



Australian Government

Australian Centre for
International Agricultural Research

Improved market engagement for sustainable upland production systems in the North West Highlands of Vietnam: Value Chain component

Laurie Bonney, Oleg Nicetic, Ray Collins,

Dao The Anh, Le Quoc Anh, Hoang Thanh Tung



Contents

1	Methodology	3
1.1	Temperate fruit and complementary crops	3
2	Key results and discussion	12
2.1	The participating villages	12
2.2	Characteristics of the Mộc Châu plum production and markets	13
2.3	Consumer value attributes of Tam Hoa Plums	14
2.4	The dynamics of selling green plums or ripe plums.....	16
2.5	Mapping Mộc Châu's Tam Hoa Plum value chains	18
2.6	Value chain interventions	23
2.7	The Hi-Q plum chain performance 2011-13	25
2.8	Other potential complementary crops for the maize rotation	29
2.9	Scaling out the value chain interventions	32
2.10	Discussion.....	33
3	Conclusions and recommendations	35
3.1	Conclusions.....	35
3.2	Recommendations	35
4	References	37
4.1	References cited in report.....	37
4.2	List of publications produced by project.....	38

1 Methodology

The research design was both structured and adaptive to the emerging research questions and findings. Some aspects that are components of a broad research method (e.g. consumer sensory evaluation as a part of value chain analysis) were undertaken at a point in time whilst others, consistent with Participative Action Research (Heron & Reason, 2001) were on-going as part of a cycle of learning, reflection and improvement. Therefore, some components of the following methodology occurred throughout the project.

1.1 Temperate fruit and complementary crops

The project was launched in May 2009 at the Inception Workshop, which aimed to obtain consensus on the project design by all project partners, building capacity for participatory, inter-institutional collaborative research, establishing field study teams and work plans, and formulating criteria and guidelines for project site selection. The methods employed to achieve each objective and sub-objective (**bolded**) will be outlined in the following sections using the structure of the original activities proposed (*italicised*).

Objective 1: Establish an understanding of constraints in maize and temperate fruit based farming systems that limit smallholder engagement in profitable markets and identify opportunities to overcome these constraints.

1.1 Profiling of market mechanisms, constraints and opportunities for more profitable farming systems for smallholders.

1.1.1 A review of market based projects was conducted between May and August 2009 to understand analytical capability and examine existing market knowledge approaches to change. Previous ACIAR projects within the region were also reviewed to assess market connection and constraints to improved market engagement (Annual Report Appendix 2).

1.1.3 – 1.1.5 Training workshops

Between April and September 2009, two training workshops were held for project staff:

- Value Chain Management Principles and Practices Workshop (Activity 1.1.3, May 2009)
- Training workshop for Rapid Value Chain Appraisal (Activity 1.1.5, September 2009) which linked into an Innovation Workshop to develop the methodology for the diagnostic studies.

Both workshops included provincial and district managers and extension agents. Outputs from these training activities included the RVCA Workbook (Appendix 1) and later the development of a conference style paper titled “Guidelines for value chain development and linking farmers to markets in the uplands of Vietnam” (Russell et al., 2010).

1.1.6 Rapid Value Chain Appraisal (RVCA)

Between September 2009 and December 2009, RVCAs (Collins & Dunne, 2008) were conducted in Mộc Châu district of the Son La Province using a modified form of M4P (2008) and interviewed 20 producers from Pieng Sang village, Phieng Luong commune, Mộc Châu district and ten village collectors working in Mộc Châu (Annual Report 2009, Appendix 4).

Objective 2: Develop improved farm and value chain management practices to optimise sustainability and profitability in smallholder maize and fruit based farming systems.

2.1 Identification and prioritisation of market opportunities for improved smallholder profitability with associated market information requirements.

China Plum Market Scoping Study (May 2010)

The RVCA identified that China frequently provides a large market outlet for green Tam Hoa Plums. In order to understand the dynamics of that market, from 7-12th May 2010, two CASRAD project team members and one UQ representative who was Chinese travelled to China to investigate the market for Vietnamese plums. Two days were spent in Pingxiang, located in western Jiangxi Province, PRC, to interview plum traders at a wholesale market close to the border between Vietnam and China (25km). This was followed by two days in Nanning, the capital of the Guangxi Zhuang Autonomous Region in Southern China, to visit the wholesale market and supermarkets.

Prior to visiting Pingxiang, an interview guide for wholesalers was prepared and a CASRAD staff member firstly interviewed a Vietnamese trader in Lang Son city who provided details of Chinese importers who could be contacted in Pingxiang. Nine plum traders were interviewed in Pingxiang and three wholesalers in Nanning. Interviews were mainly conducted by the UQ representative who is fluent in Chinese, or in Vietnamese by the CASRAD project team members with those traders who could speak Vietnamese. While the interviews were recorded, transcriptions from these recordings were not made and therefore no raw data from this research activity has been made available in English to the project team. However, a trip report of key findings was written by the CASRAD staff members and is provided in the 2010 Annual Report (Appendix 3).

Supermarket Observation Visits and Interviews (Ha Noi, May/June 2010, 2011, 2012 and 2013)

Big C and Metro are currently the largest supermarket chains operating in Ha Noi. A semi-structured interview guide (checklist) was prepared prior to conducting the interviews. Observation visits were made on May 21st, 2010 to the Big C and Metro stores to physically assess the quality of the plums being sold and observe consumer purchasing behaviour prior to interviewing category managers. Interviews were conducted with the fresh produce Quality Manager from Big C and the Category Manager for fresh produce in Northern Vietnam for Metro on 4th June, and 18th June, 2010 respectively.

In subsequent years, in the May/June plum seasons of 2011, 2012 and 2013, the research team identified temperate fruits that competed with plums and monitored their prices to determine the potential for substitution.

Long Bien Market, Wholesale and Wet Market Interviews (June/July, 2010)

In June the project team conducted interviews with fruit wholesalers operating out of the Long Bien wholesale market in Ha Noi, as well as with a Company Director of the speciality fruit wholesaler Dong Nam Viet Company (Donavi), Mrs Hoang, in Cau Giay District.

In subsequent years, in the May/June plum seasons of 2011, 2012 and 2013, the research team monitored volumes, quality and prices within Ha Noi wholesalers, wet markets and street vendors.

2.1.1 Identification and validation of product range with market potential

Speciality Fruit Retailer Interviews (Hanoi, June/July, 2010)

Initial interviews were conducted with speciality fruit (shop) retailers by the Australian team and CASRAD staff members in early June 2010, with additional follow-up interviews conducted by CASRAD in June/July. The first set of preliminary interviews was conducted

with speciality fruit retailers located opposite the Long Bien wholesale market and street vendors. Discussions focused on the profile of clientele, plum varieties, seasonality, provenance, quality perceptions, packaging, sales volumes and price.

A Rapid Plum Quality Evaluation (14th May 2010)

The event was held in Ha Noi employing focus group discussions and a sensory evaluation of Mộc Châu plums. This compared consumer preferences in regard to the origin of plums and to rank plum attributes: sweetness, firmness, colour and size according to consumer preferences. The data provided broad guidance of the nature of consumer demand to identify where value was created during the in-depth value chain analysis.

Plum Consumer Survey (July 2010)

A consumer survey with both closed and open-ended questions was developed which incorporated information from previous research activities such as focus group discussions during the *Rapid Plum Quality Evaluation* and interviews with value chain actors. In addition to the survey of 90 shopper respondents in collaborating stores from a range of demographics, follow-up phone interviews were undertaken with survey respondents in order to collect some additional qualitative information.

Shoppers were randomly approached and ninety participated in the survey. The respondents were mainly women as previous research had shown that they were the main purchasers of plums. A post hoc bias check was conducted by broadly segmenting according to age and socio-economic class based on the residential locality of the store (Summary Report of Findings from Plum Value Chain Activities 2010).

Unfortunately, due to late planning and a turn-over of staff both within CASRAD and the Australian project team, implementation of some of these activities was not as timely as it could have been. Because the Tam Hoa plum marketing season is short (6-8 weeks from April to early June) only one-round of research activities was undertaken with each set of value chain actors towards the end of the season or after the season had already ended. In addition, no observation of fruit quality, prices or consumer buying behaviour could be done to support the interview and survey data. This necessitated the use of photos to aid varietal and quality identification.

Pumpkin RVCA (July-December 2011)

Due to the emerging problems with establishing high quality plum value chains, the scope of the investigation was broadened to include other complementary crops such as pumpkins, soybeans, rice beans and mung beans.

The current state of the pumpkin chain was investigated using the RVCA method between July-December, 2011. Semi- structured questionnaires were used to interview farmers, wholesalers, retailers, processing company, plus the local DARDs. In addition, some market observations were undertaken: wholesale markets, retail markets and pumpkin processing companies.

This focused on identifying the seasonal calendar for Pumpkin, the main pumpkin production areas, the quality standards for the fresh and processing markets, the prices, and the type and frequency of information provided to suppliers.

The 2011 pumpkin research activities have been reported in (Annual Report 2011, Appendix 5b)

Complementary Crops Market Potential Analysis (March-August 2012)

A number of crops appeared to have potential for either providing profitable crops that complemented maize in the upland cropping system by assisting in crop rotations or reducing soil erosion or supplemented smallholder family incomes. These were pumpkin, rice bean, soybean and mung bean. Therefore, a Ha Noi University of Agriculture (HUA)

Team lead by Prof Pham Van Hung conducted a literature review, semi-structured interviews and administered structured questionnaires to provide:

- A holistic picture of production of selected crops in Mộc Châu and Mai Sơn;
- Understanding of the current state of the crop production system and household resources for production;
- Understanding of the opportunities and constraints relating to agricultural production in general and selected crops in particular;
- Production potential and market potential of selected crops in the north of Vietnam;
- Recommendations and policy implications.

The literature review used information collected from General Statistics Office of Son La and annual reports from the two focal districts, Mộc Châu and Mai Sơn. Social, economic and agricultural production data on communes in the villages of Phieng Luong, Muong Sang, Na Ot and Chieng Chan, was collected from annual reports of those communes.

One hundred and eleven households were surveyed with a structured survey administered during family interviews conducted by HUA researchers.

- 27 households in Phieng Luong commune, Mộc Châu district;
- 29 households in Muong Sang commune, Mộc Châu district;
- 27 household in Na Ot commune, Mai Sơn district;
- 28 household in Chieng Chan commune, Mai Sơn district.

