

**CLOSER LINKS BETWEEN RESEARCH, PRODUCTION AND MARKET TO  
ASSURANCE OF SAFETY AND HIGH QUALITY VEGETABLES  
FOR CONSUMERS**

**Research Project Title:**

Reducing pesticide residues, improving yield, quality and marketing of vegetables crops in Northern Central Vietnam through improved varieties, GAP principles and farmer focused training (021/06VIE).

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Vietnamese Academy of Agricultural Science

**I. INTRODUCTION AND RESEARCH OBJECTIVES**

The total area in Vietnam used for vegetable production is currently 643,970 ha of (Statistical Head Department, 2006) and is a 5% increase over the area of land used for vegetable production in 2001. Of this total vegetable production area, only 22,000 ha or 5% are grown using safe vegetable production practices. Full GAP accredited vegetable production is still insignificant area, only account for 2% of the total area (ASEAN-GAP training workshop, April 2008. MARD).

Vegetable growing in Vietnam is an important source of income for the country and accounts for 9% of the total cropping income including rice. The major vegetables produced in Vietnam are KangKong, brassica's (cabbage, pak choi & kohlrabi) and various cucurbits including melons and cucumbers (Anh, Ali et al. 2004).

There is potential to increase these returns to growers by maximizing yield and quality of the produce they grow. However, there are several aspects of the vegetable industry in Vietnam currently limit expansion and development of the industry and financial returns to farmers. These limitations include:

- High pesticide and nitrosamine residues in produce
- Poor post harvest temperature management and handling technology which reduces the quality of produce which reaches consumers
- Agronomic practices used by growers can limit potential yields and hence farmer income
- Traditional marketing practices can limit farmer returns

**Pesticide Residues**

A recent study has shown that up to 22% of the vegetables consumed in Vietnam may be unsafe to eat because of pesticide residues, heavy metal contamination and high nitrosamine levels (Health and Life, No. 204, Nov. 2002). In Hanoi, 9% of vegetable samples exceed pesticide residue limits and 7% have residues of banned pesticides (Moustier, Bridger et al.

2002; Anh, Ali et al. 2004). There are over 30% vegetable samples in Nghe An province in the 2007 year which have residues pesticides with 15% over permitted levels (P.H. Cuong. 2008).

In addition to pesticide residues, nitrate levels in vegetable products are commonly several times higher than permitted levels (Thach 1999), and are caused by the use of excessive nitrogenous fertilizer (Thi 1999; Thi 2000; Ha and Ali 2005).

Despite the heavy pesticide use, significant proportions of crop yields are lost to pests and diseases e.g. 25% of leafy vegetables, 23% of cucurbits and 32% of brassicas (Anh, Ali et al. 2004). One factor which further complicates the pesticide residue issue, is that constant high humidity (>75%) in many growing areas encourages foliage diseases and fungicide spraying to control these diseases (Anh, Ali et al. 2004).

The widespread use of broad-spectrum insecticides also kills beneficial predatory insects and this further encourages the use of pesticides to control insects which were previously controlled by the beneficial. Better practices involving IPM principles and the use of disease resistant varieties in a GAP framework will reduce the problems associated with indiscriminate pesticide and hopefully increase consumer confidence in vegetable produced in Vietnam.

The project team aims to use a collaborative approach involving participatory learning that will involve new vegetable varieties with reliable disease resistance combined with monitoring of pest and disease levels that will reduce the need to spray pesticides. Good Agricultural Practice (GAP) principles and a manual will be then be used in training programmes to assist with the adoption of these improved methods of pest and disease control (Ledger, Premier et al. 2006). The result will be improved production systems and quality for buyers and consumers.

### **Post Harvest Handling**

There can be a significant loss of quality of vegetable products in the supply chain, especially in retail. There are significant opportunities to improve the quality of produce reaching consumers and for reducing losses in the supply chain by improving product handling and temperature management. For example, vegetables are mainly handled in cane baskets and not cartons or any form of purpose built container designed to support the weight of stacked produce. There is little use of well-established postharvest technologies such as forced-air cooling, refrigerated transport, cool rooms on farms or at market facilities. There is little attempt to control ethylene emissions around harvested products, which are well known to reduce the quality and storage life of fruits and vegetables.

