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Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
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UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

VIETNAM INSTITUTE OF AGRICULTURAL ENGINEERING
AND POST-HARVEST TECHNOLOGY

PROJECT

STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN

REPORT

TRAINING COURSES ON POST-HARVEST TECHNOLOGY IN THE VALUE CHAIN OF VEGETABLES

Project owner: Vietnam Institute of Agricultural Engineering and Post-harvest Technology

Prepared by: Nguyen Thai Duong, Technical adviser to UNIDO Project

Hanoi, November 2014

PROJECT

STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN

REPORT

TRAINING COURSES ON POST-HARVEST TECHNOLOGY IN THE VALUE CHAIN OF VEGETABLES

Donor: United Nations Industrial Development Organization (UNIDO)

Implementing body: Vietnam Institute of Agricultural Engineering and Post-harvest Technology (VIAEP)

Senior advisor to UNIDO:

Dr. Karl Schebesta

UNIDO programme officer:

Ms. Hoang Mai Van Anh

Technical adviser to UNIDO Project:

MSc. Nguyen Thai Duong, VIAEP

Experts of the training programme:

Dr. Tran Thi Mai

Dr. Pham Anh Tuan

Dr. Nguyen Minh Nam

Dr. Le Duc Thong

MSc. Nguyen Manh Hieu

BSc. Trinh Dinh Hoa

BSc. Le Thi Mai

BSc. Cu Thi Hang

MSc. Pham Thi Thanh Tinh

MSc. Vu Duc Hung

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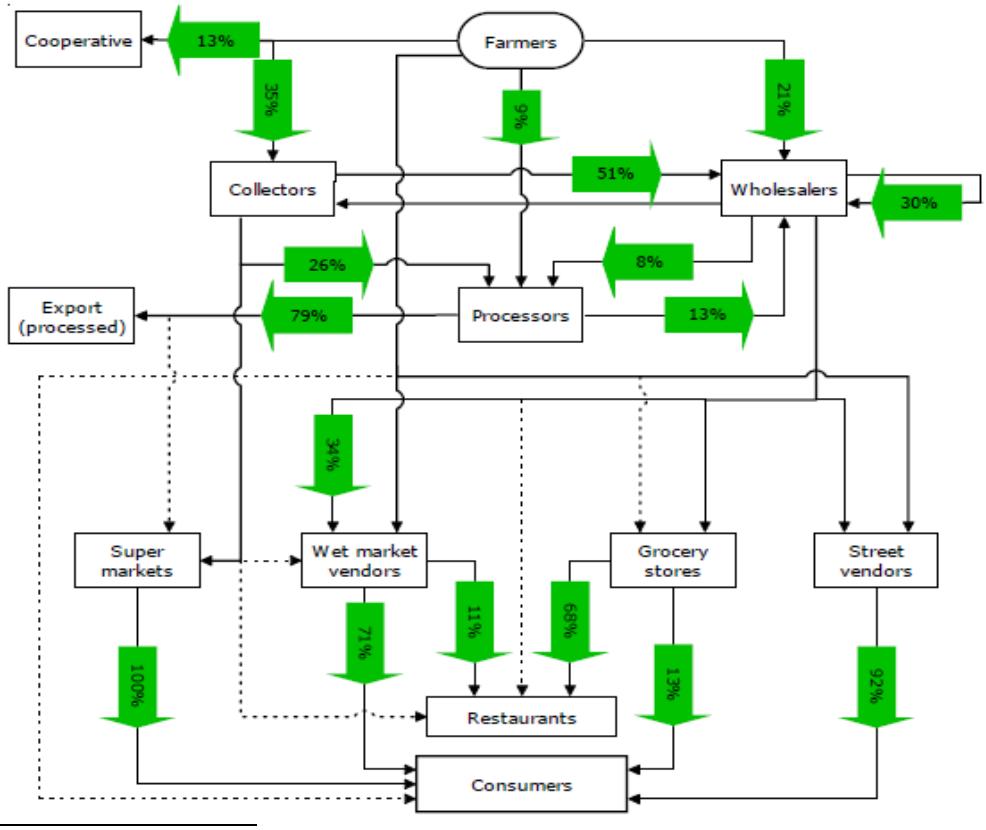
1. CURRENT SITUATION

Vegetables, including leafy, fruity, root and spicy types are indispensable in the daily meals of everyone in all over the world. For the time being, in Vietnam, various species of vegetables are produced throughout the country. However, post-harvest losses of fruit and vegetables is 22% [1], higher than those among ASEAN. Therefore, improvement of post-harvest technology for agricultural production, in general and for stages of vegetable growing, harvest and post harvest, in particular is a priority, since post-harvest losses in both quantity and quality are one of the competitive obstacles Vietnam's agro-products in the world market.

Vegetables have a short growing period, often need watering, fertilization and pesticide spraying. These make vegetables be not safe for human being if they are improperly applied. Therefore, types, time and methods of application of water, fertilizers and pesticides to avoid microbial contamination and heavy metals from dirty water, residues from excess and/or short quarantine of pesticides, nitrate concentrations from incorrect application of fertilizers, etc. are very important. Normally, most vegetable-growers haven't been aware of the risk of unsafe vegetables.

In Vietnam, the vegetable supply chain[2] is very complex and diverse as shown in the figure below.



[1] *Source: Ministry of Agriculture and Rural development of Vietnam*

[2] *Source: Post-harvest Loss in the Supply Chain for Vegetables – The Case of Chili and Tomato in Viet Nam, AVRDC Working Paper 18*

Farmers not only supply to collectors and wholesalers, but also to farmer cooperatives, processors, and private households or consumers. Although most of the supply predominantly comes from farmers, collectors also buy from wholesalers. A sizeable amount of the collector's produce is sold to wholesalers and to processors.

Today, one of the main bottlenecks in vegetable production is the high incidence of post-harvest spoilage affecting all actors along the supply chain. To solve the problem, it is essential to consider the entire production-consumption continuum.

As a result of the prevailing situation producers would like to learn more about intensive production technologies, as well as preservation technologies directly after harvest. They are also interested in improved seeds, especially resistance to diseases and would like to learn more about harvesting and preservation technologies.

Among collectors, wholesalers and retailers, more emphasis is placed on preservation, storage and packaging technologies.

To the extent that vegetable production accelerates and markets develop, the current methods of storage will become unsustainable and will prevent producers to take advantage of changes in the market. Methods for the better accumulation of produce from dispersed farmers will be required to ensure that marketing systems of large–scale farmers can be linked with those of the traditional smallholder producers.

In general, vegetables processing offers good opportunities for small-scale farmers, particularly in areas where raw materials are readily available or even in surplus, most equipment is reasonably affordable, and the products, if properly chosen, have a good demand and can be profitable.

Processing vegetables has two major advantages:

a. To preserve vegetables by slowing down the natural processes of decay caused by micro-organisms, enzymes in food or other factors such as heat, moisture and sunlight, and

b. To change vegetables into different foods, which are attractive and in demand by consumers.

However, farmers in some areas have limited access to technology and knowledge of food safety matters, lack information on training opportunities available to them, and knowledge of market techniques needed to attract buyers.

In general the situation is characterized by the limited number of micro- and small–scale processing plants and by the fact that the bulk of the primary processing activities take place manually, without the use of any mechanical equipment for the processing of vegetables. Very rudimentary techniques are used which do not allow

farmers to add value to their output before marketing and thereby increase household income. Small investments into adaptive and appropriate technologies, farmer proven in other countries, could make an important contribution to rural livelihoods in most regions of Vietnam.

To solve the above limitations and to provide safe vegetables to daily meals for human being and improve income for the vegetable-growers, the Project team of the Vietnam Institute of Agricultural Engineering and Post-harvest Technology (VIAEP) set up an outline for training courses on *Post-harvest technology in the value chain of vegetables*, including training materials and plan for delivery of training courses.

2. OBJECTIVES, PROCESS OF SETTING UP AND IMPLEMENTING TRAINING COURSES

2.1. Objectives

The training courses aim at providing knowledge on post-harvest technology for participants who directly involve in vegetable value chain in Hanoi city. Most participants are representatives of plant protection sub-department, farmer associations, leaders of vegetable cooperatives (ToT course); and farmers and retailers.

The training courses are a part of the project's effort to improve the quality of vegetables and reduce post-harvest losses through strengthening productive capacities in terms of production techniques, management and value addition. As a result, the income of vegetable-growers will increase.

2.2. Process of setting up and assessing training courses

The training courses are held in Hanoi area with 1 five-day course for training of trainers (ToT) and 10 two-day training courses for farmers and retailers.

Before organizing these courses, training materials and necessary facilities must be prepared. The materials consist of a book *Post-harvest Technology in the Value Chain of Vegetable* and 3 forms of leaflets. The main procedures of organizing the courses are composed of:

- Compiling and printing overall training materials
    - Procedure of compiling the book

Firstly, an experienced expertise team (9 experts) is established to do the following activities:

- Drawing initial ideas of outlines of training framework and training materials.
- Offering suggestions on the drafted outlines.

- Proof-reading and giving comments to drafted training materials.

- Checking the final version of the training materials before printing.

Secondly, based on the training framework, training materials are compiled by experienced experts (writers). The materials comprise 3 parts:

- Sub-harvest and post-harvest technologies.

- Good agricultural practice (GAP) in pre-processing, packaging, storage and transport of fresh vegetables.

- Management in vegetable production chain.

Thirdly, the draft of the materials is amended by the expertise team, then is accomplished by the writers.

Finally, before printing, the final version is proof-read by the 2 experts of the expertise team.

- Procedure of compiling the leaflets

The procedure of compiling the three forms of leaflets, 1) Pre-processing and storage in the value chain of vegetables, 2) Linkage of farmers, scientists, distributors/entrepreneurs and state (4 "factors") in the vegetable value chain, and 3) Post-harvest hygiene and safety in the chain of vegetable supply, is carried out as that of the book.

- Organizing training courses

  - One five-day course for training of trainers (ToT)

The ToT course is composed of 20 participants from vegetable growing localities, procurement, distribution and management units.

The participants are provided with the book of *Post-harvest Technology in the Value Chain of Vegetable* and 3 forms of the leaflets. The main contents of the training schedule are lectures, practice in the VIAEP's laboratories, visit and practice at a vegetable-growing cooperative and at a company of vegetable pre-processing and storage, and group discussions. At the closing ceremony are awarded to the participants.

  - Ten two-day courses for farmers and retailers

The training courses are for farmers and retailers with 30 persons each. The participants are provided with needed training materials. After the training the participants can gain necessary knowledge on production, pre-processing and short-term storage of safe vegetables.

In all training courses, women are empowered to raise the sense of initiative in their production.

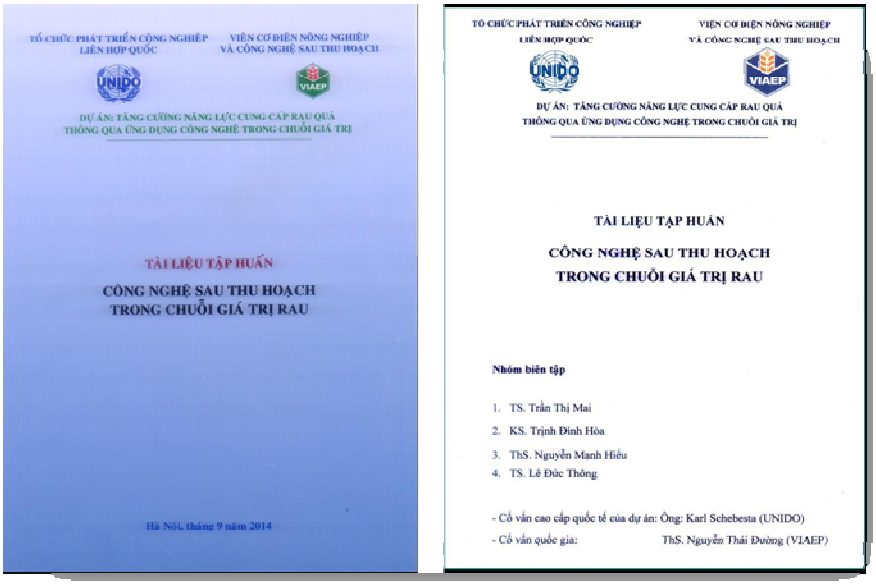
- Reports

Interim report is written on the halfway through the training programme. It reports the main items that have been done. Namely, the interim report describes contents and activities needed to release the book and leaflets, the preparation procedure and results of the ToT course.

Final report is written when the entire training programme ends. The final report sums up and assesses training outcomes on both *economic* and *social* effects, proposes necessary recommendations (if any) to multiply the results for other vegetable growing localities.

2.3. Specific implementation

In September 2014, 150 books and 5,000 leaflets under the UNIDO-permitted training issues have been released. However, the order of some parts of the book was changed and some sections/items were merged together to make the book become appropriate to the current situation of the vegetable-growing areas in Hanoi.



Outer and inner cover of the book

A 19-munite video documentary about procedures and reactions occurring during process of pre-processing, packaging, labelling and storage of vegetables is produced to make a visual and vivid description for the learners.

On September 29th to October 3rd, 2014 a five-day training course for trainers (ToT course) on *Post-harvest Technology in the Value Chain of Vegetable* was held at the Headquarters of VIAEP.

2.3.1. On the book for training courses

The book for training courses will provide learners with basic knowledge on the importance of safe vegetables in daily meals of human being, sub-harvest and post-harvest technologies, good agricultural practice (GAP) in pre-processing, packaging,

storage and transport of fresh vegetables, and management in vegetable production chain.

The main contents of the book "Post-harvest Technology in the Value Chain of Vegetables" are sketched as follows:

GENERAL INTRODUCTION, including objectives and contents of training (Good vegetable management practice under VietGAP standard, post-harvest technology and management of vegetable production chain), the importance of delivery of VietGAP to vegetable-growers, effect of training courses.

SUB-HARVEST AND POST-HARVEST TECHNOLOGIES

- General principles of sub-harvest and post-harvest technology in the value chain of vegetables.
  - *Introduction* on concepts of stages such as pre-harvesting, sub-harvesting and post-harvesting of vegetables.

    Classification of vegetables under their characteristics such as leafy, root, fruity and spicy vegetables; and classification according to criteria of nutrition, trade and cooking.
  - *Role and characteristics* of post-harvest technology in the value chain of vegetables and vegetable competitiveness.
  - *Types of post-harvest losses* as losses of quantity, quality, economy and society, etc.
  - *Causes of post-harvest losses*: Owing to processes of physiology, biochemistry (respiration, ethylene, post-harvest maturation, germination, evaporation, natural weight loss, heat generation, etc.); mechanical damages; harmful organisms (micro-organisms, insects, birds, bats, etc.)
  - *Prevention and control of post-harvest losses* through measures of chemical control; treatment with low-temperature, controlled atmosphere (CA), modified atmosphere (MA), heating, biological control and growth regulatory substances.
  - *Current situation of production, consumption and post-harvest losses* of vegetables in the world and in Vietnam, including information system on vegetable supply, qualitative criteria and evaluation methods.
  - *Shortcomings in production, pre-processing and consumption*: assessment of VIAEP's expert team through 2013-survey data, sponsored by UNIDO.

- Technology for sub-harvest treatments of vegetables.
  - *Regime and techniques for irrigation* (rain-making, drip irrigation, etc.), and influence of irrigation to quality of post-harvest products.
  - *Fertilizer use*: types and quality of fertilizers, correct ways of fertilizer application to ensure effectiveness, hygiene and food safety.
  - *Use of plant protection products*: types and quality of plant protection substances, correct ways of their application to ensure effectiveness, hygiene and food safety.
  - *Use of substances for growth regulation* to gain reduction of ethylene synthesis, germination reduction, extension of crop duration, increase of post-harvest shelf-life.

- Harvest and post-harvest technology.
  - *Harvesting and handling* right in the field (applicable for leafy, root, fruity and spicy vegetables): Harvesting time (according to growth period, colours, sizes, shapes, textures, solute concentration, chemical composition, state, etc.); harvesting methods (manual, semi-mechanical, mechanical, etc.); harvesting tools; ways of commodity arrangement, packing, transport of harvested vegetables, packaging; and tools and techniques of quality checking before harvest (photorefractive meter, hardness testing equipment)
  - *Pre-processing stages*: Cleaning technology and equipment (principles of bubbling, spraying, brushing, scrubbing, dehydrating/straining off vegetable surface, etc.; structure; operation procedure); technology and equipment for grading (principles: according to size, colour, shape, etc.; structure; operation procedure) pre-cooling techniques and steps taken in packaging houses (diagram of technological process, notes of technological process, required equipment and tools)
  - *Storage*, including vegetable characteristics and preservation technologies (varieties, cultivation techniques, sub-harvesting care, harvest maturity, physiology and biochemistry, and chemical ingredients), processes that occur in preservation period (physiological, biochemical and physical ones), factors affecting process of vegetable preservation (temperature, relative humidity, atmospheric compositions for preservation, clear preservation space), technologies and equipment for storage (physical, chemical and biological methods), special treatments for vegetables before and during preservation period (equipment and its usage; handling right in the field and in unexpected cases; handling stages in the packaging area such as narrow pallet system, general stages, layout of packing area, loading and unloading of products, conveyor system, washing, waxing, grading and distribution by sizes, simple packaging line), packaging and packing materials (selection of packing

material, standardization of packing sizes, packaging techniques, labelling and packaging to create a MAP, layout and arrangement of packages into blocks)

- *Transport and consumption*: transport means (conventional way, mobile cooling devices, refrigerated vehicles, planes), ways of commodity arrangement (manually, by pallet), bracing to keep commodity blocks standstill) and daily and long-term time of consumption.
- *Control of temperature and air humidity* during pre-processing packaging, storage and transport: using cooling container, forced air cooling, water cooling, evaporative cooling, day and night ventilation of storage space, ice cooling, some other cooling methods; increase of relative humidity, maintenance of cooling chain for easily perishable products.