Interviewees were randomly selected from amongst farmers planting selected crops and farmers who grew other crops. The questionnaire used both open and closed questions. Structured questions were utilised to explore information relating to production costs and revenue and current state of production of the household. Open-ended questions, on the other hand, were used to explore the opinions of householders about advantages and hindrances in relation to production, their future production plans and what support they believe they needed if they wanted to expand production of the selected crops.

Semi-structured interviews were also undertaken with commune and district staff. Commune staff interviewees were people who were responsible for agricultural production in general (usually the vice chairman), extension workers and land management advisors. Interviews focused on general information about the production of targeted crops, factors influencing production at a broad level and support that the commune provided for development of those products. Initially, a questionnaire was also designed for interviewing local leaders. However, when HUA researchers pre-tested the questionnaire, they realised that much better quality data about the often quite divergent operating environments in each commune could be obtained using semi-structured interviewing techniques. Moreover, due to the often disparate commune organisational structure and the responsibilities of the staff being interviewed, it was difficult to use a structured questionnaire. Therefore, a semi-structured interview guide was developed for the in-depth interviews with district leaders and group discussion with commune staff.

Similarly, district leaders interviewed included staff from the Department of Agriculture and Rural Development (DARD), staff of Department of Resource and Environment, extension workers and staff of Department of Plant Protection. The focus of these interviews was general information about the social and economic conditions in each of the focal. These interviews also provided a holistic picture about agricultural production of the districts, their priority crops and the support for development of crop production, especially for four focal crops.

The detailed report of this investigation appears in Pham Van Hung et al (2012), Survey Report on Developing Potential of Some Crops on Maize System in Mộc Châu and Mai Sơn Districts of Son La.

2.1.2 Development of whole of supply chain strategies to improve smallholder engagement

Value Chain Analysis (VCA)

Based on the findings of RVCA, more detailed VCA research was undertaken from May-July 2010 to improve understanding of both the domestic and export (China) Tam Hoa plum value chains and to identify production and marketing constraints and opportunities for improvement and identify practical intervention points for change. Within this, the following activities were undertaken:

Mộc Châu Plum Stakeholders Meeting held in Mộc Châu (4th May 2010)

The purpose of this meeting was to present the findings of the RVCA Son La scoping study back to plum stakeholders for discussion, and also to achieve two objectives:

- To identify stakeholders' demand for plum in Mộc Châu (quality, quantity requirements, packaging and labelling preferences etc) for various markets (e.g. China, Ha Noi market, local market).
- Collect information about potential stakeholders who are willing to cooperate with farmers to further develop the plum value chain and build the Mộc Châu plum brand.

Sensory Evaluation Studies (Affective Testing) (June 2011)

Due to the short plum seasons, sensory evaluation had to wait until the 2011 plum season. On 6th June 2011 sensory evaluation was undertaken to relate attributes determined in 2010 as most important for the consumer decision to buy plums (i.e. sweetness, colour and firmness) to objectively measurable parameters. Plum trees were selected in Co Do commune (Mộc Châu) and not harvested until the time of the sensory evaluation. This enabled the CASRAD team to harvest five kilograms of plums and grade into three categories of ripeness based on size, colour, firmness and sugar content. Sugar content was measured using a refractometer and categorised as: early ripening (9.5 to 10.9° Brix), medium ripening (11-12.4° Brix) and fully ripened ($\geq 12.5^\circ$ Brix), which were then evaluated by the sensory evaluation panel on Monday 6/06/2011, one day after plums were harvested.

The gender balanced evaluation panel consisted of 23 panellists, all employees of CASRAD working in a wide variety of vocations, undertook a blind tasting after being informed of procedures. This approach to forming sensory panels is cognisant with the advice of Meilgaard, Civille, and Carr (2007).

Data were analysed using SPSS Statistics v.17 for relationships between objective plum attributes (measured) and subjective attributes perceived by the panellist. Relationships were explored using Pierson's correlation analysis (e.g. sweetness measured in °Brix correlated to perception of sweetness scored by panellist between 1 and 100) or Spearman correlation analysis when data were ordinary measurements (colour of skin). Multivariate regression was used to explore the contribution of three evaluated plum attributes (sweetness, hardness and skin colour) to the level of panellist liking of plums and their decision to buy plums in the early and main season. Finally, analysis of variance, general linear model, was used to explore the impact of different attribute levels on panellist' overall liking of plums and their decision to buy plums in the early and main season. Analysis of variance was also used to explore differences between genders perception of plums and decision making whether to buy plums or not. Data were tested for normal distribution using P-P plot of standardised residuals and Levin's test was used to test for assumption of equality of variance. If the F-test showed significant differences between treatments Ryan's Q test was used to separate treatment means if assumptions of equality of variance were met and Dunnett's T3 test was used if the assumption was not met (Report on sensory evaluation of Tam Hoa Plums, 2011).

2.1.3 Confirmation of products, participants and channels suited to development as competitive value chains

Mộc Châu Plum Stakeholders Meeting held in Mộc Châu (4th May 2010)

During the Mộc Châu Plum Stakeholder's Meeting in 2.1.2, the current pumpkin markets (fresh vegetable and processing), quality requisites, and the seasonal calendar for main pumpkin production areas in Vietnam were identified (Annual Report, 2011).

2.1.4 – 2.1.6 Review and profiling of information sources service providers, access and needs

Agricultural Information Sources and Service Providers

Other ACIAR project reports and activities and links established with other international development agencies and projects were reviewed. This included the Danish funded DANIDA Program, a University of Hohenheim Project, World Vision projects, a related ASODIA Vietnam Project with plums in Mộc Châu and CIRAD's programs in mountainous regions (Annual Report 2010, Appendix 2, and Appendix 14).

Assessment of information access was also incorporated into the Community Profiling process (Annual Report 2010, Appendix 11).

Objective 3: Build competitive value chain models which engage smallholders with more profitable markets that support improved land and crop management.

3.1 Development of 4 competitive value chains through implementation of intervention strategies that effectively engage smallholders in the fruit and maize based systems and overcome current value chain constraints.

3.1.1 Value Chain Building Workshops – An Innovation Workshop (September 2011)

An Innovation Workshop was conducted in Ha Noi for project staff and those of other development agencies. The program progressed from basic to complex systems concepts, and included a review of current or recent Vietnamese and Australian value chain projects. The sessions were presented by five Vietnamese partners, three ACIAR presenters and one presenter from CIRAD and aimed to promote the better understanding in the principles and practice of agricultural systems research and, in particular, value chain systems research in Vietnam. Approximately 43 people attended from 18 Vietnamese and foreign agricultural research and development agencies.

3.1.2 Value Chain Building workshops with smallholders and supply chain members to link market opportunity and current capacity

Farmer Workshops and Collaborative Planning Meetings

In 2011, the following process was employed to establish a Farmer Interest Group to assist farmers improve their production and marketing skills in Co Do (13 farmers) and (17 farmers) from Ban On.

To do this, in 2011, project researchers and local extension agents:

- Surveyed plum production areas and identified the indicators of good quality orchards capable of supplying the Hi-Q plum chain (hereafter the high quality plum chain is abbreviated to the Hi-Q chain);
- Selected the most experienced farmers who had a record of applying recommended techniques, attending training and whose orchards met the selection criteria to attend an awareness-raising workshop;
- Conducted an awareness-raising workshop which discussed the formation of a collaborative marketing for high quality plum production and the marketing protocols required.

At the conclusion, all seventeen farmers from Ban On and only two of thirteen Co Do farmers voted to form collaborative marketing groups, so only one group, Ban On was formed. However, it was decided that the Level 1 Collector in Co Do could still provide plums for the Hi-Q chain if she was able to undertake appropriate grading to meet the quality standards of the high quality plum chain.

3.1.3 Application of collaborative research process to involve whole value chain members in development of improved value chains incorporating evaluation and review cycle.

Collaborative Problem Solving Methodology (CPSM)

CPSM as employed by Spriggs and Chambers (2007) was used to solve problems occurring in plum value chain by all actors within the chain with the project officers' support. The problems encountered by the farmer group were:

- Obtaining suitable transportation;
- The inconsistent ripeness of plums throughout the whole season;
- The instability of the plum market resulting in low consumption volume;
- Fair price structure for retailers and producers depending on the stage of the season.

Participatory Monitoring and Evaluating Methodology (PM&E)

- Plum quality was evaluated against the agreed quality standards for the Hi-Q chain by group leaders before being transported to Ha Noi. Researchers also measured the plum's sugar content and took photos to describe external attributes with farmers for each shipment.
- At the end of the season, an evaluation meeting was conducted with all chain participants to review the achievements and failures of the chain's activities, propose solutions and optimise the benefits for each group. Attempts were made to engage the Ha Noi wholesalers and retailers in these meetings however, they did not attend for reasons that will be discussed in the Results section. Hence, in 2011, two separate meetings had to be organised; a meeting with 8 farmers in Mộc Châu and with 3 wholesaler/retailer representatives in Ha Noi.
- A similar problem was experienced in 2012 however two wholesalers, Vinagap and Rau An Toan Hanoi, were able to visit Mộc Châu for a 2012 review and also conducted direct negotiations with the farmer interest group.

Annual Collaborative Value Chain Planning Meetings

These were undertaken just prior to the Tam Hoa plum season in February to April, 2012. The objectives were to:

- Increase the volume of plums marketed through the Hi-Q value chain from that achieved in 2011;
- Ensure that real benefits for the chain's actors accrued from the chain in 2012;

An annual planning meeting was also held with the Hi-Q plum chain collaborative marketing farmer group just prior to the 2013 season to review the chain performance of the previous year and plan improvements and set targets for the coming plum season.

Monitoring and advising on harvesting, packing and transporting.

In 2011, members of the research team travelled to Mộc Châu several times per week for the duration of the season to visit the harvesting and level 1 collection functions. On some occasions, team members followed trucks/buses to Long Bien Markets and Ha Noi wholesalers who had consignments of Hi-Q plum chain plums to monitor the treatment of plums.

In Ban On, plum quality was evaluated and monitored by group leaders before being transported to Hanoi. Researchers also measured the plum's sugar content and took photos to describe external attributes with farmers for each shipment.

In 2012, the emphasis of monitoring focused on revised harvesting techniques and transport arrangements. A component of this was the identification of where waste was occurring. This was achieved by measuring weight loss of marked boxes from packing by the collector to the retail outlet in all consignments from Mộc Châu to collaborating wholesalers. This identified loss rates during transportation, after grading and at the selling point.

Price monitoring.

In the 2011, 2012 and 2013 plum seasons, the research team monitored volumes, quality and prices in Ha Noi wholesalers, wet markets and street vendors as well as the prices in project retailers.