The current handling and marketing system works well if fruit and vegetables are consumed within about 24h of harvest, but it severely limits any development of export markets and retail marketing through stores or supermarkets where a longer shelf life is required and consumers expect to purchase high quality products. The postharvest technology required to improve produce is available. The key requirements for improvements in this area are:

- Incentives for farmers and marketers to improve post harvest handling
- Some new infrastructure, e.g. access to cool rooms and better containers for produce
- Training on current post harvest handling techniques

## **Good Agricultural Practice (GAP)**

GAP projects in South East Asia have generally resulted in major improvements in yield, quality of produce reaching the consumer and in food safety. Food safety improvements have been achieved through a reduction in microbial contamination of food as well as through measurement of pesticide residues in fruit and vegetable crops (Kawakami, Khai et al. 1999; Dobermann, Witt et al. 2002). (Ledger, Premier et al. 2006) have just produced a GAP manual for fresh produce in the ASEAN region which will be a useful template for the development of a GAP manual for Brassica's and Cucurbit crops in Vietnam.

The project takes expertise in plant protection, crop nutrition and irrigation management developed in Vietnam e.g. at RIFAV and local MARD agents and then build on the findings Australian agronomic projects on the same crop groups.

## **Marketing**

Marketing is emerging as a key driver of profitability for small holder vegetable farmers in Vietnam. Low market prices was identified as a serious socio-economic constraint to vegetable production by 61.5% of rural producers in the peri-urban region around Hanoi (Anh, Ali et al. 2004). At the same time, there is a trend away from the traditional marketing system of crops being purchased by collectors and sold in traditional wet markets to high quality produce being sold through supermarkets (Quang & Argenti, 1999). A range of supermarkets now sell produce including Metro Cash and Carry, Citimart, CoopMart, Fiuimart, Hanoi Minimart, Western Canned Food and Star Bowl. The future will be for these supermarkets to introduce quality standards and then buy high quality, clean produce direct from farmers who meet the Quality Assurance (QA requirements).

This project will assist growers in adapting to this system through the involvement of a major emerging supermarket chain in Vietnam, Metro Cash and Carry. The development of this linkage will be facilitated by Mr John Baker from Produce Marketing Australia (PMA).

## **Key project's objectives:**

- Contribute to reduced pesticide residues in cucurbits and Brassica crops in the Central Coast regions
- Provide an opportunity to increase farmer income through higher yields and better quality of marketed vegetables
- Create increased market opportunities for small farmer householders by improving vegetable quality and presentation.

## **II. MATERIALS AND METHODS**

The project is focused on outdoor farmers adopting methods to produce clean high quality vegetables by:

**1. New varieties:** Introducing and evaluating new varieties with good pest and disease resistance, and agronomic characteristics in field trials at Quynh Luong Commune, Quynh Luu, Nghe An province and at ASINCV at Vinh city, Nghe An province. These trials will be used to select the best performing new varieties introduced from seed companies know to the Australian team. These trials will select good varieties from collections of seed companies in Asia and Vietnam.

According to baseline survey result, there is diversity of varieties of Brassica and Cucurbits genus has been planting at visited local. Therefore in order to adopt with project's targets we selected 2 crops are cabbage and watermelon. Some varieties with good resistant to pest and diseases traits were selected from seed companies such as EastWest (Vietnam), Seminis Seeds Ltd, Syngenta, and AVRDC. Trials and demonstration including:

- **Cabbage varieties:** Green Helmet (Black rot tolerance); and 8 others new varieties.
- **Watermelon varieties:** CS202, CN46, others new promising varieties.

**2. Experimental designs are standard methods:** Replicated field trials were set up at the Agricultural Science Institute of Northern Central Vietnam to evaluate varieties, planting densities, planting time (season) and nutrition.

Semi-commercial plantings of cabbage (winter) and watermelons (summer) were established at Quynh Luong commune and Hung Dong collective. Trials shipments of produce grown using GAP standards have been marketed through Metro Cash and Carry all over Vietnam.

Baseline data has been collected on current farmer practices and crop samples have been collected and pesticide residue levels quantified to provide baseline data for the project.

**3. Participatory Agronomic Training:** There have been regular training sessions conducted at both farm communities and for professional staff at ASINCV. The field trials provide training on experimental design and management as well as providing resources for growers for the field days. The production of the GAP manual provides information that is used in Farmer Field Schools. The documents will provide training for research institutes but will also provide relevant information for growers and retailers that will be included in the GAP manual.

