Changing farming practices and cultivated vegetable will face difficulties because of traditional farming experiences and unconformity to any common production plan so far. In the case of changing to other vegetables, farmers should be provided technical trainings.

Although the safe vegetables farming technique and voluntary VietGAP are widely known and self-reported applied by farmers (see detail in Table 9), there is still uncertainty of their full compliance with the techniques/certificate. If VietGAP becomes a compulsory requirement for vegetables to be supplied to modern retailers and supermarkets[29] this will reinforce supplier (such as cooperatives) compliance. In some cases, farmers whose vegetable fields are certified with VietGAP are not sure if they are VietGAP certified.

Input supplying agents in the commune are important advisors to farmers on buying and application of pesticides. This could be a potential communication channel for the project to transmit technical knowledge to local farmers. However, farmers' knowledge about allowed/prohibited pesticides is mainly through training courses provided by government departments.

Spraying for disease prevention purposes is quite common for vegetables. Spraying frequency depends on pests and weather. Integrated pest management practices have also been applied but are not widely practiced.

The level of technology application in vegetable production is still very limited as farmers are familiar with traditional farming methods.

Farmers have not done anything to add value to vegetables. Vegetables are harvested, primarily trimmed and sold right in the field or transported directly to the primary processing house.

Farmers prefer to sell vegetables with immediate payment in cash. The deferred payment method applied by cooperatives may not be attractive to farmers.

Vegetables sold to different customers (supermarkets or regular collectors) are grown with the same conditions and farming techniques. If farmers follow VietGAP procedures, selling vegetables via normal channels will not benefit farmers nor incentivize them to pay for VietGAP audits.

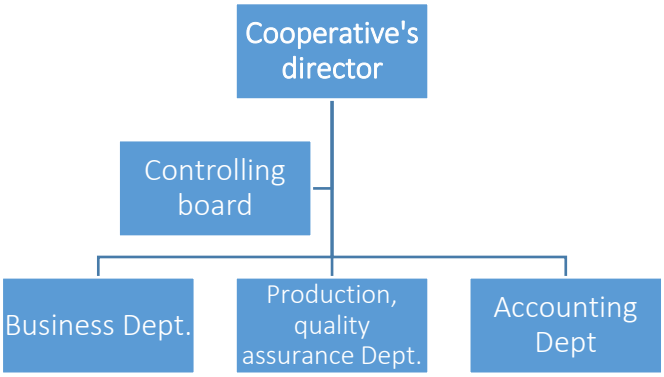
[29] (Worldbank, 2020)

#### 4.3.1.3 Cooperatives

*Organizational structure and human resources of the cooperatives*

**The surveyed cooperatives have been established and put into operation for a long time, all of which have operated under the new Law on Cooperatives 2012.** The cooperatives all have a steering board, a board of directors and a controller. In Bac Hong cooperative, the chairman of the steering board and the director are two independent people, while in Van Duc and Yen My cooperative, the Steering boards' chairman is also the director of the cooperative. The director of the cooperative will run and be in charge of the overall activities of the cooperative. Cooperatives also have staff in charge of business activities; production activities, product quality assurance; and financial accounting. Depending on the characteristics of each cooperative, the number of board members may change accordingly. For example, in Bac Hong Cooperative there are four while in Van Duc cooperative there are six people and Yen My cooperative has five people. It seems that in the management of cooperatives, women play a less important role with lower managerial positions (accountant, treasurer) and with smaller number (two of 5 or two of 6) than men.

Figure 11: Organizational structure of the cooperatives




*Source: Summarized based on the survey results, 2022*

There is a large difference in the number of cooperative members among the surveyed cooperatives. While Bac Hong Cooperative has only 25 members, Yen My Cooperative has 105 members, and Van Duc Cooperative has 168 members. Similar to the number of members, the number of farmer households with vegetable production activities who are not members but the cooperatives having production management also has a huge difference among cooperatives. The number of farmer households managed by Bac Hong Cooperative is only 60 while the corresponding number of Yen My Cooperative and Van Duc Cooperative is up to 420 and 900 households.

Table 21: General situation of surveyed cooperatives

| Name | Unit | Van Duc Cooperative | Bac Hong Cooperative | Yen My Cooperative |
|---|---|---|---|---|
| Operated with new cooperative law | | 2015 | 2012 | 2012 |
| Number of managers (steering committee, management board, controlling board, production management) | Person | 6 (1 director, 1 deputy director, 1 accountant, 2 controllers, 1 cashier) | 4 (1 director, 2 board members, 1 accountant) | 5 (3 people for governance, 1 controller, 1 accountant) |

| Name | Unit | Van Duc Cooperative | Bac Hong Cooperative | Yen My Cooperative |
|---|---|---|---|---|
| Number of women | Person | 2 | 1 | 2 |
| Member of cooperatives (participate in cooperative meeting and contribute fund for cooperatives) | Person | 168 | 25 | 105 |
| Number of farmer household cultivating vegetable (not members but has production management) | Person | 1205 | 100 | 420 |

*Source: Survey results, 2022*

***Resource of cooperatives***

To operate, not only with the cooperative's management and members, cooperatives also hire staff. For example, Bac Hong Cooperative has 12 office workers, 30 full-time workers and 10 drivers, in addition, there are seasonal workforce to mobilize when it is necessary to carry out primarily processing for unexpected increase in ordered volume.

To be able to produce and do business, cooperatives are also equipped with facilities. Two cooperatives (Bac Hong and Van Duc) have their own vegetable primary processing areas. Yen My cooperative does not have a pre-processing area because the company buy vegetable directly from farmers, so pre-processing area is not needed. The primary processing house of Bac Hong Cooperative applies the pre-processing procedure and is certified for ISO 22000. It is equipped with a system of sorting, packaging, generating QR codes and printing product labels.

A cooperative staff records and monitors all relevant information during the primary processing for traceability. Workers in the pre-processing house receive 100% of raw materials from production areas, check for origin, remove inedible parts, classify and pack, label products, store and ship the orders as confirmed. Besides the main pre-processing house, farmers from cooperatives also have a smaller-scale primary processing area for primary processing in case of too much vegetable received during the peak season. Bac Hong cooperative also has a cold storage to save product samples at the request of customers.

In two cooperatives (Bac Hong and Van Duc) there are trucks (without coolers) to transport vegetables to customers and transport vegetables to packhouses for primary processing. The farmers do not transport vegetables to the warehouse, but it will be collected by the cooperatives in the farmer's field and transport it to the warehouse for primary processing. In Yen My, the cooperative does not have a truck, farmers transport vegetables by motorbike to the company's primary processing house.

To aid management, the cooperatives also have computers with internet connection, record keeping and information filing. Especially in Bac Hong, the cooperative has equipped both supply chain and online management software. All 3 people from the management board of this cooperative are old but they can use computers and connect to the internet as well as smart phones. Some farmers in the surveyed localities also use smartphones with internet to make transactions, however, the number is not large.

Table 22: The resources/assets of the cooperatives

| Name | Unit | Van Duc Cooperative | Bac Hong Cooperative | Yen My Cooperative |
|---|---|---|---|---|
| Having primary processing area for FS (location, equipment, tools, water source …) | $m^2$ | 2,200 | 1,000 | Having no primary processing area |
| Having transportation vehicle | Car | 2 | 10 | Farmers transport by their own |
| Having computer and internet connection | Set | 2 | x | x |
| Information technology application, book recording of incoming and outgoing vegetable | | Keep book record | Having software for supply chain, online saving | Book recording |
| Proportion of farmers using smartphone with internet access | % | 15 | > 50% | 10 |

*Source: Survey results, 2022*

*Cooperative production capacity*

Two of the three surveyed cooperatives, Bac Hong and Van Duc cooperatives, have 200 hectares of vegetable land managed by the cooperative, while in Yen My, the number is lower, only 87 hectares. All of these areas are safe vegetable production areas of the city, with some VietGAP certified area. Although Yen My cooperative has the least management area, the area that has obtained VietGAP certification is the largest, reaching 74.6%. Bac Hong cooperative has least VietGAP standard area (5ha).

Due to the small area of Bac Hong Cooperative, only 5 ha in Bac Hong commune is productive land rented by the cooperative and self-produced. This area applies the VietGAP procedure and is certified. Since 2022 they have tried to transferred to organic standards (TCVN 11041; 22017). The cost of organic certification will be supported by the Hanoi DARD.

While the market is quite potential with a large Hanoi population and many businesses, the cooperative has cooperated to purchase safe products of cooperatives in Van Noi commune, Dong Anh district, Hanoi and Trang Viet commune, Me Linh district, Hanoi city with an area of 25ha. In addition, the cooperative also expands the association to purchase off-season vegetables at cooperatives/production households in Moc Chau, Son La, Sa Pa, Lao Cai provinces with a total area of up to 100 hectares.

Each cooperative produces a variety of vegetables, mainly seasonal vegetables, a few off-season vegetables, in which, mainly focuses on about 150 types of vegetables and fruits, of which there are about 15-20 types of main vegetables, including leafy vegetables, fruit, root vegetables, spices of all kinds. All participants grow vegetables. Vegetables are mainly grown seasonally. In winter, popular vegetables are cauliflower, mustard green, celery, cabbage, kohlrabi. In the spring they plant chili, lettuce, and mustard green. In the summer, they grow vegetables, spinach, morning glory. In autumn, they grow bitter melon, morning glory, cabbage, amaranth, etc. The production output of cooperatives also varies, depending on the number of members, the number of farmers the cooperative manages, and the area of land used for production. The least volume of products produced belongs to Bac Hong Cooperative with 3,000 tons/year and Van Duc Cooperative produced the largest volume of over 70,000 tons/year.

Table 23: Vegetable production capacity of the cooperatives

| Name | Unit | Van Duc Cooperative | Bac Hong Cooperative | Yen My Cooperative |
|---|---|---|---|---|
| Vegetable cultivation land area managed by cooperative | Ha | 200 | 200 | 87 |
| Safe vegetable production area | Ha | 200 | 200 | 78.6 |
| VietGAP certified land area | Ha | 25 | 5 | 58.6 |
| Number of types produced/year | Type | >20 | 100-150 | 15-20 |
| Some seasonal main types of vegetable | | Cabbage, kohlrabi, spinach, bitter gourd, eggplant | Kohlrabi, cabbage, tomato, mustard greens, morning glory, celery, cauliflower, mustard greens etc... | Morning glory, cucumber, cabbage. During summer, cucumber grown over 7 - 8ha; and morning glory grown in 10 ha |
| Total production estimate/year | Ton/year | 70,000 | 3,000 | 7,000 |

*Source: Surveyed results, 2022*

*Application of technology and traceability*

**The cooperatives have initially applied technology on traceability.** Although the two cooperatives (Bac Hong and Van Duc) have not yet developed and issued a written document on traceability procedure, recalling and handling unsafe food, they have been guided by the Hanoi DARD on traceability regulations, free support to use the Hanoi city's food traceability software (hn.check.net.vn). Both of these cooperatives used the traceability software hn.check.net.vn. These cooperatives are granted ID and password by Hanoi DARD to use and exploit the software. To do this, the cooperative has staff in charge of the tasks. The steps include using ID and password to log into the hn.check.net.vn system; then generate QR code for each product batch, update information about product batch; Print traceability stamps including product name, manufacturer's name, production date, expiry date, QR code. The traceability stamp is affixed on the product packing cover at the cooperative's primary processing house. The cooperative uses the hn.check.net.vn system for products supplied to Hanoi's supermarket system. However, the cooperative can only access to the cooperative level, all commercial products purchased and products of the cooperative are stamped by Bac Hong cooperative or Van Duc cooperative. The traceability information has not included information on the production households, who are the supplier of fresh vegetable ingredients to the cooperative for primary processing and packing products.

They currently use a QR code to identify the cooperative only and if they do traceability to each farm, a new QR code with smallholder details needs to be created and that costs VND 200 per label. The cooperative uses check.vn software to generate QR codes on static information about the cooperatives, not real-time traceability for the products and not provide traceability to the smallholder as the source

Table 24: Application of technology and traceability in cooperatives

| Name | Van Duc Cooperative | Bac Hong Cooperative | Yen My Cooperative |
|---|---|---|---|
| Production recording | Recording is required for the household supplying vegetables for | Some do and some don't | Some do and some don't |
| Application of technology to save online the information on incoming and outgoing vegetables | Book recording | Supply chain software and saved online | Book recording |

*Source: Surveyed results, 2022*

**Key issues:**

The managers of cooperatives are at high ages so innovation is limited.

Management capacity is still limited.

The capacity to apply IT in production management is still limited. The cooperative has not yet applied software to manage the supply of vegetables.

The traceability is too simple and a system for accessing information on individual producer has not yet been built.

FS has been paid attention to but not yet really effective.

### 4.3.2 Collection and preliminary processing

#### 4.3.2.1 Collectors, wholesalers, primary processors

*i. Actors*

There are two groups of actors involved in the collection and wholesale of vegetables in Hanoi, including individual business households and cooperatives. For the cooperatives, the cooperatives only collect vegetable from the members of the cooperative and a part from the outside and then supplies to the system of collective kitchens, supermarkets, and convenience stores. For actors who are individual business households, they often perform the function of collecting vegetable and also play the role of wholesalers at wholesale markets.

*ii. Characteristics*

- Cooperatives work as collectors

Two cooperatives (Van Duc and Bac Hong) buy all vegetables from cooperative members and cooperate in purchasing vegetables of cooperatives in other localities such as Moc Chau (Son La), Me Linh, Dong Anh, Sa Pa, etc. The cooperative is only the actor connecting farmers to consumers, not collecting vegetables from its members especially in Yen My. Cooperatives only operate as an intermediary between farmers and

businesses, other cooperatives (Davicorp and An Phu) and provide services to support vegetable production such as irrigation services, agricultural services, supply seeds, agricultural materials, etc.

On average, Bac Hong Cooperative collects and supplies 6 tons of vegetables every day. Total output collected and supplied to the Hanoi market is about 3,000 tons/year. Of which, 30% comes from their member produces, the remaining 70% comes from neighboring cooperatives and other provinces, include 5 cooperatives in Moc Chau (100ha), 3 cooperatives in Sapa (60ha), 8 cooperatives in Dong Anh and 3 cooperatives in Me Linh (30 hectares). The cooperative collects and supplies about 150 different types of leafy vegetables to Hanoi markets every year.

Table 25: Vegetable supplying sources and markets of 3 cooperatives

| Name | Van Duc Cooperative | Bac Hong Cooperative | Yen My Cooperative |
|---|---|---|---|
| Cooperative buy vegetable from their members and farmers who are not members | Buys all produces of their members<br>Cooperates with other farmers in Mộc Châu, Sơn La; Tráng Việt, Mê Linh and collects vegetable from these farms | Buys all produce of their members and buying most of production from associated farmers but not all. Cooperative Bac Hong has largest network including 5 associated cooperatives in Mộc Châu, 3 in Sapa, 8 in Đông Anh, 3 in Mê Linh. | Acts as intermediary but not collect and buy vegetables (cooperative collect fee for irrigation, land service/sao=360m2 and state budget) |
| Supply to collective kitchens | | School, restaurant, school meal providers. The industrial zone kitchens. | Introduce the contacts to Davicorp, cooperative An Phú |
| Supply to convenience stores | | Udo Mart | |
| Supply to supermarkets | Supply to supermarkets BigC, Aeon mall | Big C | |

*Source: Survey results, 2022*

After collecting, the cooperative will do primary processing, pack and distribute to different places depending on the market that the cooperative build. For Van Duc, the cooperative sells vegetable mainly to supermarkets in Hanoi such as BigC, Aeon mall. Bac Hong cooperative divided into groups of market development officers, using the name, seal, records and certificates of the cooperative to focus on developing three major markets: the collective kitchen systems of Three Star industrial zone and some, large enterprises such as Samsung, Yamaha, GL (40%); BigC supermarket system (4 BigC Hanoi, BigC Hai Duong…) and one-stop supermarket system (e.g. Udo Mart) in Hanoi (30%); Kitchen system of restaurants, hotels, schools such as Nhan Chinh kindergarten, etc. (30%). In Yen My, the cooperative does not do the primary processing but connects and acts as an intermediary for farmers to sign contracts and make payments with Davicorp, a company specializing in providing school meals and providing ingredients for school kitchens of nearly 100 schools in Hanoi city. In addition, the cooperative also acts as an intermediary and coordinator for farmers to link and supply vegetables to An Phu Cooperative, which specializes in providing raw materials to collective kitchens in Hanoi.

- Individual collectors

Some individual collectors invest in collecting vegetable and supply to the market. They are responsible for their own operation, and less supervised by related agencies. .

They collect vegetables in the afternoon, go to the market at night. They collect all the vegetables that farmers grow and sell, like cabbage, mustard green, cauliflower, bitter gourd, chili, etc. In general, they buy seasonal vegetables based on their availability in the households in the commune. The amount to be collected depends on the level of consumption at the market and the volume of vegetables available in the village/commune.

When collecting vegetables, they do not require any certification of FS assurance, mainly based on trust and existing relationships. For example, if farmers claim they have certified safe vegetables or VietGAP, collectors believe so, do not check, do not log and sell to everyone with the same belief that it is safe vegetables or VietGAP. They buy both vegetables from the area that meet the standards of RAT and VietGAP and also vegetables from the area that do not meet these certifications at the same price.

