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Final report

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1 Executive summary

There is an increasing demand for premium certified-safe vegetables in Hanoi, Vietnam predominately due to a growing middle class who prefer to shop in supermarkets. The Hanoi region is unable to produce enough vegetables during Summer, with the shortfall imported from China, however these vegetables are perceived to carry hazardous levels of pesticides. Therefore, there is a demand driven incentive to increase counter-seasonal vegetable production within an acceptable range of Hanoi, such as the cool, mountainous Moc Chau region.

This project focused on increasing smallholder farmers' incomes by developing the embryotic vegetable industry in Moc Chau into a premium brand, mentoring farmers to achieve VietGAP certification, which is Vietnam's national safe vegetable program, and initiating a reliable supply chain to Hanoi supermarkets.

The project achieved a breakthrough in facilitating a new value chain for vegetables produced in the Moc Chau region of northwest Vietnam to modern retail markets in Hanoi. Before the project, all vegetable marketing from Moc Chau was either to the local markets or to Hanoi via traders, and unsafe production techniques were widely practiced (Figure 1).

The new value chain, involving 68 farmers in 4 groups in Moc Chau has established effective direct trading relationships and two-way communication between the farmers and with the supermarkets and specialty, high-quality vegetable stores in Hanoi (Figure 2). ACIAR project partners are still involved, but in a relatively minor way.

Direct marketing by farmers to the retail sector represents a completely new approach and market for local farmers and it's showing clear economic benefits. In the Tu Nhien village, 10 of the 38 farmers have built new houses as a result of the additional income they have received from growing high-quality vegetables and direct marketing to modern retail outlets (Ms Luyen, pers comm).

In 2016, the 68 project farmers (71% female and 10% H'Mong) in the Moc Chau villages of Tu Nhien, Ta Niet and An Thai, produced about 691 tonnes of certified high-quality vegetables on 22 ha of land (Figure 4).

Participating farmers from the Tu Nhien village in Moc Chau earned an average net income of 300 million VND ($A18,000)[1] per ha in 2015. This compares with an average net household income of 120 million VND ($A7,560) per ha for non-project vegetable farmers in the village, which is an increase of 150% in net income.

In the neighbouring project village of Van Ho, H'Mong farmers have been producing vegetables for only one season, yet they have already recorded a net income from vegetables of 116 million VND ($A7,300) per ha per year.

Alternative land uses such as growing maize or rice return a net income to the farmer of about 20 million VND ($A1260) per ha per year, only 7% of the income they could make from certified high-quality vegetables.

Some of the social benefits of the new value chain can be summarised by comments from the Tu Nhien village leader, Ms Luyen. She said:

"*Farmers who are working in the new value chain are no longer poor, they do not have to borrow money to grow their next crop*.

"Many of the farmers have been able to improve their houses, and can more easily afford to send their children to school".

[1] *Tu Nhien cooperative data.*

Ms Luyen has been able to buy two trucks for sending high-quality vegetables from Moc Chau to Hanoi in good condition. She has also built a covered packing area and a separate crop receivals area where local farmers can bring their produce for grading and packing before it is sent to retailers such as FiviMart, Metro and BigGreen in Hanoi, on the night it arrives.

A follow-on project AGB/2014/035 has been commissioned and is focused on the sustainable scaling up the successful safe vegetable business model to more villages in the region surrounding Moc Chou.

Image 1: Moc Chou vegetables labelled and displayed in store

2 Background

The project was strongly aligned with ACIAR's strategy in Vietnam, which was developed after consultation with government agencies, other donors and the private sector. The strategy emphasised technical and agribusiness research to enhance smallholder incomes from selected high-value agriculture. In the northwest highlands, the research strategy focused on supply chains where smallholders are becoming connected to markets. The project aimed to stimulate better market integration, ensuring profitability with more sustainable management practices within farming systems. Specifically, the project aimed to contribute to ACIAR subprogram 3: Poverty reduction through market engagement for smallholders in the northern and north-western highlands, by addressing each of the following points (taken from the *ACIAR Annual Operating Plan 2010–2011*):

- Better integration of smallholders into profitable markets for high value crops
- Market and supply-chain analysis to identify critical points to enhance stakeholder relationships, and focus technical intervention to deliver improved chain competitiveness and smallholder profitability
- Methods for smallholders to access local markets and improved market information
- Market research and quality standards development for enhanced market access for fresh and processed products
- Improving production and postharvest processing technologies for temperate fruit and vegetable crops
- Alternative methods for delivery of advisory services appropriate for ethnic minorities.

The vegetable sector is an important source of income for Vietnamese smallholders and continues to expand rapidly. In 2009, Vietnam produced 11.4 million tonnes of vegetables valued at more than1 billion USD on 722,000ha of land. This accounted for more than 9% of agricultural GDP, including rice, and production volume is currently increasing at a rate of 6% per annum (MARD).

Regionality and seasonality of production

Vegetable production is primarily based in peri-urban locations close to HCMC and Hanoi, or in the specialised production region of Da Lat. The peri-urban areas are under increasing pressure from land use changing to residential and industrial, limiting vegetable production. Infrastructure has been developed in Da Lat, such as cool rooms, distribution centres and road access into HCMC, but the region has limited capacity to supply the growing northern market, particularly Hanoi.

Production from Moc Chau

Moc Chau was supplying 20% of the tomato to Hanoi in July 2003, and 13% in August, the remaining supply originating from China. The main producing areas in Moc Chau are the rural districts of Thao Nguyen town, and An Thai village of Lo Bo commune, Moc Chau town, where migrants from Hung Yen and Ha Tay have introduced the tradition of growing vegetables (Ho Thanh Sonet al., 2005).

Fresh vegetables from the region in 2005 were marketed as follows. Distribution by street vendors (46%) and ordinary market retailers (39%) safe vegetable shops and stalls sold only 7%, ordinary vegetable shops 6% and supermarkets only 1%. This is changing significantly with a trend to increasing sales through supermarkets, as occurs throughout the developed world (Ho Thanh Sonet al., 2005).

Supply to Hanoi from China

Chinese produce is now brought to Hanoi via Lao Cai, which is closer that Da Lat and competes strongly with local produce. In recent years, the exchange in agricultural products, especially fresh vegetables, between Vietnam and China has rapidly expanded. Chinese vegetables such as cabbage, mustards, tomato, and carrots are imported to Vietnam all year, but the greatest volume is from May to September when there is a shortage of vegetables in Vietnam (**Ho Thanh Son et al., 2003).**

Regions of origin of vegetables in Vietnam during summer (June and August)

Crop	June	August
Onion	-	Hung Yen, Ha Tay, Bac Ninh, Tu Liem
Tomato	Da Lat, China, Me Linh (few)	China, Da Lat, Son La
Cabbage	Da Lat, China	China
Green mustard	Hung Yen, Me Linh, Dong Anh, Thuong Tin, Tu Liem	Hung Yen, Dong Anh, Me Linh, Tu Liem
Cucumber	Hung Yen, Me Linh, Dong Anh	Hung Yen, Me Linh, Dong Anh
Runner beans	Me Linh, Dong Anh, Hoai Duc, Hung Yen	Ha Tay, Hung Yen, Me Linh, Dong Anh
Spinach	Thanh Tri, Tu Liem	Thanh Tri, Gia Lam

Source: CIRAD/RIFAV surveys

Safe vegetable production and postharvest management

A study showed 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). In addition to pesticide residues, nitrate levels in vegetable products are commonly several times higher than permitted levels and are caused by the use of excessive nitrogenous fertiliser (Ha and Ali 2005).

The recent introduction of the VietGAP system of quality assurance has helped to provide tools and a regulatory framework in which can improve the supply of safe vegetable to the Vietnamese people (Rogers et al. 2010) and this system will be adopted in the proposed project in Moc Chau.

Potential for the Moc Chau region

Both consumers and the government sector have raised concerns regarding the safety of vegetable imports from China. As a result, the private sector – particularly the modern retail sector – is seeking an alternative supply of vegetables to the north. Da Lat is too far from the northern market and transport in unrefrigerated trucks over poor roads is inefficient, resulting in poor quality produce being offered to consumers. The Red River Delta does not have the capacity to deliver on the market requirements during the summer months because it is too hot to produce crops such as tomatoes, cabbage, beans, brassicas and lettuce, and the region is focused on rice production during that period.

Markets

Changes to Foreign Direct Investment (FDI) rules have proven to be a key factor in the modernisation and globalisation of food retailers. The rise of modern retailers has been shown to have significant implications for farmers (MSM 2008). In Vietnam, the number of supermarkets increased dramatically between 1993 and 2004, with openings in HCMC between 2000 and 2004 increasing by 17% per year. In part, the emerging dominance of the

modern retail sector is based on the ability of these retailers to understand, and respond to, consumer demand. In Vietnam, consumers are demanding consistent high-quality products and more diversity of products, and the emerging Vietnamese middle class is demanding an appropriately regulated food safety system (Le Danh Tuyen et al. 2004).

Large retailers recognise the significance of the demand for safe vegetables, and are willing to pay farmers a higher price; Rogers et al. (2010) suggest as much as double the local market price for certified clean, safe vegetables in Vietnam. However, both the private sector (primarily the retailers) and the public sector are struggling to develop appropriate food safety systems that deliver on consumer requirements without creating a barrier to market access for smallholders. Despite limited food safety systems, consumer perception is that modern retailers provide safe vegetables. Additionally, there is widespread consumer doubt of any food safety claims made about vegetables purchased from local markets.

The cooler, highland regions of Vietnam have the potential to meet the counter-seasonal demands of consumers and modern retailers in large centres, and if developed appropriately, will have the capability to supply safe, high-quality vegetables that can attract a premium market price. Although these elevated regions are remote, infrastructure that enables market access has improved and these communities, including ethnic minorities, have shown a willingness to engage with markets, rather than rely on subsistence farming. The transition to more market-orientated production has most recently been witnessed in the region's rapid increase in maize production, which is mostly sold to feed mills supplying poultry producers closer to Hanoi. Many of these poultry producers, such as the Charoen Pokphand Group, have global reach and significant influence on smallholder production systems in the region.

The private sector, in particularly the modern retail sector, wants: (1) improved consistency of supply of vegetables that meets consumer demands; (2) food safety systems that can be substantiated to improve market position; and (3) more efficient supply chains that deliver reliable products.

Prior to this project, the Government of Vietnam has been pursuing improved food safety through the development of Good Agriculture Practice (GAP) as safe vegetables are important for consumers. Manuals, guidelines, a regulatory framework and farmer training had been developed, but after more than 10 years of government support, very few accredited safe vegetables were available on the market. Limitations included lack of technical guidelines suitable for smallholders, certification not recognised by consumers, and lack of market and supply chain development. Consequently, consumers have little confidence in the initiative and there was little value creation in the vegetable supply chain, leading to poor uptake of food safety systems. This project was designed to build on the GAP systems by applying them in a market-oriented supply chain, and evaluating the cost–benefit and other constraints related to involvement.

There is significant interest from the private sector, particularly from modern retailers, in sourcing vegetables from northern Vietnam. Metro Cash and Carry recognised a lack of consistent supply quality and plans to develop a distribution centre in northern Vietnam in the follow-on project AGB/2014/035. This centre is likely to include some supply chain infrastructure and farmer training to supply MetroGAP (a version of VietGAP) accredited vegetables. Part of the training will include improving record-keeping, which is critical to meeting GAP requirements. Benchmarking has been a critical aspect of monthly extension services and will continue to be developed in northern Vietnam. Metro has indicated a number of constraints affecting supply, e.g. poor quality of leafy vegetables due to insect damage, and has indicated a strong interest in collaborating to resolve issues at the farm and postharvest levels. Current training programs could also contribute to the development of FBSs.