- Practical exercises on post-harvest technology.
  - *Practice instructions in the field* include factors affecting quality of harvested vegetables (harvest maturity, harvest time, techniques, harvest tools), selection of tools and equipment suitable for individual vegetable harvesting to ensure quality of harvested vegetables, harvesting techniques.
  - *Practice in cleaning stage* consists of dry cleaning, removal of impurities; water cleaning such as manual, semi-manual and ozone bubbling methods; selection of tools and equipment appropriate to scales of households or group of households.
  - *Grading stage* is based on colour and sizes and done by hand or with specialized tools.
  - *Practice in packing and product packaging* comprises identification of packing types and their use features; MAP packing (material selection, air-ventilation holes on bags, packaging capacity of each type of bag, etc.) and carton boxes.
  - *Practical instructions of preservation technology* of some vegetable types are composed of:
    - Storage stage diagram of technological process, notes of technological process at room temperature, in cool or cold conditions (temperature, optimal humidity and probable damage) and required equipment and tools.
    - Introduction through video and PowerPoint on harvest technology, cleaning and grading, packing and preservation with mechanized or semi-mechanized techniques to learners for reference and discussion.

- Calculating practice of costs and profits: with a household scale of 200 kg per day and a team- or group-scale of 500 kg per day.

GOOD AGRICULTURAL PRACTICE (GAP) IN PRE-PROCESSING, PACKAGING, STORAGE AND TRANSPORT OF FRESH VEGETABLES

- Good production in pre-processing, packaging, storage and transport of fresh vegetables
  - *Concepts on safe vegetables, GAP and VietGAP*: GAP follows international standards. In term of GAP there is GlobalGAP, which was called EuroGAP before September 2007. It was founded by a private organization with 35 members (by 2007) from Europe and Japan. For regional standards, there is AseanGAP, and individual national standards adopt ThaiGAP, JGAP, ChinaGAP, IndiaGAP and VietGAP.

    VietGAP is abbreviation for Vietnam Good Agriculture Practice. It has main factors as follows:

    - Major contents of safe vegetable production process include areas for safe vegetable production, manpower for vegetable production, management and use of water (unpolluted resources, water saving irrigation, etc.), management and use of varieties (appropriate to geographical and soil property of specific growing areas, etc.), management and fertilizer use, management and use of agricultural chemicals to avoid abusing chemicals that harm environment of human life and change soil property, etc., harvesting and post-harvest handling, recording, recordkeeping, origin detection and revocation of products if necessary and internal checking.
    - Certification of safe vegetable production consists of necessity to recognize and understand the true nature of the certification of safe vegetable production and benefits of certification for safe vegetable production.
    - Sequence to register a certificate of VietGAP is to submit registration documents to the certifying organization: a) application for registration of VietGAP, b) map of the plot(s) and the zone for vegetable production, proposal on design and layout of production area, post-harvest handling, pre-processing, preservation, c) Results of internal checking in accordance with issued regulations; and to verify valid profile documents.
    - VietGAP certification checking comprises validity duration of the certificate, certificate granting institution, scope of certification, certification code, publication of produced commodity under VietGAP, etc.
  - *Safety management* in harvest, pre-processing, storage/preservation and distribution/consumption of vegetables is observed by VietGAP.

- *Good Management Practice* (GMP) in pre-processing and packaging of fresh vegetables takes place in packaging houses and operation.
- *Management of harmful* creatures and wastes, personal hygiene, training, monitoring and transport are also important in VietGAP.

- Current situation of safe vegetable production and solution for sustainable development.
  - *General guidelines* of the Government, the Ministry of Agriculture and Rural Development, provinces and the concerned ministries as the Ministry of Natural Resources and Environment, the Ministry of Public Health, etc. on land use, taxation and other financial policies.
  - Planning of vegetable production zones.
  - Guidance and solution to set up a feasible model(s).
  - Selection of organizations to certify, invest, support and develop training courses on management, production and business: National Agro-forestry-fisheries Quality Assurance Department, Department of Plant Protection, Department of Processing and Trade for Agro-forestry-Fisheries Products and Salt Production, National Centre for Agriculture and Fisheries Extension, Departments of Agriculture and Rural Development of provinces/ cities immediately under the Central Government.
  - Innovation of thinking of the people about production and consumption of safe vegetables, and VietGAP certification.

MANAGEMENT IN VEGETABLE PRODUCTION CHAIN

- Market information and approach ways
  - *Market information* consists of supply and demand of market; competition in quality, price, design, distribution/response service, trade promotion (brand, origin of goods, advertising, marketing and trade promotion); related policies of business organizations, the local governments, etc.
  - *Decisive tools* for existence and competitiveness of systems of vegetable supply and market include management tool for fresh product distribution channel and information on management system of fresh vegetable supply.
  - *Approach ways* to the market information comprise primary approach as wholesale markets, fairs, exhibitions, seminars, workshops, surveys of market demand, etc.; and secondary approach as publications, audio-video means/materials, etc.

- Investment and effect of economy and use.
  - *General situation.*
  - *Some concepts of investment*: general concepts, cash flow, cash value conversion of investment back to initial moment or after completion of the investment, payback, break-even point.
  - *Investment decision based on criteria*: currently equivalent value of the investment projects, internal rate of profits and payback period.
- Business model and business plan.
  - *Objectives* are to provide basic knowledge about business, business plan and main characteristics of fresh vegetable business.
  - *Model and business plan* deal with reasons for establishment of a business model and a business plan, description of a business or a production unit, tasks and goals of the business/the production unit, types of products and services, market analysis and planning, macro environment trends in production of vegetables, customers, roles of partners in the business model and business plan, marketing plan, target market segments, prices, promotion, products and places, revenue forecasting, management and operation, personnel and facilities, capital, and legal requirements.
  - *Finance and business planning* involve income, operating cash flow, accounting analysis of receipt and payment balance, finance planning, sources of private funds and needed capital, financial report, profits and loss of trademark rights, design and brand (at least 3 years), cash flow, balance sheet, and assumed risks.

(See also appendix 1 for more details of the book outline).

2.3.2. On the leaflets

The leaflets provide knowledge on safe vegetable production for vegetable-growers and those who are engaged in the value chain of vegetables. The main contents of the 3 forms of the leaflets are briefed as below:

FORM 1: PRE-PROCESSING AND STORAGE IN THE VALUE CHAIN OF VEGETABLES

- Headlines of form 1:
  - Significance of pre-processing and storage.
  - Some causes of vegetable losses
  - Process of harvest, pre-processing and storage (harvest, sorting and cleaning, washing and straining off water, packing, transport and storage).
  - Addresses of consultative services.

- The specific contents of this form are:
  - *Significance of pre-processing and storage*
    - Increasing the value of commercial vegetables and stable output.
    - Extending time for circulation, distribution and storage of vegetables in the value chain.
    - Reducing post-harvest losses.
    - Partly eliminating risks of food unsafety.
    - Creating good conditions for consumers.
    - Making jobs and increasing labourers' incomes.
    - Saving energy in transportation, circulation, distribution and consumption.
  - *Some causes of vegetable losses*
    - Improper methods of harvesting, pre-processing and storage.
    - Due to several factors of biochemistry and physiology such as respiration, thermogenesis, root strike, loss of water, etc.
    - Due to environmental factors as temperature, humidity, ventilation, etc.
    - Mechanical damage.
    - Pests such as insects, micro-organisms, rodents, birds, bats, etc.
  - *Process of harvesting, pre-processing and storage*

    Harvesting
    - Picking at appropriate maturity.
    - Choosing proper time (early in the morning or late in the afternoon). Avoiding rain.
    - Ensuring quarantine from the time of spraying pesticide and applying fertilizers to harvest moment.
    - Using proper harvesting tools and containers to avoid mechanical damage
    - Applying fast cool treatment and timely transporting to pre-processing workshop.

    Sorting and cleaning
    - Removing unusable parts as decay, root, stale leaves, etc.
    - Classifying according to qualitative standards of type 1, 2, 3, etc.

Washing and straining off water

- Washing with clean water or water with permitted antiseptic agent to remove impurities, contaminants and micro-organisms causing spoilage.
- Straining off vegetables in cool store, with a fan or a dedicated equipment.

Packing

- Using proper plastic film to ensure safety and quality of vegetables.
- Packaging each type of vegetable with appropriate weight and markets
- Packaging in clean and cool places.
- No packaging different vegetables in the same pack.

Transportation

- Using appropriate packing with correct specifications and volume; properly loading without being squashed.
- Using dedicated haulages.
- Following up technical requirements in arranging vegetable containers on the haulages.

Preservation

- Storage places must be dry, clean and cool
- Vegetables should be preserved in cool stores under appropriate methods.

- *Motto*

Health of the community mainly depends on

conscience and responsibility

of those who are involved in the chain

from production to supply of vegetables

- *Addresses consultative services*

1. An Viet High Technology Agricultural Products Join Stock Company

   Cau Dien, Nam Tu Liem, Hanoi

   Tel: 0914590800

   E.mail: anvietgreen@gmail.com,

   Website: www.anvietgreen.com

❷ Dong Xuan Cooperative for Agricultural Services

Dong Xuan, Soc Son, Hanoi

Tel: 0987605134

E.mail: ngovanliendxsshn@gmail.com

❸ Vietnam Institute of Agricultural Engineering and Post-harvest Technology

#60, Trung Kinh, Trung Hoa, Cau Giay, Hanoi

Tel: 04.37823025

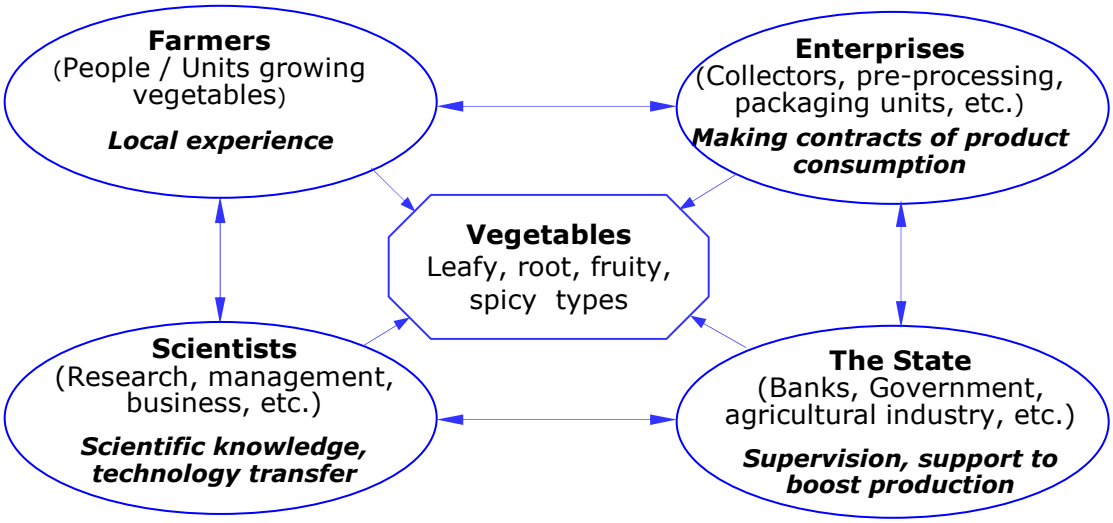
Fax: 04.38689131

E-mail: viaep2004@yahoo.com

FORM 2: LINKAGE OF FARMERS, SCIENTISTS, DISTRIBUTORS/ENTREPRENEURS AND STATE (4 "FACTORS") IN THE VEGETABLE VALUE CHAIN

- Headlines of form 2:
  - Current situation of vegetable production and consumption.
  - Model of linkage among 4 "factors".
  - Some difficulties for the linkage.
  - Benefits from the linkage.
  - 11 undertakings in making a contract.
  - Ways of effective linkage.
  - Roles and tasks of the 4 "factors".
  - Addresses of consultative services.
- The specific contents of this form are:
  - *Current status of vegetable production and consumption*
    - Production with small scales and mainly self-sufficient
    - Backward methods of cultivation
    - Lack of planning and comprehensive technology
    - Lack of production capital
    - Unstable product quality
    - Limitation of market and unstable prices

- *Linkage model of the "four factors"*



- *Some difficulties in the linkage*
  - Farmers produce vegetables in dispersion and lack of planning.
  - Scientists have not yet invested time and knowledge in vegetable production.
  - Enterprises hesitate due to fear of risks.
  - The State has not really focused on this field.
  - Rights and obligations of farmers, enterprises and scientists have not closely been linked.
  - Information channel to farmers is limited so farmers meet the difficulties in agreement and making contracts.
  - Vegetable quality is unstable, vegetable prices in domestic and foreign market are fluctuated.
- *Benefits of the linkage*
  - Vegetables are grown with high yield, good quality, available markets, stable and reasonable prices.
  - Support of techniques and finance is convenient.
  - Enterprises have enough raw materials in their production and business.
  - Governments easily orient development and implementation of management policies.

- *11 commitments to contract*

1. Banks ensure sufficient loans for producers and enterprises/ entrepreneurs.
2. The bank interest of loans is negotiated and with a convenient procedure.
3. The people's Committees of provinces, cities release planning and stipulate centralized zones for vegetable production.
4. The people's Committees of provinces, cities guide enterprises to make contracts.
5. The people's Committees of districts and communes supervise the contract making.
6. The Farmers Union has duty of guidance, propaganda and mobilization of farmers to sign and implement contracts.
7. Signed contracts must be certified by the People's Committee.
8. The producers must sell agro-products in sufficient quantity and quality, and on time.
9. The producers are not allowed to sell their agro-products to other businesses in any circumstance.
10. Enterprises must buy up agro-products timely as in the signed contracts.
11. The scientists are responsible for technology transfer in production for farmers.

- *Effective ways of linkage*

1. The factors comply with the 11 promises.
2. The vegetable-growers are encouraged to take part in agricultural production models under contracts.
3. Technological achievements are applied to vegetable production.
4. Appropriate policies are proposed to encourage technology transfers.
5. Contracts of vegetable consumption are strenuously signed by the enterprises.
6. The enterprises are encouraged to participate to fully exploit and enhance the production capacity of the vegetable-growers

7. The legal environment is improved, the signed terms are associated with penalties to enhance effects of signing and implementing contracts

- *Roles and tasks of the "four factors" in the linkage*

The State:

- Setting up strategies for a legal framework, making policies and building infrastructure for vegetable-growing areas.
- Organizing association of enterprises with farmers in vegetable consumption.
- Providing information and supports to the enterprises.

Scientists:

- Making high quality seeds and good cultivation process, proposing ways of pest control, transferring post-harvest technological achievements into vegetable production.
- Enhancing agricultural extension activities.

Enterprises:

- Building trademark, reputation and investing in vegetable growing areas for raw materials.
- Signing contracts of vegetable exclusive sales.

Farmers:

- Properly implementing the given technological processes, combining the personal experiences and approaching new technologies.
- Performing the commitments in the signed contracts.

- *Motto:*

"**Sciences** and **farmers**
Make the good vegetables to improve productivity
Market and **enterprises** are side by side
Together with the **State** to get success''

- *Addresses consultative services (the same as in form 1)*

FORM 3: POST-HARVEST HYGIENE AND SAFETY IN THE CHAIN OF VEGETABLE SUPPLY

- Headlines of form 3:
  - Reasons for safe vegetable production.
  - Notes in periods of sub-harvest, harvest, pre-processing, packaging, storage, transport and consumption.
  - Main causes of unsafe vegetable production.
- The specific contents of this form are:
  - *Why must we produce safe vegetables?*
    - To ensure the health of producers and consumers
    - To improve vegetable quality and to increase income of the producers.
    - To better competitiveness, prestige and to gain a stable output.
    - To protect the environment.
  - *Major necessary attentions in periods:*

    Sub-harvest time
    - No using chemical pesticides and fertilizers during the quarantine.
    - No using contaminated water for irrigation

    Harvesting
    - Ensuring quarantine for: Pesticides, fertilizers, irrigation
    - No using second-hand packing of pesticides and fertilizers to contain vegetables.
    - No placing vegetables directly on the ground.

    Pre-processing
    - Getting off: Impurities, stale parts, insects
    - No placing vegetables directly on the floor.
    - Regularly cleansing machinery / equipment, tools, floors and tanks / crates containing residues during pre-processing.
    - Using clean water source.
    - Using certified treatment derivatives only.
    - No eating, drinking or smoking in the pre-processing area.

- Cleansing equipment, tools, packings and containers in a separate area, far away from the area of pre-processing, packaging as well as warehouse of agricultural materials.
- Storing packings / containers in a clean and dry place.

Packaging

- Only using environmentally-friendly materials for producing packings
- Doing sanitation of packings before packaging with certified disinfectants.
- Using clean water to wash packings or/and containers.

Storage

- Using preservatives is permitted in case they meet: certification, appropriate type and dosage, and timely quarantine
- Vegetables should be stored in a dry and cool place.
- Storage time must be appropriate to each type of vegetable to retain vitamins and other substances

Transportation

- Baskets / crates or packing must be made of safe materials to fresh vegetables as stipulated.
- Transport vehicles must be regularly cleansed.