They usually buy vegetables in the commune, sometimes buy more from neighboring communes. They often travel to the field to weigh and collect vegetables by motorbikes or small trucks.

The volume of vegetables purchased by collectors varies from time to time. If consumption is at high demand, they will buy more, if consumption is slower, the amount purchased will decrease. In terms of quality, they mainly observe to ensure the vegetables are not crushed, clean. They are also interested in the isolation period after spraying pesticides but do not ask to prove, mainly rely on their trust in the farmers in the area. According to them, the isolation for biological pesticides only needs to be isolated for 1-2 days to be able to buy. When buying, they will keep them in separate bags from different farmers, but do not mark and will lose track when problems occur.

They directly collect and buy vegetable but do not check the producer's daily recording. In case there is a purchase order, they can call to inform the farmer that they will buy the expected volume, the farmer will cut it and pack it. When they  come, they just weigh and put on the trucks. In some cases, if farmers have already weighed, they do not need to weigh again. At 10 P.M, they will take them to the wholesale market to sell.

For collectors in Van Duc, they usually sell at Dong Tao wholesale market (Hung Yen), Van Quan night agriculture product market (Ha Dong), Long Bien market. For collectors in Bac Hong, they can sell at Van Quan farmers market, Long Bien market. Farmers in Yen My also bring to Tam Hiep wholesale market to sell. Their customers are usually retail buyers from different places. They come from Hanoi and many other places that the collectors do not know well. Their standard of buying vegetables is also simple, vegetables are not crushed, do not look too bad.

In case vegetables have sensory problems, for example, they are crushed, they also do not have a sanction to handle them. If the customer complains about vegetables, the collector will reduce the price or compensate for them. Prices are determined based on the market price. According to the interview results, there is currently no agency to check and monitor the quality and FS of vegetables. They have to pay the market fee...

### 4.3.3 Processing and distribution

#### 4.3.3.1 Supermarkets

In the survey sample, the 2 cooperatives of Bac Hong and Van Duc have been supplying vegetables to the supermarket system of BigC, Mega Market (Thang Long, Hoang Mai and Ha Dong) and Aeon (Long Bien, Ha Dong).

*Product quality requirements*

These supermarkets apply the quality requirements on the vegetables they buy, with the two most important criteria: physicochemical and microbiological test results (within 1 year) and certificates of VietGAP, organic, GlobalGap… Specifically:

Table 26: BigC's quality requirements on vegetable products

| Requirements on product |
|---|
| - Results of physicochemical and microbiological testing in 1 year. The physicochemical and microbiological parameters must comply with the provisions of QCVN 1-132: 2013/BNNPTNT, specifically:<br>• The maximum limit of heavy metals in fresh vegetables, fruits and tea buds shall be as prescribed in QCVN 8-2:2011/BYT.<br>• The maximum limit on harmful microorganisms in vegetables and fruits shall be as prescribed in QCVN 8-3:2012/BYT.<br>• The maximum limit on pesticides and other chemicals shall be to follow the Decision 46/2007/QD-BYT; in case there is no provision under the Decision 46/2007/QD-BYT, the Circular 68/2010/TT-BNNPTNT shall apply.<br>- Certificate of VietGAP, Globalgap, organic... |

*Source: Survey results, 2022*

*Requirements for suppliers*

In terms of documents, a supplier who wishes to provide their vegetables/roots/tubers to the BigC supermarket must provide the following documents:

- The establishment's certificate of meeting all required FS conditions, or of GMP, HACCP, ISO 22000, IFS, BRC and FSSC 22000
- For an establishment under the category that is not subject to obtained the certificate of meeting all required FS conditions as provided for in the Decree 15/2018/ND-CP, Circular 17/2018/TT-BNNPTNT and Decree 17/2020/ND-CP, it must show a written commitment to ensure FS

For Mega Market, the required documents include: contract, certificate of meeting all required FS conditions/VietGAP certificate; contracts regarding purchase and supply input materials of manufacturers/suppliers (i.e. fertilizers, pesticides); production diary of farmers and cooperatives; test results of soil, irrigation water and fresh vegetable product samples.

*Assessment of suppliers*

After receiving all required documents from a supplier, these supermarkets will conduct a supplier assessment process. For BigC, the assessment includes: an assessment of the quality management system and of social responsibility. The social responsibility assessment is based on the Vietnam Labor Code. The quality management system assessment is based on checklist for 2 different categories of suppliers:

- The suppliers who grow and do semi/pre-liminary processing of vegetables/roots/tubers: apply TCVN 11892-1:2017 (VietGAP): Good Agricultural Practices – Part 1: Cultivation.
- The suppliers who do semi/pre-liminary processing and packaging of vegetables/roots/tubers: apply QCVN 1-132:2013/BNNPTNT for fresh vegetables/tubers and tea buds that meet required FS

conditions during the process of production and semi/pre-liminary processing. This QCVN provides for the conditions regarding location, workshop facility, water, waste collection and treatment, personal hygiene, equipment and tools for semi/pre-liminary processing of vegetables/tubers, and conditions during preliminary processing.

Based on the quality assessment results, the supermarket classifies their suppliers into grades A, B, C, D, equivalent to a score of 20, 15, 4 and 0 point, respectively. No further requirement is needed for a supplier who gets an A and B grade, but if it is a C or D, the supermarket asks such supplier to take corrective action.

For Mega Market, the supplier assessment includes: the actual production conditions, the processes applied, checking book records (production logs/diary) of farmers; taking samples of the products to test on FS.

*Check product quality and assess suppliers*

In general, the supermarket has a process to monitor their suppliers through repeated assessments. For BigC, the assessment frequency is based on the results of the quality management system and social responsibility audit. For the quality management system, the assessment frequency can be: 2 years if the score is equal or >80%; 1 year if the score is the range of 60 to <80%; 6 months if the score is in the range of 40 to <60%. And, if the score is <40%, it is considered as unsatisfactory, hence, it should be improved and re-assessed after at least 1 month. The social responsibility assessment frequency is similar to that of the quality management system if the score is above 50%.

Table 27: Frequency of repeated assessments toward suppliers of BigC supermarket

| Checklist | % score | Pass/Fail | Repeat Assessment Frequency |
|---|---|---|---|
| Quality management system | >=80 | Pass | 2 years |
| | 60 - <80 | Pass | 1 year |
| | 40 - < 60 | Pass | 6 months |
| | < 40 | Fail | Can be re-assessed after at least 1 month |
| Social responsibility | >= 50 | Fail | According to the assessment results of the quality management system |
| | < 50 | Fail | Can be re-assessed after at least 1 month |

*Source: Survey results, 2022*

Regarding quality control of vegetable products, when vegetables are delivered to the general warehouse, the quality control (QC) staff do the quality check. Regular sampling is taken once per year per provider. BigC can ask suppliers to take samples for analysis and send analysis results back to BigC, or BigC can take sample by themselves toward any supplier at the warehouse when vegetables are delivered.

For the vegetable products that are certified, the checking is carried out, as follows:

Table 28: Quality control of certified vegetables and fruits by BigC

| Purchasing staff | QA-SCC staff | Shop |
|---|---|---|
| Directly buy the certified products from the supplier only | QA: Checking the certificate for a new product/updating the expired certificate: | Commodity: Only receive certified products if the product name on the system |

| Purchasing staff | QA-SCC staff | Shop |
|---|---|---|
| Otherwise, the product must be labeled with the name of the original certified manufacturer<br>Name the product on the system with certified information<br>Update information of certified product when there is a change on certificate information<br>Receipt check: Certified information must match with the certificate | • Check the corresponding certified product name of the supplier<br>• Recommend adjustment, on the system, of names of non-conforming products (note down the products without certification information)<br>• Check the label: Certification information must match with the certificate<br>QA: Create a tracking list of certified suppliers, with certified information of product and validity period attached | shows the certified information<br>HQ: Coordinate with QA to check the labelling of certified products as per the regular plan<br>Shops: Notify QA or purchasing staff if a product is found with certification labels but no certification information is shown on the system |

*Source: Survey results, 2022*

For Mega Market, the supermarket regularly monitors their suppliers by checking the production diary one a month; regularly takes samples of fresh vegetables twice a year for a supplier; suppliers shall be to take sample by themselves on a bi-annual basis. For sampling activities, information including sampling date and sampled products of a particular household of the cooperative are fully recorded to cater for traceability later on (through the traceability form). Samples were taken on a random basis.

*FS assurance by supermarkets*

Supermarkets have put in place their strict procedures to ensure FS at all stages, from receiving goods, storage, pre-processing, processing. For example, for BigC, during receiving of goods, QC staff will check 5 criteria, namely: (i) the supplier's profile; (ii) transport conditions and temperatures; (iii) packaging, labels; (iv) the quality of the goods; and (v) quantity, volume. During storage, pre-liminary processing and processing, the supermarket applies the measures to ensure FS

Table 29: Measures to ensure FS of BigC

| Step | Measures to ensure FS |
|---|---|
| Receiving goods | Check (i) the supplier's profile; (ii) transport conditions and temperatures; (iii) packaging, labels; (iv) the quality of the goods; and (v) quantity, volume |
| Storage | First In, First Out (FIFO):<br>Packaging and labels:<br>• Close-sealed food packaging<br>• Adequate information<br>• Expiry date control<br>Storage conditions:<br>• Right temperature for right product<br>• Follow the supplier's instructions<br>Prevent cross-contamination: |

| Step | Measures to ensure FS |
|---|---|
| | • Containers are safe and used for the right purposes<br>• Food storage is clean, free of polluting agents |
| Semi/pre-liminary processing, processing | Organization and arrangement:<br>• Area division<br>• Wrap/cover food<br>• Cancellation and returns<br>Quality control:<br>• Qualitative/appearance-based check<br>• Packaging, labels<br>• Expiry date<br>Three-step checking and sample keeping of food<br>• Cleaning and maintenance plan |

*Source: Survey results, 2022*

One of the measures to ensure FS of the supermarket is to provide training for staff. BigC has developed their own training process on FS (based on the MOIT program[30]) for their QC staff across the country (29 QC staff in total, including: 10 personnel at HQ level, 3 staff at regional level; and 16 staff at store transaction level).

These QC staff are responsible for providing further training to other staff in their supermarket system. For Mega Market, the training activities are, as follows:

- For newly-recruited employees: They are trained on FS, SOPs, PPEs, hygiene regulations, industry and commodity handbooks by QA. At the end of the training, they take the test. If passed, they are officially accepted to work for the Mega Market.
- For indefinite-term employees: They are given with ID for online e-Learning system of the Mega Market, and are provided with annual internal training on updated new regulations.
- In addition to internal training, Mega Market dispatch their staff to participate in various training courses provided by Hanoi DOIT and DARD.

#### 4.3.3.2 Collective kitchens

Visiting schools' canteens, the team has observed how school canteens serve their semi-boarding pupils, with a scale of from 500 to 1,000 meals/day/school. In addition, these schools have also been supported by meal catering companies who have a capacity of providing up to 100,000 meals/day. Therefore, the work of quality and FS assurance toward collective meal catering providers is subject to the inspection and supervision of competent authorities, school administrators and representatives of parents' associations.

[30] Decree 77/2016/ND-CP amending and supplementing some provisions on business investment conditions in imported and exported products, chemicals, industrial explosive materials, fertilizers, gas business, food business state agency of the MOIT.

*i. Supply of ingredients/raw materials*

- Vegetables and meat are provided in the morning by the suppliers who have sufficient dossiers and documents: the list of origin of food ingredients is posted and disclosed at the school. However, schools have not posted it on their bulletin board, but only in the kitchen area.
- As the food is processed and used within the day, so fresh vegetables and meat do not need to be stored before processing, and are semi-processed by the supplier before being delivered to the school.
- Vegetables are supplied by cooperatives
- Meats are supplied by intermediate suppliers or from slaughterhouses, according to the needs and daily meal menu.

*ii. Actual FS conditions*

The prerequisite conditions for collective kitchen follow the requirements specified in circular 30/2012/TT-BYT[31].

(1) Location is: isolated from the source of pollution, not flooded, with an appropriate area, and the wall and ceiling are made of smooth, light-colored materials that are easy to clean, reaching 100%.

(2) Processing area: is arranged between the pre-liminary processing and division of cooked food. Raw and cooked food are kept separately, food is preliminarily processed on the table of 60cm in height, processing area is equipped with an insect and pest control system. However, it is still observed that there are open doors to the outdoor area, thus making it difficult to control all pests. For some collective kitchens, they divide cooked food not in appropriate manner, lack of tools to cover and preserve cooked food in the distribution area.

(3) Garbage containers are arranged, which are delivered out during the day, equipped with a garbage container, but at some times a collective kitchen has garbage container put open.

(4) The collective kitchen has enough clean water as required for food processing.

(5) Equipment and utensils: Kitchen equipment and utensils must be suitable for each type of food, easy to maintain, easy to clean, and not contaminate food. Do not keep chemicals in pre-liminary processing, processing and storage areas. However, some collective kitchens do not have a specialized vehicle to transport the prepared meals, and do not yet have measures to preserve cooked food according to regulation anti-rodent and insect control, food shelves; foods are not kept close to the floor; Areas for fresh food storage are cleaned regularly, the temperatures are maintained and do not have raw and cooked foods stored together but are separated with adequate separation

*i. Product quality requirements*

- Appearance-based checking
- Based on the supplier's records and traceability
- Regular sampling for analysis of FS parameters

[31]Circular 30/2012/TT-BYT stipulating food safety and hygiene conditions for food service and street food businesses and food safety conditions for collective kitchens.

*ii. FS management at kitchens*

Quality and FS are the top issues of collective kitchens as food poisoning stems from poor control of foodborne pathogenic microorganisms. The FS hazards of concern are microbial contamination that comes from poor hygiene conditions (processing tools, food containers, handlers' practices), substandard raw materials and and bad manufacturing storage and cleaning processes, and cross-contamination. Therefore, managing FS in the kitchen is based on many factors: prerequisites (i.e. facilities), the processes regarding receiving raw materials, storage and semi/pre-liminarily processing ingredients, processing food and dividing meals. Evidence for these activities are the dossiers of quality management, supplier management, raw material quality control, meal tracking and storage.

Regarding documents/dossiers: the collective kitchens have all the certificates of meeting required FS conditions/written commitment paper to comply with FS requirements, they implement the three-step food checking as required[32], keeping contracts and supporting documents regarding origin of food ingredients as required.

- The schools all have the FS management plan for their collective kitchens, and ensuring FS for semi-boarding pupils; the decisions on establishment and the minutes of daily food monitoring of their own FS Self-monitoring Team, consisting of representatives of school board, catering establishment and pupils' parent association.
- The schools have their working schedules to inspect and supervise the FS conditions at their collective kitchens on a daily and weekly basis (however, they have not yet taken initiative in supervising, on regular and ad hoc manner, their food production, processing and trading establishments who supply food materials for their collective kitchens)
- The schools have developed their FS Incident Handling Plans.

**Key issues**

Most of the schools have well complied with FS regulations, entered into contracts with qualified suppliers. They are serious about publicizing the FS commitment/certificate of meeting required FS conditions and the list of food supplying sources. Actively control the food used in their collective kitchens and disclose the suppliers they selected.

The board of directors of the schools that organize meals for semi-boarding pupils have strictly complied with regulations on FS assurance, prevention and control of food poisoning and food-borne diseases. The schools have established their FS Self-monitoring Team to check and supervise on a daily basis the entire process of food delivery to the school, food preparing and processing.

The shortcomings of collective kitchens are as follows:

The schools have not yet implemented traceability, regular and/or ad-hoc food safety checking of their FBOs who supply food ingredients or processing food for their collective kitchens.

Food suppliers (vegetables/roots/tubers/fruits) have not been able to prove the tracing of origin down to the growing address. The origin is only reflected on invoices and supporting documents. Given the understaff issue, sometimes the delivery person is not the employee (hired through a labor contract) of the food supplier, but just a freelancer driver or motorbike driver hired on a casual basis.

[32] Decision 1246/QĐ-BYT, on the issuance of instruction for implementation of three-step practice mode and storage of food samples for food service business.

Most of the food suppliers are intermediaries/middlemen who do not have a delivery/receipt book with farmers or with direct growers

Most of the traceability work is manual and there is no digital traceability tool or digital records kept.

## 4.4 VC governance

Governance refers to both the legally defined rules and regulations that influence the VC, as well as the commercial norms and imperatives of competition that influence how production is structured. Governance implies that interactions between actors in the VC are frequently organized in a way that allows competitive firms to meet specific requirements in terms of products, processes, and logistics in serving their market (Smith, D, Dyer, R, and Wandschneider, T (Eds.), 2020).

This section examines the governance in vegetables VCs which cover key aspects: vegetable quality, quality control, vertical and horizontal linkage in VCs.