3 Objectives

The project aimed to underpin the development of a knowledgeable and resilient smallholder-based supply system that can meet consumer vegetable requirements in a rapidly transforming retail sector. The project objectives create an effective and sustainable linkage between modern retailers and northern Vietnam vegetable suppliers, which could supply up to 50% of Hanoi's total consumption during a six-month supply window. The project targeted mainly temperate vegetables such as tomato, lettuce, brassicas e.g. cabbage, and sweet pepper.

To achieve the aim, the following objectives were pursued:

Objective 1: Analyse consumer demand and alternative marketing channels to develop smallholder-based vegetable systems capable of delivering (now and in the future) from northern Vietnam.

This objective is built on the following activities:

Activity 1.1: Survey consumers of Hanoi retailers to identify demanded products and supply windows.

Activity 1.2: Identify and analyse alternative marketing channels (global retailers, modern local retailers, specialised/niche retailers, food service and traditional markets) using ongoing Rapid Value Chain Assessment relevant to determining the feasibility of smallholder engagement and equity.

Activity 1.3: In different channels evaluate consumer reaction to vegetable products in counter-seasonal window (outputs of Activity 2.3).

Objective 2: Optimise production and postharvest systems to supply high quality, counter-seasonal temperate vegetables from highland North Vietnam to urban retail markets in Hanoi.

This objective is built on the following activities:

Activity 2.1: Assess physical resources (land, water, climate), labour, organisational and technical skills, and motivation to produce vegetables.

Activity 2.2: Evaluate production systems of vegetable crops and varieties of temperate vegetables (identified in Activity 1.1) in conjunction with HUA.

Activity 2.3: Develop and implement best management on-farm trials and integrate that information into the Farm Business School activities (Objective 3).

Activity 2.4: Develop and test appropriate postharvest handling methods for delivering high quality, safe vegetables to market.

Activity 2.5: Coordinate the supply from three collaborating villages in Moc Chau to modern retail outlets in Hanoi and other markets.

Activity 2.6: Implement systems to improve requirements for compliance with food safety certification (e.g. VietGAP, MetroGAP).

Objective 3: Implement and analyse the Farmer Business School approach as a means of enabling smallholder farmers to build knowledge and improve decision-making based on market and supply chain information.

This objective is built on the following activities:

Activity 3.1: Assess current Farmer Business Schools, and similar, being used in other ACIAR and donor projects.

Activity 3.2: Complete farm-level economic analysis and benchmarking of smallholders in three project villages to facilitate the uptake of techniques and strategies emerging from other project activities.

Activity 3.3: In conjunction with Activity 1.2, assess the profitability of smallholder involvement in different marketing channels (global retailers, modern local retailers, specialised/niche retailers, food service and traditional markets).

Activity 3.4: Complete a cost–benefit analysis of smallholder involvement in certification systems (including food safety systems) and make suggestions for improving this ratio.

Activity 3.5: Develop farm financial management systems to integrate with FBS approaches.

Activity 3.6: Develop approach and supporting materials to deliver FBSs to support development of temperate vegetable sector in northern Vietnam.

Activity 3.7: Implement FBS in three villages for three supply seasons, with monitoring and evaluation for continual improvement in each season.

Activity 3.8: Evaluate FBS implementation and develop improved models for delivery.

Activity 3.9: Host information workshop involving NGOs, donors and government agencies, to discuss and disseminate FBS principles and approaches.

Objective 4: Contribute to an enabling regional policy environment for counter-seasonal temperate vegetable production in the northwest highland region.

This objective will be achieved by conducting the following activities:

Activity 4.1: Benchmark current regional policy settings and evaluate the extent of the vegetable production sector.

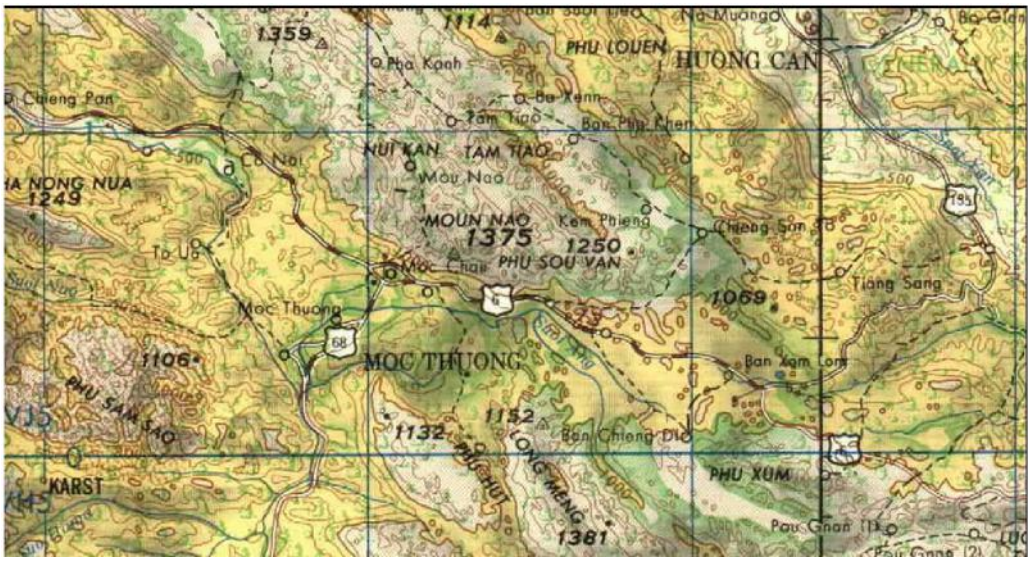
Activity 4.2: Undertake a constraints analysis to identify key regional policy issues affecting the development of a counter-seasonal vegetable production industry in the Northwest highland region.

Activity 4.3: Develop (and move to implement, where possible) a regional policy strategy that would alleviate the problems identified in Activity 4.2 and also would assist in replicating successful outcomes from this project.

4 Methodology

The key aim of the project is to understand how smallholder farmers, organised into communes or clusters, can interact successfully with large modern retailers. Large retailers will continue to expand in Vietnam, as in the rest of the developing world.

The project focused on helping to set up and support a summer temperate vegetable supply chain from three locations in Moc Chau, the communes of Van Ho, Muong Sang and Chieng Hac, in the province of Son La. The region has a high percentage of ethnic minorities (mainly Thái, Mường, H'Mông, Dao, Sinh Mun, KhơMú) who are recognised as producing lower value crops and having limited market engagement. However, the area has a favourable climate for counter-seasonal vegetable production, access to key markets (due to recently developed infrastructure) and can produce vegetables for the north when it is too hot to grow them closer to Hanoi, such as Red River Delta.



The area around Moc Chau in North Vietnam.

The inclusion or otherwise of the Van Ho, Muong Sang and Chieng Hac villages in the project is not fixed, and one of the first activities of the new project will be to review selection of these villages with a view to obtaining a diverse ethnic makeup within the groups and favourable biophysical resources for cropping. There may be an overlap of sites with the Northwest project (AGB/2008/002), specifically in the Muong Sang Commune, where they work with the Na Nga Village and we are planning to work with the An Thai and/or Bay Say villages.

NOMAFSI will help to set up and support this model supply chain from smallholder farmers to a modern retailer (Objective 2), which will then be used to study the following three broader questions in Vietnam and the region:

1. How effective is the Farmer Business School (FBS) model in delivering technical, farm management, marketing and financial skills to farmers and small communities? This section of the project will be coordinated in Vietnam by the Hanoi Agricultural University (Objective 3).
2. What are the implications at the regional level in terms of local economic and social impacts, and potential inputs into policy that will be managed in Vietnam by CIRAD (Objective 4)?
3. What is the consumer demand for safe vegetables from the north-west highland regions, and what alternative marketing channels exist for smallholder-based

vegetable systems? This will be undertaken by CASRAD, which has considerable experience in this area of Vietnam (Objective 1).

4.1 Objective 1: Analyse consumer demand and alternative marketing channels to develop smallholder-based vegetable systems capable to deliver (now and in the future) from northern Vietnam.

Activities aimed at achieving this objective were designed to provide insights into the levels and rationality of demand in Vietnam for vegetables produced in the northwest region and then incorporate this information into marketing strategies. CASRAD with experience in marketing and value chain lead these activities.

Activity 1.1: Survey consumers of Hanoi retailers to identify demanded products and supply windows.

The first step was a qualitative evaluation involving: market observations; consumer focus group discussion; key stakeholder interviews using semi-structured questionnaire; and a stakeholders' meeting. This was conducted in the first 2–3 months of the project. Subsequently, annual consumer surveys were conducted in Son La and Hanoi to identify demanded products and supply window using questionnaires based on the outcomes of the qualitative evaluation.

The output of this activity is a survey report with comprehensive information on the market demands (products, quality, quantity and supply time). The survey findings will be the basis for developing plans to implement the project other activities.

Activity 1.2: Identify and analyse alternative marketing channels (global retailers, modern local retailers, specialised/niche retailers, food service and traditional markets) using ongoing Rapid Value Chain Assessment relevant to determining the feasibility of smallholder engagement and equity.

The identification and analysis of alternative marketing channels (global retailers, modern local retailers, specialised/niche retailers, food service and traditional markets) was achieved using a Rapid Value Chain Appraisal (RVCA) conducted in the three production communities in Moc Chau, Hanoi and Son La. The method involved following product flows/channels from up-stream to down-stream of the value chain using a combination of quantitative and qualitative methods including value chain mapping, value chain governance analysis, studying profit sharing among stakeholders (especially producers) and evaluating constraints faced by farmers during production. The project team identified potential distribution and retail partners for the project. The same RVCA was undertaken from China to Hanoi in the second year. This study focused on comparisons of competitiveness of vegetables from China and counter-season vegetables from Moc Chau using samples of counter-season vegetables from Moc Chau and China to identify consumer preferences. The household capacity in production and supply of offseason vegetables were also studied. The findings of this activity serve as the foundation for planning and implementing the activities of objective 2 and 3.

Activity 1.3: In different channels evaluate consumer reaction to vegetable products in counter-seasonal window (outputs of Activity 2.3).

Consumer reaction to counter-season vegetables from Moc Chau was evaluated annually in relation to safety, quality, traceability, packaging, quantity and this information was fed back to the producers in Moc Chau. A stakeholder workshop was finally conducted involving consumers, producers and retailers to hold trust in the value chain and provide a foundation for future chain building activities.

4.2 Objective 2: Optimise production and postharvest systems to supply high quality, counter-seasonal temperate vegetables from highland North Vietnam to urban retail markets in Hanoi.

The guiding principle for this objective is to carry out research activities aimed at solving agronomic, postharvest and supply coordination limitations currently constraining development of a vibrant vegetable supply industry in the Northwest mountainous region. Objective 2 was led in Vietnam by Mr Minh from NOMAFSI in collaboration with Dr Rogers, and with specific technical input from Mike Titley at key points in the project.

Activity 2.1. Assess physical resources (land, water, climate), labour, organisational and technical skills, and motivation to produce vegetables.