Consumption

- Vegetables must not be loaded with fresh / raw food to avoid pathogens.
- Spoiled vegetables during transport or after preservation need removing.

Main causes of unsafety to vegetables

- Using uncertified pesticides, fertilizers, and preservatives.
- Improper quarantine after applying pesticides, fertilizers.
- Using contaminated water sources.
- Infections of insects and fungi.

- *Motto:*

For the sake of community health
let each farmer be
an inspector in safe vegetable production

- *Addresses consultative services (the same as in form 1)*

Layout of the leaflets

- **Transportation**
  - Using appropriate packing with correct specifications and volume; properly loading

Health of the community mainly depends on conscience and responsibility of those who are involved in the chain from production to supply of vegetables

PROJECT "STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN"

UNIDO VIAEP

PRE-PROCESSING AND STORAGE IN THE VALUE CHAIN OF VEGETABLES

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
#72 Ly Thuong Kiet str., Hanoi, Vietnam

VIETNAM INSTITUTE OF AGRICULTURAL ENGINEERING AND POST-HARVEST TECHNOLOGY
#60 Trung Kinh str., Trung Hoa precinct, Cau Giay dist., Hanoi

SIGNIFICANCE OF PRE-PROCESSING AND STORAGE

- Increasing the value of commercial vegetables and stable output.
- Extending time for circulation, distribution and storage of vegetables in the value chain.
- Reducing post-harvest losses.
- Partly eliminating risks of food unsafety.
- Creating good conditions for consumers.
- Making jobs and increasing labourers' incomes.
- Saving energy in transportation, circulation, distribution and consumption.

SOME CAUSES OF VEGETABLE LOSSES

- Improper methods of harvesting, pre-processing and storage.
- Due to several factors of biochemistry and physiology such as respiration, thermogenesis, root strike, loss of water, etc.
- Due to environmental factors as temperature, humidity, ventilation, etc.
- Mechanical damage.
- Pests such as insects, micro-organisms, rodents, birds, bats, etc.

PROCESS OF HARVESTING, PRE-PROCESSING AND STORAGE

- **Harvesting**
  - Picking at appropriate maturity.
  - Choosing proper time (early in the morning or late in the afternoon). Avoiding rain.
  - Ensuring quarantine from the time of spraying pesticide and applying fertilizers to harvest moment.
  - Using proper harvesting tools and containers to avoid mechanical damage
  - Applying fast cool treatment and timely transporting to pre-processing workshop.
- **Sorting and cleaning**
  - Removing unusable parts as decay, root, stale leaves, etc.
  - Classifying according to qualitative standards of type 1, 2, 3, etc.

- **Washing and straining off water**
  - Washing with clean water or water with permitted antiseptic agent to remove impurities, contaminants and micro-organisms causing spoilage.
  - Straining off vegetables in cool store, with a fan or a dedicated equipment.

- **Packing**
  - Using proper plastic film to ensure safety and quality of vegetables.
  - Packaging each type of vegetable with appropriate weight and markets
  - Packaging in clean and cool places.
  - No packaging different vegetables in the same pack.

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EFFECTIVE WAYS OF LINKAGE

1. The factors comply with the 11 commitments.
2. The vegetable-growers are encouraged to take

- **Enterprises:**
  - Building trademark, reputation and investing in vegetable growing areas for raw materials.
  - Signing contracts of vegetable exclusive sales.
- **Farmers:**
  - Properly implementing the given technological processes, combining the personal experiences and approaching new technologies.
  - Performing the commitments in the signed contracts.

PROJECT "STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN"

UNIDO VIAEP

LINKAGE OF "FOUR-FACTORS" IN THE VALUE CHAIN OF VEGETABLES

"Sciences and farmers
Make good vegetables to improve productivity
Market and enterprises are side by side
Together with the State to get success"

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VIETNAM INSTITUTE OF AGRICULTURAL ENGINEERING AND POST-HARVEST TECHNOLOGY
#60 Trung Kinh str., Trung Hoa precinct, Cau Giay dist., Hanoi

ADDRESSES OF CONSULTATIVE SERVICES

An Viet High Technology Agricultural Products Join Stock Company
Cau Dien, Nam Tu Liem, Hanoi
Tel: 0914590800
E-mail: anvietgreen@gmail.com
Website: www.anvietgreen.com

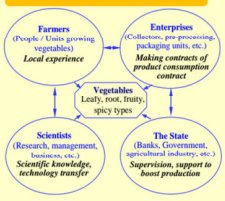
Dong Xuan Cooperative for Agricultural Services
Dong Xuan, Soc Son, Hanoi
Tel: 0987605134
E-mail: ngovanliendxsshn@gmail.com

Vietnam Institute of Agricultural Engineering and Post-harvest Technology
60, Trung Kinh, Trung Hoa, Cau Giay, Hanoi
Tel: 04.37823025
Fax: 04.38689131
E-mail: viaep2004@yahoo.com

CURRENT STATUS OF VEGETABLE PRODUCTION AND CONSUMPTION

- Production with small scales and mainly self-sufficient
- Backward methods of cultivation
- Lack of comprehensive planning and technology
- Lack of production capital
- Unstable product quality
- Limitation of market and unstable prices

LINKAGE MODEL OF THE "4 FACTORS"



SOME DIFFICULTIES IN THE LINKAGE

- Farmers produce vegetables in dispersion and lack of planning.
- Scientists have not yet invested time and knowledge in vegetable production.
- Enterprises hesitate due to fear of risks.
- The State has not really focused on this field.
- Rights and obligations of farmers, enterprises and scientists have not closely been linked.
- Information channel to farmers is limited so farmers meet the difficulties in agreement and making contracts.
- Vegetable quality is unstable, vegetable prices in domestic and foreign market are fluctuated.

BENEFITS OF THE LINKAGE

- Vegetables are grown with high yield, good quality, available markets, stable and reasonable prices.
- Support of techniques and finance is convenient.
- Enterprises have enough raw materials in their production and business.
- Governments easily orient development and implementation of management policies

11 COMMITMENTS TO CONTRACT

1. Banks ensure sufficient loans for producers and enterprises/ entrepreneurs.
2. The bank interest of loans is negotiated and with a convenient procedure.
3. The people's Committees of provinces, cities release planning and stipulate centralized zones for vegetable production.
4. The people's Committees of provinces, cities guide enterprises to make contracts.
5. The people's Committees of districts and communes supervise the contract making.
6. The Farmers' Union has duty of guidance, propaganda and mobilization of farmers to sign and implement contracts.
7. Signed contracts must be certified by the People's Committee.
8. The producers must sell agro-products in sufficient quantity and quality, and on time.
9. The producers are not allowed to sell their agro-products to other businesses in any circumstance.
10. Enterprises must buy up agro-products timely as in the signed contracts.
11. The scientists are responsible for technology transfer in production for farmers.

- **Transportation**
  - Baskets / crates or packing must be made of safe materials to fresh vegetables as stipulated.
  - Transport vehicles must be regularly cleansed.

- **Consumption**
  - Vegetables must not be loaded with fresh / raw food to avoid pathogens.
  - Spoiled vegetables during transport or after preservation need removing.

- **Main causes of unsafety to vegetables**

Using uncertified pesticides, fertilizers, and preservatives

Improper quarantine after applying pesticides, fertilizers

Using contaminated water sources

Infections of insects and fungi

ADDRESSES OF CONSULTATIVE SERVICES

An Viet High Technology Agricultural Products Join Stock Company
Cau Dien, Nam Tu Liem, Ha Noi
Tel: 0914590800
E-mail: anvietgreen@gmail.com
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Vietnam Institute of Agricultural Engineering And Post-Harvest Technology
60, Trung Kinh, Trung Hoa, Cau Giay, Ha Noi
Tel: 04.37823025
Fax: 04.38689131
E-mail: viaep2004@yahoo.com

PROJECT "STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN"

UNIDO VIAEP

POST-HARVEST HYGIENCE AND SAFETY IN SUPPLY CHAIN OF VEGETABLES

For the sake of community health
let each farmer be
an inspector in safe vegetable production

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WHY MUST WE PRODUCE SAFE VEGETABLES?

- To ensure the health of producers and consumers
- To improve vegetable quality and to increase income of the producers.
- To better competitiveness, prestige and to gain a stable output.
- To protect the environment.

MAJOR NECESSARY ATTENTIONS IN PERIODS:

- **Sub-harvest time**

No using chemical pesticides and fertilizers during the quarantine.

- **Harvesting**
  - Ensuring quarantine for:

Pesticides | Fertilizers | Irrigation

- No using second-hand packing of pesticides and fertilizers to contain vegetables.
- No placing vegetables directly on the ground.

- **Pre-processing**
  - Getting off:

Impurities | Stale parts | Insects

- No placing vegetables directly on the floor.
- Regularly cleansing machinery / equipment, tools, floors and tanks / crates containing residues during pre-processing.
- Using clean water sources.
- Using certified treatment derivatives only.
- No eating, drinking or smoking in the pre-processing area.

- **Packaging**
  - Only using environmentally-friendly materials for producing packings
  - Doing sanitation of packings before packaging with certified disinfectants.
  - Using clean water to wash packings or/and containers.

- Cleansing e
containers in
area of pre-p
warehouse of

- Storing packing

- **Storage**
  - Using preservat

certification

- Vegetables should be stored in a cool, dry place.
- Storage time must be appropriate to each type of vegetable to retain vitamins and other substances.

2.3.3. On the organization of training courses

2.3.3.1. ToT course

One of the important training activities is organization of five-day ToT course on *Post-harvest Technology in the Value Chain of Vegetables*. It was held from September 29th through October 3rd, 2014 at the Headquarters of VIAEP.

The major contents of the course is giving knowledge on vegetable post-harvest technology to the learners, group discussing in the classroom and making practice in the VIAEP's laboratories and in the production units (See also appendix 2). After the course these learners, key persons, will train their workers involved in their vegetable-growing farms or vegetable-related units. As a result, the income of those who are engaged in the vegetable value chain will increase.

The knowledge for ToT course focuses on:

- *Post-harvest technology,* including basic concepts, sub-harvest treatment, handling and storage, transport and consumption.
- *Good practice in harvest, handling, storage and consumption for safe vegetables,* including dissemination of GAP and VietGAP, current situation of safe vegetable production and solutions of sustainable development.
- *Management in vegetable production chain,* including market information, investment and economic effect, business model and plan.
- *Skill for discussion on imperative needs* related to vegetable value chain.
- *On-the-job practice* in laboratories at HQ of VIAEP and during field trip to typical vegetable growing and pre-processing units around Hanoi (Dong Xuan Agricultural Service Cooperative in Soc Son Dist. and An Viet High Technology Agricultural Products Joint Stock Company in Phuc Tho Dist.)

At the ceremony, UNIDO Country representative, Mr. Patrick J. Gilabert said "The training is a part of the project's effort to improve the quality of vegetables and reduce post-harvest losses through strengthening productive capacities in terms of production techniques, management and value addition. These consequently increase the income of smallholders".

The follow-up address, Dr. Chu Van Thien, Director General of the VIAEP emphasized that the Government's priority in addressing the problems to ensure the supply of safe vegetables for consumers, increase the international competitiveness of Vietnam's vegetable products, and improve income for vegetable growers.

Also, attendances at the opening ceremony were Ms. Hoang Mai Van Anh, the programme officer of UNIDO, all lecturers and instructors, the project team and 21 participants.

The participants of the ToT course were key persons from UNIDO identified vegetable-growing areas, procurement units, distribution points and others involved in vegetable value chain. Namely, they are from the Department of Agriculture and Rural Development of Hanoi (2 persons), the Centre for Agricultural Extension of Hanoi (2 pers.), the Farmers' Union of Hanoi (2 pers.), Dong Xuan Cooperative for Agricultural Services – Soc Son, Hanoi (2 pers.), Dao Duc Cooperative for Safe Vegetable Production (2 pers.), An Viet High Technology Agricultural Products Joint Stock Company (2 pers.), Tho An Company (2 pers.), OHF Company (1 person), Phu An Cooperative (1 person), Cu Khoi Cooperative (2 person), Vietnam ATC Co., Ltd. (2 pers.) and Hoa Binh Cooperative (1 person). Out of them *52.4%* are *female*. (for more detail, pls. see appendix 3).

The lecturers and practice instructors were experienced doctors, masters of science and bachelors of science of VIAEP.

Among 5 days of training, the specific schedule was as follows: 2 days and a half for lectures, half a day for making practice in VIAEP laboratories, 1 day for field trip to vegetable-growing cooperative (Dong Xuan Cooperative for Agricultural Services – Soc Son, Hanoi) and vegetable packing house and business (An Viet High Technology Agricultural Products Joint Stock Company in Phuc Tho dist., Hanoi), and 1 day for discussion on all necessary issues involved in safe vegetable production, procurement, distribution and consumption.

- **Lecture delivery**

Lectures were delivered in a well facilitated room at HQ of VIAEP.

Beside printed book "Post-harvest Technology in the Value Chain of Vegetables" and 3 forms leaflets given to the learners, all training materials were updated, broadened and presented in PowerPoint to help learners easily follow.

The practical activities took place in VIAEP laboratories. The focused issues were on:

- Grading
- Handling
- Washing
- Straining off vegetable surface
- Packaging, and
- Storing, etc.

First, the instructors introduced the purposes and procedure of all practical activities. Next, the instructors demonstrated the mentioned activities. Finally, each leaner practised as being instructed.

- **Group discussions**
    - ***Four-group discussion***

At the first discussion time the participants were divided into 4 groups and each group discussed 1 issue, then presented in front of the others. After presentation, the others gave supplements and remarks. The following are details of the 4 groups.

Group 1

Issue: What are the advantages and difficulties of implementing VietGAP

Presentation:

Advantages

- Producing safe products for community.
- Accessing the origin of the products.
- Ensuring the health of producers and environmental hygiene.

- Highly sharing profit form products among producers and others engaged in production.

Difficulties

- More investment and high cost.
- Complicated producing process and difficult application into current production.
- Not much awareness of the market/consumers to the concept of VietGAP leading to difficult consumption of the products.

Supplements and remarks of the other groups:

Beside the above-mentioned advantages and difficulties, other issues should be supplemented as that applying VietGAP into vegetable production can create opportunities for sustainable development of the vegetable-growing areas. However, some difficulties arise as limitations of knowledge, awareness and psychology of most growers, and small scateredly growing areas.

Group 2

Issue: What are the opportunities and challenges of VietGAP application?

Presentation:

Opportunities

- Ensuring quality and safety of vegetable products.
- Enhancing added value of the products.
- Creating consumers' confidence.
- Promoting high ability for market penetration and export of the products.
- Contributing to protection of the environment and eco-system.

Challenges

- Meeting high hindrances in changing perception of producers and consumers.
- Spending high input costs, leading to higher prices and lower consumption.
- Meeting difficulties in monitoring the quality, hygiene and safety of the products.
- Meeting difficulties in planning of vegetable-growing zones.

- Not having connected producers and vegetable related services with consumers.

Apart from the opportunities and challenges mentioned above, other issues should be supplemented as that when applies VietGAP the competitiveness of quality, hygiene and safety of the products will get higher and higher; moreover, the health of community will be ensured. However, the products have to cope with price competition with other types.

Group 3

Issue: How to change the perception of vegetable producers according VietGAP standards?

Presentation:

- Actively conveying training courses on VietGAP standards to vegetable producers and those engaged in value chain of vegetables.
- Propagating these standards through mass media.
- Encouraging vegetable production as wells VietGAP application thanks to the approved policies.
- Organizing vegetable-growers and concerned units to visit and learn successful activities of VietGAP models.
- Holding seminars, workshops on summarization and evaluation of vegetable production model under VietGAP standards.
- Urging considerations of the authorized bodies to multiply VietGAP standards.
- Making vegetable producers and concerned units understand the improvement of product value and the better lives of people participated in VietGAP model (as reduction of labour intensity, increase of income, etc.)

Learners from the other groups recommended 2 important points as showing the significant roles of the State management and necessary supports to vegetable-growers.

Group 4

Issue: How to maintain VietGAP's certification?

Presentation:

- Creating great economic value for vegetable-growers

- Actively advertising benefits of vegetables produced under VietGAP standards to gain consumers' trust.
- Making support policies for vegetable-growers and business units.
- Providing vegetable-growers with training courses on production and management skills.
- Making management mechanism for business units.

More item to be added from the other groups is that people's awareness should be raised.

- ***Two-group discussion***

Like the 1st time, at the 2nd discussion time the participants were divided into 2 groups and discussed on 2 big issues. After presentation of each group, the other gave supplements and remarks. The details are described as below.

Group 1

Issue: How to improve efficiency of safe vegetable production?

Presentation:

1. *Setting up production plans*. The most effective plan for vegetable production can be set up based on the signed contracts between the vegetable-growers and entrepreneurs or consumers. The priority should be paid attention to items with their strong points.
2. *Production management*. The items need to be well supervised as seeds/seedlings, fertilizers, plant protection chemicals, labours, water, electricity.
3. *Application of science and technology*. Achievements of science and technology should be applied to cultivation, harvesting, pre-processing, storage and processing appropriate to each type of crop/vegetable.
4. *Co-ordination in production*.
   - To co-ordinate one another, the strong points of each unit should be surveyed, analyzed and assessed, then these strong points can be intensified.
   - The coordination will gain the best benefit when the diversification of products among units is properly considered. As diversified products are released to the market, consumers will have more opportunities of choice.