### 4.4.1 Product quality and product quality control

#### 4.4.1.1 Product quality

**Product quality requirements vary between different markets and customer segments**. For traditional channel, qualitative/appearance and size of products are the two main factors when it comes to quality consideration, while FS certification (such as VietGAP certificate) and biochemical criteria are not the factors of concern. For supermarket channel, FS certification and biochemical criteria (limits of heavy metals, microorganisms and pesticide residues) are prerequisites and mandatory, and the qualitative/appearance and size factors are also paid with attention. Hence, qualitative/appearance/ sensory is a cross-cutting quality factor at all vegetable consumption markets

**The appreciation of product appearance in transactions has driven farmer's practice.** The qualitative farmer survey reveals that farmers prioritize vegetable appearance through using foliar fertilizers, spraying regularly, periodically or increasing frequency of pesticide application. While traditional markets does not require FS certification or biological, chemical criteria, farmers have no incentive to strictly adhere to good agriculture practices as the compliance cost often higher compared to conventional practices[33].

**However, the majority of interviewed farmers also said that the quality of vegetables sold to different markets (such as wholesale markets, retail or sold to cooperatives) is not a big difference.** 85.4% of interviewed farmers said that the quality of products sold to customers is the same; and only 14.6% of them said there is difference in vegetable appearance and size. The fact that farmers apply the same production practice to all markets reflects two sides of a matter: (i) The quality of vegetables between markets does not differ in terms of intrinsic quality factors, but rather administrative procedure (such as having certificate is a must); (ii) With positive view, vegetable quality generally meets the requirements of even more high-end markets such as collective kitchens or supermarkets, reflecting that the general level of product quality as well as farmers' practices have been raised.

"Defective vegetable leaves will be devalued because they do not have a nice appearance".

"Pruning vegetables are easier to sell"

"All traders require nice appearance vegetables"

*Source: Interview with farmer at Van Duc, Bac Hong commune*

[33] Worldbank (2020, p. 12) also shows that due to a lack of law enforcement in differentiating between VietGAHP and conventional practices at the market, economic benefit for those who invest in VietGAHP is not visible, which demotivates farmers to continue to invest in the VietGAHP certification. The situation with VietGAP certified vegetables is similar.

#### 4.4.1.2 Product and FS quality control in the VCs

A quality control system generally cover aspects of the self-control of producers, the internal control of organizations (e.g., cooperatives) and external control (including government agencies or independent inspection bodies, e.g., certification bodies and clients).

In Hanoi's vegetables VCs, the above aspects of product quality control are, as follows:

*i) Regarding self-control of producers*

Producers' self-control is achieved through records during production process, including input purchases and usage. Most of farmers without safe vegetable production certificate does not keep record for control purposes. Farmers with certificate have to keep farming record as mandatory regulation. However, as reported by farmers in Yen My, the farming record may not be done regularly by farmers, tied to the time of spraying or fertilizing, but can be filled as a "memoir" for regulatory compliance purposes.

*ii) Regarding internal control of organizations*

The internal control of organizations is mainly the control of the cooperatives over the vegetable production process and quality by farmers who sell vegetables to the cooperative, or over the members of the cooperative. The control forms of cooperatives include:

- Coordinate with interdisciplinary inspection teams[34] to inspect agents;
- Provide good quality inputs for farmers;
- Check the farmers' pesticide packages at the collection points of used-pesticide package placed in the fields;
- Check the farmers' farming record;
- Sampling for analysis (rapid test, or send for lab test) on regular or ad-hoc manner, proactively or at the request of customers. However, this form is costly so not all cooperatives can do it regularly.

In general, the cooperatives have different measures to control product quality , from checking the quality of inputs, the usage of inputs and the final product quality. However, the effectiveness the control measures need to be considered.

*iii) Regarding external control (third party's control)*

External control includes the control of competent authorities, certification bodies or clients. The state agency (specifically the PPD) run annual quality monitoring program at the vegetable growing areas through sampling for analysis[35]. The certification bodies also carry out regular and ad-hoc re-assessment as per specific certificate regulation. For supermarket customers they also have their quality control plans through sampling vegetable for rapid/quick tests at warehouse, taking samples or asking suppliers to do so for lab analysis, paying visit to suppliers to inspect production conditions. For school collective kitchens, quality control is carried out by school administrators or students' parents by checking the ingredients at the kitchen or visiting suppliers.

**Key issues:**

Although the quality control system consists of all 3 layers, there remain some issues that need to be discussed and improved to increase the effectiveness of the control system:

[34] Inspection team composes of members from local authorities, Hanoi PPD

[35] For farmers of the cooperative: once every 3 years, soil and water samples are tested by the cooperative.

- Farmers keep farming record as required by certificate regulation rather than directly serving for the purpose of quality control.

- The annual FS surveillance program done by state agencies still detects pesticide residual on vegetable. For example, in 2021, Hanoi PPD took 1,100 vegetable samples at planned safe vegetable production areas and detected that 36 samples/1,100 (accounting for 3.2%) had pesticide residues exceeding the maximum residual level (MRL)[36]. However, in another surveillance program done by Ho Chi Minh FS Management Board, it is noteworthy that 50% of vegetable samples taken from some wholesale markets in Ho Chi Minh city exceed MRL[37].

- The certification bodies seem to play minor role in ensuring conformity of certified parties to regulation which consequently affect quality of vegetable. Their economic benefits gained from certification service probably prevent them from withdrawing certificate in case of violation.

- In the case of school collective kitchens, the student's parents or school administrators are not experts in auditing suppliers, inspecting FS of the products. Therefore, the effectiveness and efficiency of FS inspection could be limited.

### 4.4.2 Linkage in VCs

#### 4.4.2.1 Horizontal linkage

**There is almost no formal linkage among farmers, although there is mutual support in other aspects such as labor exchange and other community relations.** Farmers, even cooperative members, are completely freed to decide that vegetables, seasons, areas, and farming techniques they use. There is no common production plan established among households. However, farmers often exchange and share, among their community, their production experience, market information or support each other when they face financial constraints (temporary borrowing in time of capital shortage), time (asking for help), about labor (exchange labor).

**Meanwhile, collectors in communes are those who link each other via a relationship that is both cooperative (supporting market information, seeking for supply sources) and competitive.** In some cases, for example in Bac Hong and Van Duc, the collectors agree to divide the market shares to avoid competition. While in Bac Hong, the two largest collectors are in charge of two independent market segments, without overlapping or encroaching on each other's playing ground. One focuses on supermarkets while the other focuses on the collective kitchen of some 40 businesses in the locality. Similarly, in Van Duc, one functions as the collector and wholesaler at Van Quan night market (Ha Dong), while the other functions as the collector and wholesaler at Dong Tao market. They share the market price situation, but do not share experience and other market information.

The collective kitchens of the same type have contact with each other to share and find market information about vegetables. For example, the kitchens of preschools and primary schools in a same district will exchange and share information about the vegetable and food ingredient suppliers for the kitchens in such ward or district.

Wholesale and retail distributors such as large supermarkets and convenience stores have less connection with each other. They are relatively independent systems.

[36] Hanoi DARD, 2021, Repot on agricultural input quality and agro-product FS management by agricultural sector of Hanoi in 2021.

[37] https://tuoitre.vn/choang-vang-khi-gan-50-mau-rau-qua-o-cho-dau-moi-tp-hcm-co-du-luong-hoa-chat-20220718073920536.htm

#### 4.4.2.2 Vertical linkage

There are both written and oral contracts among the surveyed actors in Hanoi. In some cases, they do not have any contract (i.e., free market agreements).

- The paper-based contract is implemented quite good, which is beneficial to both parties in the link and often exist between:
    - Collective kitchens with actors being the vegetable suppliers in the VC, including: the cooperatives, the meal catering companies or the vegetable suppliers. For example, a written contract between Nhan Chinh kindergarten and Davicorp company; or between Huong Viet Sinh meal catering company and the system of preschools, primary schools, and under secondary schools in Hanoi City; or between the kitchens of various enterprises in Ba Sao Industrial Park and Bac Hong cooperative.
    - Companies providing collective meals, collective kitchens with vegetable supply cooperatives, such as the contract between Davicorp and Yen My cooperative, Bac Hong cooperative...
    - System of supermarkets with vegetable cooperatives, such as contracts between BigC and Van Duc cooperatives, Bac Hong cooperatives, etc.
- Links through verbal agreements are quite often but not closely implemented between vegetable collectors and vegetable growers, such as the verbal long-term agreements (for decades) between collectors and vegetable farmers in Van Duc commune. Each collector has his/her own agreement with a certain number of vegetable growers in the area regarding vegetable purchase, with an agreed price at the time of purchase. This type of traditional connection is quite common and based on trust between reputable people who have had many years of trading experience, but still pose certain risks, and farmers are those who are affected when a risk occurs.

Free market agreements exist in the relationship between traders who collect vegetables wholesale such vegetables to customers being retailers in various wholesale markets; or in the relationship between farmers and buyers at retail and traditional markets; or between collectors and some farmers who have not been linked with previous collectors, or they want to change their relationship with previous collectors. This relationship depends entirely on the market, and the risk is very high.

### 4.4.3 Coordination mechanism in the VCs

**The surveyed vegetable cooperatives play a central and intermediary role in the modern distribution channels of Hanoi's vegetable VCs: they both produce and collect products, and coordinate and connect producers (mainly farmers) and supermarkets, convenience stores, and collective kitchens.** The central role is reflected in a way that the cooperatives are to collect, purchase, do preliminarily processing and transport vegetables from vegetable production areas to the consumption markets; the cooperatives are the entities who enter into contracts with customers, and organize for contract implementation. The intermediary role of the cooperatives (specifically Yen My Cooperative) is reflected in a way that the cooperatives connect farmers and famer groups with the markets/customers by providing information on market demand to farmers so that farmers can register to sell their products to the cooperative or farmers proactively notify the cooperative about their vegetable type, output, and harvest time so that the cooperative can develop their purchase plan and distributing vegetables to customers (Davicorp). The cooperatives also act as the intermediary payment who get paid by the enterprises and pay back to farmers. They participate in and support for price negotiation, transportation, quality control, and connecting farmers with the Davicorp.

**However, the capacity of cooperatives in the preparation of common production plan for their members in some cases is still limited.** The survey showed that, many farmers produce according to their own plans, and the cooperatives have almost no direction or significant interference in the production plans of

farmers. The reasons for this maybe that the cooperatives have limited consumption capacity as they cannot buy all the producers of their members if they developed a general production plan for the farmers to follow in case of Yen My; and maybe they do not pay much attention to make production plan, or cannot convince the farmers to follow in case of Bac Hong and Van Duc. Therefore, in order to meet diverse and fluctuating orders, the cooperatives must expand its supply source beyond the commune, establishing a network connecting vegetable production areas, not only in Hanoi but also in other provinces (for example, Moc Chau of Son La province). The failure to establish a common/general production plan also means that the cooperative faces great challenges in controlling the process of vegetable quality and production for customers.

Table 30: The cooperatives' coordination mechanism

| | Van Duc Coop | Bac Hong Coop | Yen My Coop |
|---|---|---|---|
| Managing production | The cooperative regularly purchases vegetables from 100 households, they order and manages the production of some vegetables as required | The cooperative manages part of the production process of the farmers linked with the cooperative or its own members | The cooperative manages part of the production activities of the farmers |
| Linkage | The cooperative does semi/pre-liminary processing and sell vegetables to Aeon Mall in Long Bien and Ha Dong; and Mega Market Thang Long, Hoang Mai, Ha Dong (total volume of some 2 tons/day) | The cooperative does semi/pre-liminary processing and sell vegetables to 4 BigC supermarkets in Hanoi, BigC in Hai Duong, mini mart systems, convenience stores (Udo mart), collective kitchens | The cooperative only acts as an intermediary and representative, however the cooperative receives money and pay back to the farmers; and all activities in relation to price negotiation, transport and quality control are mainly agreed between the companies and the farmers (the cooperative partially participates only) |
| Managing product quality, FS and certification process... | The cooperative disseminates information to and guides the farmers on safe food production, and collaborates in organizing training courses on safe production.<br>The cooperatives only take samples when there is a FS monitoring program of the city. It has no funds to take samples by their own initiative | The cooperative actively collects vegetable samples for regular analysis.<br>Twice a year, they take samples for testing; with the total cost of testing is up to 20 million VND/time | The company signs a contract directly with the cooperative. The company works through cooperatives. Farmers are mainly responsible for the product quality; the cooperative is to have related liability.<br>Sampling is carried out in accordance with the City's program, which is covered by the City's budget (with frequency of one per year, with 15 - 20 samples) |

*Source: Survey results, 2022*

**However, for modern distribution channel, the leading role of the VC mainly rest with supermarkets, convenience stores, collective kitchens, food supply companies (e.g., Davicorp) and meal providers (e.g., Huong Viet Sinh).** These enterprises are the actors that set quality standards and advise on the product quality standard for suppliers and for transaction (delivery time, volume, shipping method, payment) and in many cases, they establish purchase prices for suppliers in the VCs they participate. Farmers and cooperatives have little power in negotiating the terms of contracts developed by distributors. For example, long-term deferred payment terms benefit distributors, but cooperatives are unlikely to change that.

**Key issues:**

Although the cooperatives play a central, coordinating and connecting role between the production area and the consumption markets, the cooperative's capacity on preparation of general production plan is still weak.

The link between cooperatives and distributors such as supermarkets and collective kitchens is mainly based on economic contracts, with legal effect. However, the link between the cooperatives and farmers is mainly based on principle contracts or even through free trade. This fact, increases the challenges for the cooperatives in producing safe food products

## 4.5 VC support services

### 4.5.1 Access to credit

**Surveyed farmers have low demand for loans for vegetable production.** 81.3% (n=39) of farmers reported that they do not borrow for vegetable production. Therefore, access to credit is not a big issue for the farmers. Given small profits from growing vegetables, the small scale production, the limited application of technology... farmers do not really need to mobilise external capital. Only 18.8% of farmers borrows from the Vietnam Bank for Social Policies (VBSP) and some political organizations (such as Women Union, Farmer Union...).

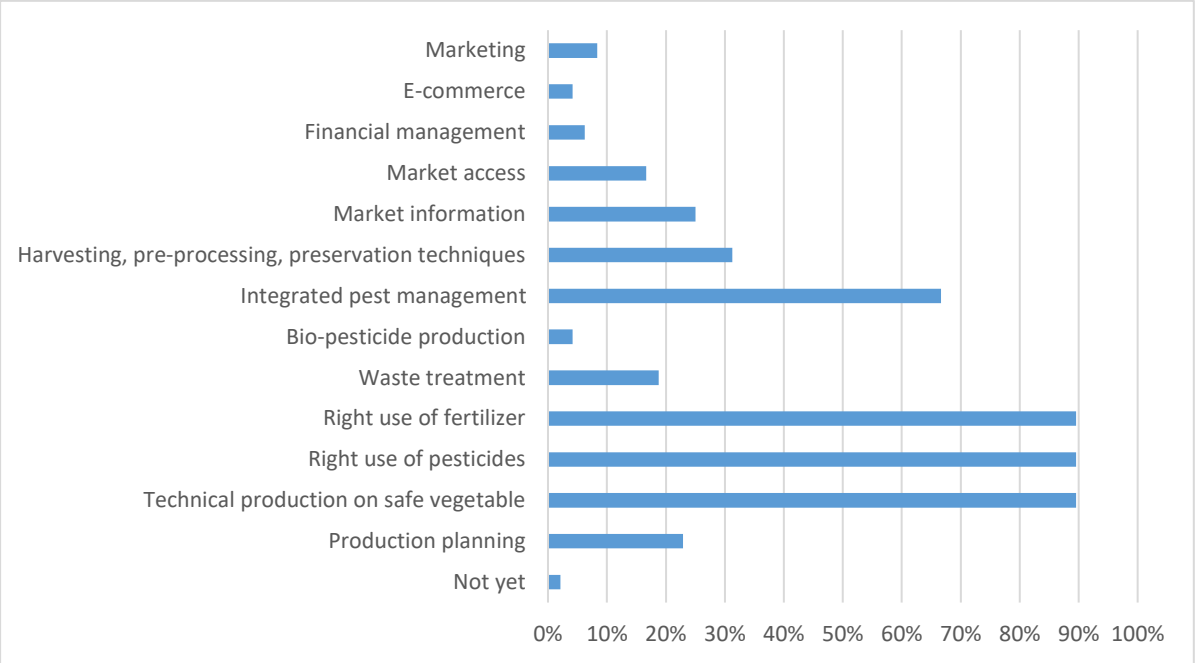
### 4.5.2 Technical support and advice

Training is an important to strengthen the capacity of farmers in vegetable production. Having surveyed at 3 cooperatives, it shows that 98% of farmers participating in cooperatives have participated in the training courses to improve capacity in vegetable production and consumption. However, there are differences in the content of training courses they participated.

**In surveyed communes, farmers are mostly trained on use of pesticides, fertilizers, and the safe vegetable farming techniques** (accounting for 90% of interviewed farmers). 67% of farmers are trained on integrated pest management (IPM)[38]. Notably, farmers have also attended training courses on waste treatment, producing bio-pesticides, financial management, e-commerce, sales skills, etc. However, the share of farmers participating in such training courses is quite low in the surveyed cooperatives.