The Vietnamese and Australian project teams jointly made an initial review of suggested communes and villages to be the focus of study and if necessary, select more appropriate communities. An assessment was undertaken of physical resources (land, water, climate), labour, organisational and technical skills, production systems, varieties and postharvest handling methods currently used by these communities. The assessment team included staff from NOMAFSI, HAU, FAVRI, Fresh Studio and experts from the Australian team, in consultation with Oleg Nicetic from AGB/2008/002. The team developed practical guidelines that incorporate current best practice and communicated them to farmers and supply chain members.

Activity 2.2. Evaluate production systems of vegetable crops and varieties of temperate vegetables (identified in Activity 1.1) in conjunction with HUA.

With participation of HUA staff, NOMAFSI studied the current status of vegetable production and supply in the project's communes with focus on the market-demanded vegetables production systems, cultivation techniques and postharvest technology. The output of this activity is a study report in which necessary interventions to improve the production systems are proposed. This report has been circulated to communities and the project's teams so that relevant information can be used in planning and implementing other project's activities.

Activity 2.3. Develop and implement best management on-farm trials and integrate that information into the Farm Business School activities (Objective 3).

NOMAFSI together with other project team members planned, based on the findings of previous studies and surveys, and implemented on-farm trials to: assess suitable varieties and crops; determine appropriate irrigation and nutrition practices. Through participatory conduction of these trials at least three vegetable varieties suitable for local growth conditions were identified and appropriate techniques for their cultivation developed.

Activity 2.4. Develop and test appropriate postharvest handling methods for delivering high quality, safe vegetables to market.

As part of the postharvest assessment, current supply chains from Moc Chau to Hanoi was reviewed and evaluated with a view to identifying problems and suggesting appropriate improvements. FAVRI tested postharvest technologies to identify the appropriate ones for the modern retailers and local markets. This included measuring crop temperatures from the point of harvest to the final retail destination, and assessing quality at either end of the supply chain. Techniques of packaging, labelling, and storage of vegetables before, during and after transportation were also tested. The expected output of this activity will be appropriate post-harvest technologies for at least 5–7 products. A postharvest handling manual will be written for the selected vegetables that will be used for the following technical training of trainers (TOT) and farmer business schools (FBS).

Three harvest times (morning, noon, afternoon) were evaluated for effect on quality of beans, cai mau, tomato and lettuce. Harvested produce was stored in a cool place (inside packing area, shaded), packed and sent all together on the night of harvest. Temperature from harvest to final destination was logged (including the temperature in storage in Moc Chau). Quality was assessed on arrival, shelf life was measured after arrival in Hanoi.

Image 2: Vegetables tested for pesticide residues

Activity 2.5. Coordinate the supply from three collaborating villages in Moc Chau to modern retail outlets in Hanoi and other markets.

The project team worked closely with Fresh Studio and the three communes in Moc Chau growing produce and transporters to develop and implement plans supporting development of a system for supplying quality vegetables to Hanoi market. NOMAFSI worked with Fresh Studio to coordinate supply from the three communes in Moc Chau to the retail outlets in Hanoi and other markets.

The project also worked with ACIAR AGB/2008/002 Improved market engagement for sustainable upland production systems in the north-western highlands of Vietnam on fresh produce value chains.

Activity 2.6 Implement systems to improve requirements for compliance with food safety certification (e.g. VietGAP, MetroGAP).

NOMAFSI oversaw the accreditation of the three communes in Moc Chau, initially to gain a Safe Vegetable Certifications from MARD. Following this, NOMAFSI managed the accreditation of the communities with a more stringent certification, VietGAP, based on Global GAP principles.

Training was provided to the project farmers in Moc Chau in safe vegetable production, weed management, fertiliser management, seedling production and water management.

On-farm agronomic trials evaluating the mung bean as a cover crop and sweet corn as a pioneer vegetable crop in helping to improve heavy rice soils for vegetable production were carried out in Van Ho.

Activity 2.7 Facilitate the implementation of FBS training activities in three villages for three supply seasons.

NOMAFSI and Fresh Studio will take primary responsibility for the implementation of FBS activities in Moc Chau. This includes organising training sessions as required, delivering technical training on safe vegetable production techniques and compliance requirements, technical agronomy and postharvest training (with assistance from FAVRI), feedback of financial and farm productivity data back to farmers in organised group session workshops to be held at end of each season, farm business planning sessions to be held at the start of each season and as required.

2.8 DARD and Master Farmer support.

DARD support was achieved and is an essential part of the support for sustainable scaling up/out strategy and business model.

4.3 Objective 3: Implement and analyse the Farmer Business School approach as a means of enabling smallholder farmers to build knowledge and improve decision-making based on market and supply chain information.

The umbrella methodology for improving smallholder decision-making with respect to engagement with markets was a farm business school. This approach is a major initiative of AGB and the work done in this project complements approaches by other ACIAR projects and indeed, by some other international projects. However, the FBS model also embodies more traditional “action research” whereby farm level economic analysis, accompanied by appropriate feedback to researchers, is used to better link farmers and researchers to agronomic and other practical farm management techniques and principles.

HUA, with its experience in household economy and FBS lead of the activities is aiming at this objective.

Activity 3.1. Assess current Farmer Business Schools, and similar, being used in other ACIAR and donor projects.

An initial assessment was made of the farm business school approach. This included a literature review, and assessment of relevant ongoing activities in other ACIAR projects (especially in Vietnam). A project-level philosophy of how the farm business school approach could be most relevant to this project was developed, and plans be formulated

as to how best to collaborate with a sister project on indigenous vegetables in Northern Vietnam (for implementing Activity 3.6).

Activity 3.2. Complete farm-level economic analysis and benchmarking of smallholders in three project villages to facilitate the uptake of techniques and strategies emerging from other project activities.

Benchmarking of the economic status of the three target communes was undertaken via farm surveys and some participatory tools. This benchmarking included an assessment of how management decisions were made by farmers, what factors effect decision-making on the farm and to what extent farm records are kept, as well as farmers' interest in enhancing their decision-making capacities. Analysis results were compiled in a report and serve as the foundation for planning and implementing activities of objective 2 and Activity 3.5.

Activity 3.3. In conjunction with Activity 1.2, assess the profitability of smallholder involvement in different marketing channels (global retailers, modern local retailers, specialised/niche retailers, food service and traditional markets).

As new agronomic, post-harvest handling or marketing techniques (including food safety certification systems) were trialled, or hypothesised, they were assessed both from economic and social acceptability viewpoints at farm level. These market trials and assessments are based in part on feedback from Objective 1. Feedback and guidance from the various trials and assessments were given to farmers via the FBS concept and directly to collaborating researchers via project coordination meetings.

Activity 3.4. Complete a cost–benefit analysis of smallholder involvement in certification systems (including food safety systems) and make suggestions for improving this ratio.

The project assessed the cost-benefit of a household's involvement in certification systems. Difficulties and constraints were also identified and ways to overcome them so as to increase the cost-benefit for households participating in the certificate systems. An assessment report and findings were circulated to households, local decision makers and scientists for use in formulating safe vegetable development plans and strategies.

Activity 3.5. Develop farm financial management systems to integrate with FBS approaches.

A farm financial management systems was developed based on the project assessment, analysis and survey findings. This was also done based on the experiences of HUA in its ongoing Oxfam-funded project on bookkeeping. A record-keeping system was designed, implemented, demonstrated and disseminated through FBS to households.

Activity 3.6. Develop approach and supporting materials to deliver FBSs to support development of temperate vegetable sector in northern Vietnam.

Based on the findings of Activity 3.1. the project proposed approaches, tools and supporting materials for effective delivery and application of FBS in the implementation of its activities in particular, and in temperate vegetable development in the Northwest in general. The outputs of this activity were approaches and supporting materials for effective delivery of FBS.

Activity 3.7. Contribute to FBS in three villages for three supply seasons, with monitoring and evaluation for continual improvement in each season.

The outputs of the activities 2.1 – 2.6, and Activity 3.5 (techniques, farm financial management systems, supply systems, etc.) were disseminated to households through FBS. In all the project's three communes, FBS will be organised using the approaches and materials proposed previously (Activity 3.6). With monitoring and evaluation, necessary adjustments to these approaches and materials were also be identified and made for their continual improvement. The involvement of local agricultural experts in presenting training sessions such as the Moc Chau agricultural office is to be encouraged.

Activity 3.8: Assess alternative vegetables for the on-season.

A comparative on-farm gross margins and profitability analysis was undertaken for different vegetables in the peak winter and off-summer season, identifying break-even pricing and cost of production. This was to identify vegetables and or other crops that could be grown in the highly peak winter season, when Red River Delta production is at a significant competitive advantage over Moc Chau. The analysis included safe versus conventional vegetables market segments and include estimates of retailer willingness to pay for consistency of safe vegetable supply in the peak season.

Activity 3.9 Develop a strategy for sustainable scaling up and out of achievements from Moc Chau study villages.

A number of review recommendations were addressed under this strategy. The strategy included review of current successful elements of market development developed by the project and integration of appropriate FFS and FBS components in the final twelve months of the current project.

Rather than develop a rigid curriculum and manual, the processes, information and materials for scaling up and out was reviewed, developed, collated and documented. As part of the strategy development, funding was allocated to secure specialist advice and organise consultation workshops required to adapt scaling up and out strategies to ethnic minority villages. These approaches were implemented and tested in two villages identified during the extended project phase.

Denis Sautier from CIRAD, lead the strategy development (final year of the project).

Capturing the success of the approach of linking farmers to retail markets, and understanding the technical and organisational support that is required was essential in the systematisation and scaling out process. For this reason, involvement from key people from years 1–3 was vital. These people were: Jeroen Pasman and Kay Amble (Fresh Studio), John Baker (PMA), Mr Hung, Dr Sen, Ms Chang, Mr Hoan (NOMAFSI), Ken Menz.

The strategy explored more sustainable partner-engagement models and included a transition strategy for the final project period and the new project AGB. This included modifying the current roles of Vietnamese partners in the project, away from direct farmer support, to provide mentoring and technical support of local extension services and lead or Master Farmer approaches.

The strategy also explored options to raise additional resources from government agencies such as DARD, DST and DQC through related vegetable policies and programs or development of private sector business models. The strategy included development of more sustainable farmer group organisation, and supply chain coordination “model” coordination that include specialist roles at both production and market ends.

4.4 Objective 4. Contribute to an enabling regional policy environment for counter-seasonal temperate vegetable production in the northwest highland region.

The intent of this objective was to facilitate regional policy development (for the vegetable sector) and to help broaden the application of project findings to a regional level. CIRAD with valuable working experience in Moc Chau, oversaw the implementation of the activities aiming at this objective.

Activity 4.1. Benchmark current regional policy settings and evaluate the extent of the vegetable production sector.

The first activity was to benchmark the current regional position through the collection of reliable information on the current state of the vegetable production sector in the northwest region, and the policy settings that have an impact in the sector. It involved multi-stakeholder workshops, key informant surveys and focus group discussions. Past and on-going experiences in Moc Chau regarding production and delivery of counter-seasonal vegetables were documented, with a focus on regional policy constraints. In addition to issues concerning government policies, policies relating to contract definitions and implementation, commodity quality requirements, logistics, pricing and delivery practices were identified. Thus, the output of this activity is a report on the policy status and environment governing the off-season vegetable production in Moc Chau.