Supplements from the other group to the above-mentioned ideas are:

- Labour productivity of the producers needs increasing.
- A supervising team should be established to propagate and support farmers.
- The State should have plans to support farmers in investment funds as well as the product consumption.
- Rights of land use and other related issues should be flexible.

Group 2

Issue: In what way to connect supply with demand?

Presentation:

1. *Product strategy*. It is one of the important strategies of the production and business contents.

   Through surveying the availability of inputs, outputs and market, the information is fully collected, analyzed and assessed, then strategies are set up for a production unit or a business.

2. *Marketing strategy*. It is an activity to promote commodities on the media.
3. *Looking for customers*. These activities can be carried out by:
   - Setting up an internet website.
   - Organizing online sales.
   - Directly selling goods through:

     Stores/Store chain.

     Other channels based on organizations or/and individuals.

     Wholesale and retail
4. *Maintaining the value chain*. The value chain can be maintained through building a connecting floor for supply and demand based on:
   - Means of communications.
   - Selection of varieties.
   - Organization of production as input selection.
   - Linkage of intermediaries such as processing entrepreneurs and researchers, etc.
   - Formation of consumption ways as model of "four factors" including farmers, scientists, distributors/entrepreneurs and the State.

- Supports to output products.
- Building a trademark or brand of products.

Note: The rights and duties of organizations and individuals engaged in the value chain of the products should be clearly defined.

The comment of group 1 is that the role of the State management is the most important in the linkage of supply and demand.

- **Assessment**

To improve efficiency for the following training courses, the organizers of the ToT course asked each learner to give his/her assessment toward the items which were directly involved in the course. The common assessment of each item is presented in percent (%) as blow:

1. *Training materials*
   - Printed book

     Very good 73 Good 27 Poor 0
   - Leaflets

     Very good 68 Good 32 Poor 0
2. *Lecturers*
   - Lecture preparation

     Very good 82 Good 18 Poor 0
   - Lecture delivery

     Very good 59 Good 41 Poor 0
3. *Practice*
   - Laboratories and practical places

     Very good 59 Good 41 Poor 0
   - Preparation for practice

     Very good 68 Good 32 Poor 0
   - Practical instructors

     Very good 65 Good 35 Poor 0
4. *Field trip*
   - Preparation for practice

     Very good 64 Good 36 Poor 0
   - Practical instructors

     Very good 68 Good 32 Poor 0

5. *Organization and training venue*

- Facilities

  Very good 77 Good 23 Poor 0

- Organizational method

  Very good 82 Good 18 Poor 0

- Serving staff

  Very good 77 Good 23 Poor 0

6. *Recommendation*

Should other ToT courses be held in the coming time?

Very necessary 64 Necessary 36 Unnecessary 0

(See also appendix 4)

In a word, the above-mentioned figures show that the assessment of all the 5 items is *very* good at 70.2% and good at 29.8%. The commendation of further ToT courses at the level of *very* necessary and necessary is 64% and 36%, respectively.

- **Comments and petition**

Attendances at the closing ceremony are Mr. Chu Van Thien, Director General of VIAEP; Ms. Hoang Mai Van Anh, the programme officer of UNIDO; the lecturers and instructors; the project team and 21 participants.

At the closing ceremony the representatives of each participation unit are invited to address their comments and recommendations to the organization and implementation of the course. Al comments and recommendations can be summed up as follows:

Comments

- All participants would like to express their thanks to UNIDO for financial aid to set up this useful course and to Vietnam Institute of Agriculture Engineering and Post-harvest Technology for professionally organizing the course with excellent training materials, useful leaflet forms, and experienced, enthusiastic lecturers and instructors.

- Thanks to the ToT course the learners have a good chance to learn many advanced knowledge from experienced lecturers and scientists. Moreover, the participants can exchange one another in many valuable issues on vegetable production, pre-processing and storage.

- Through the practical activities in the VIAEP's laboratories and one-day field trip, the participants gain more knowledge on applied state-of-the-art scientific technology of pre-processing and preservation of vegetables.

Petition

- The vegetable-growers hope that Vietnam State as well as UNIDO will give more help to cooperatives and enterprises/entrepreneurs to develop more potential markets for consumption of safe vegetables, contributing to sustainable development of cooperative as well as businesses producing safe vegetables.

- Further more ToT courses are expected to be sponsored to provide necessary knowledge on safe vegetable production, contributing to ensure health for the community.

- At least one model of pre-processing, packaging and storage of safe vegetables are expected to be set up to applied the advanced technological achievements and it is also a model to demonstrate for other vegetable producers to visit and learn. (See also appendix 5)

To close the successful ToT course every participant was awarded a certificate to certify that he/she has completed training course on *Post-harvest Technology in the Value Chain of Vegetable*.

TỔ CHỨC PHÁT TRIỂN CÔNG NGHIỆP LIÊN HỢP QUỐC
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (UNIDO)

VIỆN CƠ ĐIỆN NÔNG NGHIỆP VÀ CÔNG NGHỆ SAU THU HOẠCH
VIETNAM INSTITUTE OF AGRICULTURAL ENGINEERING AND POST-HARVEST TECHNOLOGY (VIAEP)

CERTIFICATE
Awarded to
Mr. / Ông: Trần Ngọc Liên
for having completed training course on
POST-HARVEST TECHNOLOGY IN THE VALUE CHAIN OF VEGETABLE
held in Hanoi
from September 29th to October 3rd, 2014

CHỨNG CHỈ
Cấp cho
đã hoàn thành lớp tập huấn
CÔNG NGHỆ SAU THU HOẠCH TRONG CHUỖI GIÁ TRỊ RAU
được tổ chức tại Hà Nội
từ ngày 29/9 đến 3/10/2014

TS. Patrick J. Gilabert
Đại diện UNIDO
Representative of UNIDO

TS. Chu Văn Thiện
Viện trưởng VIAEP
Director General of VIAEP

One of the 21 certificates awarded to the participants

2.3.3.2. Courses for training of entrepreneurs (ToE), farmers and retailers

The project team organized 10 two-day training courses at production units/entrepreneurs.

SCHEDULE OF TRAINING COURSES IN LOCALITIES

No.	Duration / Locality	October				November			Female %
		22-23	24-25	27-28	30-31	3-4	5-6	7-8	
1.	Hoa Binh Cooperative, Yen Nghia precinct, Ha Dong dist.	Dr. Mai MSc. Hieu							63.33
2.	Trang Viet Cooperative, Trang Viet commune, Me Linh dist.		Engr. Hoa MSc. Tinh						36.67
3.	Linh Nam Cooperative, Linh Nam precinct, Hoang Mai dist.			Engr. Hoa MSc. Hung					60.00
4.	Dao Duc Safe Vegetable Cooperative, Van Noi commune, Dong Anh dist.				Engr. Hoa MSc. Hung				76.67
5.	Farmers' Union – Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist. (Course 1)					Engr. Hoa MSc. Hung			46.67
6.	Farmers' Union – Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist. (Course 2)						Engr. Hoa MSc. Hung		66.67
7.	Dong Xuan Cooperative for agricultural Services, Dong Xuan commune, Soc Son dist.							Engr. Hoa MSc. Hung	73.33
8.	Ha Hoi Cooperative, Ha Hoi commune, Thuong Tin dist.					Dr. Mai Dr. Thong MSc. Hieu			34.48
9.	An Viet High Technology Agricultural Products Joint Stock Company, Thanh Da commune, Phuc Tho dist.						Dr. Mai Dr. Thong MSc. Hieu		46.67
10.	Thuong Coc Cooperative, Thuong Coc commune, Phuc Tho dist.							Dr. Mai Dr. Thong MSc. Hieu	66.67
							Total of female		**57.11**

Main contents of the training:

- Sub-harvest technology
- Post-harvest technology
- Good practice in pre-processing, packaging and storage of vegetables
- Model and plan of business

Training method: Co-organizers of the training course (the project officers and local managers) introduce purposes, contents and goals of the training course. The project officers briefly exchange ideas with local managers and participants about local current situations of vegetable growing to find the main discussion contents.

Presentation and delivery materials:

- Training lectures are presented in PowerPoint and video clips.
- Vegetable value chain and technological processes are presented in block diagrams with explanation.
- Training materials and leaflets on pre-processing and storage in the value chain of vegetables, linkage of farmers, scientists, distributors/entrepreneurs and state (four "factors") in the vegetable value chain and post-harvest hygiene and safety in the chain of vegetable supply are given to the participants.

After each part of the training contents analysis, assessment and discussion are given to enable the participants to have chances to gain deeper knowledge on vegetable related issues.

Constituents of the courses are 300 persons, representing Cooperative's managing committees, Cooperative councils, Farmers Unions, Women's Unions, Precinct People's Committees; managers and workers of pre-processing workshops; monitors of production groups; technical cadres and vegetable-growers. Among the participants 57.11% are *female*. (for more detail, pls. see appendix 6).

The following are localities, duration, number of participants, constituents, lecturers, instructors of the courses.

Course 1

Locality: Hoa Binh Cooperative, Yen Nghia precinct, Ha Dong dist., Hanoi.

Duration: October 22nd-23rd, 2014

Number of participants: 30, including 19 women

Constituents: the Head and cadres of the Cooperative, leaders of Farmers Union and Women's Union, and vegetable-growers.

Lecturers/Instructors: Dr. Tran Thi Mai, MSc. Nguyen Manh Hieu

Staple vegetables of the Cooperative: leafy vegetables.

Exception for this course: fruits of guava, apple and papaya

Course 2

Locality: Trang Viet Agricultural Cooperative, Trang Viet Commune, Me Linh dist., Hanoi.

Duration: October 24th-25th, 2014

Number of participants: 30, including 11 women

Constituents: the representatives of the Cooperative's managing committee, the Cooperative council, the Farmers Union and vegetable-growers

Lecturers/Instructors: Engr. Trinh Dinh Hoa and MSc. Pham Thi Thanh Tinh

Staple vegetables of the Cooperative: mustard greens in all types, tomato, kohlrabi, cauliflower, water morning glory

Course 3

Locality: Linh Nam Agricultural Cooperative, Linh Nam precinct, Hoang Mai dist., Hanoi

Duration: October 27-28th, 2014

Number of participants: 30, including 18 women

Constituents: The Farmers' Union of the Cooperative, Steering Committee, the manager and workers of the pre-processing workshop, and monitors of production groups.

Lecturers/Instructors: Engr. Trinh Dinh Hoa, MSc. Vu Duc Hung

Staple vegetables of the Cooperative: Brassica integrifolia, kohlrabi, tomato, water morning glory, spicy vegetables

Course 4

Locality: Dao Duc Cooperative for Safe Vegetable Production, Van Noi commune, Dong Anh dist., Hanoi

Duration: October 30th-31st, 2014

Number of participants: 30, including 23 women

Constituents: the Head of the cooperative, technical cadre and farmers

Lecturers/Instructors: Engr. Trinh Dinh Hoa and MSc. Vu Duc Hung

Staple vegetables of the Cooperative: mustard greens in all types, kohlrabi, cabbage, tomato, potato, carrot, water morning glory, capsicum and hot pepper, chayote, gourd.

Course 5

Locality: Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist., Hanoi

Duration: November 3rd-4th, 2014

Number of participants: 30, including 14 women

Constituents: Chairman of the Precinct People's Committee, Leader of the Farmers' Union of the precinct, Head of the cooperative and vegetable-growers.

Lecturers/Instructors: Engr. Trinh Dinh Hoa, MSc. Vu Duc Hung

Staple vegetables of the Cooperative: katuk *or* sweet leaf, pot-herb, basella alba, brassica integrifolia

Course 6 (the second course of the same locality)

Locality: Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist., Hanoi

Duration: November 5th – 6th, 2014

Number of participants: 30, including 20 women

Constituents: Members of the People's Committee and the Farmers' Union of the precinct, Deputy Head of the cooperative and vegetable-growers.

Lecturers/Instructors: Engr. Trinh Dinh Hoa, MSc. Vu Duc Hung

Staple vegetables of the Cooperative: katuk or sweet leaf, pot-herb, basella alba, brassica integrifolia and "Gang Dong Du" guava.

Course 7

Locality: Dong Xuan Cooperative for Agricultural Services, Dong Xuan commune, Soc Son dist., Hanoi

Duration: November 7th – 8th, 2014

Number of participants: 30, including 22 women

Constituents: Head of the cooperative and vegetable-growers, and 2 participants from Mushroom-growing Coop. (Phu Minh commune, Soc Son dist.)

Lecturers/Instructors: Engr. Trinh Dinh Hoa, MSc. Vu Duc Hung

Staple vegetables of the Cooperative:

- Dong Xuan Cooperative: Brassica integrifolia, cabbage, kohlrabi and pear-shaped (pyrifrom) melon, winter gourd, luffa
- Mushroom-growing Cooperative: straw mushroom

Course 8

Locality: Ha Hoi Agricultural Cooperative, Ha Hoi commune, Thuong Tin dist., Hanoi

Duration: November 3rd – 4th, 2014

Number of participants: 30, including 10 women

Constituents: Head and staff of the cooperative, members of the Farmers' Union and Women's Union, and vegetable-growers.

Lecturers/Instructors: Dr. Tran Thi Mai, MSc. Nguyen Manh Hieu

Staple vegetables of the Cooperative: cabbage, tomato and potato

Course 9

Locality: Thanh Da Agricultural Cooperative, Thanh Da commune, Phuc Tho dist., Hanoi

Duration: November 5th – 6th, 2014

Number of participants: 30, including 14 women

Constituents: Head and staff of the cooperative, members of the Farmers' Union and Women's Union, and vegetable-growers.

Lecturers/Instructors: Dr. Tran Thi Mai, MSc. Nguyen Manh Hieu

Staple vegetables of the Cooperative: cabbage, kohlrabi, cauliflower and tomato

Course 10

Locality: An Viet High Technology Agricultural Products Joint Stock Company, Thuong Coc commune, Phuc Tho dist., Hanoi

Duration: November 7th – 8th, 2014

Number of participants: 30, including 20 women

Constituents: Head and staff of the commune, members of the Farmers' Union and Women's Union, vegetable-growers and workers of An Viet High Technology Agricultural Products Joint Stock Company

Lecturers/Instructors: Dr. Tran Thi Mai, MSc. Nguyen Manh Hieu

Staple vegetables of the Cooperative: cabbage, kohlrabi, cauliflower and tomato

(For more details about discussions, pls. see also appendix 7)

3. CONCLUSIONS AND RECOMMENDATIONS

3.1. Conclusions

- ***On book and leaflets***
  - 150 books on *Post-harvest Technology in the Value Chain of Vegetables* were printed and given to the ToT participants and representatives of the farmers, procurement units and entrepreneurs in Hanoi vegetable-growing areas.
  - 5,000 leaflets were printed and given to the participants of the 11 training courses as well as to the farmers, procurement units and entrepreneurs in Hanoi vegetable-growing areas.
- ***On ToT course***
  - Constituents of the course are 21 key persons from UNIDO identified vegetable-growing areas, procurement units, distribution points and others involved in vegetable value chain. Namely, they are from the Department of Agriculture and Rural Development of Hanoi, the Centre for Agricultural Extension of Hanoi, the Farmers' Union of Hanoi, cooperatives and companies.
  - Considering women empowerment for their sense of initiative in their making livelihood, 52.4% of female were invited.
  - The results from summation and analysis of questionnaires to the participants show that:
    - The book meets basic and intermediate levels of users. To some extent it can also be used for reference to higher level of readers.
    - The leaflets are vividly presented with simple and easily understandable terminologies, and images close to vegetable-growing practice. They are useful to all concerned levels.
    - With plain words and demonstrations, the lectures attract the learners.
    - Thanks to good facilities of the laboratories, well prepared materials and the demonstration of the experienced instructors, the self-making practice brings real knowledge and good skills to the learners.
- ***On the courses for entrepreneurs, farmers and retailers***
  - 300 participants of the training courses are composed of leaders and managers of the very localities and people involved in vegetable production.
  - Staple vegetables cultivated by these localities are mustard greens in all types, cabbage, water morning glory, katuk or sweet leaf, pot-herb, basella

alba, cauliflower, tomato, gourds, luffa, capsicum and hot pepper, chayote, kohlrabi, carrot, potato and spicy vegetables.

Exception of the course are fruits such as shaped (pyrifrom) melon, guava, apple and papaya.

° Considering women empowerment for their sense of initiative in their making livelihood, 57.11% of female were invited

° The results of summation, analysis and assessment of opinions of the participants show that:

- All the contents are related to building a model of safe vegetable pre-processing and storage with state-of-the-art technological application to reduce post-harvest losses and to improve product quality, a system for quality control of harvested fruits and vegetables, storage; establishing distribution network; strengthening linkage between vegetable-growers, managers of the Cooperative and distributors under the technological support of VIAEP and UNIDO financial aid.
- Thanks to well prepared materials and the demonstration of the experienced lecturers/experts, the participants find it easy to absorb necessary knowledge on vegetable production.
- Participating in the training course the vegetable-growers eagerly discussed on post-harvest technological issues and got knowledge of effective production.
- The aged are more interested in vegetable production with high yield, attractive appearance and without squeeze price.
- Most of the young are interested in issues of post-harvest technology, effective investment, and a pre-processing and storage model to apply the given training knowledge for sustainable production development in order to create more jobs for the local labourers.
- Participating in delivery of lectures/instructions, the key persons participated in the ToT course are real instructors to the vegetable related issues. The participants of the two-day courses can trust to consultancy of these instructors on safe vegetable harvest, pre-processing and storage as well as in distribution process.

- ***Effects of the courses***

All the training courses - ToT, ToE, and for farmers and retailers – have brought about significant effects not only in economy but in society as well.