**4. Post harvest Research and Training:** Post harvest research into the temperature profile of products through the supply chain will highlight areas for improvement in packaging and package orientation within the truck to reduce temperature build up during transport. This research is the first step in mapping the supply chain to determine areas for improvement. Vietnamese researchers have already visited Australia and been trained in the Fresh Care Quality Assurance system (NSW Dept Primary Industry) and a similar QA system will be initiated for participating farmers in this project.

**5. Developing supply chain links** between Metro Cash and Carry, ASINCV, RIVAF and province level MARD extension centre and district level extension station staff, growers and retailers to ensure an effective supply chain. Mr John Baker is facilitating this part of the project. Produce Marketing Australia's main role will be to co-ordinate and help set up the marketing linkages between Metro Cash and Carry, vegetable collectors and farmers. This link will be crucial because the higher standards required by Metro and the associated higher returns to growers will be the incentive for farmers to adopt the new techniques. These supply chain linkages will be appropriately mapped.

### III. RESULTS AND DISCUSSION

#### 1. Research on variety selection for project sites

##### 1.1. Cabbage production and trials

In company with the commercial plantings there were also trials planted at ASINCV (Vinh City) these aim to develop an integrated cultural practices. These trials include:

**Cabbage variety trials:** New cabbage varieties with improved disease resistance and agronomic type are being evaluated at ASINCV, Quynh Luong Commune and the Hung Dong Co-operative. There are 9 varieties in the experiment in winter crop condition of 2007 year. Results are presented in Table 1. The variety SVR11750311 showed the highest yield at 40.1 t/ha, fast growing and good appearance. In the pilot studies, the variety Green Helmet was shown to be adaptable to local climate condition and met Metro supermarket's specifications. It also had are good resistant to some pests and diseases, tolerance to black rot disease especially and attractive medium size heads weighing 1.2 – 1.4 kg.

**Table 1. Yield and head characteristics of cabbage trial at ASINCV 2007.**

Variety name	Leaf number		Average head weight (kg)		Head size (cm)		Yield (t/ ha)
	Outer	Inner	Total	Trimmed	Height	Diameter	Actual Yield
BC76	10.3	40.8	1.90	1.30	15.2	17.7	34.4
SG129	15.4	37.7	1.20	0.76	11.5	14.4	19.2
SG130	19.5	36.2	1.56	0.94	13.5	16.2	24.6
Kilaherb (control)	16.4	41.0	1.87	1.00	13.0	13.7	26.8
Gloria	16.2	41.7	2.00	1.27	14.9	15.8	33.6
KKcross (control)	13.8	31.3	1.91	1.30	11.6	18.6	37.7
SVR11750311	16.4	42.7	2.00	1.50	12.9	20.2	40.1
PS11190	16.0	41.5	1.75	1.20	12.5	14.5	32.4
Green Helmet (Sakata)	16.4	41.0	1.57	1.00	13.9	16.7	26.8
LSD 0.05							2.84

**Agronomic Trials at ASINCV:** Planting time, density and nutrition trials have been set up using plants from the second seeding of Green Helmet. The results shown that best suitable planting time is from 30 Oct. to 10 Nov. 2007 with highest yield. Cabbage nutrition and planting density trials have also been conducted at ASINCV and the results show that the best planting in the Central coastal region, beds should be 1.2 m wide, on 2 rows per bed (50cm apart) and 40 cm between seedlings produced the highest yield of 1.2 kg cabbage heads.

Optimum fertilizer rate was 150 kg/ha N, 100 kg/ha P<sub>2</sub>O<sub>5</sub> and 50kg/ha of K<sub>2</sub>O. IPM resulted in adequate control of insects.

**GAP production pilots:** At the same time of trials at ASINCV, production demonstrations were carried out on semi-commercial pilot plantings at Quynh Luong and Hung Dong. The farmers developed a planting schedule with Metro Cash and Carry and agreed to plant 4 times from 25 Sep. till to 18 Dec, 2007. The Green Helmet variety was selected for production because it has good disease resistance meets Metro's specifications and has a good appearance. Between the two sites, 57,000 seedlings were planted which resulted in 50 tonne of cabbage heads being delivered to Metro via the platform in Hanoi, and then to all other stores in Vietnam. The plants and harvested heads were in excellent condition as the farmers were using Integrated Pest Management (IPM) for pest and disease control.