Marketing focus group

In 2012, a focus group was conducted to analyse alternative markets for both green and ripe plums. It addressed:

- General information regarding main plum production in Mộc Châu; focused production areas in Mộc Châu, transportation factors, plum tree's age, socioeconomics;
- Mapping the chains, estimating plum volume for each chain, information flow, actors' relationships.

The participants were farmers (3 people), Level 1 collectors (3), Level 2 collectors (4), extension officers (1) and officers from the 19th May Cooperative (1). This aimed to identify the characteristics of the alternative markets including the consumer value attributes required and the factors involved in market selection by farmers.

Expanding the Hi-Q Plum Market - Wholesalers and Retailers Workshop and Surveys (April 2012)

Prior to the 2012 plum season, interviews were conducted with seven potential new retailers in Hanoi to introduce the Mộc Châu plums and identify retailers' needs.

As a result, a meeting with seventeen retailers including new and existing participants was held discussing the opportunities the new value chain offered and the marketing strategy and processes for 2012, including pricing, packaging, distribution method and transportation (Annual Report 2012, Appendix 3).

Economic survey

A partial budgeting approach was employed to calculate the economic efficiency for farmers marketing through the three alternative markets; green plum chain to China, normal chains and the Hi-Q plum chain. Questionnaire based interviews were conducted with 90 farmers, 34 collectors and 6 wholesalers from the three focal chains, Pieng Sang, Co Do and Ban On.

Objective 4: Evaluation of value chain interventions and improved land and crop management techniques to support scale out of successful technologies into government and non-government development strategies

4.1 Identification, design and piloting of effective mechanisms of value chain engagement that improves stakeholder profitability.

4.1.2 Development of strategies to scale out appropriate value chain interventions

In this project the focus adopted was that of farmer-driven value chain development. The consequences of this choice were of critical importance to the establishment and operation of this chain and have ramifications for future value chain development projects.

In short, it meant that the marketing of ripe plums struggled to recruit sufficient numbers of specialty grocers to retail premium-priced, high quality plums as well as gain sufficient interest from farmers to supply a larger volume of high quality plums. The project attempted to recruit more retailers for the 2012 season but failed and accordingly was unable to significantly increase the volume marketed.

In June 2013, after identifying the largest wholesaler in Mộc Châu with 50% of the total green and ripe plum market, and discussing future collaboration, the team developed strategies to build the relationship and engage this person and other large wholesalers in the application of the chain establishment methods developed in this project. The aim of these is to increase the number of communes involved and the volume of plums marketed.

2 Key results and discussion

This chapter provides an overview of the outcomes from the community diagnostic studies as they relate to the Mộc Châu District. They were the basis for selecting the production areas in which to base the new plum chains, a profile of those areas and then, cognisant with value chain theory, the investigation into the nature of consumer value. The results then digress to consider the major over-arching dynamic in the plum market, the opportunistic supply of green plums into China and the effect this has on the supply of ripe plums into Vietnam's major markets. The results of the value chain analyses are then summarised and the results of the value chain interventions and the performance of the new chain described. Further, the results of the investigations into other complementary crops to maize are also outlined. Finally, the overall findings are discussed leading to the following Chapter 8 Conclusions.

2.1 The participating villages

The average size of agricultural landholdings in villages in Son La province is 2.71 ha. Three villages were investigated in this component were in the Mộc Châu District; Pieng Sang, a Dao Minority community, Co Do (Kinh, Thai and Hmong) and Ban On (Kinh and Thai). In all villages farmers cultivate crops in small fields, many on slopes.

Male farmers in all 3 villages in Son La have completed a sufficient level of education to be sufficiently fluent in Vietnamese and have literacy levels that would allow them to read and understand basic extension materials. Female farmers in all villages in Son La have similar education levels to male farmers.

Land is not owned by the farmers but farmers have long term rights for its use. Even though decisions about land management and agricultural production are made by individual farmers, there tends to be little variation between farmers' practices within a village, which indicates that major production decisions are made collectively with significant influence of the village leader.

Hybrid maize production occupied most of the land in all villages in Son La province and rice is grown on only 2-10% of agricultural land, mainly for farmers' own consumption while maize is grown as a cash crop. Rice is mainly grown in small areas on flat land with maize being grown on slopes.

Even though all villages included in our project component are connected to major centres by good sealed roads, there are no proper roads between villages and fields. The lack of internal roads is the main infrastructural constraint for intensification of production since the majority of fields are 3-10 km from the built-up areas on the steep slopes.

Farmers rely on maize as a cash crop but they are aware of the need for diversification, specifically legume crops (soybean, peanuts, cowpea, mung bean and rice bean) and short-season drought tolerant maize hybrids as a second crop. A lack of market information, sufficient investment capital for new opportunities and building post-harvest facilities are the major constraints for more intensive market engagement.

In Pieng Sang, Pieng Sang Village and to some extent, Co Do Village, low quality fruit are a major constraint to more profitable marketing of plums. However, recent access to the Chinese green plum market has increased the demand significantly and stabilised the average price at a level that is profitable for farmers. The lack of capital and market information was identified as the major non-natural resource constraint for future growth of agricultural enterprises in the village.

At a workshop in March 2010 with representatives of provincial Department of Agriculture and Rural Development at reflection and planning, it was agreed that for temperate fruit in

the Mộc Châu district, the focus needed to be on improving existing plum production and the introduction of early peaches.

2.2 Characteristics of the Mộc Châu plum production and markets

The Tam Hoa Plum is one of three hybrids of the Japanese Plum (*Prunus salicina*), originating from Southern China, that are grown between 700-1000m altitude mainly for the domestic market in Vietnam. In 1995, a thousand certified disease-free plum rootstock seeds of Myrobalan B were received from France and planted in Hanoi, Mộc Châu (Sơn La Province) and at Sapa (Lào Cai Province). In August 1996, four certified disease-free cultivars of *Prunus salicina*, Blackamber, Friar, Simka and Fortune, were introduced from CTIFL-France and budded onto the Myrobalan rootstocks for evaluation.

These cultivars were planted in eleven provinces but the original plantings of about 32,400 ha have expanded to approximately 100,000 ha over the last 15 years. Sơn La Province with approximately 12,000 ha appears to be the second largest growing area behind Quảng Ninh (14,000 ha) (Cao-Van & Chau, 1999). During the early 2000s, many trees were removed due to a major fall in demand and it is difficult to precisely establish how many trees survived due to opportunistic production, however the Mộc Châu Extension Centre estimates 1,719 ha is in production.

Plums are climacteric fruits, so their ripening is associated with a burst of ethylene production and an increase in carbon dioxide from increased respiration rates and fruits continue to ripen after harvest. However, cultivars of *Prunus salicina* show a diversity of climacteric behaviour and at least one of the French sourced cultivars, Blackamber, is highly climacteric (Singh, Singh, & Swinny, 2012).

Mộc Châu is one of ten Districts in Sơn La Province and the total production of Tam Hoa Plums in the Mộc Châu District is 17 - 25,000 tonnes from 1,719 ha (Mộc Châu Extension Centre). Marketing of the crop is largely opportunistic depending on the interaction of the price for green plums for processing versus ripe plums for fresh consumption so many plums are not harvested. It is not known how many plum producers there are at any one time as production is opportunistic. Despite this, the contribution of plums to household income appears to be around 20%, independent of the socio-economic status of the family (Annual Report, 2009).

2.2.1 Characteristics of Mộc Châu production

The Mộc Châu District is not geographically or climatically uniform and can be characterised into three areas based on production characteristics, environmental conditions and transportation issues.

Figure 1 characterises the geographic transect and Table 1 below it provides more detailed characteristics of each area. Primarily work was conducted in Area 1 in Ban On and Co Do Villages and in Area 3, the more isolated Pieng Sang Village of the Dao Minority.

Area 1 has the best quality plums but harvesting is later by 10 days and 15 days compared with Area 2 and 3. This creates a tension for the Hi-Q Plum Chain because of the price-quality balance. The plum season usually extends over 40-45 days with a mid-season of 20-25 days. Earliness is a key value attribute for consumers, and there is some willingness to trade-off ripeness to achieve earliness and premium prices. So to obtain premium prices, high quality plums must be marketed in the first 7-10 days of the season. In the latter stages of the season ripe plums are in abundance in the wet markets and so do not command a premium. Hence, farmers from Area 1 are keen to get to market as early as possible with fruit that, whilst it is higher quality than Areas 2 and 3, it may compromise the standards required by the Hi-Q Plum Chain marketing protocols.

Figure 1: Landscape Transect of Mộc Châu Plum Producing Districts

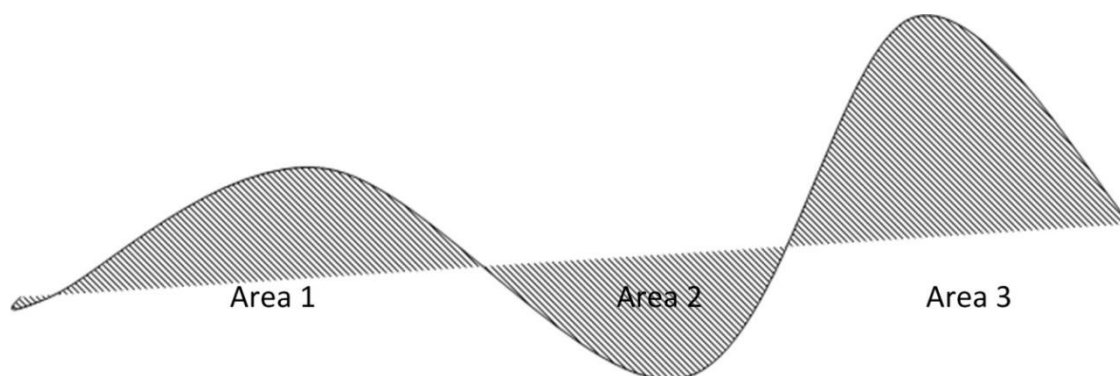


Table 1: Characteristics of plum production districts in Mộc Châu

Characteristic	Area 1	Area 2	Area 3
Location	Areas 84, 85, Co Do , Ban On , Tan Lap, Bo Lau, Ba Khem	Long Luong, Bo Nhang, Ba Phach, Chieng Di 1, Chieng Di 2, Thong khuong, Bo Bun, TK Tien Tien, Vuon Dao	Kim Chung, Mộc Châu, Tà Xùa, Pieng Sang , To Mua, Chieng Ve
Age of trees	<ul style="list-style-type: none"> • < 10 years old: 10% • 10–15 years old: 60% • > 15 years old: 30% 	<ul style="list-style-type: none"> • < 10 years old: 10% • 10–15 years old: 70% • > 15 years old: 20% 	<ul style="list-style-type: none"> • < 10 years old: 15% • 10–15 years old: 75% • > 15 years old: 10%
Average production area/household	<ul style="list-style-type: none"> • < 1 ha: 20% • 1–2 ha: 50% • > 2 ha: 30% 	<ul style="list-style-type: none"> • < 0.3: 10% • 0.3–0.5ha: 70% • 0.5–1ha: 20% 	<ul style="list-style-type: none"> • < 0.5 ha: 30 % • 0.5–1 ha: 40% • > 1 ha: 20%
Proportion of plums in each area (2009)	60%	15%	25%
Proportion of plums sold green or ripe	Green: Co Do 80%; Ban On 40% Ripe: Co Do 20%; Ban On 60%	Green: 25.8% Ripe: 74.2%	Pieng Sang Green: 95% Ripe: 5%
Seasonal calendar	Beginning season: 15 th May End of season: 20 th June	Beginning season: 5 th May End of season: 10 th June	Beginning season: 1 st May End of season: 5 th June
Quality	Best in Mộc Châu Nicely reddish colour High sugar content Large size Soft when ripe Wax coating	Consistently big size but smaller than in Ban On Hard flesh Bad quality due to farmers' low technical skills Crunchy & not soft when ripe Wax coating	Hard Smaller size Nice colour Wax coating Bad quality, acrid after taste

Source: Diagnostic Study (2009). Note: Focal villages for this component are bolded and underlined.