Activity 4.2. Undertake a constraints analysis to identify key regional policy issues affecting the development of a counter-seasonal vegetable production industry in the Northwest highland region.

The second activity was to review the information collected in phase one, and from this, identify the key policy constraints that were hindering development of the vegetable sector. This was achieved by a study of extra-regional constraints, augmented by formal SWOT and benefit/cost analyses, with emphasis on competition from China and South Vietnam, and by workshops with public authorities and private buyers to elaborate a consensus on the intra-regional weaknesses and threats to the emerging counter-seasonal vegetable sector, and define investment and training priorities. The likely relevance (replicability) of successes achieved in the current project to other communities was addressed as part of the policy review process.

Activity 4.3. Develop (and move to implement, where possible) a regional policy strategy that will alleviate the problems identified in Activity 4.2 and that also will assist in replicating successful outcomes from this project.

The third activity was to develop and publish a strategy involving regional policy initiatives that could alleviate key constraints identified in Activity 4.2. This included definition of responsible entities (or joint responsibilities). Working with those entities, the project pilot tested (and documented) two policy interventions. An important part of Activity 3 was to address any issues, including those surrounding ethnic groups, which may impede the wider application of project findings to diverse communities in the northwest region. This phase also involved the development of a private–public network (beyond that developed and involved directly in objectives 1–3) towards strengthening Moc Chau as a vegetable growing and marketing cluster. There was a stakeholders' trip to Da Lat (or Sa Pa/China) regarding the development of supply clusters and business associations.

Lessons learnt from the regional development strategy for vegetables fed into a workshop on broader policy development for North West Vietnam, in Son La at project end.

There was also a series of low-cost themed village field days for farmers in surrounding villages and farmer and team cross-visits between existing and new villages in Moc Chau (AGB-2009-053) and Sap Ha/Bac Ha (AGB-2012-059).

Activity 4.4 Moc Chau trademark implementation

This activity was managed by CIRAD, CASRAD and NOMAFSI. The activity was the registration of a certification trademark to be administered by the Peoples Committee of Moc Chau and linked to safe vegetable certification. i.e. for farmers to be allowed to use the trademark, they need to be located in Moc Chau or Van Ho districts, and be accredited for safe vegetable certification or VietGAP by DARD Son La.

CIRAD (Denis Sautier) and CASRAD (Mr Tuan) jointly lead this activity. An implementation plan with time targets, task allocation and a budget was developed.

Two additional activities in relation to the Moc Chau trademark. These are:

- Trial of the new trademark with the Ta Niet village in Moc Chau; this is being carried out by CASRAD
- Continued support for the implementation of the Moc Chau brand in Hanoi markets – to be carried out by CASRAD and CIRAD.

The main outputs of the project activities are presented in the appendices.

Image 3: Moc Chou safe vegetable trademark

5 Achievements against activities and outputs/milestones

Objective 1: Analyse consumer demand and alternative marketing channels to develop smallholder-based vegetable systems capable to deliver (now and in the future) from northern Vietnam.

No.	Activity	Outputs/ milestones	Completion date	Comments
1.1	Survey consumers of Hanoi retailers to identify demanded products and supply windows.	Survey of consumers of Hanoi retailers complete.	2012	Complete and reported previously.
1.2	Assessment of various marketing channels and alternative supply sources relevant to determining the feasibility of smallholder engagement and equity.	Revised Report on the MC value chain.	December 2014	
1.3	In different channels evaluate consumer and customer reaction to vegetable products in counter-seasonal window. Assess how much extra consumers in Hanoi are willing to pay for safe vegetables, Moc Chau vegetables grown in both in the on-season and off-season.	Report on willingness to pay for safe vegetables.	April 2015	

Objective 2: Optimise production and postharvest systems to supply high quality, counter-seasonal temperate vegetables from highland North Vietnam to urban retail markets in Hanoi

No.	Activity	Outputs/ milestones	Completion date	Comments
2.1	Assess physical resources (land, water, climate), labour, organisational and technical. skills, and motivation to produce vegetables.	Document describing outlining commune selection finalised and baseline data collected. describing in	March 2012	Complete and reported previously.

No.	Activity	Outputs/ milestones	Completion date	Comments
		detail the physical and human resources available.		
2.2	Evaluate production systems of vegetable crops and varieties of temperate vegetables (identified in Activity 1.1)	Report describing and quantifying the current production systems used in the villages involved in the project.	July 2011	Complete and reported previously.
2.3	Develop and implement best management on-farm trials and integrate that information into the Farm Business School activities.	Annual reporting back to farmers, field walks. Best practice agronomic manual produced in Vietnamese for presentation in FFS or FBS.	Annually Best Practice guides April 2014.	
2.4	Develop and test appropriate postharvest handling methods for delivering high quality, safe vegetables to market.	Best practice postharvest manual produced in Vietnamese. Quantify postharvest losses and find solutions. Postharvest study: Evaluate three harvest times on produce	Best Practice guides April 2014 Nov. 2014 July 1015	Ms Mai (FAVRI) has produced the guides in Vietnamese for cabbage, tomatoes and green beans. The guides are in Vietnamese only. Postharvest study report complete and previously reported. Presentation attached as Appendix 5 Timothy Boyd (University of Sydney student) completed in July 2015

No.	Activity	Outputs/ milestones	Completion date	Comments
		temperature and quality.		The English version of a presentation given to FiviMart
2.5	Coordinate the supply from three collaborating villages in Moc Chau to modern retail outlets in Hanoi and other markets.	Production planning and forecasting for every farmer group including weekly updates – continue existing, but integrate farmers into the process.	ongoing	Production planning and coordination is continuing as a key activity for the project. This is being transitioned from a project-focused role to a farmer group and retailer focus. The quantities of each crop available for harvest is estimated and ***reported each week.*** The actual vegetable supply is also ***reported each week***. These reports are available if required
2.6	Implement systems to improve requirements for compliance with food safety certification.	Assist new farmer groups to join the project.	One new village identified and trained by May 2015.	Complete. The Van Ho village has joined the project and have been trained in agronomy and safe vegetable production. There are currently 19 farmers from Van Ho involved. The village has achieved safe vegetable accreditation and began supplying retail markets in Hanoi in January 2016. New farmers in Moc Chau have also joined, and now there are total of 86 farmers involved project over four villages.
2.7	Facilitate the implementation of FBS training activities in three villages for three supply seasons.	Document safe vegetable and/or VietGAP accreditation procedures. Collect finished	November 2014 March 2015	The document is currently being written up by CRED and will be complete by September 2016 – refer CRED report Complete for 2014/15, but records are

No.	Activity	Outputs/ milestones	Completion date	Comments
		record keeping for encoding (Refer Objective 3). Encode finished records in the MonQI database. Provide monthly benchmark report in Excel – send to all project partners and farmers. Farm inspection with 54 farmers for agronomy and compliance. Master Farmers to visit farmers – take over some of the role.	March 2015 March 2015 Monthly inspections	continuing to be collected project staff and farmers. Complete for 2014/15. Presented to growers in workshop March, 2015. Summary attached as **Appendix 10.** Ongoing by project staff. The district and regional extension staff are being trained to take over the compliance and agronomic support roles.
2.8	DARD and Master Farmer support.	Provision of transitional funding for extension support for DARD.	March 2015	Four extension staff have been appointed and there is now one full-time extension officer operating in each village to support extension activities.

Objective 3: Implement and analyse the Farmer Business School approach as a means of enabling smallholder farmers to build knowledge and improve decision-making based on market and supply-chain information.

No.	Activity	Outputs/ milestones	Completion date	Comments
3.1	Assess current Farmer Business Schools, and similar, being used in other ACIAR and donor projects.	Current Farmer Business Schools, and similar, being used in other ACIAR and donor projects assessed and documented.	2011	Complete and reported previously.
3.2	Complete farm-level economic analysis and benchmarking of smallholders in three project villages to facilitate the uptake of techniques and strategies emerging from other project activities.	Baseline economic analysis of collaborating villages in Moc Chau complete	March 2013	Complete and reported previously.
3.3	Assess profitability of involvement in different marketing channels (Moc Chau vs Hanoi).	Take primary responsibility for farm record keeping (54 farmers), using the revised FS framework. Business analysis of vegetable production for 2014 season and present to farmers.	Report back to farmers end 2014. Report complete by November 2014.	Only 50% of farm records for 2014/15 were collected by HUA. These have been encoded by Fresh Studio and results reported to farmers in March 2015. The collection of farm records is continuing and is being used to calculate farm profitability.

No.	Activity	Outputs/ milestones	Completion date	Comments
3.1	Assess current Farmer Business Schools, and similar, being used in other ACIAR and donor projects.	Current Farmer Business Schools, and similar, being used in other ACIAR and donor projects assessed and documented.	2011	Complete and reported previously.
3.4	Complete a cost–benefit analysis of smallholder involvement in certification systems (including food safety systems) and make suggestions for improving this ratio.	Cost–benefit analysis of smallholder involvement in certification systems.	March 2014	Complete and reported previously.
3.5	Develop farm financial management systems to integrate with FBS.	Data recording sheets have been developed to encompass a stronger focus on financial data than originally envisaged by Fresh Studio. Assess the potential for simpler spreadsheet or paper based recording system and analysis system.	March 2014 June 2015	Complete and data collecting ongoing. HUA will focus on the economic assessment of the 2014–15 season instead of this additional activity. Fresh Studio Monqi system is adequate for the purposes of the project, financial assessment and reporting back to farmers.

No.	Activity	Outputs/ milestones	Completion date	Comments
3.1	Assess current Farmer Business Schools, and similar, being used in other ACIAR and donor projects.	Current Farmer Business Schools, and similar, being used in other ACIAR and donor projects assessed and documented.	2011	Complete and reported previously.
3.6	Develop approach and supporting materials to deliver FBSs to support development of temperate vegetable sector in northern Vietnam.	Approach and supporting materials to deliver FBSs developed and documented.	2012	Complete and reported previously.
3.7	FBS contribution	Contribute to FBS as required.	Ongoing	See list of training activities for this reporting period.
3.8	Assess alternative vegetables for the on season.	Undertake a comparative on-farm gross margins and profitability analysis for different vegetables in the peak winter and off summer season.	Completed for 2014. Will also need to be done for the 2015 season.	Ken Menz and HUA based on actual farm data collected by the project, combined with consumer information from CASRAD. The assessment of possible varieties being undertaken by NOMAFSI in the 2015 season. Safe versus conventional vegetables market segments specified by CASRAD and undertaken as part of project objective 1, Activity 1.2.

No.	Activity	Outputs/ milestones	Completion date	Comments
3.1	Assess current Farmer Business Schools, and similar, being used in other ACIAR and donor projects.	Current Farmer Business Schools, and similar, being used in other ACIAR and donor projects assessed and documented.	2011	Complete and reported previously.
3.9	Develop a strategy for sustainable scaling up and out of achievements from Moc Chau study villages.	A documented strategy for sustainable scaling up and out the production and supply of safe vegetables from Moc Chau to modern retail to other villages in Vietnam.	Interim report July 2015.	The overall aim of this activity is to systematise and document how to prepare a new village in Moc Chau to profitably and sustainably ***produce*** and ***market*** safe vegetables. Retaining the market focus and market-driven approach. Helvetas/CRED is taking the lead in this activity. They key activities if this component are outlined in more detail in the Helvetas/CRED work plans for 2014, 2015 and the detailed work plan**.**

Objective 4: Contribute to an enabling regional policy environment for counter-seasonal temperate vegetable production in the northwest highland region.