Dr. Gordon Rogers visited Vinh City 22<sup>nd</sup>– 26<sup>th</sup> October to assist with the transplanting of the seedlings into cooperative sites, participate in farmer field schools and to plan the agronomic trials at ASINCV.

### ***1.2. Research on watermelon crop***

**Variety selection trials:** 13 new promising varieties of watermelon crop were trialed to compare agronomic traits. The replicated experiments were set up on two sites, Quynh Luong and Hung Dong (Vinh city). Farmers and scientists assessed varieties independently. Farmers preferred high yield, good resistance to pests and diseases, but did not really consider the supermarket specifications and customer preferences. Eg. some farmers selected VN27 and VN38 with large fruit size and high yield. Few farmers selected CS202 and CN46, because their yields were lower than VN27 and VN38, however CS202 and CN46 fruit were of good quality with high Brix (10.5 – 11.6) and fruit characteristics which more closely matched the customers' preference (See Table 2). After discussion the farmers decided to use CS202 and CN46 varieties for the planned expansion next season.

**Table 2. Yield and constituents of watermelon yield in the trial at a planting density of 7400 plants per hectare**

No	Trait name Variety /Site name	Average fruit weight (kg)	Yield (t/ha)
<b><i>I.</i></b>	<b><i>Hung Dong</i></b>		
1	CN-46	2.6	21.5
2	SWEET 16	4.2	35.6
3	WD2503	3.7	9.2
4	SWEETS ENORITA	2.9	31.3
5	CS - 202	2.4	27.1
	<b><i>LSD (0.05)</i></b>		<b><i>2.77</i></b>
<b><i>II.</i></b>	<b><i>Quynh Luong</i></b>		
6	VN26	3.47	66.0
7	VN30	3.12	67.3
8	VN27	4.09	90.1
9	VN40	3.22	74.0
10	VN31	2.85	58.5

11	VN35	4.34	73.9
12	VN38	4.77	95.5
13	VN9	4.68	82.1
	<b>LSD (0.05)</b>		<b>4.42</b>

**Agronomy trials:** Planting time, planting density and nutrition trials have been set up at ASINCV experimental field using SC202 and CN46 varieties. The data is currently being analyzed.

**GAP production pilots:** Two semi-commercial pilot watermelon trials set up in 2007 at Quynh Luong and Hung Dong. Two watermelon varieties were planted which were suited to the climate in the central coastal region of Vietnam, and which met specifications from Metro supermarket of - 2.5 kg weight, good internal color and soluble solids level (Brix). The varieties chosen were CS202 and CN46 varieties. Trials following replicated trials were also conducted in watermelons. Total shipments to Hanoi was estimated up to 100 tons, delivery timeframe is from early June to Aug. with 7-10 ton per week, therefore first planting is 20 March, and last planting is 10 June of 2008.

## 2. Development of Good Agricultural Practice manual.

The project will use a participatory approach to encourage the uptake of good agricultural practices (GAP) by the collaborating Vietnamese Institutes and the stakeholders (farmers, extension staff and commercial partners). The manual will be developed collaboratively between Vietnamese and Australian teams for two major annual crop groups: cucurbits and brassicas and will be a practical guide and will include information on varietal selection and evaluation; water management; crop nutrition; crop scheduling; effective pest and disease management including insect scouting; and, correct postharvest handling (i.e. harvest maturity, temperature management, grading, transport and packaging).

Training courses were held on farm based around trials and production pilot trials. Training courses include FFS and TOT. Documents and materials were developed based on practices activities that will be used for GAP manual development.

The project team was developed record forms for Quality Assurance and farmers encouraged keeping their own records. The farmers have also begun to keep detailed records of their agronomic practices for traceability, which is an important first step for introducing a QA system in the future. (See also Appendix 2)

## 3. Uniting smallholder farmers into a group for safe vegetables production

First step of the project was a baseline survey to understand socioeconomic conditions at 3 sites with 90 farmer householders in Nghe An province. The survey was also used for site selection based on major criteria to choose 2 sites for implementing next activities. The first baseline survey was carried out at:

- Hung Dong commune, Vinh city
- Quynh Luong commune, Quynh Luu district
- Hung Loi commune, Hung Nguyen district

Site selection criteria included:

- Soil and climate conditions
- Traditional vegetables cultivation practiced
- Diversity of brassica and cucurbit crops produced and a need to improve the quality of vegetables and marketing.