2.3 Consumer value attributes of Tam Hoa Plums

The preliminary Rapid Plum Quality Evaluation conducted on 14th May 2010 as part of the RVCA, indicated that sweetness, firmness, colour and size were important to consumers. In 2011, a more in-depth sensory evaluation (after Meilgaard, Civille, & Carr, 2007) was undertaken employing an objective assessment of these characteristics (Annual Report 2011, Appendix 5c: Report on sensory evaluation of Tam Hoa plums). This indicated that the bio-physical characteristics of these value attributes as well as consumer perceptions and consumers' ability to distinguish between these characteristics were more complicated than envisaged.

Sensory perceptions and the objective measurement of plum value attributes

The overall decision to buy plums is strongly related to consumers' perception of sweetness as indicated by their red colour (Tables 2 and 3). There was no clear

preference for firmer or softer plums, however firm and soft plums were preferred in comparison to hard plums.

Table 2: Relative contribution of objective consumer value attributes to the preference and purchase decision (2011)

	Overall preference Adjusted R^2 =0.272		Influence decision to buy in early ₂ season Adjusted R^2 =0.216		Influence decision to buy in main season Adjusted R^2 =0.238	
	Adjusted β	S	Adjusted β	S	Adjusted β	S
Sweetness (Brix) ⁰	0.041	P=0.452	0.101	P=0.279	-0.067	P=0.466
Hardness (kg/cm ²)	-0.239	P=0.010	-0.067	P=0.481	-0.205	P=0.029
Colour of skin (0 yellow-green, 1 purple-red)	0.334	P=0.002	0.374	P=0.001	0.392	P<0.001

Table 3: Relative contribution of perceptions of consumer value attributes to preference & purchase decision (2011)

	Overall preference Adjusted R^2 =0.556		Influence in purchase decision in early season Adjusted R^2 =0.269		Influence in purchase decision in main season Adjusted R^2 =0.280	
	Adjusted β	S	Adjusted β	S	Adjusted β	S
Perceived Sweetness	0.686	P<0.001	0.383	P<0.001	0.389	P<0.001
Perceived Hardness	0.101	P=0.149	0.204	P=0.024	0.211	P=0.019

As the red colouration developed, sugar content increased towards 11⁰ Brix and hardness dropped below a penetration force of 6 kg/cm², consumers were more likely to purchase. A further increase in sugar content and softening of the plums did not significantly increase the purchasing decision. However, there were gender differences in perceptions. Females appeared to more influenced by red colouration whilst men were more influenced by sweetness. Multivariate regression analysis showed that colour was the strongest and most easily observed predictor of the positive purchasing decision.

The on-farm trials found that the training and pruning of the plum trees and application of relatively large quantities of fertiliser in experimental orchards resulted in a significant increase in the quantity of plums produced and in plum size. The treatments delayed the development of red colouration and sugars. This caused the plums in experimental orchards to be harvested late, resulting in lower profitability in comparison to the traditional production regime.

Thus, the results of sensory evaluation and the field drivers of those characteristics indicate that effort in experimental orchards should be refocused from yield and fruit size to colour and sugar content. Fertiliser input may need to be reduced and the balance among N:P:K changed. Pruning during the ripening stage to expose fruit to sunlight could be considered and progressive harvesting when fruit passes 11⁰ Brix should be introduced.

2.4 The dynamics of selling green plums or ripe plums

Between 2008 and 2012, ripe plum consumption fell whilst green plum market demand has fluctuated (Table 4). Green plums are collected and packed into cardboard boxes without grading by 10-12 wholesalers, who each send two or three 20-30 tonne trucks per day to Tan Thanh on the border where they are sold by consignment in Pingxiang market and re-sorted into ripe plums for fresh produce consumption or green plums for processing.

Table 4: Relative plum market volumes in the focal districts 2008-2012 (Tonnes)

	2008	2009	2010	2011	2012
All Areas Total					
Green	4,416	5,159	3,784	3,790	7,891
Ripe	18,584	19,841	18,217	16,210	9,109
All Areas Total	23,000	25,000	22,000	20,000	17,000
Area 1					
Green	1,339	2,111	1,145	1,311	2,870
Ripe	12,461	12,889	12,055	10,689	7,330
Area 1 Total	13,800	15,000	13,200	12,000	10,200
Area 2					
Green	887	1,018	769	628	1,145
Ripe	2,563	2,732	2,531	2,372	1,405
Area 2 Total	3,450	3,750	3,300	3,000	2,550
Area 3					
Green	2,191	2,030	1,869	1,852	3,876
Ripe	3,559	4,220	3,631	3,149	375
Area 3 Total	5,750	6,250	5,500	5,000	4,250

Source: General Statistics Office of Son La and Mộc Châu and Mai Sơn District statistics.

The project's 2009 investigation of the market for green plums in Pingxiang and Nanning in southern China showed that the demand for Vietnamese Tam Hoa plums is dependent on the price and availability of the Chinese Man Com variety, which means it is highly unpredictable. The factors driving Chinese demand are:

- Chinese large scale domestic production which is difficult to forecast as it is strongly affected by climate and disease;
- International market demand for processed plum (largely from Japan, Korea, Hong Kong, Singapore and Thailand) which is also unpredictable due to fluctuating internal and global economic conditions.

When Chinese demand is high, green plums are diverted from many Vietnamese production areas into that market, but if the demand is low and the Vietnamese season is good then prices are driven down in Vietnam by a glut. As a consequence, some trees are not harvested in some years.

However, other factors also influence the price of ripe plums:

- 1) Competition and substitution by other fruits occurs due the large variation in the timing and duration of the plum harvest period as well as the rate of ripening. This may mean that the premium price period for plums coincides with that of Longans, Lychees, Rambutans and other types of plums (Table 5). If those fruits are similarly priced or cheaper then substitution may occur which moderates the price of Tam Hoa plums.

Table 5: Seasonal competitors with Tam Hoa Plums

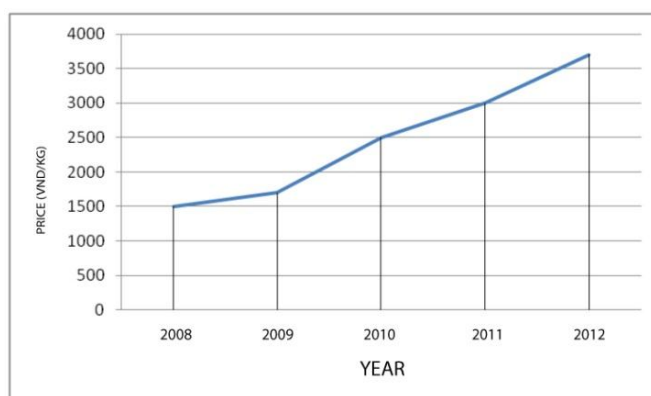
Product	April				May				June				July			
	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4
2013 Tam Hoa Plums																
2012 Tam Hoa Plums																
2011 Tam Hoa Plums																
Lychees (1)																
Longans (2)																
Yellow plums (3)																
Red plums (3)																
Rambutans																

Note: Sources (1): (Nguyen, Truong, & Dao, 2005); (2): (Jiang, Zhang, Joyce, & Ketsa, 2002); (3): The scientific and varietal names of these fruit are not known and this data has been sourced from interviews with wet market traders. Little appears to be known about their seasonal variation in harvest date but it is likely to be as variable as Tam Hoa Plums. Note also that hatched areas simply help differentiate the months.

- 2) The profitability and workload of competing enterprises such as cattle production, tea harvesting and dairying;
- 3) Ripe plum harvesting is much slower than for green plums (100-150kg versus 400-500kg per day), which means a higher cost of production for ripe plums;
- 4) Green plums have a much shorter harvesting season of 5-10 days whilst ripe plums have a season of 25-35 days. So, if the farmer has more profitable enterprises then the longer, more complicated engagement with harvesting ripe plums is an opportunity cost for his livelihood.
- 5) Marketing green plums avoids the cost and effort involved in fruit fly control. Originally, the production of green plums developed because there were no effective controls and the market demand grew. However, today there are cost-effective means of fruit fly control but the avoidance of having to undertake the tasks persists as an incentive to harvest green plums.
- 6) There are increasing farm labour shortages for plum harvesting because the trees in many orchards have been planted too close and allowed to grow without pruning which, in some instances, has resulted in the canopy becoming intertwined making picking difficult.

Green plums are usually harvested from the warmer hilly slopes, commonly starting nearly 10 days earlier than ripe plums. Some areas such as Pieng Sang (Area 3) and Co Do (Area 1) are early areas but produce poorer quality ripe plums and this is an important

Figure 2: Price changes for green plums (2008-12)



Note: Prices not adjusted for inflation

decision-making factor for farmers supplying green or ripe plum markets. As soon as the higher quality areas start harvesting, the prices for these poorer quality supplies drop significantly.

Therefore, farmers in areas producing poorer quality plums make early decisions to optimise their income by selling to the Chinese market if the prices are reasonable, thus minimising the risk that they will receive no income from plum production.