Economically, it is obvious that the application of the knowledge on post-harvest technology and the practically trained skills brings forth high

productivity and good quality of vegetables; hence, people engaged in vegetable value chain get higher benefits.

Socially, the trained knowledge and practice encourage the efforts of youth to invest their finance and strength in forming excellent vegetable-growing models or companies. Thanks to these, many jobs for rural labourers are created and wave population movement of the youth to the cities to seek jobs significantly reduces. Moreover, the jobs remarkably decrease social evils in the rural areas.

Expectance: more detailed impact of the training programme has been monitored and will be reported later.

3.2. Recommendations

Almost all of the participants of the trainings courses gave their feedback to the Board of the Training Organizers as below:

- At least one model of pre-processing and storage of safe vegetables is expected to be built in Hanoi vegetable-growing area. When the model is built, the state-of-the-art technologies for vegetable pre-processing and storage are applied, vegetable-growers and entrepreneurs will have a good chance to visit and learn how to produce safe vegetables with high profits. Hereby, they can build other models when they afford to do so.

- A refresh ToT course is expected to be held for the previous ToT's participants to broaden their knowledge on new technological issues and to discuss problems that arise during their application of post-harvest technology.

- To meet the demand of specific vegetable growing of each locality guiding brochures of about 40-50 pages on technologically detailed processes for 4 main types of leafy, fruity, root and spicy vegetables should be written and published.

- Vegetable-growers and entrepreneurs desire VIEAP's achievements of post-harvest technologies to be transferred into vegetable production as many as possible and more help from VIAEP's experienced experts.

4. ACKNOWLEDGEMENT

On behalf of VIAEP, the Project Team would like to express sincere thanks to Mr. Philippe Scholtes, Mr. Karl Schebesta, Mr. Patrick J. Gilabert, Ms. Hoang Mai Van Anh and other staffs of UNIDO for great supports to the project.

We hope to get more assistances and further cooperation.

5. APPENDICES

Appendix 1

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

VIETNAM INSTITUTE OF AGRICULTURAL ENGINEERING
AND POST-HARVEST TECHNOLOGY

Project: STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN

TRAINING FRAMEWORK ON VEGETABLE VALUE-ADDED CHAIN

Project *"Strengthen the supply capacity of the fruit and vegetable sector by applying proper technologies along the value chain"*

GENERAL INTRODUCTION

- Objectives and contents of training, including 3 main parts:
  - Good vegetable management practice under VietGAP standard.
  - Post-harvest technology.
  - Management of vegetable production chain.
- Why should vegetable-growers learn VietGAP?
- Effect of the training courses.

PART I. GOOD VEGETABLE MANAGEMENT PRACTICE UDER VIETGAP STANDARD

CHAPTER I. BRIEF INTRODUCTION ON GAP AND VietGAP

I. VietGAP some GAP in the world

1. Definition and progress of VietGAP (VietGAP if abbreviation of Good Agriculture Practice of Vietnam).
2. GAP in accordance with international standards: GlobalGAP (before September 2007, it is called EuroGAP). Founded by a private organization with 35 members (by 2007) from Europe and Japan (www.globalgap.org).
3. GAP in accordance with regional standards: AseanGAP
4. GAP in accordance with individual nation: ThaiGAP, JGAP, ChinaGAP, IndiaGAP

II. Seven rules and seven targets of GAP

1. Seven rules
   - Management: Integrated Pest Management (IPM), production management, Integrated Field Management.
   - Systems: Measures and progresses of production, pre-processing, storage, processing and consumption.
   - Science: Technical and technological achievements, scientifically arranged measures.
   - Reality: suitability with specific conditions of production and crops.
   - Detective capability of product origin to control its quality.

- Transparency: Taking notes of production diary, promulgation of product quality, brand name
- Legality: Certificates of brand name, quality, etc.

2. Seven targets

- Ensuring productivity, quantity and quality for social food security.
- Ensuring agricultural sustainable development, natural biodiversity and agricultural production.
- Ensuring sustainable development, and mitigating environmental pollution and chemical application for plant protection through management measures, environmentally-friendly scientific achievements.
- Ensuring welfare of producers.
- Ensuring hygiene and food safety for consumers and health community.
- Ensuring economic efficiency of agricultural production and competitiveness and penetration of international markets.
- Ensuring detective capability of product origin.

III. VietGAP and its necessity to be applied

- To develop sustainable agriculture, it is necessary to solve main challenges and contradictions as follows:

1. Agricultural development and market versus environment protection and biodiversity
2. Agricultural development versus guarantee of food hygiene and safety
3. Agricultural development versus interests and welfare of labourers.
4. Agricultural development versus public health.
5. Production versus consumption, quantity versus quality.
6. Interests of producers versus consumers.
7. Immediate development versus long-term development.
8. Increasingly fierce competition in the market mechanism and integration.

- Key factors of VietGAP

1. Major contents of safe vegetable production process under VietGAP

1.1. Areas for safe vegetable production.

1.2. Manpower for vegetable production.

1.3. Management and use of water: unpolluted resource, water saving irrigation, etc.

1.4. Management and use of varieties: appropriate to geographical and soil property of specific growing areas, etc.

1.5. Management and fertilizer use: appropriate to soil property and vegetable varieties

1.6. Management and use of agricultural chemicals: avoid abusing chemicals to harm environment of human life and to change soil property, etc.

1.7. Harvesting and post-harvest handling: paying attention to losses

1.8. Recording, recordkeeping, origin detection and revocation of products if necessary.

1.9. Internal checking

2 . Certification of safe vegetable production under VietGAP standards

2.1. Necessity to recognize and understand the true nature of the certification of safe vegetable production.

2.2. Benefits of certification for safe vegetable production.

3. Sequence to register a certificate of VietGAP

3.1. Submitting registration documents to the certifying organization: a) application for registration of VietGAP, b) map of the plot(s) and the zone for vegetable production, proposal on design and layout of production area, post-harvest handling, pre-processing, preservation, c) Results of internal checking in accordance with issued regulations.

3.2. Valid profile documents.

4. VietGAP certification checking (validity duration of the certificate, certificate granting institution, scope of certification, certification code, publication of produced commodity under VietGAP, etc.)

CHAPTER II. CURRENT SITUATION OF SAFE VEGETABLE PRODUCTION AND SOLUTION FOR SUSTAINBLE DEVELOPMENT

1. Guidelines of the Government, the Ministry of Agriculture and Rural Development, provinces and concerned ministries as the Ministry of Natural Resources and Environment, the Ministry of Public Health.
2. Planning of vegetable production zones.
3. Guidance and solution to set up a feasible model(s).
4. Selection of organizations to certify, invest, support and develop training courses on management, production and business.
5. Innovation of thinking about production and consumption of safe vegetables, and VietGAP certification.

CHAPTER III. APPLICATION OF EM TECHNOLOGY (EMRO-Japan) AND DERIVETIVES OF E2-TB, TB-BK3, NW-E5 IN SAFE VEGETABLE PRODUCTION (with specific subject)

1. Environment treatment in production, business, and rural living.
2. Processing and production of bio-fertilizer from agricultural residues and their use for safe vegetable production.
3. Spraying of leaf-type fertilizers for vegetables and growth promoting.
4. Deodorization and cleaning of environment for preservation, production, sales and packing of plant protection products.

CHAPTER IV. SPECIFIC CHARACTERISTICS AND QUALITY OF FRESH HARVESTED VEGETABLES

1. Classification of vegetables under their characteristics: leafy, root, fruity and spicy vegetables.
2. Vegetable competitiveness.
3. Information system on vegetable supply.
4. Classification according to criteria: nutrition, trade and cooking.
5. Qualitative criteria and evaluation methods.

5.1. Qualitative criteria: perceptibility, physio-chemistry, humidity, impurities, harmful organisms, heavy metals (safe limits, technical solutions to limit infecting sources of heavy metals).

5.2. Methods of evaluation: in accordance with the Vietnamese standard (TCVN) and some other standards appropriate to production conditions in Vietnam.

PART II. POST-HARVEST TECHNOLOGY

CHAPTER I. INTRODUCTION

1. Concepts of stages: pre-harvest, sub-harvest and post-harvest.
2. Role of post-harvest technology (for agriculture development, national economy, loss reduction, etc.)
3. Characteristics of post-harvest technology (involved in pre-harvest, sub-harvest, stages in post-harvest technology, diversity of post-harvest technology).
4. Post-harvest losses and their causes

   - Concepts of loss types: losses of quantity, quality, economy and society.

   - Causes of post-harvest losses:

     - Owing to processes of physiology, biochemistry (respiration, ethylene, post-harvest maturation, germination, evaporation, natural weight loss, heat generation, etc.)
     - Due to mechanical damages
     - Due to the harmful organisms (micro-organisms, insects, birds, bats, etc.)

   - Post-harvest losses in the world and in Vietnam.
5. Prevention and control of post-harvest losses through measures: chemical control; treatment with low-temperature, controlled atmosphere (CA), modified atmosphere (MA), heating, biological control and growth regulatory substances.

CHAPTER II. SUB-HARVEST TECHNOLOGY

1. Regime and techniques for irrigation in sub-harvest stage (rain-making, drip irrigation, etc .), and irrigation influence to quality of post-harvest products.
2. Fertilizers use (used fertilizers, correct ways of fertilizer application and quality, hygiene and food safety)
3. Use of plant protection products (used plant protection substances, correct ways of fertilizer application and quality, hygiene and food safety)
4. Use of substances for growth regulation, reduction of ethylene synthesis, germination reduction, extension of crop duration, increase of post-harvest storage.

CHAPTER III. HARVEST TECHNOLOGY

1. Harvesting and handling right in the field (applicable for leafy, root, fruity and spicy vegetables)

   1.1. Harvesting tools

   1.2. Harvesting methods (manual, semi-mechanical, mechanical, etc.)

   1.3. Harvesting time (according to growth period, colours, sizes, shapes, textures, solute concentration, chemical composition, state, etc.)

1.4. Ways of commodity arrangement, packing, transport of harvested vegetables, packaging.

1.5. Tools and techniques of quality checking before harvest (photorefractive meter, hardness testing equipment.

2. Pre-processing stage

2.1. Cleaning technology and equipment (Principles: bubbling, spraying, brushing, scrubbing, drying/dehydrating, etc.; structure; operation procedure)

2.2. Grading technology and equipment (principles: according to size, colour, shape, etc.; structure; operation procedure)

2.3. Pre-cooling techniques

2.4. Steps taken in packaging house (diagram of technological process, notes of technological process, required equipment and tools)

3. Storage

3.1. Vegetable characteristics and preservation technologies (varieties; cultivation techniques; sub-harvesting care; harvest maturity; physiology and biochemistry: mutative respiration, non-mutative respiration, etc.; chemical ingredients)

3.2. Processes occur in preservation period

- Physiological and biochemical processes: respiration, synthesis of ethylene, changes of chemical ingredients.
- Physical processes: evaporation, natural weight loss, generation of heat and diseases caused by harmful organisms (micro-organisms, insects, etc.)

3.3. Factors affecting process of vegetable preservation: temperature, relative humidity, atmospheric compositions for preservation, clear preservation space.

3.4. Technologies and equipment for storage

- Physical methods (including diagrams and explanations of technological process, needed devices): cold method, heat treatment, irradiation, CA or MAP, 1 - MCP and ozone.
- Methods of chemical (including diagrams and explanations of technological process, needed devices): ethylene adsorbent, composite films, coating film, chemical preparations.
- Biological methods (including diagrams and explanations of technological process, needed devices): bio-preparations, bio-traps, bio-baits, natural enemies of insects.

3.5. Special treatments for vegetables before and during preservation period

- Using equipment
- Handling right in the field
- Handling in unexpected cases
- Handling stages in the packaging area: narrow pallet system, general stages, layout of packing area, loading and unloading of products, conveyor system, washing, waxing, grading and distribution by sizes, simple packaging line.

3.6. Packaging and packing materials: selection of packing material, standardization of packing sizes, packaging techniques, labelling and packaging to create a MAP, layout and arrangement of packages into blocks.

4. Transport and consumption

4.1. Transport: transport means (conventional way, mobile cooling devices, refrigerated vehicles, planes), ways of commodity arrangement (manually, by pallet), bracing to keep commodity blocks standstill.

4.2. Consumption: daily and long-term time

5. Control of temperature and air humidity during pre-processing packaging, storage and transport

5.1. Temperature control: Cooling container, forced air cooling, water cooling, evaporative cooling, day and night ventilation of storage space, ice cooling, some other cooling methods.

5.2. Increase of relative humidity, maintenance of cooling chain for easily perishable products.

5.3. Handling at reception places: loading and unloading, temporary storage temperature, selection and repackaging, ripening, display of goods for consumption.

CHAPTER IV. PRACTICAL EXERCISES ON HARVEST TECHNOLOGY

1. Harvest stage

1.1. Factors affecting quality of harvested vegetables: harvest maturity, harvest time, techniques, harvest tools.

1.2. Selection of tools and equipment suitable for individual vegetable harvesting to ensure quality of harvested vegetables.

1.3. Practice of harvesting techniques: scales of household, teams/group or cooperatives.

2. Cleaning and grading stages

2.1. Dry cleaning, removal of impurities.

2.2. Water cleaning: manual, semi-manual, ozone bubbling

2.3. Selection of tools and equipment appropriate to scales of households or groups.

3. Grading stage: according to colour and sizes by hand or using specialized tools.

4. Product packaging

4.1. Identification of packing types and their use features

4.2. MAP packing: material selection, air-ventilation holes on bags, packaging capacity of each type of bag, etc.

4.3. Carton boxes

5. Storage stage diagram of technological process, notes of technological process, required equipment and tools): at room temperature, in cool or cold (temperature, optimal humidity and probable damage)

6. Introduction through Video and PowerPoint on harvest technology, cleaning and grading, packing and preservation with mechanized or semi-mechanized techniques to learners for reference and discussion.

7. Calculating practice of costs and profits: with a household scale of 200 kg per day and a steam- or group-scale of 500 kg per day.

PART III. MANAGEMENT IN VEGETABLE PRODUCTION CHAIN

CHAPTER I. MARKET INFORMATION AND APPROACH METHODS

1. Market Information

    1.1. Supply and demand of market

    1.2. Competition: quality, price, design, distribution/response service, trade promotion (brand, origin of goods, advertising, marketing and promotion).

    1.3. Related policies of business organizations, the local governments, etc.

2. Approach ways to market information

    2.1. Primary approach: wholesale markets, fairs, exhibitions, seminars, workshops, surveys of market demand, etc.

    2.2. Secondary approach: publications, audio-video means/materials, etc.

CHAPTER II. INVESTMENT AND ECONOMIC EFFECT AND USE

1. Assessment of economic effect of investment projects: general situation, some concepts of investment (general concepts, cash flow, cash value conversion of investment back to initial moment or after completion of the investment, payback, break-even point.
2. Investment decision based on criteria: currently equivalent value of the investment projects, internal rate of profits.

CHAPTER III. BUSINESS MODEL AND BUSINESS PLAN

1. Objectives: To provide basic knowledge about business, business plan and main characteristics of fresh vegetable business.
2. Model and business plan

    2.1. Reasons for establishment of a business model and a business plan.

    2.2. Description of business

    2.3. Background/Context

    2.4. Tasks and goals

    2.5. Types of products and services.

    2.6. Market analysis and planning.

    2.7. Macro environment trends in production of vegetables.

    2.8. Customers.

    2.9 . Roles of partners in the business model and business plan.