[38] MARD issued the Decision No 2027/QĐ-BNN-BVTV dated 2/6/2015 on enhancing application of IPM on crops for the period 2015-2020; the Directive No 8141/CT-BNN-BVTV dated 24/11/2020 on continuing application of IPM on some key, high economic value and export crops. The content and curriculum of IPM trainings follow the Decision No 697/QĐ-BVTV-TV dated 19/3/2018 by PPD. According to the Decision 2027/QĐ-BNN-BVTV, IPM contents for vegetable focus on building demonstration models on farming techniques that apply probiotics, compost, microbial fertilizers, herbal pesticides, pheromone, insect traps and baits…reducing use of chemicals. DARD/PPD is responsible for delivering IPM classes.

Figure 12: Share of farmer farmers participating in training courses




*Source: Survey results, 2022*

**Vegetable farmers in the surveyed communes are mostly received support of production inputs, less support for commercial and market aspects.** About 94% of surveyed farmers said that they were supported with seeds, fertilizers, and pesticides; 19% of them have received support on traceabiity (system development, traceability stamps, barcodes...); 19% of them have been supported on VietGAP certification. However, no support for development of greenhouses, nethouses, pre-processing houses... have been provided; application of technologies, development of websites, registering for One Commune One Product (OCOP), registering for certification trademark/collective trademark.

Table 31: Support received by vegetable growers

| Type of support | Percentage of farmers received support (%) |
|---|---|
| Support for seeds, fertilizers and pesticides | 93,8 |
| Support for machines, equipment, tools | 2,1 |
| Traceability (building system, traceability stamps, barcodes...) | 14,6 |
| Support for certification of VietGAP, Organic, Globalgap… | 18,8 |
| Others | 4,0 |

*Source: Survey results, 2022*

### 4.5.3 Transportation and logistic

The survey results show that 2/3 cooperatives have their own pre-processing area used to preserve and semi-process vegetables after harvesting to help improve the value of vegetables. Particularly, Yen My Cooperative does not have a preliminary processing area. Bac Hong is certified with ISO 22000 for its

preliminary processing facility, equipped with a system of sorting, packaging, generating QR codes and printing product labels for use, and is managed by an engineer who manages the primary processing and traceability process. In addition, Bac Hong cooperative also has a cold storage to store product samples at the request of customers. This is a great advantage of the cooperative in the vegetable VC.

For transportation activities, it is found that the two cooperatives (i.e., Bac Hong and Van Duc) have their own trucks (without refrigerated containers) to transport vegetables to customers and transport vegetables to their preliminary processing. For Yen My, the cooperative does not have any truck, and farmers mainly transport vegetables by their own motorbikes.

**Key issues:**

- People are not aware that the access to credit is a measure to help increase production value when taking advantage of external financial resources instead of using available resources.

- Lack of practical soft skills in the current vegetable VC in the context of the 4.0 industrial revolution time. People need to step by step improve this.

- The logistical facilities meet at a basic level for the storage and transportation needs of the cooperatives.

## 4.6 Technology application in the VCs

Technology is considered as one of the driving forces to improve dynamic productivity, improve production efficiency and contribute to FS.

**Farmers in the surveyed areas have a very limited level of technology application in their vegetable production, due to small-scale production, long-standing traditional farming habits.** The most commonly applied technology is the use of plastic coating which is mainly applied in Bac Hong commune, with aim to protect vegetables from heavy rains, humidity and too cold weather. In addition, in the survey sample, only one farmer uses the net house, one farmer applies drip irrigation, and two farmers use spray irrigation to save water; one farmer uses technology in preliminary processing and preservation; 2 farmers apply mechanization for land preparation. No high-tech, 4.0 technologies such as automatic temperature control, Internet of Things (IOT), Unmanned Aerial Vehicle (UAV) have been used; and also, no hydroponics is used. No technology has been used for harvesting, or for e-traceability.

Table 32: Current status of technology application in vegetable production in the survey communes

| Types of technology | Percentage of application (%) |
|---|---|
| Plastic membrane | 39.6 |
| Net houses | 2.1 |
| Mechanization | 4.2 |
| Drip irrigation | 2.1 |
| Sprinkler irrigation | 4.2 |
| Preliminary processing | 2.1 |
| Preservation | 2.1 |
| Others | 16.7 |

*Source: Survey results, 2022*

**Key issues:**

- Technologies which have been applied in vegetable production are quite simple, almost no high technology has been applied to vegetable production in the surveyed communes. The production, collection, processing and trading of products still rely solely on traditional farming methods and experience.

- The introduction of simple technologies, which have been widely applied in other vegetable areas of Hanoi such as sprinkler irrigation and drip irrigation can be one suggestion for the project's intervention.

## 4.7 Traceability in the VCs

Traceability is the ability to trace a product unit through different stages along a supply chain. Traceability is based on the principle of one-step back (recognition of direct supplier) and one-step forward (recognition of direct customer). In this section, we evaluate the traceability ability of the vegetable VCs based on their ability to identify a product unit through different stages based on information stored and information transmitted to the actors along the VC for each shipment.

The form of traceability is still mainly based on book keeping/recording of sellers and buyers for small-scale FBOs. On a larger scale, such as a large supermarket, the traceability system relies on archival records combined with QR codes or barcodes that contain information to be traced toward a shipment.

The ability to trace the origin along the VC depends on customer requirements and goods quality requirements.

### 4.7.1 Supply of inputs

Input materials for the vegetable VC include: Seeds, pesticides, fertilizers (inorganic, organic). However, the book keeping/recording of the input agents mainly involves: noting the quantity of goods coming in, however, for customers, it is not fully recorded, only large and indebted customers are recorded; while small customers are hardly recorded. They only record their indebted customers, not the customers who buy little or those who are indebted for few days as most of them pay in cash.

### 4.7.2 Farmers

Traceability is mainly based on the farmers' book noted with information during the process of vegetable production, the diary of usages of pesticides and fertilizers. Information recorded at this stage includes:

- Record the information of the buyers:
- Purchase of seeds and pesticides from agents and cooperatives
- Crop calendar schedule
- Irrigation schedule
- Pesticides and fertilizers schedule
- Information about buyers:
    - Through cooperatives
    - Through traders who are regular buyers
    - Selling at wholesale markets
    - Retail in the village

Table 33: Information noted by farmers during the process of vegetable production

| Information | Percentage of application (%) |
|---|---|
| Not keep/record any information | 22 |
| Name of inputs (fertilizers, pesticides) | 64 |
| Price of inputs | 38 |
| Where to buy inputs | 31 |
| Date of input purchase | 46 |
| Diary of fertilizer use | 82 |
| Diary of pesticide use | 90 |
| Date of sowing | 64 |
| Labor/labor hiring cost | 21 |
| Keep VietGAP notebook | 8 |

*Source: Survey results, 2022*

Table 34: Recording of pesticide use

| Information recorded regarding use of pesticides | Percentage of application (%) |
|---|---|
| Name of the pesticide used | 94 |
| Date of spraying | 100 |
| PHI | 83 |
| Concentration and amount of use | 80 |

*Source: Survey results, 2022*

Table 35: Recording of fertilizers

| Information recorded regarding use of fertilizers | Percentage of application (%) |
|---|---|
| Name of the fertilizer used | 91 |
| Date of application | 100 |
| Concentration used | 78 |
| Dosage used | 85 |

*Source: Survey results, 2022*

### 4.7.3 Cooperatives

Cooperatives are the central and important link of the vegetable VCs. The cooperatives buy vegetables from farmers, then delivers them to large customers such as supermarkets, collective kitchens, and also partly to wholesale markets. The cooperatives have been guided by the Hanoi DARD on regulations on traceability, and are subsidized to use the Hanoi's food traceability software (hn.check.net.vn), with ID and password to log into the system, then generate QR code for each of product batch, update information about product batch; printing out traceability stamps including product name, manufacturer's name, production date, expiry date, QR code. The traceability stamp is affixed on the product packaging at the cooperative's semi/preliminary processing house.

At the supermarkets, when scanning QR code, the reading can help to trace back to the cooperative-level, but not down to farmer household level. The cooperatives aim to trace down to farmer household-level, but at present, it can only be able to trace to cooperative level. Household-based farmers limit to taking notes for their own management. 100% of households use smart-phones which can be served to connect information and traceability.

The cooperative has developed and implemented the Quality Control and Traceability Processes according to customers' requirements. The steps include: Receiving requests for traceability from customers (supermarkets, kitchens, canteens); The cooperative asks customers to keep the entire batch of products in case food issues are detected; The cooperative organizes to trace the production dossier to determine the name of the farmer household; organize for sampling of products from the batch, and at the same time take samples at the remaining patch of vegetables being harvested of the household (possibly in the vegetable field being harvested)

The readings on the traceability stamp on the product packaging can provide the following information: product name, product image, net weight; name and address of the cooperative; information and address of the place of distribution of the product, information on the date of production; instructions for use and preservation printed on the traceability stamp.

### 4.7.4 Collectors

Collectors play an intermediary role in the vegetable VCs. They receive orders from their customers and collect goods from farmers. Customers place orders through Zalo. Orders are often made when the price is high, and at normal time, they bring and sell at the markets.

Classification of vegetables is carried out through different ways, through the Color of the fastener tie for easy to recognize, and based on the quality, the price can be set for the vegetable grower. Different batches of vegetables purchased from different fields are kept separate from each other. As different product batches from different fields have different quality grades so they are classified and sold to different segments of customers to avoid confusion. As 10 sellers have both best and medium quality of goods, best ones are sold to customers who placed orders, and medium ones are sold to retailers. Normal ones are sold to kitchens and affordable meal shops.

Not many collectors keep note, only keep their own note at home for monitoring of the payments. Date, name, quantity, buying price. Some do not keep any note at all. When vegetables are sold directly to wholesale markets, they do not ask for information about such batches of vegetables, they do not check the quality and origin of vegetables.

No case of food traceability and recall due to food poisoning has been occurred. However, if it happens, it is said that within 1-2 days they can be able to trace where the goods come from.

### 4.7.5 Collective kitchens

In this study we visit collective kitchens at elementary schools, middle high schools and hospital. The collective kitchens at schools in the city have been fully meet the regulations on basic hygiene and FS conditions[39]. Ingredients and food are provided by catering companies to primary schools at different levels: the kindergartens and primary schools who have kitchens where food is prepared at the schools. The catering company has developed and issued the regulations on food traceability as required by ISO 22000. However, in the process, it has not updated the requirements on recall and handling of unsafe food.

The schools' canteens are supervised by the school board and pupils' parents. They jointly check the quality of meals, menus, and suppliers' profiles.

The raw material batches are delivered within the same processing day and are supplied to the kitchen. Fresh ingredients such as vegetables and meats are delivered in the morning to prepare for the lunch. Food distribution is carried out by the teachers in charge of the class. Therefore, in the event of a FS related incident, it is a clue that contribute to trace back the origin of food.

The collective kitchens all record the quality control process according to the three-step food audit book: hence, they know the information of the supplier, time, type, and volume of goods delivered. Food samples are stored for 24 hours to monitor meal quality and can trace the cause in case of FS incidents. However, if there is an outbreak, the epidemiological process should start as soon as possible so that the investigation of the cause of the foodborne illness.

Collective kitchen at Ha Dong hospital serves foods to hospitalized patients. The meals are prepared according to the dietitian's recommendation for specific illness. Meals prepared by the kitchen are labeled with adequate information as per the regulations on goods labels. However, no traceability apps such as QR code/GS1 code have been applied. Barcodes on product labels When using Zalo or App QR apps to scan the barcodes on the products, the reading only shows information on classification codes of the meal.

### 4.7.6 Retailers

#### Supermarkets

Fresh vegetables displayed in large supermarkets are packaged, labeled, and kept separately based on suppliers. Labeling information includes the name of product, name and address of the production establishment, instructions for use and preservation. They have QR code, GS1 on the label for the purpose of traceability. The reading includes: the product name and image, the name and address of the production establishment. For a supplier being the safe vegetable production cooperative, information can be traced down to household member-level.

The documents required for suppliers and farmers include: contract, certificate of meeting FS conditions/ VietGAP certificate; contracts to provide inputs by manufacturers/suppliers (fertilizers, pesticides); production diary of farmers and cooperatives; test results of samples of soil, irrigation water and fresh vegetable products.

In addition, the supermarkets also supported the application of traceability software down to member households, using e-diary to provide information on the production process (date of planting, fertilizers, pesticides used).

+ Regarding traceability, recall and handling of unsafe products: Each supplier is managed through their quality control dossiers, traceability process, sampling for testing, products are with full information about

[39] Circular 30/2012/TT-BYT regulations on food safety and hygiene conditions for food service establishments, street food and food safety conditions for collective kitchens.

the origin, sufficient information that can be traceable to the production establishment and cooperative. Some suppliers such as Tu Nhien Safe Vegetable Cooperative can trace down to their member households, using the e-diary and QR codes.

The supermarkets have also issued and applied procedures for traceability, recall and handling of unsafe food. It provides for that, in case a customer gets sick when using food (including fresh vegetables, pork), the supermarket shall be to make a list of warehouses that have received the product and the customers those who have purchased the product, then proceed to isolation, recall and dispose the product. In case of doubt, it is to have the samples stored and/or take samples of the product from the same lot displayed on sale, tested for confirmation. Confirmatory analysis results then serve as the basis for the decision on handling of the lot/batch.

- In case the analysis result of the sample is failed, the supermarket will trigger recall, isolate and remove the product batch from the counter, notify to the consumer through their customer information system (i.e., as a buyer has their shopping card) and also the supermarket cameras.

**Key issues:**

There is limited possibility to do traceability at traditional market places

- Smallholder farmers do not keep the production diary as this the notebook update activity is not convenient. They can remember what they practice on farm so that they think they do not need the writing. In addition, since the average age of the farmers is quite high and they hesitate to learn new technology such as smart phone or computer that support the traceability work

- The motivation of the deployment and application of traceability system is the requirement from customers. If supermarket/store/school systems require that vegetable suppliers must have an effective internal traceability and VC traceability system in place, so there would be a driven force for the traceability system.

## 4.8 Climate Smart Agriculture (CSA) in the VCs

### 4.8.1 Awareness of CC

**The surveyed farmers are quite aware of CC and its causes.** According to them, communications on CC is quite available in the mass media. Farmers are also clearly aware of frequent extreme weather, particularly in 2021 and 2022. High temperature or late winter affects the vegetable growth; or sudden intense rains damage vegetables. Farmers are also aware that the main cause of CC is the increased GHG emissions (accounting for 58% of farmers surveyed), in which, for agriculture, the excessive use of inputs (46%) and improper farming methods (33%) also contribute to CC.

Table 36: Causes of CC according to farmers' assessment

| Cause | Percentage of response (%) |
|---|---|
| Do not know what CC is | 12.5 |
| Do not know the cause of CC is | 14.6 |
| Due to increased greenhouse gas emissions | 58.3 |
| Due to excessive use of inputs (inputs, fertilizers, electricity, water) | 45.8 |
| Due to deforestation | 37.5 |

| Cause | Percentage of response (%) |
|---|---|
| Due to inappropriate farming practices | 33.3 |
| Others | 6.3 |

*Source: Survey results, 2022*

### 4.8.2 The impact of CC on vegetable production

The four biggest impacts of CC on vegetable production that farmers perceive clearly are: more difficult to care, more pests and diseases, reduced yields and changes in crop season. Up to 48% of the respondents confirmed that their vegetable yield decreased significantly; 76% noticed more pests and diseases, 85% said it was more difficult to care for, and 47% noticed a change in seasonality. As a result, farmers have to increase the use of fertilizers, pesticides and irrigation water to ensure their crops.

Changes in farmers' farming practices to respond to CC, in turn, have impacts on the economic efficiency of vegetable production, environmental pollution and FS issues. High temperature in frequently wet farming conditions increases the density of insects and fungi. The resistance of vegetables decreases, weakening the ability to fight against these insects and pathogens. Then, farmers will have to use more agro-chemical products, thereby increasing production costs (insecticides, pesticides, fungicides...), soil and water pollution and finally a serious threat to FS. When the temperature increases, vegetable plants cannot grow or die, they must be replanted (sow) again and again; heavy rains destroy plants, productivity (in 2021 and 2022) decreases by 40-50%, quality and appearance of vegetables affected, income is lower than previous years.

Table 37: Effects of CC on vegetable production

| Effects of CC | Percentage of response (%) |
|---|---|
| Do not know/Have no idea | 4.3 |
| Reduced productivity | 47.8 |
| More diseases and pests | 76.1 |
| More water used | 13 |
| Reduced use of pesticides | 2.0 |
| Increased use of pesticides | 26.1 |
| Reduced use of fertilizers | 4.3 |
| Increased used of fertilizers | 30.4 |
| Increased use of seeds | 13.0 |
| Seasonal change | 45.7 |
| More difficult to care | 84.8 |
| Others | 8.7 |

*Source: Survey results, 2022*

### 4.8.3 Current situation on CC adaptation and mitigation by the actors in the VCs

In such context of CC, farmers have had certain adaptation and mitigation strategies in using water, pesticides and fertilizers.

- Regarding reduced use of water, 65% of the farmers applied right irrigation, only irrigate when needed, 23% of the farmers using drought-resistant varieties, 7% used drip irrigation, and 19% used sprinkler irrigation. Only 2% of farmers can calculate the amount of water for irrigation. In addition, 83% of farmers often use water immersion in the canal (without direct irrigation) combined with fertilizing at the root.