No.	Activity	Outputs/ milestones	Completion date	Comments
4.1	Benchmark current regional policy settings and evaluate the extent of the vegetable production sector.	Benchmark report on regional policy settings in Moc Chau compared to da Lat.	Report March 2015	Dr Sautier has requested an extension of the due date for this report due his wife's ill health and his need to be in France.
4.2	Undertake a constraints analysis to identify key regional policy issues affecting the development of an counter-seasonal vegetable production industry in the Northwest highland region.	Key regional policy constraints identified and the prioritisation of possible intervention points.	March 2013	Complete and reported
4.3	Develop (and move to implement, where possible) a regional policy strategy that will alleviate the problems identified in Activity 4.2 and that also will assist in replicating successful outcomes from this project.	Conduct cross visits to transfer learnings from one group to another.	Van Ho visited Moc Chau 9/12/14 MC and Van Ho visited Hanoi 1/2/15.	Complete and reported
4.4.	Moc Chau trademark implementation. Support for the implementation of the Moc Chau brand.	Moc Chau safe vegetable certificate has successfully completed Support provided	March 2016 2016 season	Trademark certification achieved in March 2016 and implementation meeting was held in Moc Chau in March 2016. Ongoing support will be provided until the marketing system has developed into a self-sustaining system. This is part of the scaling out activities and the proposed new project AGB-2014-035.

6 Key results and discussion

The project achieved a breakthrough in facilitating a new value chain for vegetables produced in the Moc Chau region of northwest Vietnam to modern retail markets in Hanoi. Before the project, all vegetable marketing from Moc Chau was either to the local markets or to Hanoi via traders, and unsafe production techniques were widely practiced (Figure 1).

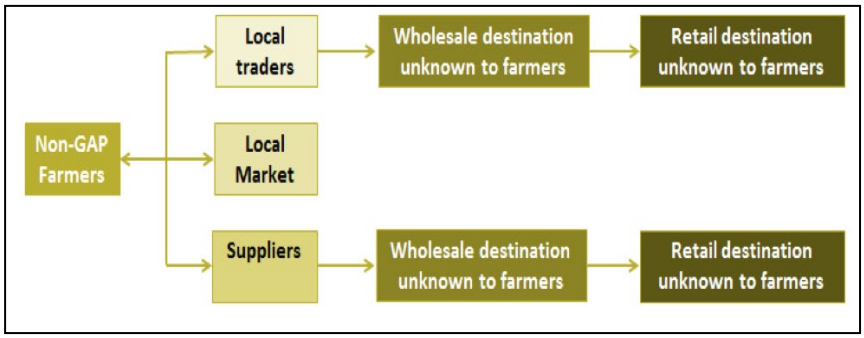


Figure 1. Moc Chau vegetable value chain before intervention by the project.

The new value chain, involving 68 farmers in four groups in Moc Chau has established effective direct trading relationships and two-way communication between the farmers and with the supermarkets and specialty, high-quality vegetable stores in Hanoi (**Figure 2**). ACIAR project partners are still involved, but in a relatively minor way.

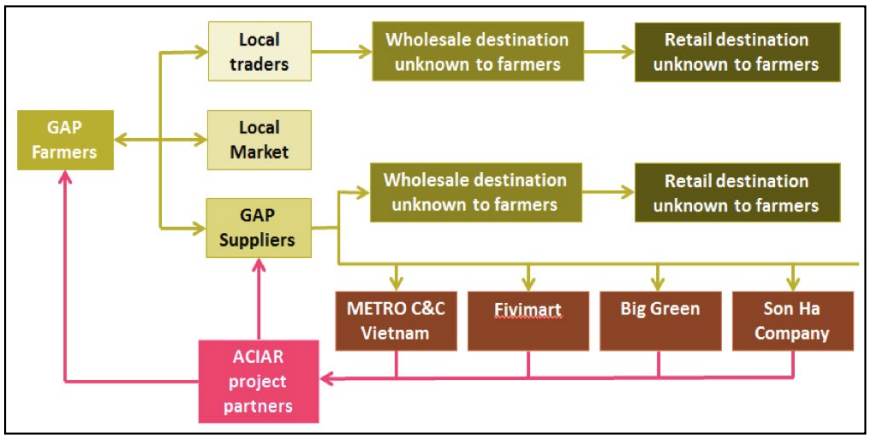


Figure 2. Moc Chau vegetable value chain after intervention by AGB/2009/053.

Direct marketing by farmers to the retail sector represents a completely new approach and market for local farmers and it's showing clear economic benefits. In the Tu Nhien village, 10 of the 38 farmers have built new houses as a result of the additional income they have received from growing high-quality vegetables and direct marketing to modern retail outlets (Ms Luyen, pers. comm.).

In 2015, the 68 project farmers (71% female and 10% H'Mong) in the Moc Chau villages of Tu Nhien, Ta Niet and An Thai, produced about 420 tonnes of certified high-quality vegetables on 22ha of land (Figure 4).

Participating farmers from the Tu Nhien village in Moc Chau earned an average net income of 300 million VND ($A18,000)[2] per ha in 2015. This compares with an average

[2] *Tu Nhien cooperative data.*

net household income of 120 million VND ($A7,560) per ha for non-project vegetable farmers in the village, which is an increase of 150% in net income.

In the neighbouring project village of Van Ho, H'Mong farmers have been producing vegetables for only one season, yet they have already recorded a net income from vegetables of 116 million VND ($A7,300) per ha per year.

Alternative land uses such as growing maize or rice return a net income to the farmer of about 20 million VND ($A1260) per ha per year, only 7% of the income they could make from certified high-quality vegetables.

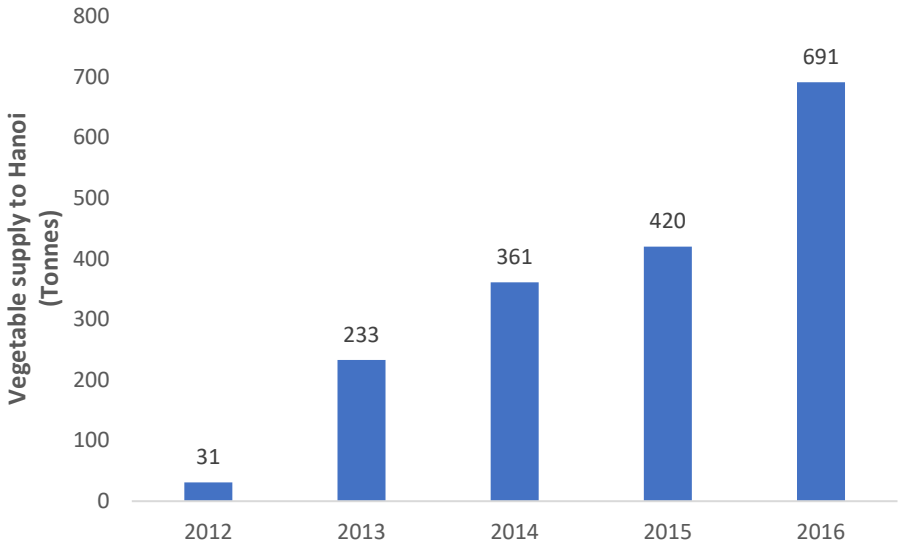


Figure 3. Vegetable supply to Hanoi from Moc Chau via project initiatives.

Some of the social benefits of the new value chain can be summarised by comments from the Tu Nhien village leader, Ms Luyen. She said:

"*Farmers who are working in the new value chain are no longer poor, they do not have to borrow money to grow their next crop*.

"Many of the farmers have been able to improve their houses, and can more easily afford to send their children to school".

Ms Luyen has been able to buy two trucks for sending high-quality vegetables from Moc Chau to Hanoi in good condition. She has also built a covered packing area and a separate crop receivals area where local farmers can bring their produce for grading and packing before it is sent to retailers such as FiviMart, Metro and BigGreen in Hanoi, on the night it arrives.

Objective 1: Analyse consumer demand and alternative marketing channels to develop smallholder-based vegetable systems capable to deliver (now and in the future) from northern Vietnam.

A consumer study was conducted in July 2012 by CASRAD, John Baker and Tan Loc with a focus on identifying consumer preferences and views of the Moc Chau region. The study is reported in the CASRAD Consumer Report

Appendix 1, and was the basis for the logo design and marketing strategy. The main findings were that consumers value quality, freshness, origin, and safe certification and that consumers associate Moc Chau with milk, hills, tea, plums and cool/climate.

Alternative marketing channels available to Moc Chau farmers were identified and analysed with a study that evaluated Metro Cash and Carry, FiviMart and BigGreen retailers in Hanoi. The study included the following traditional wholesale markets: Long Biên, Đầu Mối Phía Nam, Dịch Vọng, Ngã Tư Sở wholesale markets and two suburban wholesale markets.

A second study focused on evaluating the economic potential of the model supply chain that has been set up by the project – i.e. Moc Chau farmers to Hanoi retailers. It also included some comparisons to local markets in Moc Chau and Hanoi. The second report encompasses the first report, so the combined report is presented as Appendix 2.

Consumer reactions to vegetable production in the counter-seasonal window was evaluated with surveys, and based on the results, a logo was designed to capture the flavour of Moc Chau and with consumers in Hanoi. The logo and the brand were launched in conjunction with FiviMart in Hanoi. This event is reported in Appendix 3 and included POS materials, posters and a segment shown on television in Vietnam.

Objective 2: Optimise production and postharvest systems to supply high-quality, counter-seasonal temperate vegetables from highland North Vietnam to urban retail markets in Hanoi.

An assessment of physical resources (land, water, climate), labour, organisational and technical skills, and motivation to produce vegetables was completed by NOMAFSI and is included as Appendix 4.

Vegetable production systems and varieties of temperate vegetables were evaluated by Dr Hang and Mr Hai from HUA a report is included as Appendix 5. The study was based on a physical assessments and farmer interviews, and focused on the An Thai village (Muong Sang commune) and the Ta Niet village of the Chieng Hac commune.

Postharvest handling methods for delivering high quality, safe vegetables to market.

The approach taken in 2013 to on-farm trials was to focus on the evaluation simple management practices such as new varieties, irrigation techniques and pest control techniques. The emphasis was on grower-directed trials, which could be easily evaluated in the field and are likely to lead to practice change.

The farmers visited Da Lat in early 2013 and saw examples of simple irrigation systems, mulching, protected cropping structures, and generally advanced growing techniques. Following this trip, some of the farmers have decided to invest 50% of input costs on research to improve their production skills and reduce input costs.

Financial training was held in 2012 to support decisions on varieties, record keeping and economic effects of change.

Varietal, agronomic trials and additional with trials on protected structures have been completed for the 2012 season (in conjunction with Fresh Studio) including tomato, lettuce varieties, fertiliser, grafted tomato, substrates for seeding, pesticides and mulching tests compared to traditional ones) and achieved agreement with farmers on trial farm area and responsibilities at three targeted villages An Thai, Tu Nhien and Ta Niet, Moc Chau District, Son La.

The results of agronomic trials have been incorporated into FBS training and a report is included as Appendix 6.

Develop and test appropriate postharvest handling methods for delivering high quality, safe vegetables to market.