    2.10. Marketing plan.

    2.11. Target market segments.

    2.12. Prices, promotion, products and places.

    2.13. Revenue forecasting.

    2.14. Management and operation

    2.15. Personnel and facilities

    2.16. capital

    2.17. Legal requirements

3. Finance and business planning

- 3.1. Income.
- 3.2. Operating cash flow.
- 3.3. Accounting analysis of receipt and payment balance
- 3.4. Finance planning.
- 3.5. Sources of private funds and needed capital.
- 3.6. Financial report
- 3.7. Profits and loss of trademark rights, design and brand (at least 3 years)
- 3.8. Cash flow
- 3.9. Balance sheet
- 3.10. Assumed risks

Appendix 2

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

VIETNAM INSTITUTE OF AGRICULTURAL ENGINEERING
AND POST-HARVEST TECHNOLOGY

Project: STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN

TRAINING SCHEDULE

(for ToT course)

Time			Content	Responsible organization/person
Mon., Sep. 29, 2014	Morning	9:00 - 9:30	Registration	Organizing board and participants
		9:30 - 11:30	○ Arranging needed activities for the course ○ Introducing the importance of the training course ○ Visiting and preparing laboratory and practical place for the training activities	Department of Science, Training and International Cooperation (DeSTIC)
		11:30 - 14:00	**Lunch break**	
	Afternoon	14:00 - 14:30	Opening ceremony	- Mr. Patrick J. Gilabert, UNIDO - Mr. Chu Van Thien, VIAEP - Participants, lecturers, organizers
		14:30 - 15:30	*Post-harvest technology* ○ Chapter I. Basic concepts Stages of: - Post-harvest technology - Losses, and - Main causes in post-harvest, etc. ○ Chapter II. Sub-harvest treatment Application of: - Irrigation technique - Fertilizers - Pesticides, and - Retaining substances, etc.	Dr. Mai[3], Dr. Thông[4]
		15:30 - 15:45	Coffee/tea break	
		15:45 - 17:00	*Post-harvest technology* (cont.) Chapter III. Handling and storage - Harvest and handling in field - Handing steps in packing house - Technologies and equipment for storage, etc.	Dr. Mai, Dr. Thông

[3] Dr. TrầnThị Mai
[4] Dr. Lê Đức Thông

Tue., Sep. 30, 2014	**Morning**	8:00 - 9:45	*Post-harvest technology* (cont.) Chapter III (cont.). Transport and consumption - Transport vehicle - Loading methods - Temperature and moisture content control during transport - Unloading at distribution and/or selling places	Dr. Mai, Dr. Thông
		9:45 - 10:00	Coffee/tea break	
		10:00 - 11:30	Controlled Atmosphere (CA) and Modified Atmosphere Packaging (MAP) for vegetable preservation	Dr. Tuấn[5]
		11:30 - 13:30	**Lunch break**	
	Afternoon	13:30 - 15:00	Applying 1-MCP for vegetable preservation	Dr. Nam[6]
		15:00 - 15:15	Coffee/tea break	
		15:15 - 16:30	Discussion in post-harvest technology: - Harvest - Handling and Storage - Transport, and - Consumption, etc	Dr. Mai, Dr. Thông
Wed., Oct. 1, 2014	**Morning**	8:00 - 11:30	○ Practical activities: - Grading - Handling - Washing - Straining off vegetable surface - Packaging and storing, etc. ○ Venue: Dept. of Technology for Food Preservation, VIAEP headquarters	Dr. Mai, Dr. Thông BSc. Mai[7], BSc. Hằng[8]
		11:30 - 13:30	**Lunch break**	
	Afternoon	13:30 - 15:00	*Good practice in harvest, handling, storage and consumption for safe vegetables* ○ Chapter I. Introduction on GAP and VietGAP - Concepts - Regulations - Aims, and - Process of implementation, etc. ○ Chapter II. Current situation of safe vegetable production and solutions of sustainable development - General policy and plans - Choice of organization for granting certificate, - Change of vegetable-growing attitude in their production, etc.	MSc. Hiểu[9]

[5] Dr. Phạm Anh Tuấn
[6] Dr. Nguyễn Minh Nam
[7] BSc. Lê Thị Mai
[8] BSc. Cù Thị Hằng
[9] MSc. Nguyễn Mạnh Hiểu

		15:00 - 15:15	Coffee/tea break	
		15:15 - 16:30	Discussion on GAP for harvesting, handing, storage and consumption: - Difficulties - Solutions - Process for getting certificate, etc.	MSc. Hiểu
Thu., Oct. 1, 2014			Field trip to vegetable packing house and business	All participants and lecturers
Fri., Oct. 3, 2014	**Morning**	8:00 - 9:45	*Management in vegetable production chain* o Chapter I. Market information - Supply and demand of market - Competitiveness - Policy, and - Approach, etc. o Chapter II. Investment and economic effect - Assessment of economic effect of investment projects - Sectors of investment decision, etc.	BSc. Hòa[10]
		9:45 - 10:00	Coffee/tea break	
		10:00 - 11:30	*Management in vegetable production chain* (cont.) o Chapter III. Business model and plan - Reasons for establishment of a business model - Business plan - Market analysis - Finance plan, and - Benefit, etc.	BSc. Hòa
		11:30 - 13:30	**Lunch break**	
	Afternoon	13:30 - 15:00	Discussion in management of vegetable production chain	All participants and lecturers
		15:00 - 15:15	Coffee/tea break	
		15:15 - 16:30	- Closing ceremony - Awarding certificates to participants	- Director General of VIAEP - DeSTIC - All participants

[10] BSc. Trịnh Đình Hòa

Appendix 3

LIST OF PARTICIPANTS OF ToT COURSE

ON POST-HARVEST TECHNOLOGY IN THE VALUE CHAIN OF VEGETABLES

No.	Full name	Sex	Institution	Phone number	Address
1	Lê Thị Kim Oanh	Female	Department of Agriculture and Rural Development of Hanoi	0915323957	Station of Plant Protection
2	Tô Thị Loan	Female	Department of Agriculture and Rural Development of Hanoi	0985343808	Station of Plant Protection
3	Trương Thị Mai	Female	Centre for Agricultural Extension of Hanoi	0987944155	Bureau of Agricultural Extension and Cultivation
4	Kiều Thị Hường	Female	Centre for Agricultural Extension of Hanoi	0985898206	Bureau of Agricultural Extension of Tu Liem Dist.
5	Trần Hữu Đức	Male	Farmers' Union of Hanoi	0912218556	17/77/381 Nguyen Khang, Cau Giay, Hanoi
6	Đỗ Thị Thu Duyên	Female	Farmers' Union of Hanoi	0989532486	Group 18, Trung Hoa, Cau Giay, Hanoi
7	Ngô Văn Luyến	Male	Dong Xuan Cooperative for Agricultural Services – Soc Son, Hanoi	01676114755	Thuong hamlet, Dong Xuan Commune, Soc Son Dist., Hanoi
8	Trần Ngọc Liên	Male	Dong Xuan Cooperative for Agricultural Services – Soc Son, Hanoi	0987605134	Ca hamlet, Dong Xuan Commune, Soc Son Dist., Hanoi
9	Dương Văn Đức	Male	Dao Duc Cooperative for Safe Vegetable Production	01696444289	Dao Duc Cooperative for Safe Vegetable Production
10	Dương Thị Nội	Female	Dao Duc Cooperative for Safe Vegetable Production	0975176976	Dao Duc Cooperative for Safe Vegetable Production

11	Nguyễn Hữu Đạo	Male	An Viet High Technology Agricultural Products Joint Stock Company	0987431237	Southern Tu Liem, Hanoi
12	Lương Đình Thiện	Male	An Viet High Technology Agricultural Products Joint Stock Company	0973981499	Phuc Tho Dist., Hanoi
13	Văn Thị Nang	Female	Tho An Company	0989542275	Thu Duong hamlet, Thu Phu commune, Thuong Tin dist., Hanoi
14	Đặng Thị Thúy	Female	Tho An Company	0968972351	Am Ho hamlet, Van Tao commune, Thuong Tin dist., Hanoi
15	Hoàng Thị Dung	Female	OHF Company	0988353575	OHF Company
16	Hoàng Đình Tiến	Male	Phu An Cooperative	0964988679	Phu An Cooperative, Thanh Da commune, Phuc Tho dist., Hanoi
17	Lê Văn An	Male	Cu Khoi Cooperative	0945446887	Group 4 – Cu Khoi precinct, Long Bien dist., Hanoi
18	Hoàng Văn Đào	Male	Cu Khoi Cooperative	01692883512	Group 2 – Cu Khoi precinct, Long Bien dist., Hanoi
19	Ngô Kiều Oanh	Female	Vietnam ATC Co., Ltd.	0913213175	Van Hoa commune, Ba Vi dist., Hanoi
20	Đoàn Thị Ngọc Tam	Female	Vietnam ATC Co., Ltd.	01666372889	Van Hoa commune, Ba Vi dist., Hanoi
21	Trịnh Văn Vịnh	Male	Hoa Binh Cooperative	0979121209	Yen Nghia precinct, Ha Dong dist., Hanoi

Appendix 3

LIST OF PARTICIPANTS OF ToT COURSE

TT	Name	Institution	Phone No.	29-Sep	30-Sep	1-Oct	2-Oct	3-Oct
1	Tô Thị loan	Chi cục bảo vệ thực vật Hà Nội	0985.343.808					
2	Lê Thị kim Oanh	chi cục BVTV Hà Nội	0915323957					
3	TRần Ngọc Liên	HTX DV NN Đông xuân SócSơn - Hà Nội	0987 605 134					
4	Ngô văn Luyến	HTX DV NN ĐÔNG XUÂN SÓC SƠN - HÀ NỘI	0167 611 4755					
5	Hoàng văn Đức	HTX DV Cơ Khối Long Biên Hà Nội	0169C883512					
6	Lê văn An	HTX DVNN Cơ Khối Long Biên Hà Nội	0945496887					
7	Đinh Văn Vinh	HTX DVTH Hoa Bình P. Yên Nghĩa, HĐông	0979121209					
8	Nguyễn Thái Đạo	Cty An Việt	0987431237					
9	Hoàng Thị Dung	chi cổ phần OHF	0988.353.575					
10	Hoàng Đình Tiến	HTX Thanh Đa	0964988679					
11	Kiều Thị Hường	Trung tâm Khuyến nông Hà Nội	0985898206					
12	Phùng Thị Mai	Trung tâm khuyến nông HN	0987994155					
13	Dương thị Nụ	Hợp tác xã rau an Toàn Đạo Đức	0975176976					
14	Phùng Văn thi	HTX rau an toàn đạo đức	01696444289					
15	Văn Thị Nang	Cty Thọ An	098542275					
16	Đặng Thị Thúy	Cty Thọ An	0968972551					
17	Đoàn Thị Ngọc Tam	CTy TNHH ATC VN	01666372889					
18	Lương Đình Thuần	Chủ cơ sở sản phẩm công nghệ cao An Việt	0973981499					
19	Ngô Kiên Oanh	Công ty TNHH ATC VN	0913213175					
20	Đỗ Thị Thu Duyên	Hội Nông dân TP Hà Nội	0989532486					
21	Trần Hữu Đức	Hội Nông dân TP Hà Nội	0912218556					

UNITED NATIONS
INDUSTRIAL DEVELOPMENT ORGANIZATION

VIETNAM INSTITUTE OF AGRICULTURAL ENGINEERING
AND POST-HARVEST TECHNOLOGY

Project: STRENGTHEN THE SUPPLY CAPACITY OF THE FRUIT
AND VEGETABLE SECTOR BY APPLYING PROPER TECHNOLOGIES ALONG THE VALUE CHAIN

QUESTIONNAIRE /PHIẾU THĂM DÒ

To the participants of ToT course. /Kính gửi các học viên khóa tập huấn cho đào tạo viên.

To improve efficiency of the following training courses, the organizers of the ToT course would like you to give your assessment toward the items below:

Để nâng cao hiệu quả cho các khóa học tiếp theo, Ban Tổ chức khóa Tập huấn cho các đào tạo viên mong muốn các anh/chị cho ý kiến đánh giá theo các mục sau:

7. Training materials / Tài liệu tập huấn

- Printed book / Sách đã được in
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐
- Leaflets / Các loại tờ rơi
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐

8. Lecturers / Các giảng viên

- Lecture preparation / Việc chuẩn bị bài giảng
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐
- Lecture delivery / Cách giảng bài
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐

9. Practice / Thực hành

- Laboratories and practical place / Các phòng thí nghiệm và địa điểm thực hành
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐
- Preparation for practice / Chuẩn bị cho buổi thực hành
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐
- Practical instructors / Cán bộ hướng dẫn thực hành
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐

10. Field trip / thực hành tại thực địa

- Preparation for practice / Chuẩn bị cho buổi thực hành
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐
- Practical instructors / Cán bộ hướng dẫn thực hành
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐

11. Organization and training venue / Tổ chức và địa điểm học

- Facilities / Trang thiết bị
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐
- Organizational method / Phương pháp tổ chức
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐
- Serving staff / Nhân viên phục vụ
  Very good / Tốt ☐ Good / Đạt ☐ Poor / chưa đạt ☐

12. Recommendation / Đề xuất

- Should other ToT courses be held in the coming time? / Trong thời gian tới có nên tiếp tục tổ chức các khóa học tập huấn cho các đào tạo viên?
  Very necessary/Rất cần ☐ Necessary/cần thiết ☐ Unnecessary/Không cần ☐

Hanoi, October 3rd, 2014

Participant / Học viên

Appendix 5

COMMENTS AND PETITIONS OF THE PARTICIPANTS TO THE TOT COURSE

- ***Mr. Tran Ngoc Lien***, the monitor of the course, representative of Dong Xuan Cooperative for Agricultural Services – Soc Son

Comments:

- Firstly, I would like to express my thanks to UNIDO and VIAEP for the excellent course. I can say the contents of ToT course are interesting. The learners have a good chance to learn much advanced knowledge from experienced lecturers and scientists. Moreover, the participants can exchange one another in many valuable issues on vegetable production, pre-processing and storage.

- Through the practical activities in the VIAEP's laboratories and one-day field trip, the participants gain more knowledge on advanced scientific technology of pre-processing and preservation of vegetables.

Recommendations:

- The vegetable-growers hope that Vietnam State as well as UNIDO will give more help to cooperatives and enterprises/entrepreneurs to develop more potential markets for consumption of safe vegetables, contributing to sustainable development of cooperative as well as businesses producing safe vegetables.

- To express a common voice in the sustainable development of safe vegetable production, all production units, entrepreneurs and management departments need to join in one goal.

Through many discussions of all participants, the following ideas I express on behalf of the ToT course:

- Hopefully, more ToT courses will be sponsored to provide necessary knowledge on safe vegetable production, contributing to ensure health for the community.

- It is better that one model of vegetable pre-processing and storage is established to apply advanced technological achievements.

- To meet the demand of specific vegetable growing of each locality guiding brochures of about 35-40 pages on technologically detailed processes for 4 main types of leafy, fruity, root and spicy vegetables should be written and published.

- ***Mr. Nguyen Huu Dao***, representative of An Viet High Technology Agricultural Products Joint Stock Company

Comments:

- First of all, on behalf of my company, I would like to express many thanks to UNIDO for financial aid to set up this useful course and to Vietnam Institute of Agricultural Engineering and Post-harvest Technology for professionally organizing

the course with excellent training materials, useful leaflet forms, and experienced, enthusiastic lecturers and instructors. The ToT course is a good chance for exchanges of priceless experiences among the vegetable growers, procurement units, entrepreneurs and those who are engaged in the value chain of vegetables.

- Through the training course the participants get more understanding of post-harvest technology and immeasurable risks that unsafe vegetables will threaten human lives.

Recommendation:

- As for me, the training is too short for many aspects to be discussed. In the forthcoming time, I hope that UNIDO and VIAEP will co-ordinate each other to sponsor other ToT courses with longer time.

- I hope in the future one model of pre-processing and storage of vegetables is formed so that vegetable growers and entrepreneurs around Hanoi can visit and learn the advanced technology.

- ***Ms. Le Thi Kim Oanh***, representative of Station of Plant Protection under Department of Agriculture and Rural Development of Hanoi

Comments:

- Being a unit under Hanoi Department of Agriculture and Rural Development, the Station of Plant Protection is assigned by the Department for the management and supervision of safe vegetable production across Hanoi. We are honoured to be invited to participate in the ToT course as a role of managers.

- Thanks to the grant of UNIDO and professional organization of VIAEP, the ToT course gave us valuable experiences of practical production, useful and thoroughly prepared training materials on post-harvest technology, and excellent experiments in VIAEP laboratories. After this course we will re-assess the way of current management of the Department for better management in coming time.

- The Department will promote cooperatives, entrepreneurs/enterprises to apply research achievements of VIAEP to enhance the value of vegetables.

Recommendations:

- The way of conveyance of the lecturers is good to participants of ToT course, but if for farmers the conveyance should be more easily understandable.

- Further more ToT courses are expected to be held.

- ***Mr. Tran Huu Duc***, representative of Farmers' Union of Hanoi.

Comments:

- I am honoured to go in for this useful ToT course. I would like to thank UNIDO for financial aid and VIAEP for professional organization of the course.

- Training materials and leaflet forms were thoroughly prepared and useful for farmers, managers, practical supervisors and entrepreneurs. Training schedule and teaching way are appropriate to almost all of levels.

Recommendations :

- If possible, more training courses like this need replicating in coming time to wake up to awareness of people about risks of unsafe vegetables, aiming at contributing to ensure community health and getting rid of agricultural environmental pollution.

- Through training courses, VIAEP could give consultancy to production units, entrepreneurs/companies, groups of households, etc. to form models of safe vegetables.

- The Farmers' Union of Hanoi needs VIAEP support on forming an online safe vegetable exchange floor.

- ***Ms. Ngo Kieu Oanh***, representative of Vietnam ATC Co., Ltd.

Comments:

- I totally agree on previous comments of the participants on the financial aid of UNIDO and professionally prepared materials and organization of VIAEP.

Recommendations:

- In the forthcoming time, if possible, an internet commercial portal needs forming to link supply and demand of safe vegetables with the support of UNIDO and the Government of Vietnam.

- ***Ms. Dang Thi Thuy***, representative of Tho An Company

Comments:

I would like to thank to UNIDO and VIAEP for giving managers, entrepreneurs, companies to expand their vision on the importance of the value chain of safe vegetables.

- ***Mr. Le Van An,*** representative of Cu Khoi Cooperative

Comments:

- On behalf of the cooperative I would like to thank to UNIDO and VIAEP for everything.

- After this ToT course, we will guide and disseminate advanced post-harvest technology and practical experiences to farmers.

- ***Mr. Trinh Van Vinh***, representative of Hoa Binh Cooperative

Comments:

- It gives me a great pleasure to participate in this interesting training course and on behalf of Hoa Binh Cooperative I would like to thank to UNIDO and VIAEP for their great cooperation to set up this course.

- After the ToT course, I will bring the knowledge gained from experienced lecturers and skilled instructors of VIAEP to apply into our cooperative production, primary processing and storage, aiming at ensuring more safe vegetables for consumers.

Recommendations:

For the time being, in Hoa Binh Cooperative the pre-processing system is outdated, storage system is not completely available; therefore, vegetable products are always in high risks of poor quality and contamination of harmful bacteria and poisons. We hope international organizations like UNIDO and research institutes like VIAEP share supports to the cooperative in terms of advanced technology and necessary materials for safe vegetable production, pre-processing and storage.