Table 38: Measures to reduce water use in vegetable cultivation

| Mitigation measures | Percentage of response (%) |
|---|---|
| No measure is applied | 20.8 |
| Drip irrigation | 16.7 |
| Only irrigate when needed | 64.6 |
| Carefully calculate the amount of irrigation water needed | 2.1 |
| Sprinkler irrigation | 18.8 |
| Use drought-resistant varieties | 22.9 |
| Other (specify) | 16.7 |

*Source: Survey results, 2022*

- Regarding the use of pesticides, 68% of farmers have enhanced preventive measures (instead of focusing on treatment), 64% of farmers have followed the recommended instructions (right type, right amount, right way, right time), only 2% of farmers used less than the recommended-level and 11% of the respondents did not have measures to reduce pesticide use.

In general, there is a similarity in groups of measures among farmers in the 3 communes surveyed. Particularly in Bac Hong, there were a higher number of farmers using preventive measures, and in Yen My, there were some farmers who make biological pesticides or using less than recommended- level. Measures that help reducing the use of chemical plant protection product can be: hand-catching, using sticky traps, pruning and cutting the diseased branches, or applying crop rotation.

Table 39: Measures to minimize the use of pesticides in vegetable cultivation

| Mitigation measures | Percentage of response (%) |
|---|---|
| No measure is applied | 10.6 |
| Apply lower-than-recommended | 2.1 |
| Homemade biological pesticides | 6.4 |
| Strengthen preventive measures | 68.1 |
| Follow the recommendation (right type, right quantity, right time, right way) | 63.8 |
| Others | 17.0 |

*Source: Survey results, 2022*

- Regarding reduced use of fertilizers, more than half of the surveyed farmers (53%) used fertilizers according to the "4 rights principles"; 34% of farmers used homemade organic fertilizers to replace chemical fertilizers; 9% of farmers applied less-than-recommended rate of fertilizers, and 19% of farmers did not apply any measure to reduce the quantity of fertilizers used.

In comparing the use of fertilizers in the 3 communes of Van Duc, Yen My and Bac Hong: not many measures have been applied by Van Duc farmers to reduce the fertilizer use, and also use less organic fertilizers than that of Bac Hong famers. Farmers in Yen My also used more organic fertilizers (e.g., kitchen ash).

Table 40: Measures to minimize the use of fertilizers in vegetable cultivation

| Mitigation measures | Percentage of response (%) |
|---|---|
| No measure is applied | 19.1 |
| Use less than recommended | 8.5 |
| Increase use of homemade organic fertilizers | 34.0 |
| Follow the recommendation (right type, right amount, right time, right way) | 53.2 |
| Others | 14.9 |

*Source: Survey results, 2022*

**Key issues:**

- Vegetable farmers are mostly elderly, difficult to absorb new technical advances, farming techniques are mainly based on their experience while more pests and diseases occur frequently. Fertilizers and pesticides are also of many types, difficult to remember and difficult to control quality.

- Vegetable farmers often have limited financial resources to invest in appropriate control measures, lack of funds, lack of knowledge about soil health and soil/plant/climate ecological balance.

- As there is an increase in diseases, many pesticides are used, thus results in health effects and FS risks.

- There is a high risk of soil degradation, imbalance of ecosystems and biodiversity, increase of new diseases and soil born disease.

- The vicious cycle of disease, drought, increased fertilizers, increased watering, increased pesticides, increased costs, decreased income, increased environmental pollution, increased GHG emissions, increased risk of FS issues, reduced resistance of farmers, reduced productivity of land and farmers.

## 4.9 Gender in the VCs

### 4.9.1 Gender gaps

At household level, gender gap analysis is seen through four aspects[40], including:

- Gender roles in various stages in the vegetable production process, time use of men and women
- Access to and control of resources,
- Stereotypes and beliefs that hinder or promote gender relations

[40] USAID, Gender Analysis, Chapter 205, https://20122017.usaid.gov/sites/default/files/documents/1870/205.pdf

- Decision making and power structures

### 4.9.2 Gender role in various stages of vegetable VCs

The survey results show that both men and women participate in all stages of vegetable production. Farming households believe that "farm activities need the participation of both husband and wife" (FGDs). However, in some stages, there is a different division of labor based on gender roles. The table of stages in the vegetable production process in suburban agricultural cooperatives shows that there is a difference in the pattern of division of labor.

Table 41: Household based labor distribution related to vegetable production

| Activity | Main doer | | |
|---|---|---|---|
| | Women | Men | Both |
| Participate in training courses | 64.6 | 20.8 | 10.4 |
| Manage finance | 64.6 | 14.6 | 16.7 |
| Buy inputs (seeds, fertilizers, pesticides) | 62.5 | 18.8 | 18.8 |
| Transact with partners | 60.4 | 25 | 8.3 |
| Participate in cooperative, farmer group | 60.4 | 25 | 10.4 |
| Prepare production plan, decide what to grow | 54.2 | 20.8 | 25 |
| Decide what to grow | 56.3 | 20.8 | 22.9 |
| Apply fertilizers | 52.1 | 12.5 | 31.3 |
| Keep farm diary | 47.3 | 22.9 | 8.3 |
| Plant seed | 45.8 | 8.3 | 45.8 |
| Do accounting of cost-benefit of vegetable production | 45.8 | 22.9 | 22.9 |
| Manage and treat field waste | 43.8 | 16.7 | 31.3 |
| Spray pesticides | 41.7 | 41.7 | 14.6 |
| Harvest | 39.6 | 4.2 | 56.3 |
| Sort, semi/pre-liminary and preserve | 39.6 | 8.3 | 43.8 |
| Learn about regulations and policy on FS | 37.5 | 16.7 | 27.1 |
| Learn about market | 37.5 | 22.9 | 12.5 |
| Prepare soil | 35.4 | 18.8 | 45.8 |
| Daily care (irrigate, visit field…) | 35.4 | 8.3 | 54.2 |
| Transport | 31.3 | 20.8 | 35.4 |
| Decide on big expenditure (>10 million VND) | 29.2 | 18.8 | 43.8 |
| Learn about and operate technology | 12.5 | 20.8 | 18.8 |
| Produce bio-pesticides | 12.5 | 2.1 | 41.7 |
| Borrow loan | 6.3 | 6.3 | 12.5 |

| Activity | Main doer | | |
|---|---|---|---|
| | Women | Men | Both |
| Produce organic fertilizers | | 16.7 | 8.3 |

*Source: Survey results, 2022*

**Qualitative and quantitative information shows that the traditional model of labor division between men and women is still being maintained at all stages of vegetable production in the surveyed area**. Most of the men will take on heavy work like land preparation, or hazardous work like spraying pesticides. While women will do various jobs like tending, weeding, planting. Although the results of interviews shows that both men and women do spraying pesticides. But qualitative information shows that there is a big difference. In fact, both husband and wife may buy pesticides, but if there is a man in the family or the husband has no other job, he will be the one who directly sprays pesticides. There seems to be no difficulty for both male and female farmers in reading and using insecticides or pesticides because they are advised by the seller. Training on pesticides conducted by cooperatives in the past time for both men and women.

The survey results show that women play an important role in planning production, deciding which vegetables to grow. Information from the household survey suggests that, for future interventions of the project, if it is the provision of training for farmers on production planning, plant variety selection, and vegetable care, then such training should focus on women.

Important note regarding FS, SAFEGRO Project, if it is to train/guide on right use of pesticides for vegetables, such training should include both men and women as the high number of women/wives who buy pesticides, while spraying is mainly practiced by men.

### 4.9.3 Access to and control production resources

Nowadays, women have many opportunities to participate in training courses, and to purchase agri-inputs. The household survey results show that 65% of women attend training courses on vegetable production, this rate in men is approximately 21%. Similarly, more than 60% of women buy agri-inputs, but only 19% of men do this work.

**Decision-making power: The results of the qualitative and quantitative survey indicate that the role of "cashier", women have a reputation in managing finances and expenditure in the family.** However, qualitative information shows that men are the ones who decide on big things, important family decisions such as building new house, career orientation for children. Information from the survey suggests that women' empowerment has an advantage because they are reputable and do a lot of work in vegetable production. However, more power does not mean more work. And the negotiation skills to share the work of women may be something to consider.

**Regarding access to loans for agricultural production, information from cooperatives and people confirmed that accessing loans is not an issue. The unsecure loan from** Women Union and Famer Association are available at commune level. A household can borrow up to 70 million VND, of which 25% is for clean water and environmental sanitation. According to current regulations, both husband and wife must be named on the loan contract. Therefore, both women and men face no difficulty in access to loan, and they do not require to have collateral.

### 4.9.4 Stereotypes and belief that hinder or promote gender relations

**The burden of housework is one of the barriers for women that may limit opportunities for capacity building or social participation**. With the current labor division model in Hanoi suburban communes, rural women are still doing housework. The interview results shows that on average, rural women in Hanoi suburban

communes work from 12-14/hour/day. Time spent doing housework (unpaid job) is 2-3 hours/day more than men. This finding is similar to other recent studies on unpaid jobs in Vietnam (Care International, 2022). Regarding gender distribution, 96.6% of women do domestic work (cooking, cleaning the house, washing dishes, etc.) during the day compared to 83.7% of men. Meanwhile, the percentage of women doing care work (including childcare and care for the elderly, the sick, or people with disabilities) was 10 percentage points higher than that of men (67.2% vs. 57%). Women also spent a more remarkable amount of time on unpaid care and domestic work during the day than men did. On average, women spent about 4.46 hours/day on unpaid care and domestic work, while men spent 3.02 hours/day (Care International, 2022).

While women have to play the dual roles of being the main doer in the field and also taking on the housework, it creates a burden on them. The woman in the story below is an example and she feels tired of and unfair because of unfair treatment, while they themselves are not easy to overcome.

Case study: Housework does not discriminate by sex

Ms. Thuan's family has 4 people, of which the husband and wife are the main workers, their 2 children are studying at university and at high school. Her family business is to farm and also to collect vegetables and sell them at wholesale market. Her family has been in the vegetable collection business for 25 years. Ms. Thuan has been the leader of the production team of Van Duc Agricultural Cooperative for 5 years. Ms. Thuan is also a member of the Commune Women Union.

The division of work in her family is quite clear and based on the gender roles of husband and wife. Her husband plays a main role in business and agricultural production (3 crops of vegetables per year). Her husband also makes decision about their child educational orientation, building house, buying car...

Picture: Ms. Chu Thi Thuan, 45, Van Duc commune, Gia Lan district

Ms. Thuan said that her husband made decisions to collect what kinds of vegetables at where and the re-selling price. The reason for this is that her husband is the one who drives the truck to the collection sites, so he will decide what vegetables to buy in what amount. "Since he travels in different places, he has his observations, so he advises me on reasonable selling price. Sometimes, as a seller, I stand in one place just to sell vegetables, I do not know much about the market". Although, she is also involved in their family business, she believes that letting her husband make the decisions helps reduce stress. "He cannot complain me in case our business would not going well".

In contrast, Ms. Thuan plays a main role in all housework (unpaid job) such as taking care of the children, cleaning, and cooking for the whole family. She believes that the workload of housework (unpaid job) in rural families is huge, if without sharing between husband and wife, it is a burden for her. Her working time is about 14 hours/day on average, from 5am to 12pm, and there is no lunch nap. Her husband's average working time is 11 hours/day, from 7am to 12pm, with at least 1 hour of lunch break.

As a member of the WU, Ms. Thuan has participated in many communication campaigns on gender equality. In her view, gender communication should focus on men to help them change their behavior.

"I do not know what gender equality is. The only thing I know that since the day I got married to now, for 30 years, I has been supported by nobody to wash dishes for a single time. Observing my neighbors,

most of the housework is carried out by women. I think housework should not be divided by sex (men or women). Housework is the work of both. So, if the Project decides to do anything, I think there need to implement communication that the housework should be shared by both men and women. We're so tired. Sometimes, he went home and saw an unfinished work which look messy. He then shouted, what did I do at home, I said you went out (to work) and I went out also so who do you yell at? In short, communication on GE to men is needed".

### 4.9.5 Decision making and power structures

Information from group discussions shows that women and men in suburban communes are sharing similar stories. Individual efforts are not enough to overcome gender stereotype barriers. Interventions on institution and policy, and from community-based organizations where they belong, can be helpful in helping individuals to overcome gender stereotypes that do not favor both men and women.

The survey results show that **women have the highest decision-making power in the family regarding selection of food, of seeds/varieties, and production planning and purchase of pesticides**. All these stages are redefined as important stages related to FS.

### 4.9.6 Gender capacity of stakeholders

**Gender understanding and gender mainstreaming capacity of cooperatives**. Among 10 cooperatives under the screening survey, there are 55 managers and 21 of them are female managers (accounting for 38%). In some cooperatives, the number of women who are the position of production groups/team leaders (Van Duc, Bac Hong) is higher than that of men. But the cooperatives have not yet come up with measures and have no idea to strengthen the female leadership role in agricultural production.

Both 3 surveyed-cooperatives had never received any training on gender mainstreaming. The concept of gender equality, although is quite familiar to most peri-urban residents as well as cooperative managers, but is still in lack of actions that help creating equal opportunities for both men and women, particularly women's empowerment at these cooperatives.

**Key issues:**

- Women are identified as having more decision-making power regarding food choices, selection of seeds/varieties, production planning and purchase of pesticides. These are important stages that closely related to FS. Communication programs on FS have been so far focusing on women

- Avoid inculcating gender stereotypes that women are the best when it comes to food choices. Upcoming capacity building communication programs related to food choice; vegetable care, selection of pesticides... should balance the participation rate for both women and men

- Similarly, regarding the user guidance on pesticides, training/guiding on safe use of pesticides should also include both (men and women). Given the fact that women are the ones who usually buy pesticides while men are the ones who practice spraying pesticides in the fields. Therefore, guidelines for safe use of pesticides and insecticides should aim at both

- Both men and women are being encouraged to participate in access to capacity building opportunities. Opportunities to access to training programs for capacity building, input decisions in agricultural production are mainly made by women. While both husband and wife participate in borrowing loans.

# 5 Conclusion and recommendations for SAFEGRO's interventions

## 5.1 Conclusions

Although the broader value chain approach for interventions should encompass vegetables in general, the research team suggests that **mustard greens, cucumber, and morning glory** should be the priority for the focused VC analysis and risk assessments. Bac Hong, Van Duc and Yen My cooperatives were selected for VC analysis and potential supports. Finally, Bac Hong and Van Duc are proposed to participate in the pilot models of project, and morning glory/mustard greens is recommended for risk assessment along VC.

### Farming practice

Input supplying agents are important advisors of farmers for buy and application of pesticides. Using biopesticides is becoming more popular in vegetable production in surveyed areas. However, chemical pesticide is still an essential part. Integrated pest management practices have also been applied at moderate scale. It is widely reported by farmers that they apply safe vegetable farming techniques and VietGAP, but the level of their compliance with those good practices has not verified or strictly controlled.

### Vegetable quality and FS, quality management

Findings from farmer survey show that vegetable quality being sold to different end markets is not significantly different at farm gate. They are produced under the same farming techniques. The most important quality criteria for vegetable are appearance and size while certificate and chemical, biological criteria are only required by collective kitchens and supermarkets. The overestimation of former group of quality criteria would result in farmer's overuse of pesticides and fertilizers, while underestimate safety of vegetable.

There is missing cooperation and link between state management bodies, certification bodies, main buyers and cooperatives in vegetable quality and FS control, such as inspection, audit and sharing of sample test result.

### Linkage in VC

While relations between cooperatives and buyers is based on paper-based contract, the relation between cooperatives and farmers is not always alike. Cooperatives have not set up a common production plan to coordinate scheduling planting, cultivating, treatment and harvesting for farmers who supply vegetables to them. This makes cooperatives unable to fully control a consistent supply of quality and safe vegetables quality at farming stage and to be risky in term of vegetable safety.

### Traceability

Effective traceability was not observed during the field surveys.. As a result, it is unable to attribute responsibility to individuals or groups nor to focus training and support for farmers in case of occurrence of unsafe food incident.

## 5.2 Proposed VCs for risk assessment and Project's pilot models

The three VCs that were selected (based on various factors as mentioned in the research methodology section above) for the survey, namely: Van Duc cooperative, Yen My cooperative and Bac Hong cooperative. All of them are found relevant for the Project's support through its pilot model developed by the Project and with collaboration of relevant partners.

The project's pilot model includes VC actors, public sector partners, and other partners that provide certification and testing services, and vegetable production technologies, with different roles and are to be supported by the Project in order to carry out relevant activities to achieve the overall goal of developing safe, added-value and sustainable agri-food product VCs.

Based on the survey results, the research team recommends 2 VCs via cooperatives and one VC to Minh Khai wholesale market to participate in the pilot model of the Project in the first phase:

As of VCs via cooperatives include:

- VC #1: Farmers of Bac Hong/farmers who have link with Bac Hong Cooperative -> Bac Hong cooperative -> BigC supermarket, convenience stores, collective kitchens
- VC #2: Farmers of Van Duc -> Van Duc Cooperative -> Aeon Supermarket, Mega Market, collective kitchens

As of VC to Minh Khai market includes:

- VC#3: Farmers of Bac Hong -> Collectors in Bac Hong -> Wholesalers in Minh Khai -> Retailers in wet markets (locating in central districts and in Bac Hong commune).