FAVRI undertook some postharvest storage trials of lettuce, tomato and cabbage in 2012. Temperature monitoring of vegetable consignments from Moc Chau to Hanoi was undertaken in both the 2012 and 2013 seasons.

The inconclusive results from the 2012 trials indicated that they were not well planned. The 2013 monitoring of vegetable consignments from Moc Chau to Hanoi was much better. The results from the 2013 post-harvest trials, including estimate of physical and economic losses are presented in the postharvest report, included as Appendix 7.

Coordinate the supply from three collaborating villages in Moc Chau to modern retail outlets in Hanoi and other markets.

Vegetables delivered from Moc Chau project farmers to modern retailers in Hanoi has increased dramatically during the life of the project (see Figure 3).

The area planted for vegetables by the project farmers increased from 40 Ha in 2012 to 190 Ha in 2013, an increase of 350%.

Fresh Studio in collaboration with NOMAFSI coordinated the supply of vegetables from Moc Chau to Hanoi. Fresh studio and NOMAFSI visit each farmer every two weeks. They estimated crop yields, checked crops for pest and disease or other problems, checked pesticide and agronomic records and review with the farmer. Fresh Studio produced a report each week which shows a predicted total amount of each crop available from the farmers, how much was actually harvested and how much was sent to the project channels. An overview of Moc Chau field and supply operations is included as Appendix 8.

Within each village, there was a farmer group leader who coordinates supply from individual farmers and consigns to retailers in Hanoi. Ms Luyen (Tu Nhien) bought a truck for sending vegetables to Hanoi and Ta Niet village are considering buying one.

Implement systems to improve requirements for compliance with food safety certification (e.g. VietGAP, MetroGAP).

In 2012 Fresh Studio, NOMAFSI and HUA initiated and supported a quality assurance system with farmers and suppliers in Moc Chau under the broader Safe Vegetable Certification scheme (DARD). This is not the same as MetroGAP, but similar, and broadened the relevance of the project.

As a result, the project team obtained safe vegetable certification from DARD, Son La for farmers from the Tu Nhien, Ta Niet and An Thai villages. In addition, approximately 10 individual farmers in Tu Nhien and Ta Niet villages also have VietGAP accreditation.

Training, accreditation and ongoing compliance support is a major task of the project and currently paid for out of project funds.

Facilitate the implementation of FBS training activities in three villages for three supply seasons.

NOMAFSI played a key role in the coordination and management of FBS training. The FBS training activities were focussed on farms and in the Moc Chau region. Various participants delivered training including: Fresh Studio, DARD (Son La), NOMAFSI, HUA, CIRAD, FAVRI and Australian team members. FBS Training Activities Undertaken in Moc Chau are included as Appendix 9.

Objective 3: Implement and analyse the Farmer Business School approach as a means of enabling smallholder farmers to build knowledge and improve decision-making based on market and supply chain information.

Assess current Farmer Business Schools, and similar, being used in other ACIAR and donor projects.

A report was completed in late 2011 that provided a conceptual overview of FBS, an account of other comparable extension methods used in Vietnam and an interpretation of FBS, as it will apply in this current project. A review of the FBS is included as Appendix 10.

Complete farm-level economic analysis and benchmarking of smallholders in three project villages to facilitate the uptake of techniques and strategies emerging from other project activities.

Benchmarking reports were completed based upon an original survey of three villages, An Thai, Ta Niet and Tu Nhien and are included as Appendix 11 and Appendix 12.

In conjunction with Activity 1.2, assess the profitability of smallholder involvement in different marketing channels (global retailers, modern local retailers, specialised/niche retailers, food service and traditional markets).

Fresh studio presented an analysis of farm yields, input costs and returns by crop and back to the farmers each season. This was presented in a group meeting, and farmers also received an individual written analysis of how each crop has performed, and this was benchmarked against the overall farmer group. These presentations were highly informative, and provided the farmers with information they could use to make sound business decisions on crop choice and management. These analyses formed the basis for the FBS training.

An assessment of farm level profitability was carried out by HUA using data collected by the project team during the 2012 and 2013 seasons. A detailed economic analysis has been completed and is included as Appendix 13.

CASRAD produced an assessment of value chain level profitability of alternative marketing channels and this is presented in their report as Appendix 14.

Complete a cost–benefit analysis of smallholder involvement in certification systems (including food safety systems) and make suggestions for improving this ratio.

HUA undertook a study and reported on the costs and benefits of certification, with recommendations on how to improve the ratio, which is included as Appendix 15.

Develop farm financial management systems to integrate with FBS approaches.

Data recording sheets were developed to encompass a stronger focus on financial data than originally envisaged by Fresh Studio.

Data processing software (MonQi) was also adapted to process this information in such a way as to be fully integrated with the technical data.

Develop approach and supporting materials to deliver FBSs to support development of temperate vegetable sector in northern Vietnam.

Some supporting FBS materials relating to crop choice and management, as well as marketing, were developed and presented to farmers in the form of FBS.

Objective 4: Contribute to an enabling regional policy environment for counter-seasonal temperate vegetable production in the northwest highland region.

Benchmark current regional policy settings and evaluate the extent of the vegetable production sector.

The review of present policies was completed with documents from Province district and communes. A survey on the state and prospects for vegetable production was conducted in all the Moc Chau district's 29 communes with commune leaders, the most vegetable-oriented villages and vegetable traders. Data was processed in Excel table and is included as Appendix 16.

Undertake a constraints analysis to identify key regional policy issues affecting the development of an counter-seasonal vegetable production industry in the Northwest highland region.

Several studies were undertaken in relation to identifying constraints to the development of Moc Chau region.

These were:

1. Survey of agricultural inputs available in the Moc Chau region.
2. Trip to Da Lat so that farmers could see what needed to be done.
3. Identification of the need for a local group which includes farmers to take ownership and direct development of the region as a key temperate vegetable producing region.

A Report on Agricultural Inputs in the Moc Chau District is included as Appendix 17.

Develop (and move to implement, where possible) a regional policy strategy that will alleviate the problems identified in Activity 4.2 and that also will assist in replicating successful outcomes from this project. Integrated land, crop and value chain management.

The main focus in relation to this activity was to help facilitate ownership of the project logo and trademark.

A certification trademark was registered and is owned and administered by the Moc Chau People Committee. The trademark issue and the associated administrative structure is critical to the long-term sustainability of Moc Chau supplying safe, fresh vegetables to retailers in Hanoi.

Image 4: Project staff and farmers promoting Moc Chou safe vegetables

7 Impacts

7.1 Scientific impacts – now and in 5 years

Most agricultural research in Vietnam has concentrated on the lowlands, and the increasing interest in market-based approaches to agricultural development has followed suit. As a result, significant knowledge gaps remain in relation to agricultural production and marketing systems in highland areas, with a culturally diverse make-up of communities complicating dissemination of research outputs. Research integrating production and marketing aspects has not been done on a significant scale. This project will be significant in its contribution to the development of innovative approaches to improve high-value production systems, management practices and market engagement for rural families in highland communities that have the potential to benefit from improved connection to markets in Vietnam.

The project will result in an improved understanding of the principles that impede and support the smallholder's ability to engage with markets, particularly those that are rapidly transforming. This will be achieved in the context of the smallholder engaging with the private sector and the effect of Vietnam's commune structures. Importantly, we will gain insight to supply chain communication that involves commune structures, the private sector and modern retailers. The project team will collect new information on the effectiveness of FBSs in providing the necessary farming and business skills for production of safe, high-quality vegetables, and on the contribution of current and market-linked GAP vegetable crops to the average household income in the north-west highlands.

With strong interest from the Government of Vietnam to improve both adoption of food safety systems and market engagement of those smallholders who are disconnected from markets, the project's outputs will most likely be incorporated into future government-based activities. This likelihood will increase through the delivery of Objective 4, which will provide an understanding of how regional development can use the outcomes of project activities in broader regional development.

Many donor programs in Vietnam have benefited from the successful implementation of FFSs, and are often looking for novel communication mechanisms to reach smallholders and support better market engagement. We have liaised with both ADDA (a Danish NGO at the forefront of FFS that is seeking new models of communication) and IFAD (which is looking at the 2012–2015 investment cycle and showed interest in using the FBS approach).

For Vietnam, this project represents a new and practical approach. It is market-led (with direct involvement of the private sector) on one side, farmer-driven on the other side, and between those two sits a diverse range of Vietnamese institutions, representing various scientific disciplines, working well together.

To date, the main scientific and communication outputs have been:

1. Sautier D, Nguyen TTL, 2014. Strengthening an Emergent Horticulture Cluster in Vietnam: Interest Group and Certification Trademark. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, oral).
2. Nguyen, Phi Hung, 2014. Obtaining and Maintaining Certifications for Safe Vegetables in Vietnam. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, oral).
3. Pham, Thi My, 2014, Vietnamese Good Agricultural Practices (VietGAP) For Vegetable, Fruit And Tea. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, poster).

4. Nguyen, Phi Hung, 2014. Results of Testing Different Cabbage Varieties in Off-Season (Summer) in Moc Chau, Son La Vietnam. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, poster).
5. Ma, Hoang Thi Tuyet (2014) influence of temperature and package materials on loss of fresh vegetables||during transport. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, poster).

7.2 Capacity impacts – now and in 5 years

The Vietnamese project partners have a high capacity to achieve relevant project outcomes, as demonstrated through their involvement and success in both ACIAR, national and international projects. However, despite institutional linkages within the Ministry of Agricultural and Rural Development (MARD), organisations typically work on projects in isolation. A significant gap exists between scientific outputs and community impact (described below), a result of the limited capacity of organisations to convert scientific impact into economic, social or environmental outcomes.

As such, a significant focus of the capacity building within this project relates to drawing together different Vietnamese organisations and fostering collaboration to increase the effectiveness of current and future research work. We also expect this project to support the development of organisational and individual capacity to transform scientific outputs into market-relevant impacts.

Through this project, we will increase the diagnostic skills of staff to support the development and implementation of food safety and market engagement guidelines. The project will involve MALICA members (CASRAD, CIRAD and FAVRI) in delivering objectives related to assessments of consumer demand and implications at a regional level. The Hanoi Agricultural University will play a key role in the development and implementation of FBS and NOMAFSI will coordinate activities at a regional level, while building its technical skills in crop agronomy, postharvest science and experimentation. Within communes and production groups, the project will improve the capacity to manage production that facilitates the consistent supply of quality vegetables to modern retailers.

Our project partners will become more adept at delivering more market-orientated activities, and continue to use these skills after the project concludes. This market-oriented approach will primarily be delivered through the FBS, where evaluation will gauge their ability to influence communities.

The vegetable industry in Vietnam will be able to effectively produce clean vegetables in the north-west region, and regional communes will be able to communicate and trade effectively with international retail chain stores.

More than 20 training activities have been undertaken since the last report, and these are detailed in the training section of this report.

Regional level: The *Rau An Toan Moc Chau* certification trademark was approved by NOIP in March 2016 and is owned by the Moc Chau Peoples Committee. This was a major achievement for the project and critical for scaling up and out.

Farmer skills: An additional 21 farmers have been included as project farmers and trained, included 19 from Van Ho (new village). They have all received VietGAP standard training by DARD, Son La, Fresh Studio and NOMAFSI staff. Farmers have also received training in agronomic and pest management skills, and have received one-on-one guidance from Fresh Studio and NOMAFSI field staff in the form of field visits every fortnight. The farmers have had the benefit of on-farm trials (varieties, nutrition, mulches, protected cropping, fertiliser management) and the results of these have been presented back to the farmers by field days and group meetings.