Appendix 6

LIST OF PARTICIPANTS OF TRAINING COURSES FOR ToE, FARMERS AND RETAILERS ON POST-HARVEST TECHNOLOGY IN THE VALUE CHAIN OF VEGETABLES

Course 1. Oct. 22nd-23rd, Hoa Binh Cooperative, Yen Nghia precinct, Ha Dong dist.

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian: 22-23/10/2014

Địa điểm: HTX Hoà Bình - Phường Yên Nghĩa, Q. Hà Đông, TP Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Nguyễn Cảnh Doãn	Tổ 16 yên nghĩa	Doãn	Doãn
2	Mỹ Thị Tình	tổ 15 yên nghĩa	tình	tình
3	nguyễn thị Bình	Tổ 15 yên nghĩa	Bình	Bình
4	ng Thị Mây	Tổ 15 yên nghĩa	Mây	Mây
5	ng Hữu Thường	Tổ 16 yên nghĩa	Thường	Thường
6	Lê Thị Anh	T14 yên nghĩa	Anh	Anh
7	Đặng Thị Thường	T 14 yên nghĩa	Thường	Thường
8	Nguyễn Trung Thời	T 16. yên nghĩa	Thời	Thời
9	Nguyễn Văn Thời	T 16 yên nghĩa	Thời	Thời
10	Nguyễn Đăng Lái	16 yên nghĩa	Lái	Lái
11	Nguyễn Thị Tâm	T 15 yên nghĩa	Tâm	Tâm
12	Ngagên Thị Duyên	T 15 yên nghĩa	Duyên	Duyên
13	Hà Thị Thắm	T 14 yên nghĩa	Thắm	Thắm
14	Trần Văn Thường	T 14 yên nghĩa	Thường	Thường
15	Nguyễn Hữu Vân	T 15 yên nghĩa	Vân	Vân
16	Nguyễn Thị Nga	T5 yên nghĩa	Nga	Nga
17	Nguyễn Đình Hồng	T14 yên nghĩa	Hồng	Hồng
18	Trần Thị Thuyên	Tổ 15 yên nghĩa	Thuyên	Thuyên
19	Nguyễn Văn Thắng	Tổ 16 yên nghĩa	Thắng	Thắng
20	Nguyễn Thị Hạnh	Tổ 15 yên nghĩa	Hạnh	Hạnh
21	Nguyễn Thị Huấn	Tổ 14 Yên Nghĩa	Huấn	Huấn
22	Nguyễn Văn Biểu	Tổ 14	Biểu	Biểu
23	Vũ Phúc Thuật	Tổ 15 - yên nghĩa	Thuật	Thuật
24	Nguyễn Đình Khánh	Tổ 14 - yên nghĩa	Khánh	Khánh
25	Nguyễn Thị Nga	Tổ 16 - yên nghĩa	nga	nga
26	Nguyễn Văn Hường	Tổ 16 - yên nghĩa	Hường	Hường
27	Lê Đức Sơn	Tổ 15 - yên nghĩa	Sơn	Sơn
28	Trần Văn Vinh	Tổ 14 - yên nghĩa	Vinh	Vinh
29	Nguyễn Tuấn Khanh	Tổ 15 - yên nghĩa	Khanh	Khanh
30	Nguyễn Văn Cảnh	Tổ 16 - yên nghĩa	Cảnh	Cảnh

Course 2. Oct. 24th-25th, Trang Viet Cooperative, Trang Viet commune, Me Linh dist.

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian: 24-25/10/2014

Địa điểm: HTX Trang Việt - Trang Việt - Mê Linh - Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Ngô Văn Bách	xóm 5	Bách	Bách
2	Nguyễn Thị Trà	Xóm 6	Trà	Nguyễn Thị Trà
3	Đinh Công Thành	x 5	Thành	Thành
4	Lê Thế Toán	x 5	Toán	Lê Thế Toán
5	Ngô Văn Quyền	x 8	Quyền	Quyền
6	Ngô Văn Thế	x 7	Thế	Thế
7	Nguyễn Văn Toàn	x 5	Toàn	Toàn
8	Lê Văn Lâm	x 5	Lâm	Toàn
9	Nguyễn Văn Da	x 8	Da	Da
10	Nguyễn Văn Ban	x 7	Ban	Ban
11	Ngô Văn Thắng	Xóm 5.	Thắng	Thắng
12	Trần Quang Tú	xóm 8.	Tuấn	Tuấn
13	Ngô Xuân Tình	xóm 5	Tình	Tình
14	Trần Thị Tiếp	xóm 6	Tiếp	Tiếp
15	Trần Thị Thản	x-óm 6	Thản	Thản
16	Quách Thị Nhu	x 8	Nhu	Nhu
17	Đinh Thị Hồng	x 6	Hồng	Hồng
18	Nguyễn Thị Hằng	x 6	Hằng	Hằng
19	Ngô Thị Hồng	xóm 7	Hồng	Hồng
20	Nguyễn Thị Vân	xóm 7	Vân	Vân
21	Nguyễn Thị Oanh	xóm 7	Oanh	Oanh
22	Lê Sỹ Cát	Xóm 5.	Cát	Cát
23	Trần Thị Hằng		Hằng	Hằng
24	Vũ Thị Vang		Vang	Vang
25	Mai Văn Đam		Đam	Đam
26	Ngô Văn Toán		Toán	Toán
27	Trần Thị Vinh		Vinh	Vinh
28	Nguyễn Văn Minh		Minh	Minh
29	Vương Văn Thế		Thế	Thế
30	Nguyễn Hồng Tiến		Tiến	Tiến

Course 3. Oct. 27th-28th, Linh Nam Cooperative, Linh Nam precinct, Hoang Mai dist.

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

HỢP TÁC XÃ NÔNG NGHIỆP LĨNH NAM Q. HOÀNG MAI - TP. HÀ NỘI

Thời gian: Ngày 27 ÷ 28 tháng 10 năm 2014

Địa điểm: HTX Nv Linh Nam - Hoàng Mai - Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Lê Thị Ngan	HTX nông nghiệp Linh Nam	Ngan	Ngan
2	Lê Thị Mai Anh	" nt "	Maianh	Maianh
3	Nguyễn Hồng Nhung	" nt "		
4	Trịnh Tuyết Nhung	" nt "	Nhung	Nhung
5	Nguyễn Minh Kiên	" nt "		
6	Lê Thanh Quang	" nt "		
7	Lê Văn Kiên	" nt "		
8	Ta Văn Thanh	" nt "	Thanh	Thanh
9	Nguyễn Thị Hĩnh	" nt "	Hĩnh	Hĩnh
10	Lê Thị Toán	" nt "		
11	Vũ Văn Hạnh	" nt "		
12	Trương Văn Sửu	" nt "		
13	Nguyễn Thị Đảm	" nt "	Đảm	Đảm
14	Nguyễn Hồng Lý	" nt "		
15	Nguyễn Thị Tỷ	" nt "		
16	Lê Hồng Sáng	" nt "		
17	Nguyễn Thị Tuyến	" nt "		
18	Trương Quốc Huy	" nt "		
19	Lê Thị Quyên	" nt "		
20	Dương Thu Ngân	" nt "		
21	Lê Hồng Ngọc	" nt "		
22	Nguyễn Ngọc Chính	" nt "		
23	Nguyễn Thị Ngọc	" nt "		
24	Nguyễn Thị Liên	" nt "	liên	liên
25	Nguyễn Thị Công	" nt "		
26	Lê Thị Tính	" nt "		
27	Nguyễn Mạnh Tùng	" nt "		
28	Lê Hồng Minh	" nt "		
29	Nguyễn Thanh Huyền	" nt "		
30	Nguyễn Văn Chung	" nt "	Chung	Chung

Course 4. Oct. 30th-31st, Dao Duc Safe Vegetable Cooperative, Van Noi commune, Dong Anh dist.

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian: Ngày 30 - 31/10/2014

Địa điểm: HTX Đạo Đức - Vân Nội - Đông Anh - Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Trần Văn Hoài	Thôn Đông Tây	Hoài	Hoài
2	Phạm Thị Lý	"		
3	Nguyễn Ngọc Nội	"		
4	Ngô Thị Hảo	"	Hảo	Hảo
5	Lại Đức Thắng	"	Thắng	Thắng
6	Trần Thị Toan	"	Toan	Toan
7	Lê Thị Tý	"		
8	Hoàng Thị Liêu	"		
9	Trần Thị Bảo	"	Bảo	Bảo
10	Ngô Thị phối	"	phối	phối
11	Dương Thị Tân	"	Tân	Tân
12	Lại Thị Ngoan	"	Ngoan	Ngoan
13	Tô Thị Dung	"	Dung	Dung
14	Dương Thanh Huyền	"	Huyền	Huyền
15	Phạm Ngọc Thọ	"		Thọ
16	Dương Thị Hằng	"	Hằng	Hằng
17	Vũ Thị Vui	"	Vui	Vui
18	Lại Thị Hoàng	"	Hoàng	Hoàng
19	Nguyễn Kim Chi	"	Chi	Chi
20	Lại Văn Vượng	"	Vượng	Vượng
21	Dương Văn Chung	"	Chung	Chung
22	Dương Văn Đạo	"	Đạo	Đạo
23	Lại Đức Quỳnh	"		Quỳnh
24	Trần Thị May	"		May
25	Lại Thị Nu	"		Nu
26	Trần Thị Hoài	"		Hoài
27	Trần Thị Thu	"		Thu
28	Lại Thị Quý	"		Quý
29	Ng Thị Hoa			Hoa
30	Dương Thị Hà			Hà

Course 5. Nov. 3rd-4th, Farmers' Union – Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist. (the first group)

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian... Ngày 3 ÷ 4 tháng 11 năm 2014.....

Địa điểm... HTX dịch vụ Nông nghiệp Cự Khối Long Biên - Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Phạm bá Chí	Tổ 5. P. Cự Khối.		
2	Đào đình Hiệp	Tổ 5		
3	Lê thị Huế	Tổ 5	Huế	Huế
4	Lê thị Minh	Tổ 5.		
5	Phạm bá Trí	Tổ 8		
6	Đào đình Vượng	Tổ 6.	Vượng	Vượng
7	Đào đình Thới	Tổ 5.	Thới	Thới
8	Đào đình Hưng	Tổ 5.	Hưng	
9	Đào quốc Chính	Tổ 9.		
10	Nguyễn hữu Dưỡng	Tổ 5	Dưỡng	Dưỡng
11	Phạm thị Bình	Tổ 9		
12	Trần thị Dư	Tổ 9.		
13	Nguyễn thị Hoa	Tổ 9		
14	Nguyễn thị Đoan	Tổ 9		
15	Nguyễn duy Kiên	Tổ 4.		
16	Ngô quang Hưng	Tổ 4		
17	Lê văn Phong	Tổ 4		
18	Ngô thị Lượng	Tổ 12.		
19	Hoàng hữu Quảng	Tổ 12	Quảng	
20	Đỗ thị Tính	Tổ 12	Tính	
21	Nguyễn đình Thực	Tổ 10.		
22	Nguyễn thị Hoan	Tổ 10.		
23	Chu thị Xiêm	Tổ 10. P. Cự Khối.		
24	Đào thị Dung	Tổ 10.		
25	Nguyễn thị Quý	Tổ 10		
26	Nguyễn hữu Minh	Tổ 11		
27	Đào thị Thanh	Tổ 11		
28	Ngô Kiên Lưu	Tổ 11		
29	Phùng xuân Lượng	Tổ 11		
30	Đào thị Thuyết	Tổ 11		

Course 6. Nov. 5th-6th, Farmers' Union – Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist. (the second group)

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian: 5-6 tháng 11 năm 2014

Địa điểm: HTX dịch vụ Nông nghiệp Cự Khối - Long Biên - HN

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Ngô quang Thắng	Tổ 8. P. Cự khối		
2	Nguyễn thị Duyên	Tổ 8		
3	Nguyễn thị Hạnh	Tổ 8.		
4	Phạm thị Mậu	Tổ 8.		
5	Trương thị Hường	Tổ 13.		
6	Hoàng thị Luận	Tổ 13		
7	Đào thị Luận	Tổ 13		
8	Hoàng thị Ngại	Tổ 13.		
9	Trương thị Oanh	Tổ 13		
10	Lê thị Định	Tổ 7.		
11	Phạm bá Tín	Tổ 7.		
12	Nguyễn thị Na	Tổ 7.		
13	Nguyễn thị Thu	Tổ 7		
14	Đặng thị Minh	Tổ 3.		
15	Đào thị Quý	Tổ 3		
16	Hoàng văn Thắng	Tổ 1		
17	Ngô thị Tuy	Tổ 1		
18	Nguyễn thị Luy	Tổ 1		
19	Phạm thị Hồng	Tổ 1		
20	Phan thị Kiều	Tổ 1.		
21	Phạm bá Chiến	Tổ 6		
22	Đặng quốc Bảo	Tổ 6		
23	Nguyễn thị Lan	Tổ 6 - P. Cự khối		
24	Nguyễn văn Thoả	Tổ 1.		
25	Hoàng văn Đào	Tổ 2.		
26	Đào văn Tuyến	Tổ 2		
27	Đào ngọc Bính	Tổ 2		
28	Hoàng thị Lan	Tổ 2.		
29	Đào thị Tươi	Tổ 2		
30	Ngô văn Long	Tổ 5		

Course 7. Nov. 7th-8th, Dong Xuan Cooperative for agricultural Services, Dong Xuan commune, Soc Son dist.

HỢP TÁC XÃ DỊCH VỤ NÔNG NGHIỆP ĐÔNG XUÂN

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian: Ngày 7÷8 tháng 11 năm 2014

Địa điểm: HTX dịch vụ nông nghiệp Đông Xuân - Sóc Sơn - Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Nguyễn văn Trấn	HTX DV Đông Xuân - Sóc Sơn	chấn	chấn
2	Nguyễn thị Thanh	nt	thanh	thanh
3	Nguyễn thị Mát	nt	Mát	Mát
4	Ngô thị Lộc	nt	Lộc	Lộc
5	Nguyễn thị Tuân	nt	Tuân	Tuân
6	Nguyễn thị Nhung	nt	Nhung	Nhung
7	Nguyễn thị Huế	nt	Huế	Huế
8	Tạ thị Hới	nt	Hới	Hới
9	Nguyễn thị Lương	nt	Lương	Lương
10	Nguyễn thị Loan	nt	Loan	Loan
11	Thiều thị Nhớ	nt	nhớ	nhớ
12	Nguyễn thị vân	nt	vân	vân
13	Nguyễn thị Huyền	nt	huyền	huyền
14	Bùi Thị Sơn	nt	Sơn	Sơn
15	Nguyễn thị Bảy	nt	Bảy	Bảy
16	Nguyễn thị Mùi	nt	mùi	Mùi
17	Bùi thị Thường	nt	Thường	Thường
18	Nguyễn thị Hồng	nt	Hồng	Hồng
19	Nguyễn thị Hà	nt	Hà	Hà
20	Ngô Thị Thanh	nt	Thanh	Thanh
21	Nguyễn văn Ngọt	nt	ngọt	ngọt
22	Nguyễn văn Hoạt	nt	hoạt	hoạt
23	Nguyễn văn Thiu	nt	Thiu	Thiu
24	Trần Ngọc Liên	nt	Liên	Liên
25	Ngô văn Luyến	nt		
26	Nguyễn thị Tập	nt	Tập	Tập
27	Ngô thị oanh	nt	oanh	oanh
28	Ngô thị yến	nt	yến	yến
29	Nguyễn văn Phúc	nt	phúc	phúc
30	Tạ văn Luận	nt	Luận	Luận

Course 8. Nov. 3rd-4th, Ha Hoi Cooperative, Ha Hoi commune, Thuong Tin dist.

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian..... ngày 3/11/2014 - 4/11/2014.....

Địa điểm..... Hợp tác xã nông nghiệp xã Hà Hồi.....

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Nguyễn Hữu Tiến	Hà Hồi - Thường Tín		
2	Đỗ Văn Dương	nt		
3	Từ Đức Toàn	nt		
4	Lê thị Lệ Huyền	nt		
5	Lê Đức Duy	nt		
6	Từ Duy phương	nt		
7	Lê Văn Sy	nt		
8	trịnh thị Chiến	nt		
9	Từ Văn Lộc	nt		
10	Nguyễn Văn Quang	nt		
11	Nguyễn Doãn Túc	nt		
12	Đỗ Lê Cử	nt		
13	Nguyễn Trung Thắng	nt		
14	Đặng Văn Minh	nt		
15	Từ Thị tuyết	nt		
16	Uông Huy Mạnh	nt		
17	trịnh thị Quế	nt		
18	Lê Văn Thủy	nt		
19	Nguyễn Thị Hợp	nt		
20	Từ Văn Xuân	nt		
21	Hoàng Thị Lợi	nt		
22	trịnh Văn Cách	nt		
23	Uông Văn Dũng	nt		
24	Đỗ Văn Huân	nt		
25	Ngô Quốc Cường	nt		
26	Đinh Thị trinh	nt		
27	Đỗ thị Minh	nt		
28	Lê Thị thủ	nt		
29	Đặng thị thúy	nt		
30				

Course 9. Nov. 5th-6th, An Viet High Technology Agricultural Products Joint Stock Company, Thanh Da commune, Phuc Tho dist.