The selection of actors and partners who participate in the pilot model should ensure the following criteria:

- All VC actors and partners agree and are willing to participate; commit to fully and responsibly implement all the support activities of the Project as well as the partners participating in the model
- Actors and partners need to be diverse and representative, including vulnerable groups such as women and the poor
- Get agreement from Hanoi Working Group, Hanoi DARD
- Relevant to the project's goals, objectives, scale and activities

The list of actors will be defined by project and two cooperatives before implementing pilot model.

## 5.3 The objectives of the pilot models and expected results

### 5.3.1 Objectives

The objective of development of the Project's pilot models is to test different interventions designed and implemented within the framework of activities under Component 1, 2 and 3 of the Project; and based on that, it is to review and draw lessons learnt, and replicate the organizational and operating model of the VCs in order to achieve dual goals: (i) produce safe food and (ii) value-added to products and actors in a sustainable way.

### 5.3.2 Expected outputs of the pilot model

At the completion of the pilot phase, the model is expected to achieve the following results:

- A mechanism on organization and operation of the VC, with the participation of various compositions, including actors and service providers with clearly defined roles and a financially sustainable model developed. The VC management is expected to follow international standards;
- The VC products are safe, with quality meeting the requirements of the market, and have a higher added-value than before-the-intervention;
- The capacity of the participating actors and partners of the pilot model is enhanced to perform their daily tasks in a more efficiently manner, while at the same time to proactively support for smooth organizational and operational process of the VCs;

- Activities related to CSA, gender mainstreaming, gender sensitivity are implemented in an effectively, environmentally and socially sustainable manner.

### 5.3.3 Proposal of Project's interventions for the pilot model

This section proposes actors, partners participating in the pilot model and activities that will be carried out by corresponding actors, partners as well as SAFEGRO project. This proposal preliminarily derives from the VC assessment results and in conjunction with other activities of SAFEGRO project including traceability, gender, CSA, training framework, communication. This proposal contains, therefore, a combination of different activities from other group's works.

#### VC management

VC management can be understood as "methodologies to help manage, standardize and optimize the VC end-to-end"[41]. Within the project framework with reference to the Decision 3073/QĐ-BNN-QLCL dated 27/12/2013 issued by MARD on approval of the program for building and developing safe agri-product VCs, the VC management works would include crop production management, FS and quality management, certification and verification, traceability and recall. SAFEGRO should support these aspects via performance of the pilot models.

##### *Vegetable production management*

Primary crop production is the responsibility of PPD at all levels. The following activities should be carried out to reinforce current crop production management:

- Input quality control:
  - Carry out quality control of agri-inputs through inspection of supply agents
  - Providing the list of pesticides, raising awareness of agents through training courses and other means
- Perform crop production management by implementing regulation on Production Unit Code (PUC)

MARD recently issued the Decision 3156/QĐ-BNN-TT date 19/8/2022 on temporary guideline on issuing PUC. According to this Decision, a production unit is an area that produces one or more types of crops, which may include one or more production sites that are collectively controlled by a standard or production techniques for each crop or group of crops. PUC is a code helps to identify a production unit with aims to monitor and control production, control product quality and trace production's origin. To implement this Decision, Hanoi DARD also issued the plan 84/KH-SNN dated 3/10/2022.

Issuance procedure and management of PUC contains different aspects of crop production management such as geographical location, farming areas, types of crops, farming techniques, production volume, markets. This database is valuable for not only state management bodies but also cooperatives to make production plan. SAFEGRO can help Hanoi PPD to pilot PUC issuance and management by applying into the project pilot models.

##### *Food safety risk assessment and management*

SAFEGRO will carry out FS risk assessment activity in selected VCs to identify risks for FS along VC. Based on risk assessment result, recommendations on risk management will come out and used as basis for FS

[41] The concept was originally introduced by Michael Porter in Competitive Advantage: Creating and Sustaining Superior Performance (1985).

improvement in the VCs. Trainings on risk assessment, risk-based FS management will also be delivered to relating actors and partners, including state management bodies.

*Monitoring, assessing product quality and food safety*

FS management, risk assessment requires to test inspection sample for compliance and non-compliance parameter. SAFEGRO has designed an activity that development of a national Laboratory Information Management System (LIMS) that permit sharing of food testing data within the inter-ministerial network of FS laboratories and the designated national reference laboratory. Trainings for laboratory staffs in sampling, SOPs and test protocol will be also organized. The selected laboratory will involve in sampling and doing test for pilot models.

*Building up and applying traceability system*

Food traceability is central to FS management and a method to add value to food products. Currently, digital-based traceability in VCs is very limited while the current traceability systems are unable to trace back to individual farmers. SAFEGRO will help to set up a pilot traceability system in the project's pilot models. This system is aligned with GS1 and tentatively connected to current traceability system managed by Hanoi NAFIQAD. Detailed activities for traceability have been proposed in traceability report prepared by other group of SAFEGRO consultants.

*Consolidating, widening application of certificate*

To assure FS along VCs, it is essential to standardize all procedures, practices via registering certification for all actors in the VCs. This also helps state management bodies to manage, audit and monitor all actors in VC with standardized procedures.

Some of the most important FS management system are: Global FS Initiative (GFSI), Hazard Analysis and Critical Control Point system (HACCP), International Food Standard (IFS), British Retail Consortium (BRC), Safe Quality Food (SQF) 2000 and International Organization for Standardization ISO 22000:2018

SAFEGRO can provide VC actors technical assistance to register and apply certificates that are relevant to their situation. This could include the following steps:

- Identify actor's demand for certificates and advise certificate that is relevant to current actor's conditions
- Collaborate with certification body to carry out audit process to identify points need to be improved
- Provide trainings, supports for actors to meet certificate regulations
- Certification body to assess and issue certificate

Building up Food safety market model

Due to a major proportion of vegetable is marketed through wholesale and retail markets of Hanoi, it is essential to improve food safety of these channels, called food safety market model which initially focuses on one wholesale markets (preferably Minh Khai) and retail markets (2-3 markets locating in central districts and one in Bac Hong commune). The tentative activities would be: deliver trainings on food safety practices to traders; re-arrange the business areas; support infrastructure improvement such as lighting system, toilets; support business signage with contact details for some traders; pilot traceability; classify and treat organic waste disposed from markets…

### VC management guideline in accordance with international standards

It has been 10 years since MARD launched the program for building and developing safe agri-product VCs in 2013 (under Decision 3073/QĐ-BNN-QLCL dated 27/12/2013). A summary report for this program prepared by NAFIQAD in Jan 2021 indicated some obstacles such as i) small proportion of agri-products was traded through controlled VCs; ii) linkages between actors in VCs are still loose with absence of sustainable and long-term contracts; iii) the rate of VCs with products being certified as safety[42] by provincial NAFIQAD was low because verification is voluntary while policies to support for verification is absent.

It is likely that a comprehensive VC management mechanism has not been in place to guide through process. To deal with this issue, SAFEGRO will help to develop a guideline that provide instruction on how to manage and develop food VCs with assurance of FS along VC. This guideline will basically lean on international standards with consideration to Vietnam context and will be applied into the project's pilot models. By the end of pilot period, there will be a summary on implementation of guideline, and the pilot models to finalize this guideline.

The tentative outline of the VC guideline can be seen in Annex 4.

### Applying digital transformation in VCs

Digital transformation is the process of using digital technologies to create new or modify existing-business processes, culture, and customer experiences to meet changing business and market requirements. Digital transformation will be the key support of SAFEGRO gives to pilot models. Digital transformation can be embedded in different activities such as management of PUC, farming records, traceability, capacity building etc.

### Improve capacity of production and supply of the VCs

SAFEGRO will develop a training framework that targets to almost all VC actors (farmers, collectors, cooperatives, wholesalers, retailers, supermarkets, convenient stores, collective kitchens) and partners (management bodies, certification bodies, labs…) of the pilot models in order to improve capacity of production and supply of the VCs. These trainings cover a wide range of topics made tailored with given actors, partners and will be delivered via face-to-face, online training classes and e-learning platform. The tentative training framework for VC actors and partners can be seen in Annex 3.

### Gender mainstreaming in the VCs

- Build a network of key gender officers in all department/partners/actors participating in the VC. Select those who are willing to integrate gender into their department
- Strengthen gender mainstreaming capacity for key gender focal person and VC actors
- Cooperate with Women's Union at Central, province/city level to launch a communication campaign to raise awareness about gender and food safety. Promoting the participation of women and disadvantaged groups in the selected VCs
- Seminar/series of Education on risks and the role of men and women in ensuring food safety.
- Provide training courses on leadership skills for woman leaders or potential woman leaders among selected cooperatives and enterprises.
- Building a model of gender-responsible food safety villages/communes (in Hanoi).

[42] MARD issued a guideline on verifying products in VC through Decision 3075/QĐ-BNN-QLCL dated 20/7/2016.

- Allocate budget for community initiatives on women-led businesses/cooperatives with women leaders, prioritize women's participatory initiatives, contribute to creating jobs for women or businesses with women own.

### Increase ability of market access and added value of products in the VCs

The VC products which meet all requirements need to be recognized by consumers. This can be achieved through labelling and carrying out promotion, communication program to raise awareness of consumers. SAFEGRO therefore can run following activities:

- Develop communication strategy and program to raise awareness of FS for consumers
- Organize the promotion, communication program and develop branding identity to promote pilot model's products to consumers.

The overall structure of the pilot model with actors, partners and their roles in the model is demonstrated in Figure 13. The roles of actors, partners in the pilot models are summarized in

Figure 13: Overall diagram of the pilot model to support the vegetable

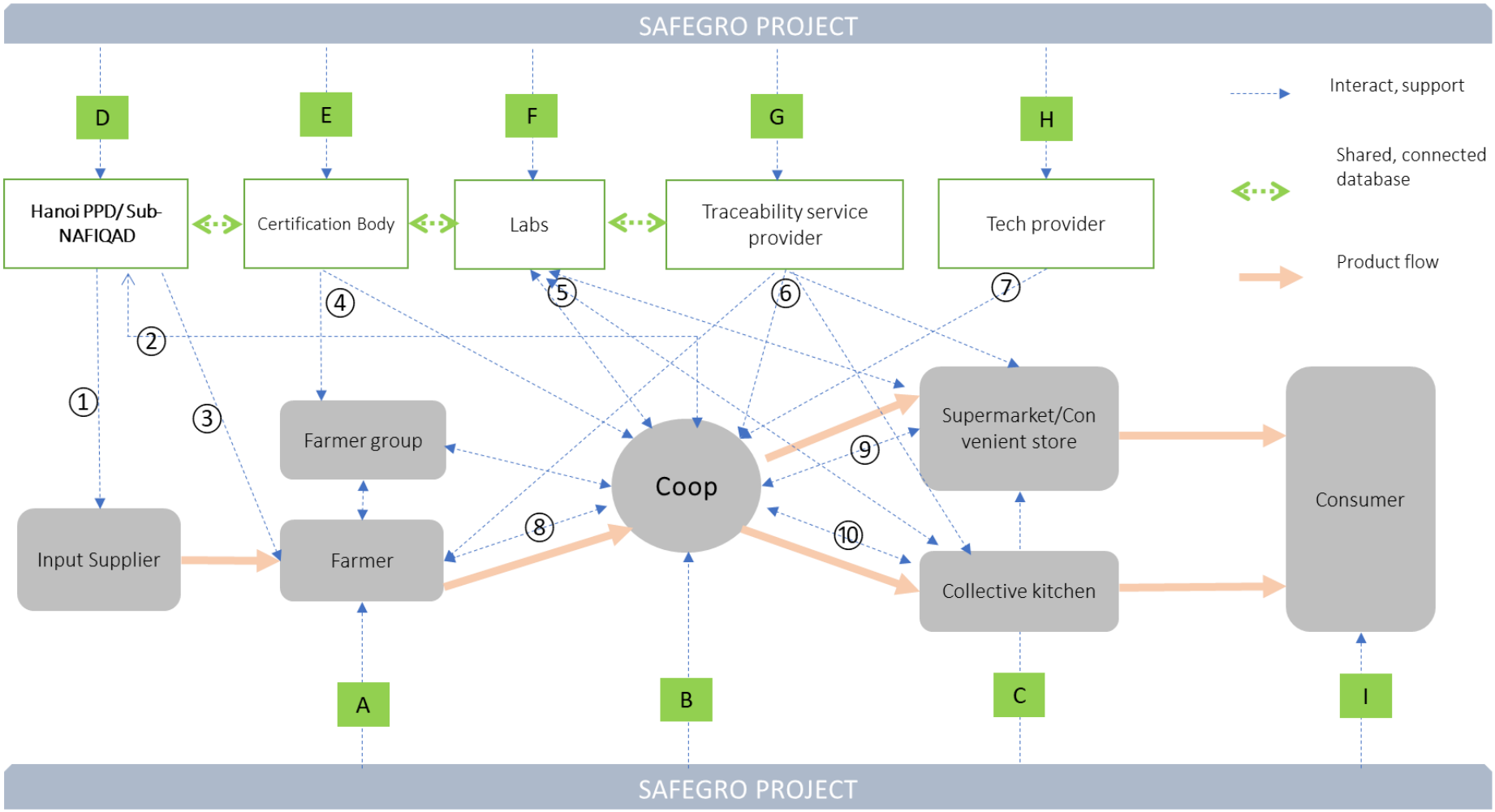


Table 42: The role of actors, partners in the pilot models

| # | The role of actors, partners |
|---|---|
| ① | PPD:<br>- Quality control of agri-inputs through inspection of supply agents<br>- Providing information on the list of pesticides through training courses and other means |
| ② | Cooperative:<br>- Prepare the application for obtaining the PUC, and send it to PPD.<br>- Record and store traceability information of the PUC<br>PPD:<br>- Approve the application and issue the PUCs for the cooperatives<br>- Perform the work on management and inspection of PUC[43]; carry out regular risk-based monitoring; notify the monitoring results to the cooperatives and relevant actors<br>- Organize training courses on planting and cultivation techniques according to VietGAP standards or other certification standards<br>- Disseminate information and support policies related to cooperatives<br>Hanoi NAFIQAD:<br>- Manage FS of the cooperatives' preliminary processing and processing facilities according to regulations<br>- Notify the results of assessment and monitoring to the cooperatives and related parties |
| ③ | PPD: |

[43] Inspect the planting area according to Minute 02, Appendix 1, MARD Decision 3156/QD-BNN-TT dated September 19, 2022 regarding issuance of temporary guidelines on issuance and management of planting area codes (including inspection of 9 groups of criteria (from criteria 1 to criteria 9) regarding conditions required to ensure food safety in production according to the instructions under Section II, Form BB 1.1, Appendix II, MARD Circular 38/2018/TT-BNNPTNT dated 25/12/2018).

| # | The role of actors, partners |
|---|---|
| | - Organize training courses on planting and cultivation techniques according to VietGAP standards or other certification standards<br>- Monitor and take samples to analyze the quality of vegetables<br>- Collaborate with the Project to implement the CC adapted vegetable farming demonstration model |
| ④ | Certification Bodies:<br>- Issue the certification (for example VietGAP or other certification) for the vegetable growing area that meets standard<br>- Regular re-assess in accordance with the regulations, notify such assessment results to the PPD<br>- Advise the cooperatives and farmers on standard farming techniques |
| ⑤ | Labs:<br>- Provide sampling and analysis services upon request from the cooperatives, supermarkets, collective kitchens<br>- Disclose the analysis results on the online database so that the cooperatives, supermarkets, and collective kitchens can access |
| ⑥ | GS1:<br>- Provide technical support services to develop traceability system down to farmer level<br>- Guide the operation of the traceability system at field level for actors (farmers, cooperatives, management agencies, labs)<br>- Participate in FS incident handling rehearsals with relevant parties<br>- Cooperatives and farmers: implement, apply the traceability system on product and semi-processed product lots/batches |
| ⑦ | Technology providers:<br>- Introduce, provide, and guide the operation of applied technologies in vegetable production (sprinkler irrigation, drip irrigation, net house, greenhouse, UAV, IoT, AI, automation...[44]) |
| ⑧ | Cooperatives:<br>- Collect data, digitize farmers' data on production capacity (area, vegetables, planting time, harvesting time, expected yield...)<br>- Sign the contract on vegetable supply links with farmers/farmers' group |

[44] Under the framework of Activity 1232.1 Survey the food technology innovation network, create database and establish a communication network

| # | The role of actors, partners |
|---|---|
| | - Purchase vegetables according to the agreed plan and contract<br>- Check production practices, manage the quality of vegetable products of farmers<br>- Provide technical guidance to farmers<br>**Farmers:**<br>- Sell vegetables to the cooperative according to the agreed plan<br>- Comply with the technical instructions of the cooperative |
| ⑨ | **Cooperatives:**<br>- Sign the supply contract with the supermarket<br>- Supply vegetables under the contract<br>**Supermarkets/convenience stores:**<br>- Checking the quality and origin of products on regular and ad-hoc basis<br>- Inspect and check the suppliers, and recommend practices for suppliers |
| ⑩ | **Collective kitchens:**<br>- Inspect and check the cooperatives about the origin and quality of products on regular and ad-hoc basis |