Therefore there are 2 sites were selected for project implementation are:

1. Quynh Luong commune located near the coast, 80 km from north to Vinh city where 140 ha of vegetables are grown by 1000 farmer householders with plentiful fresh water from wells. Good soil and climate conditions for vegetables. Local farmers are planting vegetables such as onion, leafy cabbage, tomato, carrot, cucurbits.
2. Hung Dong commune located closed with Vinh city, with 30 ha of vegetables production including young seedling vegetables, leafy cabbage, cucurbits. Local authorities are intending to expand more vegetables areas production up to 100 ha in future.

Farmers at both 2 sites have previously grown cabbage and watermelon, but had changed to plant others short duration vegetables and high return. Produce has been sold to local markets or collectors with low return and unknown quality.

Next, commune executive committee and preference farmer group were established. They held meeting to discuss activities that were needed achieve successful production of clean, high quality target vegetables crops.

Professional input will be provided by ASINCV and MARD staff to provide some guidance on scientific aspects of compliance with safety specifications and QA. Farmer groups have been trained in the practices on their farms based required to hopefully achieve FreshCare and VietGAP accreditation.

#### **4. Linking with supermarkets for product outputs**

The link between Metro Cash and Carry supermarket was developed with support from Australian marketing experts and Vietnamese scientists, Metro buyer and farmers. The Metro fresh produce buyer from Hanoi (Mr Thai) has visited project sites at Quynh Luong commune and Vinh city and was very impressed by the operations. These meetings were very valuable in opening communication between Metro and the farmers. This project is to date, the only example of direct farmer-Metro communication in Vietnam

Farmer representatives have also visited Metro's Hanoi operations to better understand how the cabbage and watermelon needs to be prepared for market. The farmer group and Metro buyer negotiated a supply contract, according to Metro specifications. The team also developed and agreed planting schedule.

The marketing strategy developed for the cabbages involved the promotion in the Metro Cash and Carry magazine as well as in in-store posters and promotions. In addition, each cabbage had a sticker attached which indicated it was produced under the guidelines of safe vegetable production. There was also information provided to Metro staff on how to handle the product in the store, and how the crops were produced (see Appendix 1). On completion of the first season of cabbage we will prepare articles for local newspapers to promote the potential success of this type of supply chain and production system.

The successful marketing strategy and production strategy has resulted in 50 tonnes of cabbage being delivered to Metro supermarket, from January 2008 to early April 2008. This summer, 100 tons of watermelons are planned to be delivered to Metro from early June to Aug 2008.

### **5. Farmers training.**

Farmer field schools were run at both Quynh Luong Commune and Hung Dong Co-operative. These were based around growing the commercial pilot trials to supply Metro supermarket. The cabbage and watermelon variety trials were also used as a demonstration trial at each site.

Two Integrated Pest Management (IPM) and postharvest workshops were held on the December 5<sup>th</sup> and 6<sup>th</sup>, 2007. Thirty one people attended the Quynh Luong workshop, and 23 people attended Vinh City workshop.

Farmers used Integrated Pest Management (IPM) and GAP principles, and as a result the crops were in excellent condition. The farmers kept written records in booklets specially prepared. This was seen as the first step to developing an on farm QA system.

Vietnamese (5) and Australian (1) collaborators attended GAP training workshop in Hanoi 3 - 5<sup>th</sup> December, 2007 for tomato and cucumber production. Many principles discussed at this meeting were also relevant to cabbage and watermelon and will be included in the GAP manuals produced for this project. Training course on ASEAN-GAP in 8<sup>th</sup> May, 2008, holding by MARD at ASINCV.

## **IV. CONCLUSION**

The on-farm trials at the Quynh Luong commune and Hung Dong co-operative have helped facilitate the uptake of new farming practices. This will continue with subsequent seasons and more growers are expected to participate in the commercial plantings if the initial trials prove to be profitable.

The highlight from this reporting period is the production of high quality cabbages using GAP at Quynh Luong commune and Hung Dong (Vinh city) and the enthusiasm from Metro Cash and Carry to sell these products in the Hanoi store. This is a very positive step for developing an alternative supply chain for these farmers which could be more reliable and profitable than the existing ones they use. The use of IPM and the agronomic record books has also been an important first steps for the adoption of a QA system for the growers.