Figure 2 demonstrates that the

decision to supply the green plum markets has recently been easier because green plum prices have been steadily rising. In early season 2013, nearly 300 tonnes/day (approximately 7 trucks with loading capacity of nearly 40 tonnes/truck) were being sent to the Chinese market.

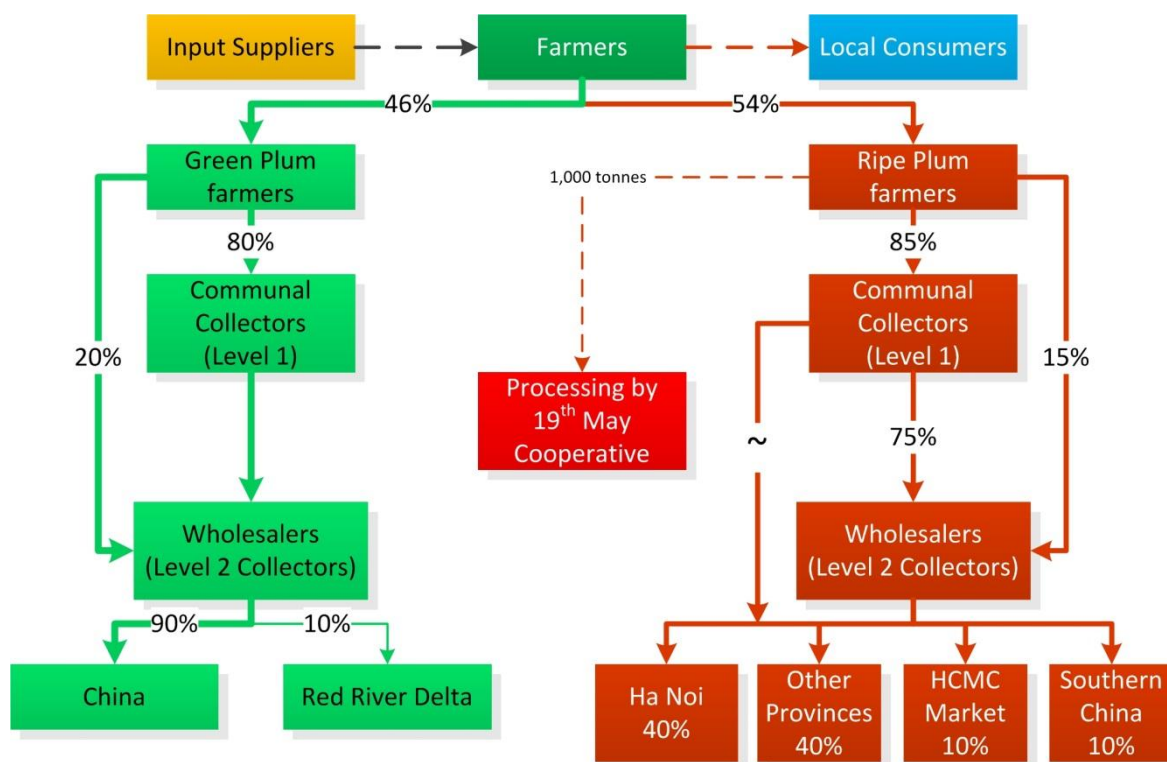
Tam Hoa Plums are consumed fresh in Vietnam and often used as a special ‘treat’ for visitors, a gift or a temple offering.

2.5 Mapping Mộc Châu’s Tam Hoa Plum value chains

The channels to market

Mộc Châu has two main channels for marketing its Tam Hoa plums; the green plum chains into China and the ripe plum channels to both north and south Vietnam, with Ha Noi and HCMC being the dominant destination markets. The indicative chains for these are shown in Figure 3.

Figure 3: Mộc Châu Tam Hoa Plum value chains with typical relative product volume flows



Source: Interviews with collectors in Mộc Châu 2010-13. Relative volumes are estimates. No official records are available.

Small farmers in all areas usually involve their families in the harvesting process. The larger growers will typically hire 5-10 labourers to pick plums paying them VND 150,000 per working day.

A typical Level 1 Collector (one to several local villages) would buy 400 tonnes/year, usually on-selling the same day to a Level 2 Collector or Wholesaler (collecting from many Level 1 Collectors and multiple areas). There are about five large Wholesalers in Mộc Châu selling around 1-4,000 tonnes/year, however, the largest who has about 50% of the market, sells about 6-8,000 tons per season; 7 x 12 tonne trucks per day to Ha Noi, 1 x 12 tonne truck per day to HCMC and 2 x 40 tonne trucks per day to China. Notwithstanding the simple categorisation in Figure 3, there are many small wholesalers using different permutations of these typical chains which are often reliant on personal or familial

relationships employing every possible form of transport from motor bikes to buses and small trucks.

Farmers usually transport their plums in large polythene bags on the back of motor bikes to the Level 1 Collector's premises, usually a private house. There plums are graded on a concrete floor, packed into boxes and weighed ready for transport further down the chain. The packing boxes are usually second hand cardboard boxes (sometimes with Chinese characters printed on the box) which weigh about 40 Kg. Some collectors use new boxes but these are generally regarded as adding too much expense. Boxes are usually packed till over full with sides and tops bulging; causing considerable instability when they are packed into the transports. Pick-ups usually occur from mid-afternoon to early evening from several different collectors then the plums are driven the six hours to Long Bien Market in Hanoi or elsewhere during the night. The plums arrive in Hanoi between 2200-0200 hrs at Long Bien Market, but because businesses generally close at 2000 hrs special arrangements have to be made for receipt with a retailer/wholesaler for specific consignments.

Some plums are also consumed locally and these are usually of inferior quality. Others, consigned to the long journey to HCMC of around 1,600 km and in excess of 24 hours driving, have to be hard-fleshed with less juice content and so are sourced from Area 3 and Area 1. The Long Bien Market receives most of Mộc Châu's plums throughout the season. Plums from all three Mộc Châu areas are sold to other provincial markets, often via Long Bien, because of their less strict quality requirements. A relatively small proportion of the market supply is used by the 19th May Cooperative in Mộc Châu for processing into brandy and other plum products.

Market outlets in Ha Noi

The market outlets for plums are:

- *Supermarkets (Big C or Metro)* – there are few large supermarkets in Ha Noi and their fresh produce sections are small. For example, from 18th-25th May, 2012 the sales volume of one specialty grocer alone was 700kg whilst in the same period one Big C Supermarket moved only 110kg. Despite several attempts to engage the supermarket chains in the Hi-Q chain, there was little interest in a coordinated marketing chain for Tam Hoa plums.
- *Normal fruit shops* – a large number of small stores which do not have an emphasis on high quality produce.
- *Specialty grocers* – statistics were unavailable to enable the determination of the precise number of this type of outlet, however collaborating wholesalers indicated that there were likely to be 250-400 small, specialty grocers in Ha Noi. These are frequently situated in high middle-upper income areas or high traffic areas in business districts.
- *Wet markets* – there are many permanent 'wet' or street markets in Ha Noi which sell a wide range of fresh produce, varying from very high to average quality.
- *Street vendors* – vendors on-foot or using push bikes selling a variety of food and fresh fruit are a feature of Ha Noi streets.

Value chain analysis mapping

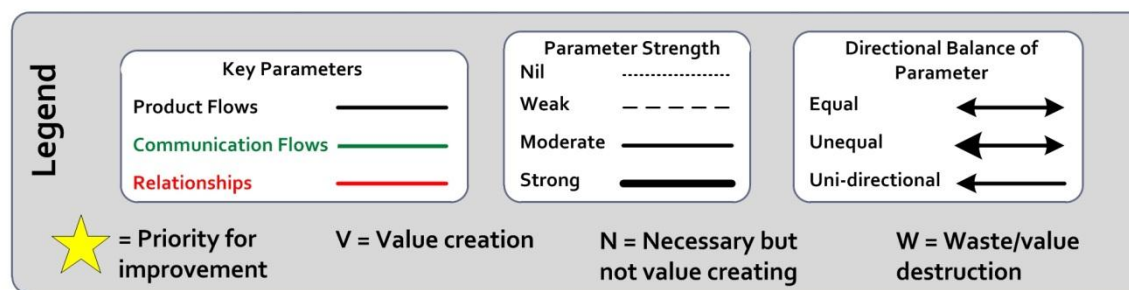
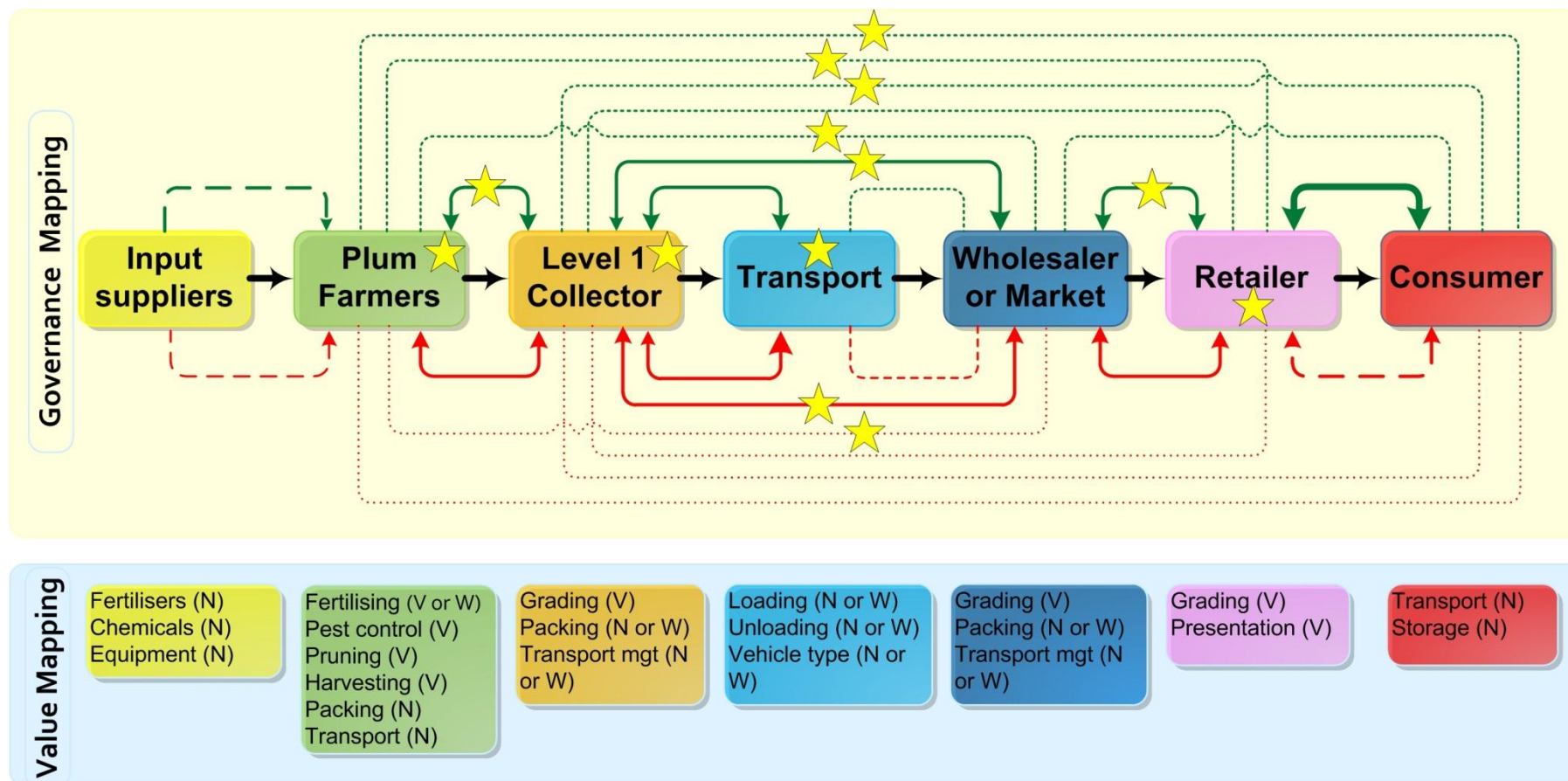
Figure 4 is a value chain management map; a heuristic summary characterising the complex flows of product, information and communication and relationships that are the key parameters for coordinating value chains (Bonney, Clark, Collins, Dent, & Fearn, 2009). This map is based on interviews with chain participants between 2010 and 2013 plus observation of chain operations at each stage. This map highlights:

- That dyadic relationships (e.g. farmers and their collectors or wholesalers and retailers) are often adequate for the purposes of coordinating the flow of plums within that relationship but not for coordinating the efficiency and effectiveness of the chain as a whole;
- The lack of communication and information about the consumer at the upstream end of the chain;
- The lack of an over-arching governance relationship such as might occur if there was a lead firm or chain leader undertaking coordination;
- The lack of comprehensive, systematic communication and information along the whole chain;
- The lack of understanding of supplier-customer needs between upstream and downstream chain members;
- The importance of the level 1 collector and level 2 collector or wholesaler for the functioning of the chain;
- That value creation opportunities in the processes at each stage of the chain, designated in the value map by the (V) symbol¹, are not common. For farmers, fertilising can actually degrade value, pruning takes several years to have effect and so incorporating a 'grading whilst harvesting' technique is the only short term means to create value.

This presents many opportunities for improving the chain's performance (Figure 4).

¹ Value creation is defined as adding value beyond the basic value necessary to be in business for that product i.e. if producing for a high quality plum market then pruning increases fruit size or grading to select larger, riper plums, both known consumer value attributes, so are classed as 'value creating' (V). On the other hand, adequate 'packing' is required for any class of product to reduce waste in getting the product to market and so is classed as 'necessary but not value adding' (N).

Figure 4: Value Chain Map of the Mộc Châu Tam Hoa Plum value chain



Where then is value created or destroyed?

The priority improvement areas identified for intervention are those represented by the yellow stars. The following section provides brief details of the interventions implemented based on this analysis.

As a result of the initial Rapid Plum Quality Evaluation, the management techniques associated with improving sweetness, firmness, colour and size were the subject of on-farm field trials as these forms of value are created on-farm in the plum orchards and are reported elsewhere in the Project Reports.

The implications of the sensory evaluation for the on-farm trials were that effort in the orchards should be refocused from yield and fruit size to colour and sugar content to maximise the creation of value. Fertiliser input may need to be reduced and the balance between N:P:K changed, pruning during the ripening stage to expose fruit to sunlight could be considered and progressive harvesting when fruit passes 11° Brix should be introduced.

There are also significant risks for value creation that occur on-farm. The application of larger quantities of fertiliser increases the quantity of plums produced and plum size but delays the development of the red skin colouration and sweetness which negatively influences the purchasing decision. If this leads to later harvesting then it risks diminishing value because of lower prices later in the season.

Figure 4 also indicates that the creation of consumer value elsewhere in the chain is largely confined to grading and store merchandising. On the other hand, value destruction through inadequate packaging, handling and transport arrangements that degrade fruit quality can occur along the whole chain.

Anecdotally, participants in non-project chains estimated that losses were between 10 and 25% depending on the stage of the season. Project monitoring of losses in the Hi-Q chain during marketing in the 2012 season involved weighing plums every 2-3 days during the season prior to shipping from Ban On and Co Do in Mộc Châu and then on their arrival at the collaborating wholesalers/retailers in Ha Noi (CASRAD Final Report, 2013). The results showed the average losses by weight to be in:

- Transport - 0.6%
- After grading - 2.3%
- At sale - 1.5%

Figure 5: Tam Hoa ripe plums in Ha Noi grocer



Other forms of value destruction, such as the loss due to inadequate merchandising could not be

established quantitatively but anecdotally, retailers indicated that the consumer information provided by the project may have contributed to their perceptions of an increase in shopper interest in Mộc Châu plums.

Consumer buying behaviour

The project's in-store consumer survey (90 respondents) found poor consumer recognition of Tam Hoa plums amongst other varieties but 51% were identified "Mộc Châu plums". The survey indicated that Tam Hoa plums were the least recognised and named of the three common types of plums in the marketplace; yellow (48%), red (33%) and Tam Hoa (19%) plums.

Tam Hoa Plums are considered to be working class fruit due to their lower price compared to many other alternative fruits, so a lower income demographic comprise the most frequent consumers of Tam Hoa plums (74%). Higher income consumers tend to eat plums much less frequently and prefer imported fruits or high quality specialty fruit.

Shoppers usually purchased plums from small, permanent fruit shops (73%), street vendors (22%) or supermarkets (5%) with very few purchasing from high quality grocers.

High-class grocers apparently had little interest in selling plums as they were considered a popular, lower value fruit with inconsistent quality and lacking the intrinsic values such as provenance and packaging which differentiates other higher value fruit. Notwithstanding this, Mr Le Nang Cong (Ha An Joint Stock Coy) who owns a store in a high income area in Ha Noi stocking Australian meat and fruit reported that “price was no object” for purchasing early plums, particularly if they were high quality. Similar comments were received by other specialty grocers (Annual Report 2010, Appendix 5: Consumer Report on Tam Hoa Plum in Ha Noi).

2.6 Value chain interventions

Due to delays caused by the changeover of both Vietnamese and Australian project personnel, value chain interventions to develop a high quality plum chain did not commence until 2011.

The priorities for improvement in Figure 4 (identified by a yellow star) became the focus for interventions by the Project Team and the collaborating chain from the farmer interest group in Ban On and the Co Do collector

Plum farmers

Production and marketing protocols were agreed upon and stipulate:

- Eligibility of plum orchards are that they must be from 8-14 years old, and located 700-1000m altitude above sea level with suitable sun light and humidity;
- These orchards have to implement the recommended management techniques;
- A harvesting protocol ensures equity and fairness between member farmers in fulfilling orders;
- Farmers are able to appoint representatives to negotiate and contract on their behalf;
- The interest group's focus is wider than just plums extending to other food crops.

In addition to the formal production and marketing protocols, farmers have shown a willingness to collaborate in trials to improve chain practices. In 2011, collaborating farmers were asked to trial harvesting techniques that incorporated visual grading for ripeness whilst plums were being picked. This reduced grading by collectors but did not eliminate it as tree vegetation and blemished, misshapen or green plums were still present in sufficient quantities to require grading. However, it also reduced the efficiency of pickers to about 40% of the normal productivity significantly increasing the cost of production. This strategy was therefore abandoned in subsequent seasons.

Plum farmers-Collectors

One farmer interest group was established in Ban On, the commune producing the best quality fruit. Whilst the Co Do farmers decided not to form an interest group, one of the larger collectors in that commune opted to collaborate with the project. The quality, quantity and timeliness of information flows for the collaborators were improved by:

- Collaborative planning, monitoring and evaluation meetings prior to, and at the end of the season. This included self-monitoring by the farmer interest group, in part using photographs;
- Training in aspects of plum in harvesting, handling and value chain management principles which was then implemented by the group in their marketing practices.

Collectors

There appears to be no standards within the plum industry for grading and packaging. The Ban On and Co Do Project collectors were:

- Trained in the grading of plums for colour, size, blemishes and waste. These procedures were adopted and improved the quality of plums for the Hi-Q chain and raised retailer satisfaction with the consistency of plum quality;
- As a result of an identified consumer preference for unpackaged plums (Annual Report 2010, Appendix 5: Consumer Report on Tam Hoa Plum in Ha Noi), a retailer preference for 3-10kg boxes and a wholesaler preference for 30 – 40 kg boxes, the project trialled and introduced improved, branded packaging of various sizes (40kg, 10kg, 3kg) to reduce damage in transit and build geographic identification. These reduced waste occurring in transit to wholesalers.

Transporters

- Alternative forms of transport were trialled (e.g. buses, dedicated plum freight trucks, mixed produce freight trucks). As volumes from the chain increased, full loads of plums in dedicated freight trucks became the norm;
- The stacking of plum boxes and their placement in mixed loads was modified to reduce losses due to handling damage and the collapse of stacked boxes. This, as well as the use of the stronger boxes contributed to a reduction in waste due to crushing damage;
- Timing of arrivals at Long Bien were monitored and improved ensuring that the Hi-Q plum chain produce did not miss the next day's market at Long Bien or wholesaling in Ha Noi.

Retailers

The RVCA found that Mộc Châu Plums were often poorly presented and placed in-store. This was due to the lack of merchandising skills of the retail store owners and lack of knowledge about the provenance of the plums. Whilst the training of store owners in merchandising was beyond the scope of the project, the introduction of branded boxes and consumer information in the form of coloured posters did improve consumer awareness of Mộc Châu Plums.

Collector-Wholesaler and Wholesaler-Farmer information flows

Collaborative planning, monitoring and evaluation meetings were conducted prior to and at the end of each season with farmers, collectors and wholesalers and retailers were invited. Only two wholesalers attended in 2012. This was because these small business owners had difficulty in leaving their shops for a two day trip to Mộc Châu. Tam Hoa plums were such a small part of their business due to their short season and low profitability compared to staple food lines that the cost-benefit balance did not provide any incentive for them to invest the time in the 12 hour round trip and time on-site visiting the Mộc Châu suppliers.