Table 43: SAFEGRO's support activities for the pilot models

| # | Activity | Beneficiaries | Expected output | Implementation time | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Q2/ 23 | Q3/ 23 | Q4/ 23 | Q1/ 24 | Q2/ 24 | Q3/ 24 |
| I | IMPROVE MANAGEMENT EFFECTIVENESS AND FOOD SAFETY IN THE VC | | | | | | | | |
| 1.1 | Vegetable production management | | | | | | | | |
| 1 | Support PPD to enhance capacity of granting and management of production unit code (PUC) (applying digital technology/digitalization) | Hanoi PPD | 02 training classes are organized | | x | x | | | |
| 1.2 | Food safety risk assessment and management | | | | | | | | |
| 1 | Support Hanoi PPD, Hanoi NAFIQAD to strengthen capacity of food safety risk assessment, risk management and risk communication | Hanoi PPD, Hanoi NAFIQAD | 02 training classes are organized | | x | | x | | |
| 2 | Support Hanoi NAFIQAD to strengthen production quality management, food safety management in the VC | Hanoi NAFIQAD | 02 training classes are organized | | x | | x | | |
| 1.3 | Equip basic devices for operation and food safety | | | | | | | | |
| 1 | Equipment for operation (desktop, tablet, printer, label printer, QR code printer, software, database, internet, equipment for meeting room/study room…) | HTX | | x | x | x | | | |
| 2 | Equipment for food safety (toilet, lavabo, dust bin, effective microorganism, panel, water filter, washing basin, basket...) | HTX | | x | x | x | | | |
| 3 | Field monitoring devices (temperature sensor, humidity sensor...( for CSA model) | Farmer, cooperative | | x | x | x | | | |
| 4 | Saving watering system, nethouse repair (for CSA model) | Farmer | | x | x | x | | | |
| 1.4 | Monitoring, assessing product quality and food safety | | | | | | | | |

| # | Activity | Beneficiaries | Expected output | Implementation time | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Q2/ 23 | Q3/ 23 | Q4/ 23 | Q1/ 24 | Q2/ 24 | Q3/ 24 |
| 1 | Support to analyze vegetable sample (by using quick test or sending to lab) to check vegetable quality | Cooperative | 200 quick test kits are provided<br>60 samples are analyzed by lab | x | x | x | x | x | |
| 2 | Cooperate with supermarket/convenient store to evaluate, monitor the participating cooperatives | Supermarket /convenience store | 02 visits are made | | | x | | x | |
| 3 | Provide training to student's parents, school managers on inspecting skills, supplier evaluation and food safety knowledge | Collective kitchen | 02 training classes are organized | | | x | | | |
| 4 | Provide training to kitchen staffs, manager on knowledge and skills to ensure food safety in food pre-process, preservation, and process | Collective kitchen | 02 training classes are organized | | x | | x | | |
| 1.5 | **Consolidating, widening application of certificate** | | | | | | | | |
| 1 | Training to consolidate farmer's knowledge on VietGAP (for those who got certificate), use of pesticides and fertilizer economically and effectively, practice of IPM | Farmer | 04 training classes are organized (common for cooperatives in the pilot model)<br>40 farmer/class are trained (women are prioritized) | x | x | | | | |
| 2 | Support to get VietGAP certificate for other production area | Farmer | 50% of vegetable area of cooperative is certified | | x | x | x | | |
| 3 | Support cooperative to follow ISO 22000/HACCP regulation | Cooperative | Processing house operate in accordance with the provisions of ISO 22000/HACCP | | x | x | x | | |
| 4 | Support Certification Body to grant, periodically evaluate, re-evaluate certificate | Certification Body | 02 training classes are organized | | | x | | x | |
| 5 | Provide training to CB staffs on sampling methodologies | Certification Body | 01 training classes are organized | | | x | | x | |

| # | Activity | Beneficiaries | Expected output | Implementation time | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Q2/ 23 | Q3/ 23 | Q4/ 23 | Q1/ 24 | Q2/ 24 | Q3/ 24 |
| 6 | Enhance capacity of sampling, analyzing for lab staffs | Lab | 02 training classes are organized | | x | | x | | |
| 7 | Build a mechanism that enable sharing analysis data among pilot labs and relating partners in the pilot models | Lab | 01 system is established | | x | x | x | | |
| 1.6 | **Build up and apply traceability system** | | | | | | | | |
| 1 | Contract with GS1 and relevant traceability tech provider to build up a traceability system for pilot model | GS1 | 01 traceability system is established and operated | x | x | x | x | x | |
| 2 | Guide farmers to apply the traceability system developed by the project | Farmer | Farmers participate and apply the system | | x | x | x | x | |
| 3 | Technical support to Hanoi NAFIQAD to manage, operate the traceability system administrated by Hanoi NAFIQAD, consider to integrate project's traceability system into Hanoi NAFIQAD's system; ready to connect with the Vietnam national traceability portal (VNTP) when VNTP is in place | Hanoi NAFIQAD | Hanoi NAFIQAD capacity is enhanced | | | x | x | | |
| 4 | Support to strengthen capacity for Hanoi NAFIQAD staffs to handle and rehearse recall in case of occurrence of food safety incident | Hanoi NAFIQAD | 02 rehearsals are organized | | | | x | | x |
| 5 | Support to establish handling procedure and rehearse in case of occurrence of food safety incidents | Collective kitchen | 01 rehearsals are organized | | | | x | | x |
| 6 | Cooperate with supermarket/convenient store to rehearse tracing, recall in case of occurrence of food safety incidents | Supermarket /convenience store | 01 rehearsals are organized | | | | x | | x |
| II | **IMPROVE CAPACITY OF PRODUCTION AND SUPPLY OF THE VC** | | | | | | | | |

| # | Activity | Beneficiaries | Expected output | Implementation time | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Q2/ 23 | Q3/ 23 | Q4/ 23 | Q1/ 24 | Q2/ 24 | Q3/ 24 |
| 1 | Forming and building capacity for VietGAP farmer groups on operation, production and supply plan, quality monitoring... | Farmer | 04 farmer groups are established (having regulations, operation plan) Groups with women leaders account for more than 70% | x | x | x | x | x | |
| 2 | Support cooperative to prepare documents for registration and management of PUC managed by cooperatives; support cooperative to set up quality management system, food safety of vegetable provided by farmers | Cooperative | 06 PUCs are granted to cooperatives (PUCs are organized by farmer groups) Quality management system is organized and operated | x | x | | | | |
| 3 | Support cooperative to set up and manage database on supply resource (digital based application) | Cooperative | Digital based supply resource management is established and operated | x | x | x | | | |
| 4 | Support to build up a cooperation mechanism between pilot cooperatives in supplying vegetable | Cooperative | 02 meetings between participating cooperatives are organized | | | | | x | x |
| 5 | Strengthen cooperative leader's capacity of building production and supply plan, governance, market access, online sale, marketing, information technology skill... | Cooperative | 03 training classes/year are organized | | | | | x | x |
| 6 | Introduce relevant vegetable farming technologies to farmers (i.e. saving watering, drip watering...) | Farmer | 02 conferences/year are organized (common for cooperatives in the pilot models) | | x | | x | | |
| 7 | Set up a demonstration model on CSA in vegetable production, climate smart land preparation | Farmer | 02 CSA, climate smart land preparation are established | | x | x | x | | |
| 8 | Organize visits, study tours for farmers to high tech, sustainable, innovative vegetable production models | Farmer | 02 study tours are organized (common for cooperatives in the pilot models) | | | | | x | x |

| # | Activity | Beneficiaries | Expected output | Implementation time | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Q2/ 23 | Q3/ 23 | Q4/ 23 | Q1/ 24 | Q2/ 24 | Q3/ 24 |
| | | | 40 Farmer are participated (women are prioritized) | | | | | | |
| 9 | Provide training on techniques, technologies, skills to reduce harvest lost, by product processing, organic fertilizer production | Farmer | 03 training classes are organized (common for cooperatives in the pilot model)<br>40 farmer/class are trained (women are prioritized) | | | | | x | x |
| III | INCREASE ABILITY OF MARKET ACCESS AND ADDED VALUE OF PRODUCTS IN THE VC | | | | | | | | |
| 1 | Support cooperatives to connect with potential buyers (supermarket, convenience store, collective kitchen) to increaser market opportunities | Cooperative | 02 conferences/year are organized with participation of cooperatives and potential buyers | | | | | x | x |
| 2 | Support cooperative to reinforce branding (website, logo, brand identity, participating in trade promotion, advertisement…) | Cooperative | Website of cooperative is built up/maintained<br>Brand identity is designed<br>Cooperative participated in 01 fair, communication events organized by project | | | | | x | x |
| 3 | Project, cooperative cooperate with supermarkets/convenience stores to organize communication events, promotion events to advertise cooperative's products to consumers | Supermarket /convenience store | 02 communication events are organized | | | | | x | x |
| 4 | Regular organization of communication and promotion programs for pilot model products to consumers | Consumer | 04 communication events are organized | | | | | x | x |
| IV | GENDER MAINSTREAMING IN THE VC | | | | | | | | |

| # | Activity | Beneficiaries | Expected output | Implementation time | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Q2/ 23 | Q3/ 23 | Q4/ 23 | Q1/ 24 | Q2/ 24 | Q3/ 24 |
| 1 | Build a network of key gender officers in all department/partners/actors participating in the VC. Select those who are willing to integrate gender into their department | Multi actors | A network of gender focal person<br>Each actor have at least a gender focal person | x | x | | | | |
| 2 | Strengthen gender mainstreaming capacity for key gender focal person and VC actors | Multi actors | 01 training course on Gender mainstreaming for gender focal person and VC actors | x | x | | | | |
| 3 | Cooperate with Women's Union at Central, province/city level to launch a communication campaign to raise awareness about gender and food safety. Promoting the participation of women and disadvantaged groups in the selected VCs | Women Union | 04 communication events/campaign are organized in 04 selected communes of 02 project districts. | | x | | x | | |
| 4 | Seminar/series of Education on risks and the role of men and women in ensuring food safety. | Primary /Secondary schools, BOET and Hanoi DOET | Series of Education on linkage between food borne disease (FBDs) and gender are organized in 4 selected schools located in 02 project communes. | | x | | x | | |
| 5 | Provide training courses on leadership skills for woman leaders or potential woman leaders among selected cooperatives and enterprises. | Women leader | 01 training classes on leadership for 20 women leaders/potential leaders are organized<br>Women leaders knowledge on food safety are enhanced | | x | | x | | |
| 6 | Building a model of gender-responsible food safety villages/communes (in Hanoi). | Commune PPC | 01 Food safety commune/village models is established | x | x | x | x | x | |

| # | Activity | Beneficiaries | Expected output | Implementation time | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Q2/ 23 | Q3/ 23 | Q4/ 23 | Q1/ 24 | Q2/ 24 | Q3/ 24 |
| 7 | Allocate budget for community initiatives on women-led businesses/cooperatives with women leaders, prioritize women's participatory initiatives, contribute to creating jobs for women or businesses with women own. | Women farmer | 04 community initiatives toward gender equality and women empowerment (< 50 million VND or CAD 2,941 /community initiative). | | x | x | | | |

# Annexes

Annex 1: Checklist for selection of vegetable VCs

| # | Criteria | Score range | Score | Note |
|---|---|---|---|---|
| I | Production scale and FS condition | | | |
| 1 | Vegetable cultivation land area managed by cooperative | | | |
| | < 50ha | 1 | | Specify |
| | > 50ha | 2 | | Specify |
| 2 | Production certificate | | | |
| | No certificate | 0 | | |
| | Certificate of FS Eligibility | 1 | | Certified area |
| | VietGAP | 2 | | Certified area |
| | Organic | 3 | | Certified area |
| | Other certificate | | | |
| II | HTX Production management and FS condition | | | |
| 3 | Production organization | | | |
| | Do not manage farmer's vegetable production | 0 | | |
| | Partly manage farmer's vegetable production | 1 | | |
| | Totally manage farmer's vegetable production | 2 | | |
| 4 | Linkage with farmer | | | |
| | No contract | 0 | | |
| | Verbal agreement | 1 | | |
| | Principle contract | 2 | | |
| | Economic contract | 3 | | |
| 5 | Quality, FS management | | | |
| | Do not manage product quality, FS | 0 | | |
| | Manage product quality, FS | 1 | | |
| | Taking sample and send to lab for test | 2 | | |
| 6 | Residual analysis | | | |
| | No analysis | 0 | | |
| | Do residual analysis when applying for certificate | 1 | | |
| | Analysis on demand by customers | 2 | | |
| | Periodic analysis | 3 | | |
| III | Infrastructure for production and trade | | | |
| 7 | Pre-processing house | | | |
| | No pre-processing house | 0 | | |
| | Having pre-processing house | 1 | | Area of pre-processing house (m2): |

| # | Criteria | Score range | Score | Note |
|---|---|---|---|---|
| | Pre-processing house meet FS condition | 2 | | |
| | Certified pre-processing house | 3 | | |
| 8 | Transportation | | | |
| | No means of transport | 0 | | |
| | Motorbike | 1 | | |
| | Truck | 2 | | How many? |
| | Cold truck | 3 | | How many? |
| IV | Product market | | | |
| 9 | Buy vegetable from farmers | | | |
| | Do not buy | 0 | | |
| | Buy vegetable from member and non-members | 1 | | |
| | Only buy from member | 2 | | |
| 10 | Market | | | |
| | Retailers (traditional market) | 1 | | |
| | Collector | 1 | | |
| | Wholesalers (wholesale market) | 1 | | |
| | Collective kitchen | 2 | | |
| | Convenience store | 2 | | |
| | Supermarket | 2 | | |
| | Online | 1 | | |
| 11 | Linkage with buyers | | | |
| | No contract | 0 | | |
| | Verbal agreement | 1 | | |
| | Principle contract | 2 | | With who: |
| | Economic contract | 3 | | With who: |
| V | Record, traceability | | | |
| 12 | Farming record | | | |
| | Cooperative do not require farmers to record | 0 | | |
| | Cooperative encourage farmers to record | 1 | | |
| | Cooperative require farmers to record | 2 | | |
| 13 | Business record | | | |
| | No record of business | 0 | | |
| | Record business on paper | 1 | | |
| | Record business on computer/smartphone | 2 | | |
| VI | Information tech accessibility | | | |
| 14 | Equipment for working | | | |
| | No computer | 0 | | |
| | Having computer without internet | 1 | | How many |
| | Having computer with internet | 2 | | |
| 15 | Information technology in management | | | |
| | No | 0 | | |

| # | Criteria | Score range | Score | Note |
|---|---|---|---|---|
| | Yes | 1 | | |
| 16 | Proportion of farmers having smartphone with internet | | | |
| | <30% | 0 | | What the number |
| | From 30% to < 50% | 1 | | |
| | > 50% | 2 | | |
| VII | Level of participation in project pilot model | | | |
| 17 | Level of participation | | | |
| | Do not want to participate | 0 | | |
| | Participate on condition | 1 | | What condition |
| | Ready to participate | 2 | | |
| 18 | Willingness to participate in capacity building trainings by SAFEGRO | | | |
| | Do not want to participate | 0 | | |
| | Participate if relevant content | 1 | | |
| | Participate in all trainings as required | 2 | | |
| 19 | Willingness to participate in pilot traceability model | | | |
| | Do not want to participate | 0 | | |
| | Participate on condition | 1 | | What condition |
| | Commitment to participate | 2 | | |
| 20 | Corresponding budget | | | |
| | Do not want to contribute to | 0 | | |
| | Ready to invest to meet FS condition | 1 | | |