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian: 5 – 6 / 11 / 2014

Địa điểm: Xã Thanh Đa, Huyện Phúc Thọ – TP Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Nguyễn Duy Tường	Thanh Đa – Phúc thọ		
2	Nguyễn Đình Thân	nt		
3	Hoàng Văn Hanh	nt		
4	Lê Thị Thành	nt		
5	Nguyễn Thị Dần	nt		
6	Nguyễn Thị Thinh	nt		
7	Nguyễn Thị Thái	nt		
8	Nguyễn Thị Hiền	nt		
9	Nguyễn Thị Minh	nt		
10	Nguyễn Thị Lộc	nt		
11	Lưu Thị Thư	nt		
12	Nguyễn Đắc Tường	nt		
13	Nguyễn Khang Phú	nt		
14	Nguyễn Văn Phùng	nt		
15	Nguyễn Văn Quang	nt		
16	Nguyễn Thế Hới	nt		
17	Nguyễn Thế giáp	nt		
18	Lê Văn Chúc	nt		
19	Nguyễn Thị Hoa	nt		
20	Hoàng Thị Sửu	nt		
21	Nguyễn Thị Yến	nt		
22	Hoàng Đình Tiến	nt		
23	Nguyễn Thế Thanh	nt		
24	Hoàng Đình Nước	nt		
25	Hoàng Thị Á Mở	nt		
26	Hoàng Văn Tùng	nt		
27	Nguyễn Thị Thuỷ	nt		
28	Nguyễn Văn Chế	nt		
29	Nguyễn Duy Phúc	nt		
30	Nguyễn Thị Lộc (Thái)	nt		

Course 10. Nov. 7th-8th, Thuong Coc Cooperative, Thuong Coc commune, Phuc Tho dist.

DANH SÁCH HỌC VIÊN THAM GIA TẬP HUẤN DỰ ÁN UNIDO 2014

Thời gian: 7 - 8/11/2014

Địa điểm: Xã Thượng Cốc - Huyện Phúc Thọ - TP Hà Nội

TT	HỌ VÀ TÊN	ĐỊA CHỈ	KÝ TÊN	
1	Nguyễn Thị Long	Thượng Cốc, Phúc Thọ, Hà Nội		
2	Đỗ Thị Hải	nt	Hải	Hải
3	Nguyễn Thị Hoà	nt	Hoà	Hoà
4	Phạm Thị Mỡ	nt	Mỡ	Mỡ
5	Dương Thị Hiền	nt	Hiền	Hiền
6	Nguyễn Thị Hoa	nt	Hoa	Hoa
7	Nguyễn Thị Hạnh	nt	Hạnh	Hạnh
8	Nguyễn thị Trâm	nt	Trâm	Trâm
9	Nguyễn Thị Bé	nt	Bé	Bé
10	nguyễn thị Được	nt	Được	Được
11	Khuất thị Hoàn	nt	Hoàn	Hoàn
12	Đỗ Thị Quyên	nt	Quyên	Quyên
13	nguyễn đăng Quyết	nt	Quyết	Quyết
14	Lê thị thà	nt	Thà	Thà
15	Nguyễn Thế Huấn	nt	Huấn	Huấn
16	đỗ Kim Oy	nt	Oy	Oy
17	Nguyễn văn Hảo	nt	Hảo	Hảo
18	Nguyễn Thị Thảo	nt	Thảo	Thảo
19	Đỗ Thị Hường	nt	Hường	Hường
20	nguyễn Thị Nam	nt	nam	nam
21	Nguyễn Thị Tâm	nt	Tâm	Tâm
22	Nguyễn Thị Bích	nt	Bích	Bích
23	Nguyễn Văn Để	nt	Để	Để.
24	Bùi Công Hiệp	nt	Hiệp	Hiệp
25	Lê Nhân Tiến	nt	Tiến	Tiến
26	Nguyễn Thế Huấn	nt	Huấn	Huấn
27	Nguyễn Ngọc Thắng	nt	Thắng	Thắng
28	Nguyễn Sao Mai	nt	Sao Mai	Sao Mai
29	Trần Nguyễn Hải Đạo	nt	Đạo	Đạo
30	Nguyễn Thanh Quang	nt	Quang	Quang

Appendix 7

COMMENTS AND PETITIONS OF THE PARTICIPANTS TO THE COURSES FOR ToE, FARMERS AND RETAILERS

Course 1

Locality: Hoa Binh Cooperative, Yen Nghia precinct, Ha Dong dist., Hanoi.

Duration: October 22nd-23rd, 2014

Staple vegetables of the Cooperative: leafy vegetables.

Exception for this course: fruits of guava, apple and papaya

Discussion contents:

- Current situation of the Cooperative: Being a locality very near the centre of Hanoi and following VietGAP standards, Hoa Binh Cooperative has a good chance to provide safe vegetables to Hanoians. The Cooperative grows many types of leafy vegetables. Besides, it also grows guava, apple and papaya.

- Discussions, solutions and recommendations:

  ° All the contents were related to building a system for quality control of harvested fruits and vegetables, storage; establishing distribution network; strengthening linkage between vegetable-growers, managers of the Cooperative and distributors under the technological support of VIAEP.

  ° A model of safe vegetable pre-processing and storage is expected to be built at the locality to increase productivity, improve product quality and reduce post-harvest losses and bring about benefits to the farmers.

  Also, building the above-mentioned model can create more jobs for the very locals, limit social evils.

Note: The participants suggested that post-harvest technology for guava, apple and papaya should be added in the training schedule. The lecturers/instructors met the suggestion by giving half a day for discussion on the storage of the above-mentioned fruits.

Course 2

Locality: Trang Viet Agricultural Cooperative, Trang Viet Commune, Me Linh dist., Hanoi.

Duration: October 24th-25th, 2014

Staple vegetables of the Cooperative: mustard greens in all types, tomato, kohlrabi, cauliflower, water morning glory

Discussion contents:

- Current situation of the Cooperative: The Cooperative intensifies many types of vegetables, but ***doesn't belong to*** the safe vegetable production area under the

VietGAP standards of Hanoi; therefore, some given training contents are still unfamiliar to the farmers. So far vegetable-growers haven't had many chances to approach to technological achievements; hence, post-harvest losses are high and product quality is unstable. This negatively affects product price and income of the producers.

- Discussions, solutions and recommendations:

  - Participating in the training course the vegetable-growers eagerly discussed on post-harvest technological issues and got knowledge of effective production.
  - A model of safe vegetable pre-processing and storage is expected to be built at the locality with state-of-the-art technological application to reduce post-harvest losses and to improve product quality.
  - The aged are more interested in vegetable production with high yield, attractive appearance and without squeeze price.
  - Most the young are interested in issues of post-harvest technology, effective investment, and a pre-processing and storage model to apply the given training knowledge for sustainable production development in order to create more jobs for the local labourers. As a result, farmers will have a strong attachment to their native land. In addition, the social evils will decrease.
  - One petition is that vegetables with unclear origin should be strictly controlled by the authorized bodies to get rid of unfair price competition.
  - Post-harvest residues and by-products are also a big problem. Some technological achievements of VIAEP can be applied to distribute to solution of agricultural environmental pollution.

Course 3

Locality: Linh Nam Agricultural Cooperative, Linh Nam precinct, Hoang Mai dist., Hanoi

Duration: October 27-28th, 2014

Staple vegetables of the Cooperative: Brassica integrifolia, kohlrabi, tomato, water morning glory, spicy vegetables

Discussion contents:

- Current situation of the Cooperative: Being a unit follwing VietGAP standards, the Cooperative produces different types of vegetables. It has a small, simple pre-processing shed with 30 workers.

- Discussions, solutions and recommendations:

- Processes of harvest and post-harvest: The Cooperative belongs to the safe vegetable production zone of Hanoi; therefore, the production must meet VietGAP standards. However, some improper harvest procedures lead to high rate of losses. After participating in the training course, the vegetable-growers understood the importance of technological processes of harvest and post-harvest.
- Effects of technical operations in harvest, pre-processing and storage: following up the technical operations will limit losses in stages of harvest, pre-processing and storage, increase productivity and quality of products.
- Opinions of production and consumption: So far most vegetable-growers have had a simple view that they would produce as many vegetables as they can and sell up as fast as possible. This creates unstable market and occurs price squeeze. To get rid of these limitations, investment in material facilities and application of post-harvest technology should be properly considered. At first, the investment and technological application can meet many difficulties as high cost product and low benefit. However, in the long-term period, the vegetable-growing unit will get high benefit thanks to sustainable production, good quality product and stable market.
- Sustainability of the very locally vegetable production: Combination of VietGAP standards, post-harvest technology and proper business plan will create sustainable production, reduce losses, increase benefit and encourage farmers to have a strong attachment to their land.
- Model of storage using MAP technology: The manager and workers of the pre-processing and storage workshop have a desire to visit and learn experiences from a vegetable model workshop applying technology of MAP and 1-MCP to leafy vegetables

Course 4

Locality: Dao Duc Cooperative for Safe Vegetable Production, Van Noi commune, Dong Anh dist., Hanoi

Duration: October 30th-31st, 2014

Staple vegetables of the Cooperative: mustard greens in all types, kohlrabi, cabbage, tomato, potato, carrot, water morning glory, capsicum and hot pepper, chayote, carrot, gourd.

Discussion contents:

- Current situation of the Cooperative: Being a traditional vegetable production of Hanoi area since the 1960s, now the Cooperative lies in VietGAP Programme area and is in the vegetable-growing planned zone of the city.

- Production technique: the Cooperative combine traditional production and application of VietGAP norms to build a band name of safe vegetable "Dao Duc" to supply to some supermarkets, restaurants, collective kitchens, etc. However, the incomprehensive application of post-harvest technology leads to high losses, ununiformed quality. Due to incomprehensiveness, when applying technology for pre-processing and MAP storage, the head cost is high and consumption is limited.

- Solution: To retain the "Dao Duc" safe vegetable brand name, the Cooperative pays more attention to post-harvest technology application, product quality and sale services, etc. Periodical training courses on post-harvest technology are expected to be held to provide novel achievements to the people engaged in the vegetable value chain.

Course 5

Locality: Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist., Hanoi

Duration: November 3rd-4th, 2014

Staple vegetables of the Cooperative: katuk *or* sweet leaf, pot-herb, basella alba, brassica integrifolia

Discussion contents:

- Current situation of the Cooperative: the Cooperative is in the vegetable-growing planned zone of the city and implements VietGAP Programme. Most leafy vegetables grow in alluvium soil built up by the Red River. The above-mentioned products are mainly wholesaled to vegetable-mongers. Due to lack of knowledge on post-harvest technology, many disadvantages arise as:

    - Katuk (sweet leaf) is pre-processed and storage at a normal temperature (hot in the summer, warm in the spring and the autumn), leading to quick spoilage, high loss. It is harvested and often sold within the same day with unstable price.
    - Pot-herb and basella alba are cleaned by water and naturally strained off, so they are too soft or rotten by the water.
    - Brassica integrifolia is often withered by sunshine and wind.

- Solutions and recommendations:

    - Sub-harvest technology can intervene to help vegetables have tough stems, get rid of dirt to avoid to much water washing, assure enough moisture content for leaves and harvest in late in the afternoon or early in the morning.

- Using MAP or combination of MAP and cooling agent for pre-processing and storage is appropriate to the local products. However, using MAP packing and cooling storage will raise high head cost.
- The local vegetable-growers desire to get a support of a pre-processing and storage model to build the very local brand name of the vegetables, create more jobs for the locals, contributing to a decrease of social evils.

Course 6 (the second course of the same locality)

Locality: Cu Khoi Cooperative for Agricultural Services, Cu Khoi precinct, Long Bien dist., Hanoi

Duration: November 5th – 6th, 2014

Staple vegetables of the Cooperative: katuk or sweet leaf, pot-herb, basella alba, brassica integrifolia and "Gang Dong Du" guava.

Discussion contents:

- Current situations of the Cooperative: It is described in course 5, but at this course apart from katuk or sweet leaf, pot-herb, basella alba, Brassica integrifolia the participants are representatives of households growing "Gang Dong Du" guava, a speciality originated from Thai Binh province.

- Solutions and recommendations:

- All issues are the same as course 5.
- The "Gang Dong Du" guava bring about big benefit for the growers, but a big problem that arises is difficulties in storage and transport to the consumption places because of fast change of quality and high post-harvest losses; therefore, using CA technology for storage is expected to be applied.
- Consultancy and support to form an effective pre-processing and storage model is expected to raise quality and benefits of "Gang Dong Du" guava.

Course 7

Locality: Dong Xuan Cooperative for Agricultural Services, Dong Xuan commune, Soc Son dist., Hanoi

Duration: November 7th – 8th, 2014

Staple vegetables of the Cooperative:

- Dong Xuan Cooperative: Brassica integrifolia, cabbage, kohlrabi and pear-shaped (pyrifrom) melon, winter gourd, luffa
- Mushroom-growing Cooperative: straw mushroom

Discussion contents:

- Current situations of the Cooperatives:
    - Although the Cooperative hasn't participated in VietGAP Programme, yet it has been one the most dynamic vegetable-growing units in Hanoi area.
    - Thanks to the help of VIAEP, a pre-processing and storage workshop was built with pre-processing tables, a 42-cubic-metre temporarily cooling store and a 15-cubic-metre pre-cooling store. However, the workshop is still in need of more facilities.
    - Brassica integrifolia is produced according to VietGAP standards and sold right at the locality by contracts.
    - Pear-shaped melon is produced according to the experiences from other localities. It is rather difficult to be stored and transport.
    - Substrate for mushroom growing are straw and stubble. After harvesting mushroom, the substrate can be used as compost to improve humus for the soil.
- Solutions and recommendations:
    - The brassica integrifolia needs expanding growing area, but post-harvest losses of both quantity and quality are high because of far distance of transport. After the training course, application of MAP technology and combination of MAP and cooling agent in pre-processing and storage will be tested to find distributors and assess its effects, then, in case it shows good effect, the application will be expanded.
    - With good taste and flavour, the pear-shaped melon is easily consumed. Until now the Cooperative has fumbled about the way to increase yield and quality, to extend shelf-life and to reduce post-harvest losses. Thanks to the video clips and pictures shown during the training course, and discussions with the VIAEP experts, the members of the Cooperative hope the existing problems will be solved when the technological achievements are comprehensively applied through the chain of sub-harvest, harvest, pre-processing, storage, transport and distribution.
    - The mushroom-growers hope to get more assistance of VIAEP experts and UNIDO financial aid to improve production in both quantity and quality. Moreover, the cooperation between the two cooperatives will bring about great benefits for the farmers.
    - The growers hope to get technical supports on treatment of residues of vegetable, pear-shaped melon and mushroom to change them into humus for soil and prevent from environmental pollution and the germ of diseases.

Course 8

Locality: Ha Hoi Agricultural Cooperative, Ha Hoi commune, Thuong Tin dist., Hanoi

Duration: November 3rd – 4th, 2014

Staple vegetables of the Cooperative: cabbage, tomato and potato

Discussion contents:

- Current situations of the Cooperative: Being a traditional vegetable production of Hanoi area since tens of decades, so far the Cooperative has built and developed the brand name of Thuong Tin potato. It is expected to be a member of VietGAP Programme.

- Discussions, solutions and recommendations:

  ° The discussions about problems of leafy vegetables (cabbage and tomato) are similar to the above-mentioned courses.

  ° A big problem of potato is easily rotten when it suffers from mechanical damage and during storage time.

  ° To solve the problems mentioned above, technological achievements should be properly applied from the sub-harvesting to the time of distribution to the customers. Propaganda of the potato brand name and distribution system should be paid more attention.

Course 9

Locality: Thanh Da Agricultural Cooperative, Thanh Da commune, Phuc Tho dist., Hanoi

Duration: November 5th – 6th, 2014

Staple vegetables of the Cooperative: cabbage, kohlrabi, cauliflower and tomato

Discussion contents:

- Current situations of the Cooperatives: Being one of the members of VietGAP Programme, the Cooperative produces different types of vegetables, mostly cabbage, kohlrabi, cauliflower and tomato.

- Discussions, solutions and recommendations:

  ° The discussions about problems of leafy vegetables (cabbage and tomato) are similar to the above-mentioned courses.

  ° Residues from cabbage are very large, causing environmental pollution. Moreover, the residues can also be useful if an appropriate technology is applied to change them into animal feed or others.

- One eager suggestion of the locals is to get a pre-processing and storage model to obtain more benefits from vegetable production, simultaneously create more jobs for the locals, contributing to a decrease of social evils.

Course 10

Locality: An Viet High Technology Agricultural Products Joint Stock Company, Thuong Coc commune, Phuc Tho dist., Hanoi

Duration: November 7th – 8th, 2014

Staple vegetables of the Cooperative: cabbage, kohlrabi, cauliflower and tomato

Discussion contents:

- Current situations of the Cooperatives: Located next to Thanh Da Agricultural Cooperative and a member of VietGAP Programme, the commune produces almost the same vegetable types. However, the commune has an advantage thanks to presence of An Viet High Technology Agricultural Products Joint Stock Company in its area. The number of workers of the Company is 30.

- Discussions, solutions and recommendations:

- The discussions about problems of leafy vegetables are similar to course 9.
- The training course took place at the premises of An Viet Co., Ltd.; therefore, the contents of Good Practice in harvest, pre-processing and packaging at the workshop were paid more attention. Issues of hygiene, and labour and food safety were instructed in details.
- As the plan of the initial forming of the project, a model of pre-processing, packaging and storage would be built here, the manager and workers of the Company desire to get it as soon as possible.
- Since the Company went into operation, the vegetable-growers have got more benefits and social evils in the area have greatly been limited.

6. SOME IMAGES OF THE TRAINING PROGRAMME