Retailer-Farmer information flow

There was no interest amongst retailers in meeting with farmers for the same reason as explained in the previous section.

Consumer-Farmer information flow

The Project's consumer research showed that consumers had no interest in the provenance of Tam Hoa plums beyond understanding that they were safe from contaminants. Only ten per cent of respondents knew that Tam Hoa plums came from Mộc Châu and were more likely to suggest Lạng Sơn in Lạng Sơn Province or Bắc Hà in Lào Cai Province.

Collector-Wholesaler relationship for chain coordination

A moderate strength relationship already exists but is variable from quite strong and trusting with a long term commitment of up to 20 years to short term transactional relationships. Evidence was found that some Collector-Wholesaler relationships have intuitively adopted many of what could be called 'value chain management principles'. That is, principles of relational reciprocity, co-investment of resources, co-innovation to solve problems, value-sharing and tolerating periods of loss to ensure the longevity of the relationship.

The Project Team conducted training and provided advice on chain development to facilitate the development of longer term relationships and cooperation to deliver value. The collaborating collectors adopted much of the recommended behaviour. The economic analysis, in a subsequent section, demonstrates that they achieved a net benefit from the Hi-Q chain which was several times as much as the normal chain, however the impact of that on their total business was small due to the small volume of high quality plums.

Wholesaler-Farmer relationship for chain coordination

The lack of incentive for Wholesalers and Retailers to visit Mộc Châu for discussions with farmers is understandable given that the small volumes sold represent a very small income for stores (Table 6). For this reason the intervention to improve this component of coordination was not successful. However, when two Wholesalers did so in 2012, they were able to form direct supply relationships with two farmers in addition to meeting with the interest group itself and negotiating process changes to improve the quality and consistency of supply.

2.7 The Hi-Q plum chain performance 2011-13

As mentioned previously, the commencement of chain coordination did not occur until 2011. In the following three years the Hi-Quality Chain achieved the following throughput:

- 2011 – 940 kg through TWO retailers (one dropping out)
- 2012 – 1,400 kg through THREE retailers
- 2013 – 3,066 kg through FOUR retailers

As the volume marketed in 2011 was too small for analysis, the following analyses are largely confined to 2012-13.

The collaborating stores were small independent retailers with a localised clientele and a 'convenience' store format similar but even smaller than the IGA X-press stores in Australia. Despite a strong focus by the project team in 2011/12 and 2012/13 on increasing the throughput of the chain by recruiting much larger numbers of such stores, this failed (Annual Report, 2012).

Table 6 shows the low volume throughput and gross income derived from Tam Hoa plums. Whilst there was no available data on the contribution of plums to the store

turnover, it was apparent from in-store observations that it was very small, possibly lower than 1%. Given that the 42 day plum season in 2013 was slightly longer than average for Tam Hoa plums, their contribution to annual store turnover would have been extremely small.

Table 6: The importance of Tam Hoa plums to each individual retailer (2013)

Company	Total Weight (kg)	Average kg/day	Av. Gross Income/day VND (A\$)
Ha An	961	25.29	556,368 (27.82)
Vinagap	1,160	30.53	671,579 (33.58)
Donavi	585	15.39	338,684 (16.93)
Fivimart	360	9.47	208,421 (10.42)

Note: Big Green did not participate in 2013.

Figure 6 indicates the retail price fluctuation for Hi-Q and non-project stores in the 2012 season. The project stores, Big Green, Ha An and Vina Gap had negotiated a stable price to growers of VND 22,000 and also held their retail price stable during the season. It shows that non-project stores suffered an opportunity cost by being involved and so appear to have been disadvantaged in 2013.

Figure 6: The fluctuation of retail prices in Hi-Q chain stores and non-project stores (2012)

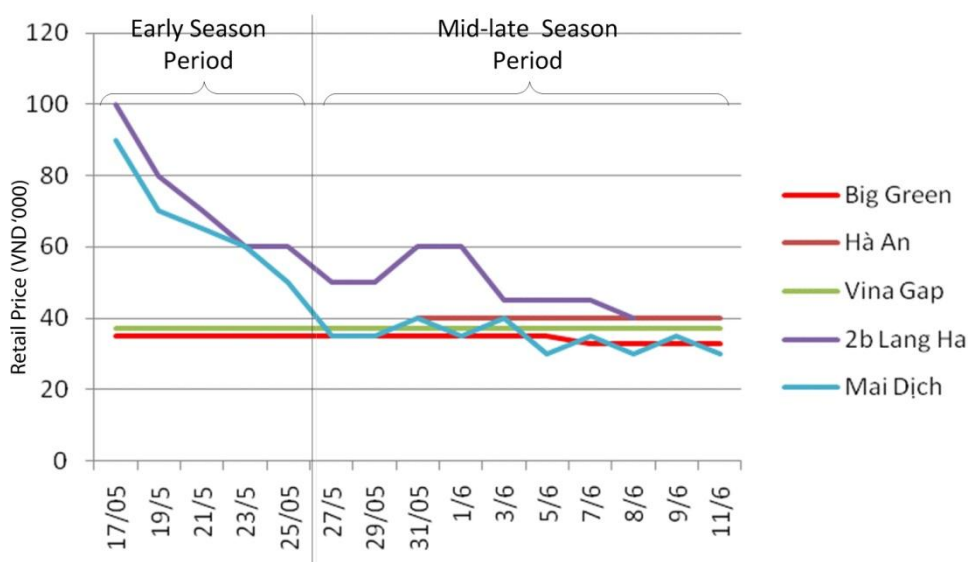


Table 7 provides an overview of the cost-benefits of being involved in each of the three plum channels and provides further insight into chain behaviour. It indicates that there is an advantage to all the stages of the chain in coordinating the marketing of a line of high quality plums into specialty grocers. However, combining the retail data from Tables 6 and 6 indicates that the net benefit to the four retailers of Hi-Q plums ranged from VND 65,000 – 175,000 per day and VND 2,489,500– 6,648,000 for the 2012 season.

Because the Co Do farmer group decided not to participate in the project, the volumes above were effectively achieved through one farmer group of ten farmers. Whilst the net profit in Hi-Q plums for farmers is 260% higher than for ripe plums and 460% higher than green plums and 380% higher for collectors, the overall volume throughput was regarded as too low. Mr Phong, the collector from the Ban On Group, said:

If the high quality chain can consume farmers' plums at this higher price, then local farmers are very happy. But, we have to increase the consuming volume more to motivate other farmers to join.

Table 7: Comparison of profit and net benefit to chain stages from different plum marketing channels (2012)

Chain Stage	Green (Co Do)				Ripe plums (Normal market)				Hi-Quality (Ban On Farmer Interest Group)					
	Purchase Cost	Input Costs	Sale Price	Net Profit	Purchase Cost	Input Costs	Sale Price	Net Profit	Purchase Cost	Input Costs	Sale Price	Net Profit	Net Benefit vs Ripe	Net Benefit vs Green
Farmer		795	3,200	2,405		3,968	8,200	4,232		3,968	15,056	11,088	6,856	8,683
Collector	3,200	150	4,000	650	8,200	160	12,500	4,140	15,056	1,650	23,000	6,294	2,154	5,644
Wholesaler	4,000	150	NK	NK	12,500	1,200	14,000	300					N/A	NK
Retailer					14,000	2,100	22,000	5,900	23,000	5,200	37,000	8,800	2,900	N/A

Assumptions:

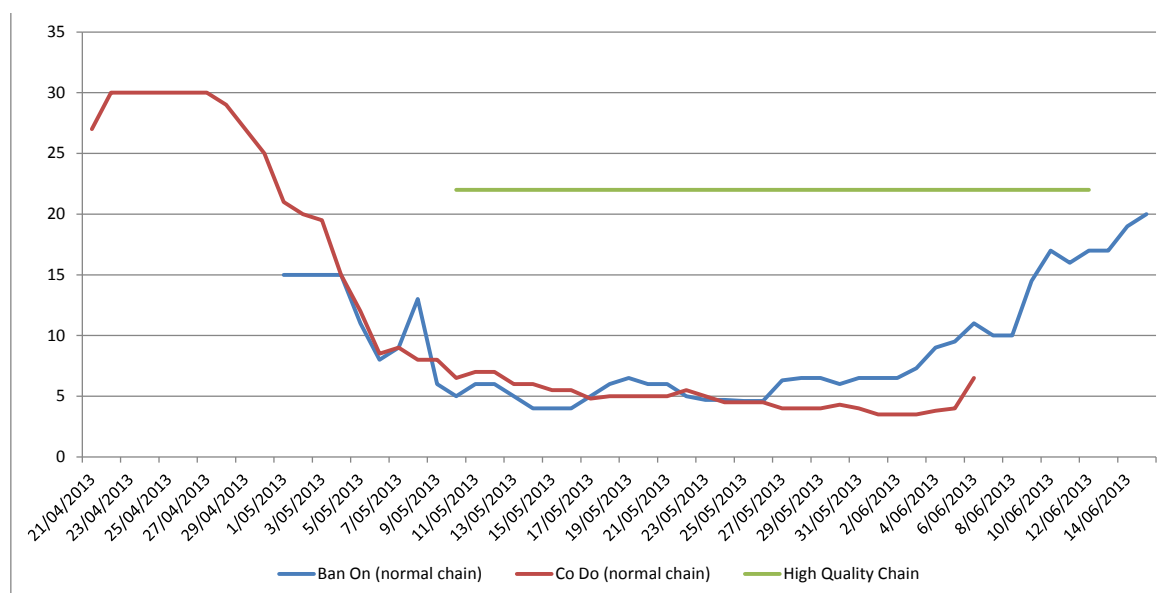
- 400 trees per hectare.
- All prices and costs are from 2012 and based on interviews conducted by the project team with the Ban On Group and Co Do farmers.
- In 2012, all plums in Ban On were sold as ripe or to the Hi-Q Project. Co Do sold 80% of its plums green to China.
- Labour costs include the cost of family labour at VND150,000/day, the normal rate in 2012.
- Green plums:
 - Generally are not fertilised, pruned or protected from pests so the costs listed are just for labour.
 - Labour costs are lower for green plums. Ban On farmers estimated harvesting green plums costs 23% of the harvesting ripe plums (1.5 days/tonne versus 6.5 days/tonne).
 - Collectors buy green plums at the farmer's house and so incur a cost of transport. The bags/boxes used are second hand.
 - The price paid by wholesalers to collectors is an estimate as the latest project data is 2009 when the price was very low.
- Ripe plums:
 - Farmer's costs were averages of the Ban On Group. Other costs were averaged from those provided in interviews with downstream chain actors.
 - Few farmers regularly apply fertilisers, fruit fly chemicals or prune their trees.
- Hi-Q Plums:
 - Costs are those provided by the Ban On Group, its collectors and collaborating retailers.
 - Hi-Q plums are a direct supply to retailers in Ha Noi and do not go through the Long Bien markets as do ripe plums (refer hatched cells).