The farmers in Van Ho (new group) also joined two cross visits to other farming regions (in Ha Noi and in Tu Nhien) to better understand the vegetable industry in those regions.

The capacity of Vietnamese institution staff: Staff from the market teams, CASRAD, FAVRI and Fresh Studio have had opportunities to work with modern retailers in Hanoi. This enhances their capacity by giving them a more practical appreciation of private sector realities. Further, staff from CASRAD have been trained in relation to logo implementation and testing by John Baker, Australia.

Research Training: Mr Nguyen, Phi Hung is undertaking his PhD program at the University of Sydney.

7.3 Community impacts – now and in 5 years

7.3.1 Economic impacts

The vegetable sector is expanding rapidly in Vietnam. The production area increased from 426,000ha in 2000 to the current level of 772,000ha, producing 11.4 million t valued at more than US$1 billion and accounting for 9% of agricultural GDP. In the northern provinces, 5.8 million tonnes of vegetables are currently produced on 390,000ha (nearly half of total production). In the north-west uplands, 0.85 million t are produced, worth US$70 million annually.

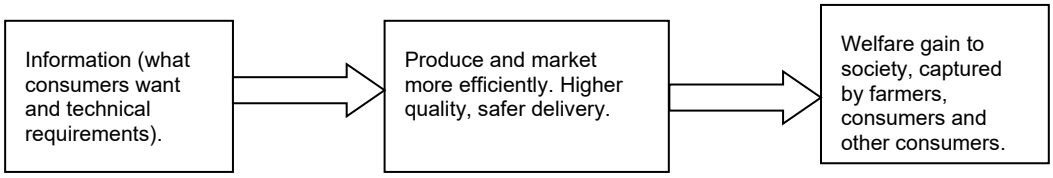
A recent study (Mergenthaler et al. 2008) estimated and extrapolated large increases in the quantities of vegetables to be purchased via this sector, both in per capita and percentage market share terms. It concluded that Vietnam is undergoing a rapid economic development, and that high-value supply chains will rapidly gain market share at the expense of more traditional subsectors. It estimated that by 2015, 30% of fresh vegetables would be sold via the modern retail sector.

A recently completed CARD project (Rogers et al. 2010) showed that improved vegetable quality and the implementation of food safety systems allowing vegetables to meet supermarket standards can be achieved at minimal additional cost of production, paying a 40% price premium to farmers. If we restrict our focus to the north-west uplands, 30% (to supermarkets) of US$70 million (value of production) could potentially be achieved by the project over the next 5+ years, yielding net gains of 40% in additional value per unit of production. This represents a potential annual gain of US$8.4 million per year (i.e. 70 x 0.3 x 0.4).

While benefits take some time to eventuate, they should commence within the life of the project, and could extend to other crops (e.g. fruit) and other regions.

The price elasticity of fresh vegetables in Vietnam has been calculated at 0.5 in a number of studies. This means that the benefits of any research efficiency gains will be shared between farmers and consumers. Income elasticity has been calculated at 0.7, indicating that as consumer incomes increase, demand will be significantly higher. In fact, this increase in demand is evident from official time series production and consumption statistics. Overall, there is no sign of price decreases in response the rapid increases in production over the last two decades. This conclusion is based upon an analysis undertaken by an international market development organisation (Fresh Studio Asia), using its own primary data (official price series data on fresh vegetables is unavailable).

A simplified economic impact pathway can be summarised thus:



The project has demonstrated the significant economic potential and income benefits to farmer households from the development of a new value chain for safe vegetables.

In 2015, the 68 project farmers (71% female and 10% H'Mong) in the Moc Chau villages of Tu Nhien, Ta Niet and An Thai, produced about 420 tonnes of certified-safe vegetables on 22 ha of land. The annual figure has risen consistently (Figure 4) and can be reasonably expected to continue rising in similar fashion in future years even from the existing sites.

Participating farmers from the Tu Nhien village in Moc Chau earned an average net income of ***300 million VND ($A18,000)***[3] ***per ha in 2015***. This compares with an average net household income of 120 million VND ($A7,560) per ha for non-project vegetable farmers in the village, which is an increase of 150% in net income.

In the new project village of Van Ho, H'Mong farmers have been producing vegetables for only one season, yet they have already recorded a net income from vegetables of 116 million VND ($A7,300) per ha per year.

Alternative land uses such as growing maize or rice return a net income to the farmer of about 20 million VND ($A1260) per ha per year, only 7% of the income they could make from accredited-safe vegetables.

To put this in perspective, the average annual net household income measured by the HUA baseline data on study sites at the project start ranged from 11.6 million VND ($695), for the Tu Nhien village to 8.4 million VND ($503) for the An Thai village, with an average farm size of 1092 m^2 across the villages studied.

This means that adopting the new safe vegetable value chain would potentially increase the average farmer household income to about 32.8 million VND ($1965), ***an increase in average farm income of 290%!***

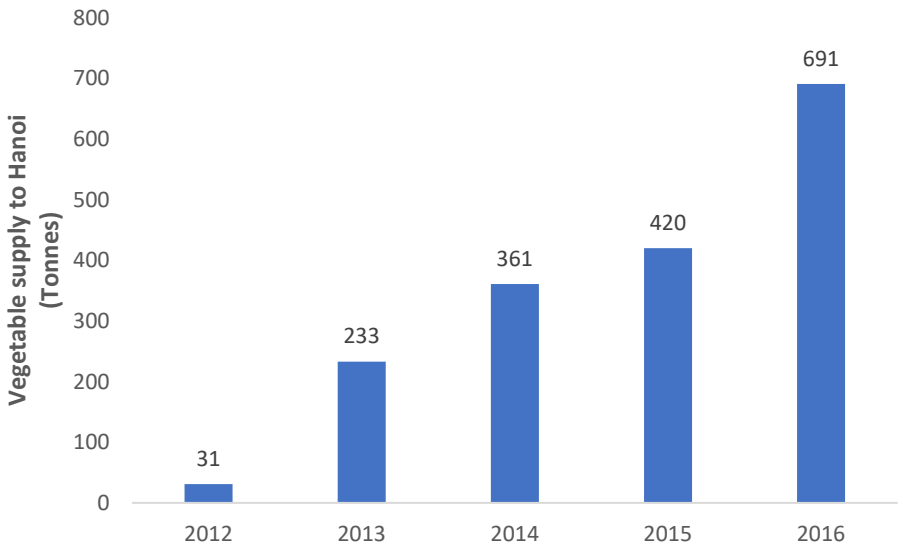


Figure 4. Safe vegetable supply to Hanoi from Moc Chau via project initiatives.

The added value occurs with other value chain participants as well. The total value chain benefits, measured in a CASRAD value chain study (Appendix 1) 45% flow to the farmers

[3] *Tu Nhien cooperative data.*

and the remaining 55% spread among other members, but primarily the retailers. While there is a positive farm price and quality differential in favour of supply to Hanoi, economic benefits also come from additional production, prompted to a considerable degree by farmers' knowledge that a guaranteed market outlet exists for their products.

The preference for farmers to sell to Hanoi markets is striking, and is manifest in the dramatic increase in delivered volumes from Moc Chau to Hanoi: 31 tons in 2012; 233 tons in 2013; 360 tons in 2014; 420 tons in 2015. At this stage of the market chain development, approximately 50% of project-farmers' product is sold via Hanoi. Thus further scope to increase supply to Hanoi exists, even from within the current project farmer group. The potential from outside this group is still largely untapped.

7.3.2 Social impacts

The northern region of Vietnam has significant populations of ethnic minorities. These ethnic minorities have been disadvantaged through limited opportunities to engage in transforming markets. In most, if not all, cases, the ethnic minorities are smallholder farmers with limited access to additional assets. The project will develop approaches that improve the livelihood of these smallholders to redress the disadvantage they experience as a consequence of their geographic isolation and other barriers such as language (particularly for ethnic minority groups).

The ethnic mix of communities in which we are planning to work is diverse. The Van Ho commune in order of predominance is: H'mong, Muong, and some Dao and King people. The Chien Hac commune is mainly Kinh and the Muong Sang commune is a mix of Muong and Kinh people. There is a fourth option on the Chieng Di Village of Moc Chau Town farm, which is mainly ethnic Thai people.

Women play a major role in all aspects of vegetable production and marketing in Vietnam at many levels, and as such the project team will remain aware of this and take into account any likely impacts on women expressed or implied that may flow as part of changes to work or social networks that may emerge as a consequence of the project operations. In particular, the project leader will consult with project staff from AGB/2006/112 in this regard.

As infrastructure development provides access to these groups, they are exposed to market influences and are liable to exploitation or disadvantage through inexperience and lack of information. By working together with each level of government, the project will seek to improve the delivery of government services to disadvantaged communities and to foster their capacity for engaging with government and business networks.

Additional social impacts will be achieved through improved nutritional and food safety benefits by making vegetables available in key consumption markets and production zones. AVRDC has determined that vegetables are the cheapest source of human nutrients (all except niacin) in northern Vietnam.

It is also likely that there will be farmer health benefits through reduced pesticide use in the development of food safety systems, which in general reduce pesticide use and require improved applicator safety.

Some of the social benefits of the new value chain can be summarised in comments from the Tu Nhien village leader, Ms Luyen. She said: "*Farmers who are working in the new value chain are no longer poor, they do not have to borrow money to grow their next crop. Many of the farmers have been able to improve their houses, and can more easily afford to send their children to school*".

In the Tu Nhien village, 10 of the 38 farmers have built new houses as a result of the additional income they have received from growing safe vegetables and direct marketing to modern retail outlets (Ms Luyen, pers. comm.).

Ms Luyen has been able to buy two trucks for sending high-quality vegetables from Moc Chau to Hanoi in good condition. She has also built a covered packing area and a separate crop receivals area where local farmers can bring their produce for grading and packing before it is sent to retailers such as FiviMart, Metro and BigGreen in Hanoi, on the night it arrives. Other villages in the project have observed similar impacts. The Ta Niet village have bought a truck and have leased new land to expand operations. The An Thai village has formed a cooperative.

Training: A total of 85 farmers (60% female) have been trained in agronomy, accredited as safe vegetable producers. They are now suppling safe vegetables to Hanoi**.**

New value chain: The project has achieved a breakthrough in facilitating a new value chain for safe vegetables produced in the Moc Chau region of northwest Vietnam to modern retail markets in Hanoi. Before the project, all vegetable marketing from Moc Chau was either to the local markets or to Hanoi via traders, and unsafe production techniques were widely practiced (Figure 5).

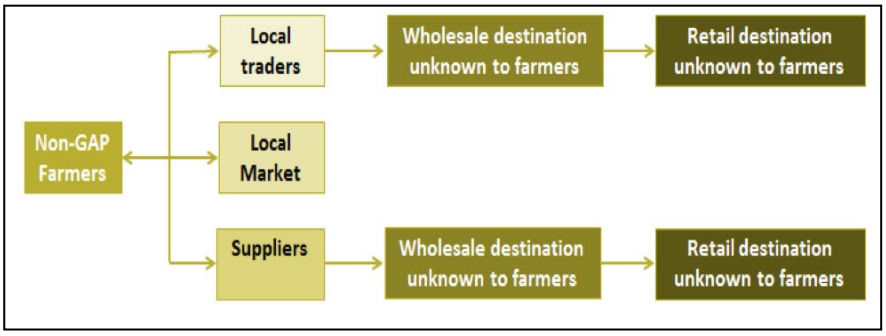


Figure 5. Moc Chau vegetable value chain before intervention by the project.