Annex 2: Score ranking for vegetable VCs

| Criteria | Weighing factor | Index | Total score ranking for vegetable VCs | | |
|---|---|---|---|---|---|
| | | | Mustard green | Cucumber | Morning glory |
| Governance | 20% | Aligned with government priorities and key products. (Export vs. domestic markets) | 1 | 0.8 | 0.6 |
| | | Potential impact of improved legislation, coordination, and enforcement. | 0.8 | 0.8 | 0.8 |
| | | Responsible agency (MARD, MOH, MoIT), especially regarding Decree 15. | 0.6 | 0.6 | 0.6 |
| | | Transparency | 0.6 | 0.6 | 0.6 |

| Criteria | Weighing factor | Index | Total score ranking for vegetable VCs | | |
|---|---|---|---|---|---|
| | | | Mustard green | Cucumber | Morning glory |
| Public Health | 20% | Microbiological pathogens | 0.8 | 0.8 | 0.8 |
| | | Chemicals (pesticides, heavy metals, nitrate) | 1 | 0.6 | 1 |
| | | Physicals | 0.2 | 0.2 | 0.2 |
| | | Allergens | 0.2 | 0.4 | 0.2 |
| | | Buyers' FS risk score | 0.8 | 0.6 | 0.8 |
| | | Importance in the food system and diet (consumption volumes HCMC vs Hanoi) | 0.8 | 0.2 | 0.6 |
| | | Incidence of Food-borne illness | 0.4 | 0.4 | 0.4 |
| Potential for Social Impact | 15% | Engagement and gender equality | 0.6 | 0.45 | 0.6 |
| | | Women economic empowerment | 0.6 | 0.45 | 0.45 |
| | | Youth empowerment (age under 30) | 0.6 | 0.45 | 0.3 |
| | | Assn for Customers Rights Protection | 0.6 | 0.6 | 0.6 |
| | | Commitment of local govt including enforcement, penalties, and sanctions | 0.45 | 0.45 | 0.45 |
| Environment and CC | 15% | Environment impacts of production (water, air, soil) | 0.6 | 0.6 | 0.45 |
| | | Climate impacts – level of GHG emissions and need for mitigation | 0.45 | 0.6 | 0.6 |
| | | CC vulnerability - need for CC adaptation | 0.6 | 0.45 | 0.45 |
| Business and Market Models | 10% | Market type (domestic market). | 0.4 | 0.2 | 0.4 |
| | | Market type (export market). | 0.1 | 0.2 | 0.1 |
| | | Potential for export | 0.2 | 0.2 | 0.1 |
| | | Presence of market access restrictions. | 0.4 | 0.4 | 0.4 |
| | | Postharvest losses | 0.4 | 0.3 | 0.4 |
| | | Potential for processing to increase the value added | 0.1 | 0.3 | 0.1 |
| | | Availability of FS certification system. | 0.3 | 0.3 | 0.2 |

| Criteria | Weighing factor | Index | Total score ranking for vegetable VCs | | |
|---|---|---|---|---|---|
| | | | Mustard green | Cucumber | Morning glory |
| | | Cost effectiveness (cost: benefit) of adopting certification systems. | 0.3 | 0.2 | 0.2 |
| | | Economic opportunities, especially for small holders and/or women | 0.3 | 0.3 | 0.2 |
| | | Employment opportunities, especially for small holders and/or women | 0.4 | 0.3 | 0.4 |
| | | Market requirement for safer foods. | 0.4 | 0.4 | 0.4 |
| | | Degree of competition in the supply chain. | 0.3 | 0.3 | 0.3 |
| | | Large companies and/or cooperatives able to act as change agents. | 0.3 | 0.3 | 0.2 |
| | | Potential for public-private partnerships | 0.2 | 0.2 | 0.1 |
| | | Potential for sustainable and scalable pilots | 0.3 | 0.3 | 0.1 |
| | | Risks of recalls, rejections, and reworks | 0.2 | 0.2 | 0.2 |
| Primary Production | 5% | Number of people involved (sex-disaggregated data) | 0.2 | 0.15 | 0.2 |
| | | Geographic coverage | 0.25 | 0.15 | 0.2 |
| | | Complexity of the production system. | 0.15 | 0.1 | 0.1 |
| | | Prevalence of conflicts in resource use. | 0.15 | 0.15 | 0.15 |
| | | Availability of technical guideline/practices for safer product (VietGAP, Global Gap, etc,) | 0.2 | 0.2 | 0.2 |
| Knowledge and Behaviors | 10% | Degree of consumer awareness (gendered) | 0.4 | 0.4 | 0.4 |
| | | Availability of FS campaign/education | 0.3 | 0.3 | 0.3 |

| Criteria | Weighing factor | Index | Total score ranking for vegetable VCs | | |
|---|---|---|---|---|---|
| | | | Mustard green | Cucumber | Morning glory |
| | | program or training material [informal, non-formal and formal education) | | | |
| Linkages | 5% | Relevant coordination linkages and resources available. | 0.15 | 0.15 | 0.15 |
| | | Other donor projects and gov't programs (WB; VCs; cooperatives etc.) | 0.15 | 0.15 | 0.1 |
| SUM | | | 18.25 | 16.2 | 16.1 |
| PRIORITY RANKING | | | 1 | 2 | 3 |

Annex 3: Tentative training framework of the project

| Targeted learners | Main contents | Method | | |
|---|---|---|---|---|
| | | Face-to-face | Online | E-learning |
| Farmer | 1. Method of determining and selecting soil and water quality in vegetable farming | | | x |
| | 2. Methods of production and use of organic fertilizers in vegetable farming | x | | x |
| | 3. Prevention of pests and diseases by biosecurity methods | x | | |
| | 4. Safety in the use of chemicals (pesticide) in vegetable farming | x | | |
| | 5. Methods in recording and keeping a diary of vegetable farming | x | | x |
| | 6. Methods of forming and maintaining a product traceability system in the vegetable VC | x | x | x |
| | 7. Access to credit and maximize credit efficiency in the vegetable VC | x | x | x |
| | 8. Practical soft skills in the vegetable VC in the context of 4.0 digital time | x | x | |
| | 9. Some high technologies for vegetable production, collection and processing | x | x | |
| | 10. VietGAP Plus Certification | x | x | x |
| | 11. Commercialization of products based on available information technologies | x | x | x |

| Targeted learners | Main contents | Method | | |
|---|---|---|---|---|
| | | Face-to-face | Online | E-learning |
| Cooperative | 1. Safe production standards for safe vegetables, VietGAP, GlobalGAP and organic vegetables | x | | x |
| | 2. Procedures and requirements for registration for certification of VietGAP, GlobalGAP and organic vegetables | | | |
| | 3. Cooperatives management skills of vegetable farming | | | |
| | 4. Apply some basic IT in the safe vegetable VC | | x | |
| | 5. Certifications, packaging, labels | | | |
| Processor | 1.FS requirements in safe vegetable production | x | x | x |
| | 2. Vietnamese Standards and Regulations in Good Agricultural Practice | | | x |
| Wholesale, retailer management | 1. FS requirements in safe vegetable production | x | x | x |
| | 2. Maximum limits on heavy metals in vegetables and fruits, according to QCVN 8-2:2011/BYT and Circular 12/2021/TT-BYT | x | x | x |
| | 3. The maximum limit on harmful microorganisms in vegetables and fruits as prescribed in QCVN 8-3:2012/BYT and Circular 12/2021/TT-BYT | x | x | x |
| | 4. Maximum limits on pesticides and other chemicals according to Circular 50/2016/TT-BYT; Circular 03/2016/TT-BNNPTNT | x | x | x |
| | 5. Certification of qualified FS facilities, GMP, HACCP, ISO 22000, IFS, BRC, FSSC 22000 | x | x | x |
| Certification training | 1. FS requirements in safe vegetable production | x | x | x |
| | 2. Vietnamese Standards and Regulations on Good Agricultural Practices. Classes on traceability | x | | x |
| Government staff | 1. Knowledge improvement in checking, inspection and supervision in the vegetable VC and traceability | x | | x |
| | 2. Efficiency improvement of safety chain supervision and Inspection. | | x | |
| | 3. Improvement of knowledge and skills in the Laboratory. | | x | |
| | 4. Upgrade LIMS system | | x | |
| School kitchen | 1. FS in the Kitchen. Procedure of wash hands before handling. records, evaluation and monitoring | x | x | x |
| | 2. Method of traceability of food materials processing | x | x | x |

| Targeted learners | Main contents | Method | | |
|---|---|---|---|---|
| | | Face-to-face | Online | E-learning |
| | 3. Method of keeping records of daily food supply, processing and use | x | x | x |
| Lab | 1. Training on Laboratory skills | x | x | x |
| | 2. Knowledge of LIMS connection | x | x | x |
| | 3. Organic products in Vegetable Production | x | x | x |
| Gender training | 1. Improvement of awareness and knowledge on gender issues | | | x |
| | 2. Monitoring and evaluation tool with gender analysis in policies, plans, programs and projects | x | | |
| | 3. Women's rights and access to decision-making in the vegetable VC. | x | | |

Annex 4: Tentative outline of VC guideline in accordance with international standards

## 1. Introduction

Background/context and rationale

Objective of the guideline

- To guide through VC management by state management bodies
- To guide development of current VC

Target audience

- State management bodies
- VC actors

How to use this guideline

Structure of the guideline

## 2. Terms and definitions

- Value chain
- Supply chain
- Value chain governance
- Value chain management
- Food safety
- Quality management

## 3. A framework for management of agri-food VCs

A diagram describing framework

## 4. Regulatory framework for FBOs

- Food safety condition requirement
  - Document
  - Infrastructure
  - Organization of FBO assessment – a risk-based approach to inspection
- Business registration

    - Document
    - Registration process
- International regulatory framework and risk-based systems

## 5. Food safety certification

- VietGAP
- GlobalGAP
- GMP
- HACCP
    - Vietnam HACCP
    - International HACCP
- ISO 22000
- GFSI and vTPA

## 6. Food safety control system and VCs

- Risk-based inspection
- Surveillance programs for Microbiological Hazards
- Surveillance program for Chemical Contaminants
- Reporting on Foodborne Disease
- Risk communication
- Monitoring and evaluation

## 7. Value chain management

- Farming management
- Quality management
- Transparency, trust and traceability
- Digital transformation

## 8. Circular economy, CSA in VCs

- Circular economy model in agri-food value chains
- CSA
- Waste management

## 9. Finance for compliance with international standard

- Cost of food safety compliance
- Financial access for VC

## 10. Value chain support – roles of public sector

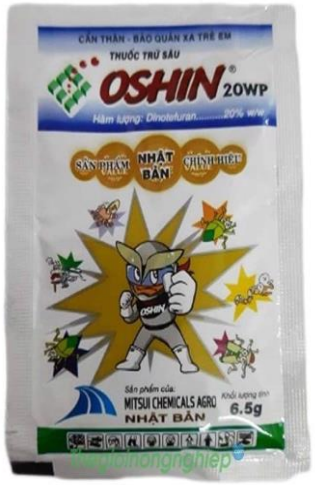
- Production planning
- Collective actions
- Farming contract
- Linkage
- Product certification
- Marketing
- Public-private-producer partnership (PPPP)
- Labelling
- Product identity

Annex 5: Most common pesticides used in mustard greens, morning glory and cucumber (based on the survey results)

| Group | Morning glory | | |
|---|---|---|---|
| | Pesticide name | Ingredient | Photo |
| Disease chemical pesticides | Daconil 75WP | Chlorothalonil |  |
| | Antracol 70WG | Propineb |  |
| | Ridomil Godl 68WG | Metalaxy M + Mancozeb |  |

| | | | |
|---|---|---|---|
| | Score 250EC | Difenoconazole |  |
| **Pest biopesticides** | Bitadin WP | Bacillus Thurigiensis + Granulosis virut |  |
| | Cóc chúa | Emamectin Benzoate + Matrine |  |
| | Delfin 32WG | Bacillus thuringiensis (Var. Kurstaki) |  |

| | | | |
|---|---|---|---|
| | Dupont Prevathon 5SC | Chlorantraniliprole |  |
| | Reasgant 3.6EC | Abamectin |  |
| | Siêu nhân mỹ | Emamectin Benzoate + Matrine |  |
| | Tasieu 5WG | Emamectin Benzoate + Matrine |  |
| | | | |

| | | | |
|---|---|---|---|
| **Pest chemical pesticides** | Actara 25WG | Thiamethoxam |  |
| | Match 050EC | Lufenuron |  |
| | Oshin 20WP | Dinotefuran |  |

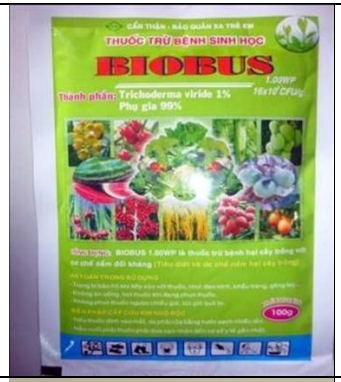
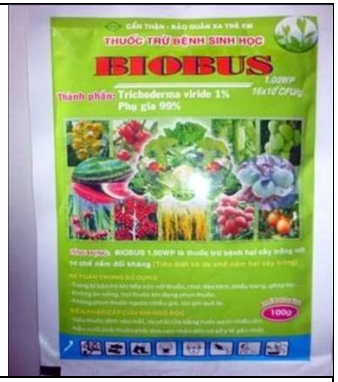
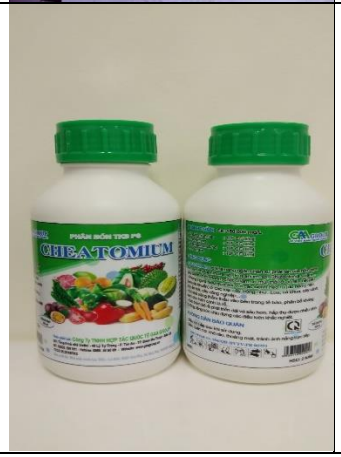
| | | | |
|---|---|---|---|
| | Takumi 20WG | Flubendiamide |  |

| Group | Mustard greens | | | Cucumber | | |
|---|---|---|---|---|---|---|
| | Name of pesticide | Ingredient | Photo | Name of pesticide | Ingredient | Photo |
| Disease chemical pesticides | Anvil 5SC | Hexaconazole |  | Ridomil Godl 68WG | Metalaxy M + Mancozeb |  |
| | Antracol 70WG | Propineb |  | Daconil 75WP | Chlorothalonil |  |

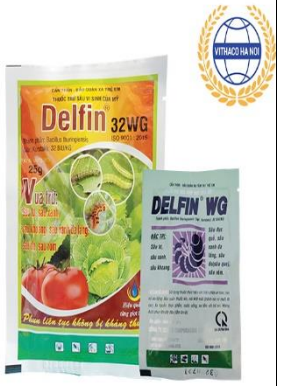
| | | | | | | |
|---|---|---|---|---|---|---|
| | DOBINS 650WP | chlorothalonil + mantalaxyl |  | | | |
| | Manbull | Mancozed |  | | | |

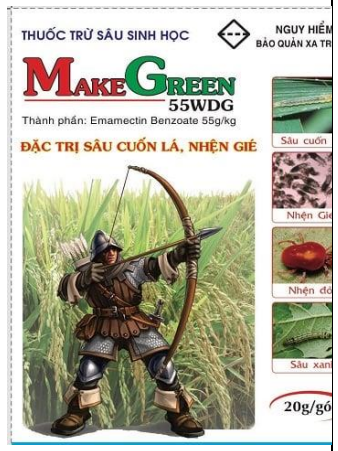
| | | | | | | |
|---|---|---|---|---|---|---|
| | Daconil 75WP | Chlorothalonil |  | | | |
| | Zineb bul 80WB | Zineb |  | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Profiler 711.1WG | Fluopicolide + Fosetyl Aluminium |  | | | |
| | Dobins 650WP | Chlorothalonil + Metalaxyl |  | | | |
| | | | | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Disease Biopesticides, anti-biotic** | Biobus 1.00WP | Trichoderma viride |  | Biobus 1.00WP | Trichoderma viride |  |
| | Cheatomium | Cheatomium + B.polymyxa + Pseudomonas + B. Pumilus: |  | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Validacin 5L | Validamycin A |  | | | |
| | | | | | | |
| **Pest biopesticide** | Cóc chúa | Emamectin Benzoate + Matrine |  | Đại bàng Mỹ | Emamectin Benzoate |  |

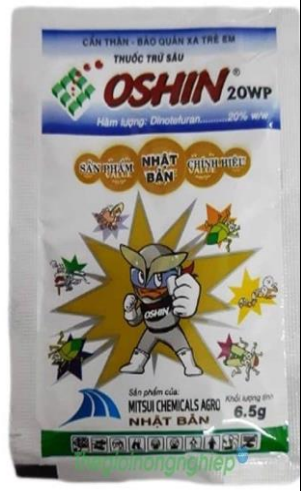
| | | | | | | |
|---|---|---|---|---|---|---|
| | Cóc vàng | Emamectin Benzoate |  | Reasgant 3.6EC | Abamectin |  |
| | Delfin 32WG | Bacillus thuringiensis (Var. Kurstaki) |  | Radiant 60SC | Spinetoram |  |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Dupont Prevathon 5SC | Chlorantraniliprole |  | Dupont Prevathon 5SC | Chlorantraniliprole |  |
| | Vua ếch độc (Makegreen 55WG) | Emamectin Benzoate |  | MakeGreen 55WDG | Emamectin Benzoate |  |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Radiant 60SC | Spinetoram |  | | | |
| | Reasgant 3.6EC | Abamectin |  | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Siêu nhân mỹ | Emamectin Benzoate + Matrine |  | | | |
| | Bitadin WP | Bacillus Thurigiensis + Granulosis virut |  | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Đại bàng Mỹ | Emamectin Benzoate |  | | | |
| | MikMire 7.9EC | Emamectin benzoate |  | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pest chemical pesticides | Actara 25WG | Thiamethoxam |  | Actara 25WG | Thiamethoxam |  |
| | Match 050EC | Lufenuron |  | Oshin 20WP | Dinotefuran |  |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Movento 150OD | Spirotetramat |  | Thiện xạ 200WP | Acetamiprid |  |
| | Oshin 20WP | Dinotefuran |  | Trigard 100SL | Cyromazine |  |

| | | | | | | |
|---|---|---|---|---|---|---|
| | Peran 50EC | Permethrin |  | Match 050EC | Lufenuron |  |
| | Takumi 20WG | Flubendiamide |  | | | |

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