At present, the Vietnamese vegetable industry often fails to meet the requirements of many QA systems such as ASEAN GAP or EURO GAP. The practices introduced for the cabbages and watermelon in Nghe An province are the first step for farmers in learning what is required to meet ASEAN GAP or VietGAP standards. These QA systems will only be adopted if there is a financial benefit for the increased effort. It is hoped that the linkage with Metro Cash and Carry will provide the financial incentive for the farmers to produce clean vegetables to meet ASEAN or VietGAP standards.

The initial successful achievements of project this CARD project (021/06VIE) should be publicized widely to vegetable producers, not only cucurbits and brassicas but also other vegetables crops in central coastal part Vietnam.

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## APPENDIX

### Appendix 1:

#### **An Integrated Production, Distribution and Marketing Plan for Melon and Cabbage in Vinh Province, Vietnam**

##### Background:

A collaborative project between researchers and farmers in Vinh Province of Vietnam and Applied Horticultural Research in Australia aims to improve the income of smallholders by encouraging adoption of clean and sustainable production practices.

Components of the project include:

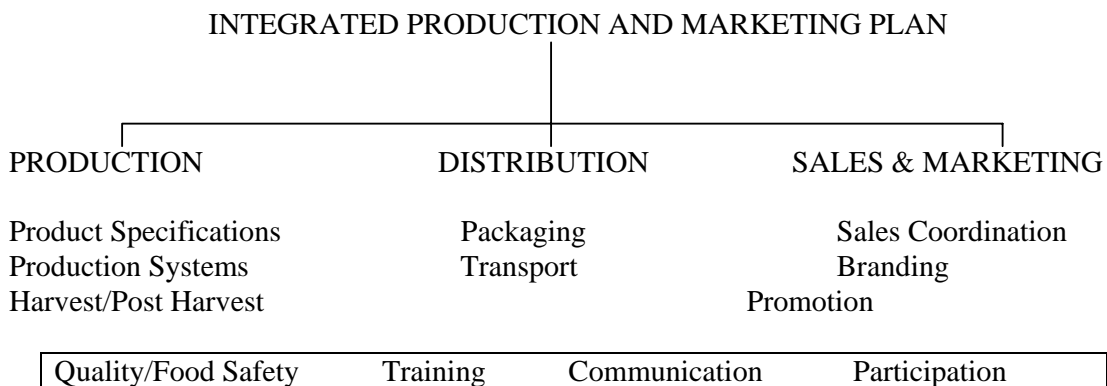
- Reducing pesticide residues and
- Improving yield, quality and marketing of Cucurbit and Brassica vegetable crops in Northern Central Vietnam through:
  - Improved varieties,
  - GAP principles and
  - Farmer focused training.

##### Major activities include:

1. New melon and cabbage products being marketed to consumers, initially through Metro Cash & Carry Vietnam.
2. New technology developed, tested and documented on how to produce melons and cabbage in Vinh Province.
3. Improved links between the industry, research and extension organisations involved in the project.
4. Two scientists from Vietnam trained in Australia in the production of melons and cabbage.

To maximize the benefits of the program to farmers in Vinh Province, an integrated production, distribution and marketing plan is proposed, based on the melon and cabbage product specifications nominated by retailer Metro Cash & Carry Vietnam.

Some Components of the Plan:



PRODUCTION:

1. Product Specifications – supplied by Metro Cash & Carry Vietnam
2. Production systems, incorporated in a Good Agricultural Practice (GAP) Manual and including:
  - a. New Varieties
  - b. Crop scheduling
  - c. Water management
  - d. Crop nutrition
  - e. Pest and disease management
3. Harvest/ Post Harvest practices, incorporated in GAP Manual
  - a. Harvest maturity
  - b. Harvest scheduling
  - c. Temperature management
  - d. Grading and packing

DISTRIBUTION:

1. Packaging
  - a. Carton selection best suited to each product
  - b. Efficient packing in cartons
  - c. Stacking for transport
2. Transport
  - a. Maintaining ‘cool chain’
  - b. Minimizing damage – rice straw etc
  - c. Reliable delivery
3. Supply Chain Links
  - a. ASINCV, RIVAF and province level MARD extension centre and district level extension station staff
  - b. Growers and
  - c. Retailer

SALES & MARKETING:

1. Sales Coordination
  - a. Establish sales and marketing structure - cooperative
  - b. Select and appoint sales coordinator
2. Branding
  - a. Cartons
  - b. Individual products e.g.
    - i. Labels on melons
    - ii. Ties on cabbage
  - c. Retail materials – posters, leaflets
3. Promotion
  - a. In-store (Metro)
    - i. Posters, leaflets etc (branded)
    - ii. In-store sampling