The new value chain, involving three villages in Moc Chau and one village in Van Ho has established effective direct trading relations and two-way communication between the farmer groups with supermarkets and traders, specialty safe vegetable stores in Hanoi (**Figure 6**).

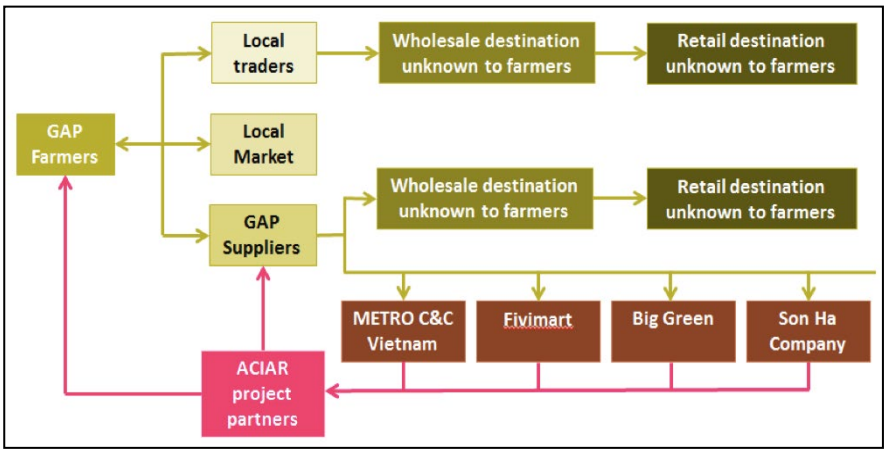


Figure 6. Moc Chau vegetable value chain after intervention by the project.

Vietnamese farmers and organisations are taking more responsibility, but a fully self-funding model which is both fair and sustainable, requires further development, to facilitate scaling within the existing provincial planning and operational framework.

The project established a 4th village site at Van Ho, which has a strong ethnic minority population, mainly H'Mong. This site is now functioning, farmers (all H'Mong) have received training and are supplying vegetables to the local market. They have received safe certification and operating as a cooperative.

There is strong institutional support for the project with Moc Chau people committee and the Van Ho people committee. The District authorities and village leaders have been supporting to farmers by investing up to 50% of the input costs in some demonstration plots. The Tu Nhien village and the Dong sang commune are also both supporting farmer groups to have community land for demonstration vegetable farms. The aim is to attract more farmers to produce safe vegetables.

7.3.3 Environmental impacts

The adoption of Good Agricultural Practices (GAP) farming methods such as Integrated Pest Management (IPM) and the use of disease-resistant varieties will replace or prevent the introduction of injudicious use of agro-chemicals, contributing to long-term environmental sustainability. The improvement of the farming systems, in particular soil management, will create significant benefit to off-site ecosystems. Soil and fertiliser management practices will be optimised and this will minimise nutrient runoff into waterways and maximise the crop utilisation of applied nutrients. Practices which make use of organic nutrient sources and incorporation of crop residues back into the soil will be encouraged, resulting in improved soil physical and chemical properties, and encourage the build-up of soil organic matter.

Consideration will be given to potential impacts of applied fertiliser, especially manures to fate of these, e.g. Potential pollution of waterways during the rainy season. Steps will be taken to minimize any adverse environmental effects in this regard.

Reduced pesticide use and residues in food.

The result of the above activities is that consumers buying vegetables produced under the project have eaten 1230 tonnes of vegetables which they can be assured, do not contain harmful pesticide residues.

A total of 85 farmers have been trained and accredited as safe vegetable producers under the Vietnamese DARD-administered program. This system requires farmers to use only approved pesticides, follow withholding periods and that vegetables produced under the system are able to be traced back to growers. The farmers must keep detailed records of each crop including planting, harvest dates, pesticides and fertilisers applied. These records are checked every fortnight by project staff.

Protected cropping structures: The project is advising farmers about low-cost protected cropping structures (simple and easy to build with available local materials) in the region. These structures contribute to an ability to adapt to climate change which is likely to increase the duration and intensity of rainfall in the region.

Reduced microbial contamination of biogas in An Thai: The use of contaminated water is prohibited under the safe vegetable and VietGAP guidelines. Therefore, An Thai farmers have adopted composting techniques to reduce microbial contamination of animal manure and allow this to be used on vegetable crops.

Reduced fertiliser use: Under safe vegetable and VietGAP guidelines, farmers have been made aware of, and have reduced, reducing high rates of nitrogen on crops, which can result in the accumulation of toxic nitrosamines in vegetables.

7.4 Communication and dissemination activities

The key driver for adoption – and the reason the systems set up during the project will perpetuate beyond the life of the project – is the establishment of a new market in Hanoi for counter-seasonal vegetables produced during summer from the north-west highland region of Vietnam.

Initially, the retail partner, Metro Cash and Carry, will offer a premium price above local market prices and a guaranteed quantity in return for farmers producing the required quality and quantity of safe, GAP-compliant vegetables delivered to Hanoi markets that meet the crop specification. In the medium to long term, and if farmers are successful with this model, other farmer groups will be encouraged to adopt the clustering approach and to deal with modern markets in the North of Vietnam. Other modern retailers and traders, not just Metro Cash and Carry, will want to deal with farmers in the Moc Chau region for a supply of good quality summer vegetables.

The information generated by this project will primarily be used to assist the integration of smallholder farmers into the rapidly expanding world of modern retail marketing of vegetables in Vietnam.

At the farm level, information on production and crop handling techniques, financial planning, business management and marketing generated from within the project and generally will be delivered to farmers using the FBS model. This will deliver results to famers in an accessible way. A useful activity would be the production of a video in Vietnamese to illustrate the effects of this project and possibly AGB/2008/002 and AGB2006/112 on ethnic minority groups and women in the northwest highland regions.

The ACIAR agribusiness program is developing a new communication and dissemination strategy that is being referred to as a FBS. The development is occurring in a number of projects in Indonesia (AGB/2006/115), Vietnam (AGB/2008/002 and AGB/2006/112) and the Pacific (PC/2008/044).

The communication and dissemination strategy is based upon the use and development of FFSs, but seeks to build and expand this model into what could be described as an FBS. Historically, FFSs are based on improved on-farm management with farmers engaged in a participatory manner, involving them in the decision-making process. This on-farm focus is beneficial, but it neglects critical aspects of livelihood improvement with limited connectivity to markets and an inability to resolve constraints that limit this market connection. As such, the strategy for this project is to transform the FFS model into an FBS by incorporating aspects and activities that relate to enterprise choice, better market engagement and a through-chain participatory approach to solving constraints that limit the flow of product and information throughout the supply chain.

Other agencies involved are Hanoi Agricultural University, which is helping to coordinate the FBS activities, and local agricultural officers from relevant organisations, such as DARD, that will be involved from the beginning, especially in communication activities and delivery of some aspects of the FBS. This will assist in the continuation of activities once funding for the project concludes.

The final research output of the communication and dissemination activities will be a tested and refined model of an FBS that has been implemented to improve the production and marketing of vegetables for modern retailers.

The following communication activities have been undertaken by the project team since the last report:

- 5 scientific papers presented at IHC201
- *Moc Chau safe vegetables' for the common interest of farmers, suppliers, retailers and consumers*.(2014) By Nguyen Thi Quynh Chang, Bui Thi Hang, Bui Van Tung, Le Khai Hoan and Pham Thi Sen. (ACIAR Newsletter, December 2014).
- *Trade not aid* Partners magazine, Issue 1 (2015) p12-13.

8 Conclusions and recommendations

8.1 Conclusions

In 2016, the 68 project farmers (71% female and 10% H'Mong) in the Moc Chau villages of Tu Nhien, Ta Niet and An Thai, produced about 691 tonnes of certified high-quality vegetables on 22 ha of land (Figure 4).

Participating farmers from the Tu Nhien village in Moc Chau earned an average net income of 300 million VND ($A18,000)[4] per ha in 2015. This compares with an average net household income of 120 million VND ($A7,560) per ha for non-project vegetable farmers in the village, which is an increase of 150% in net income.

In the neighbouring project village of Van Ho, H'Mong farmers have been producing vegetables for only one season, yet they have already recorded a net income from vegetables of 116 million VND ($A7,300) per ha per year.

[4] *Tu Nhien cooperative data.*

8.2 Recommendations

A follow-on project AGB/2014/035 has been commissioned and is focused on the sustainable scaling up the successful safe vegetable business model to more villages in the Moc Chou region.

Further detailed recommendations for the follow-on are project are:

1. It is suggested the project to support some incentive allowance for the extension workers initially or allocate some budget for extension activities (e.g. training) to provide incentives for them to involved in the project. The activities organised by the extension system at district and commune levels would also enhace their capacities.
2. It is suggested the project should make a participatory plan with the districts on project activities and the project should clearly inform the districts/ farmer groups what activities it will financially support in the subsequent year. This helps the districts as well as farmers themselves to allocate their budget for the activity implementation.
3. It is suggested the project should make a quarterly plan/ monthly plan and share with the districts and involved partners for their coordination and commitment of human resources and budgets.
4. More opportunities should be given to NOMAFSI staff in coaching and training farmers and extension workers in group governance and group development.

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9.2 List of publications produced by project

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2. Nguyen, Phi Hung, 2014. Obtaining and Maintaining Certifications for Safe Vegetables in Vietnam. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, oral).

3. Pham, Thi My, 2014, Vietnamese Good Agricultural Practices (VietGAP) For Vegetable, Fruit And Tea. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, poster).

4. Nguyen, Phi Hung, 2014. Results of Testing Different Cabbage Varieties in Off-Season (Summer) in Moc Chau, Son La Vietnam. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, poster).

5. Ma, Hoang Thi Tuyet (2014) influence of temperature and package materials on loss of fresh vegetables||during transport. IHC2014 International Horticulture congress, Brisbane August 2014 (Accepted, poster).

6. Moc Chau vegetables gaining stronger foothold in Hanoi market (ACIAR article)

10 Appendixes

Appendix 1: CASRAD Consumer Report

Appendix 2: CASRAD Value Chain Report

Appendix 3: CASRAD Promotional Activities

Appendix 4: Moc Chau physical resources NOMAFSI

Appendix 5: Moc Chau Vegetable Skills Study HUA

Appendix 6: Moc Chau farmer trial report 2013

Appendix 7: Postharvest Trial Report 2013

Appendix 8: Overview of Moc Chau Field and Supply Operations

Appendix 9: FBS Training Activities Undertaken in Moc Chau

Appendix 10: Farmer business school review paper

Appendix 11: Baseline economic studies – Ta Niet and An Thai

Appendix 12: Baseline economic studies – Tu Nhien

Appendix 13: CASRAD Value Chain Report

Appendix 14: HUA 2012 Economic analysis

Appendix 15: HUA report on the costs of certification

Appendix 16: Moc Chau Regional Survey Policy settings

Appendix 17: Report on Agricultural Inputs in the Moc Chau District

All appendices are available to download at this link:
https://www.dropbox.com/sh/vtmofo3nm0xhcar/AADqxo0H8H-19U4Cu68MOLK_a?dl=0