- iii. Metro staff education
- b. Food service customers – tourist hotels and restaurants
- c. Trade e.g. 'Asiafruit' magazine

QUALITY/FOOD SAFETY:

Document in GAP Manual and communicate to farmers/suppliers (including training)

1. Quality standards required, based on Metro specifications
2. Food safety requirements, based on international standards

TRAINING:

ASINCV and RIFAV:

- Field trials - training on experimental design and management
- ELISA system to test for pesticide residues
- Mapping supply chain to determine areas for improvement
- Marketing
- Fresh Care Quality Assurance system

Farmers:

- Farmer Field Schools
- Field trials
- Preparation of GAP manuals
- IPM
- Post harvest
- Marketing
- QA system

COMMUNICATION:

Establish communication networks between farmers, researchers, AHR, Metro and their customers.

PARTICIPATION:

1. Identify farmers interested in participation
2. Establish structure to coordinate supply in Vinh and sales and marketing program.

*Produce Marketing Australia*

*August 2007*

**Appendix 2:**

**Farmers' Record Sheets of QA measurement  
for Melon and Cabbage in Nghe An Province, Vietnam**

FIELD RECORD SHEETS

**1. Diary record sheet of fertilizer/ Growth stimulating / soil preparation chemicals**

Farmer name:.....

Sign no. (Accession No.):.....

Field / farm location: .....

Technical person:.....

Date (1)	Chemical detail (2)	Quantity (Kg/ litre) (3)	Salesperson (4)	Rate (đồng) (5)

**2. Diary record sheet of pesticides**

Farmer name:.....

Sign no. (Accession No.):.....

Field / farm location: .....

Technical person:.....

Date (1)	Chemical type (2)	Code (3)	Quantity (4)	Rate (đồng) (5)	Salesperson / producer (6)

**3. Diary record sheet of soil preparation**

Farmer name:.....

Sign no. (Accession No.):.....

Field / farm location: .....

Technical person:.....

Date (1)	Environment to be treated (2)	Treatment (3)	Chemical name (4)	Dosage (5)	Area (6)

**4. Record sheet of fertilizer use / growth promoting**

Farmer name:.....  
 Sign no. (Accession No.):.....  
 Field / farm location: .....  
 Technical person:.....

Date	Crop name	Plot/ bed	Fertilizer	Treatment	Dosage	Area	Applied method
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

**5. Diary record sheet of plant protection chemical**

Farmer name:.....  
 Sign no. (Accession No.):.....  
 Field / farm location: .....  
 Technical person:.....

Date	Chemical name	Dosage	Spray volume	Endemic name	Crop name	Area	Sprayer
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)

**6. Diary record sheet of epidemic control**

Farmer name:.....  
 Sign no. (Accession No.):.....  
 Field / farm location: .....  
 Technical person:.....

Date	Crop name	Epidemic name	Polluting level (%)	Control plan	Expertise
(1)	(2)	(3)	(4)	(5)	(6)

**7. Diary record sheet of product**

Farmer name:.....  
 Sign no. (Accession No.):.....  
 Field / farm location: .....  
 Technical person:.....

Date (1)	Crop name (2)	Plot location (3)	Area (4)	Quantity (5)

**8. Diary record sheet of product classifying**

Farmer name:.....  
 Sign no. (Accession No.):.....  
 Field / farm location: .....  
 Technical person:.....

Date (1)	Crop name (2)	Classification (3)				Buyer (4)	Total sale quantity (đồng) (5)
		Level A (kg)	Level B (kg)	Level C (kg)	Level khác (kg)		

**9. Postharvest treatment folder**

Farmer name:.....  
 Sign no. (Accession No.):.....  
 Field / farm location: .....  
 Technical person:.....

Date (1)	Crop name (2)	Treatment (3)

**10. Record sheet of vegetables bring to market**

Farmer name:.....

Sign no. (Accession No.):.....

Field / farm location: .....

Technical person:.....

	Date	Detail
Crop name		
Variety		
Sowing, transplanting		
Irrigation		
Polluting matter		
Pesticide names		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
Basal fertilizing		
Top dressing		
Leaf fertilizer		
Additive		
Harvest		
Package		
Transport to buyer		