Mr Chu Quang Tao, the largest farmer in the Ban On Group, who has 1,500 trees, harvests 10 tonnes per day at season's peak and trialled the project's 'grading at picking' technique said:

The price is good but high quality plums are too much trouble. I need to have at least 30% of my crop going through this chain if I am going to do this.

Figure 6 shows the significant production and quality differences between the two areas involved in the Hi-Q plum chain despite them being geographically only several kilometres apart. Co Do starts the season 10-15 days earlier than Ban On and finishes earlier. However, when Ban On starts producing it matches Co Do in price and then exceeds it because of the higher quality. However, Figure 6 also demonstrates the significant price differential achieved by the Hi-Q plum chain; albeit a standard price for the season.

Figure 7: Comparative 2013 prices received by Ban On and Co Do ripe plums with the Hi-Q plum chain



2.8 Other potential complementary crops for the maize rotation

The aim was to determine the market potential of crops complementary to upland maize in the North West Highlands of Vietnam. The research was conducted by a team from the Hanoi University of Agriculture (HUA) led by Prof Pham Van Hung, Pham Van Hung, Head of the Department of Accounting & Quantitative Analysis, Faculty of Economics & Rural Development.

The main crops of the Mộc Châu district are maize, rice, tea, arrowroot, vegetables and fruit trees (peach, plum, etc.). Pumpkin, soybean, rice bean and mung bean are sub crops grown as the second crop in a year. During the project period, rapeseed has also become a major crop in the district.

Table 8: Current land use of survey households (square metres) (n=111)

Items	Mường Sang	Phiêng Luông	Nà Ót	Chiềng Chăn
1. Land area per household (m ²)	23,681	29,817	23,283	28,329
2. Cultivated area per household (Unit: m ²)				
- Maize	23,608	22,964	11,760	26,596
- Soybean	N/A	N/A	700	400
- Pumpkin	6,317	5,450	100	167
- Rice bean	1,000	N/A	N/A	2,500
- Mung bean	1,000	N/A	100	1,900
- Rice	2,875	2,927	1,880	4,341
- Other crops	19,375	4,183	10,841	5,683

After assessing a range of small, legume crops, those chosen for investigation were processing pumpkins, rice bean, soya bean and mung bean.

Pumpkin can be grown as the first crop which is competitive with maize or as the second crop which is complementary crop to maize (refer Table 8). In contrast, the number of households growing rice bean and soybean is small (Table 9).

Table 9: Some major crop rotations in the local area (n=111)

Mường Sang	Phiêng Luông	Nà Ót	Chiềng Chăn
Maize - Rape	Maize – Pumpkin	Maize	Maize
Maize - Pumpkin	Pumpkin - Pumpkin	Terraced rice	Maize – Mung bean
Rice - Maize	Maize	Rice – Rice	Rice – Rice
Rice - Pumpkin	Pumpkin – Rice	Cassava	
Rice – Vegetables	Arrowroot		
Vegetables	Rice – Rice		
Cassava	Terraced rice – Tea		

Pumpkin, soybean and rice bean are all grown as second crops.

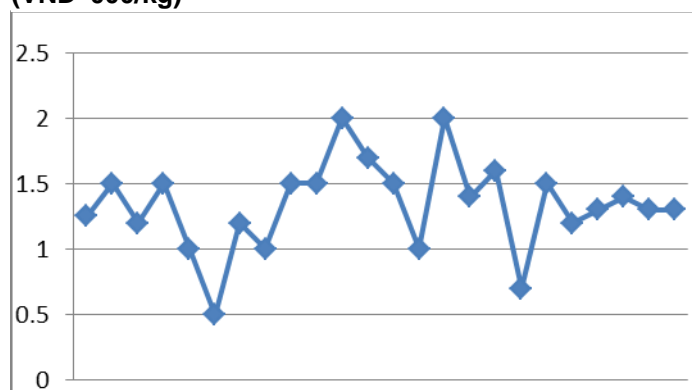
Among selected crops, only pumpkin and mung bean are considered as commercial crops while rice bean and soybean are mostly produced for family consumption (Table 10). Of the target crops, the most commonly grown are pumpkins and Phiêng Luông is the main producer.

Table 10: Number of households growing target crops (n=111)

Item	Mường Sang (n=29)	Phiêng Luông (n=27)	Nà Ót (n=27)	Chiềng Chăn (n=28)	Total (n=111)
Soybean	0	0	1	2	3
Pumpkin	6	24	3	3	36
Rice bean	1	0	0	1	2
Mung bean	1	0	2	5	8

Figure 8: Pumpkin prices in Moc Chau in 2011

(VND '000/kg)



In 2011 and 2012 pumpkin prices fluctuated significantly. This, combined with the thin-shelled variety grown makes them difficult to store for any more than one month so pumpkins are declining in popularity as a potential crop and led to a decrease in the area grown. In contrast, prices for mung bean are quite high and stable.

Farmers generally rely on their mobile phones for obtaining information and access their own social networks rather than formal sources of information or collectors. Information about inputs for production focuses mainly

on input prices. Farmers often collect information related to input prices from input suppliers, neighbours and relatives.

Householders interviewed believe that water, capital and transportation are limiting their ability to produce crops (Table 11). Horizontal collaboration amongst farmers and vertical collaboration between farmers and other stakeholders in production and marketing of agricultural products have not been developed.

Table 11: Constraints on agricultural production (n=111)

Responses	Percentage of total respondents (%)
1. Dependent on natural water	34.83
2. Lack of capital	32.58
3. High input price	5.62
4. Difficulty in transportation	10.11
5. Lack of labour	4.49
6. Lack of technical support	4.49
7. Others	7.87

Interestingly, there was a wide variation between communes in their interest in applying new farming practices. Phiêng Luông was the most interested (90%), Mường Sang (59%), Chiềng Chăn (50%) moderately interested, and Nà Ót quite disinterested (33%). Between 50 and 72% of people believed they would have to use a bank loan of around VND 30 million over a period of 21-30 months if they were going to attempt to grow a new crop.

Infrastructure in the target communes is poor, especially for two communes in Mộc Châu district. Most of inter-village and inter-field roads are just “land lines”. Hence, it is very difficult to travel in wet season. As rice usually gets the priority in the use of water this could be limiting in drier seasons.

Table 12: Farmer willingness to expand production of the target crops (n=111)

Commune (no. families interviewed)	Mường Sang (n=29)		Phiêng Luông (n=27)		Nà Ót (n=28)		Chiềng Chăn (n=28)	
	No. H'holds	Area (m ²)	No. H'holds	Area (m ²)	No. H'holds	Area (m ²)	No. H'holds	Area (m ²)
Soybean	3	1,667	2	4,000	9	2,222	3	4,100
Pumpkin	9	8,289	19	8,326	3	1,833	1	2,000
Rice bean	2	7,000	1	10,000	2	5,000	1	2,500
Mung bean	2	1,650	1	2,000	1	50	9	2,611

Table 12 identifies the number of households in each commune who are willing to increase the area of specific crops and the area they want to grow. It demonstrates that, whilst most of the interest focuses on growing pumpkins, when compared to the total numbers of farmers in each commune, there is little willingness by smallholders to consider growing new

or commercial versions of these crops. However, the proposed increases in areas grown are significantly larger than the average currently grown (Table 8). The implications of these results will be discussed in Section 7.10.

2.9 Scaling out the value chain interventions

Unfortunately, due to the challenges for chain development outlined earlier, scale-out interventions have not been piloted. The project team focused on expanding the number and size of Mộc Châu collectors and Ha Noi wholesalers and retailers to achieve sufficient scale in the focal chain. Unfortunately, Ha Noi wholesalers and retailers were reluctant to invest their time into developing a premium Tam Hoa plum chain because there is little incentive to invest time and money into an inherently variable product with a short season and several substitutes which contributes only a very small proportion of their store income. The large supermarket retailers were not interested for the same reason.

However, in the last month of the project (June 2013), the approach of having regular discussions with key chain figures to monitor progress and gather more detailed data resulted in identifying a significant player in the Mộc Châu District. The project team was able to make contact with and immediately build a relationship with the largest plum wholesaler who has 50% of the market with about 6-8,000 tonnes per season; 7 x 12 tonne trucks per day to Ha Noi, 1 x 20 tonne truck per day to HCMC and 2 x 30-40 tonne trucks per day to China. This wholesaler has been in business since 1998 and also markets other fruit and vegetables. He provided valuable information not previously known about the market and offered to introduce the team to the other five largest wholesalers in the region whom he said met regularly. During a visit to one of his large orchards he demonstrated he was using many of the value chain management principles that underpin the model for the Hi-Q chain. Finally he expressed a desire to market premium plums and to work with the project team in the future. This large-scale capacity to access a diversity of markets offers the Ban On Hi-Q chain an opportunity to increase the scale of premium high quality which the farmers and collectors indicated was necessary to incentivise the grading and packaging necessary to get consistent quality.

The project team has discussed and developed strategies, based on value development practices used earlier in the project, to exploit this opportunity. Fundamentally, the strategies are to:

- Use this relationship to develop the volume that was lacking throughout this project;
- Employ the principles and practices developed in this project to improve the high quality supplied through the large wholesaler group;
- Expand the market to HCMC.

The Vietnamese partners in CASRAD have since engaged with this wholesaler for a joint follow-on project with ASODIA, a French NGO working in the Mộc Châu plum industry.

2.10 Discussion

The industry has large numbers of producers, probably 30-40,000 smallholders across much of NW Vietnam. Smallholders mainly produce small amounts; from less than a tonne to several tonnes per annum. Production is opportunistic, determined by price and farmers move in and out of production. Whilst there is a significant benefit advantage per kilogram for the Hi-Q plum chain, the low volume throughput for anyone in the chain means that the overall benefit is low compared to other channels where higher volumes can be achieved.

Hence, there is a reluctance to invest in the recommended inputs that require money, time and effort. The number of producers in Mộc Châu is not known but it is likely with production being between 17-25,000 tonnes that there are several thousand. Thus, the incentivisation and coordination of these large numbers of smallholders are the keys to any industry development.

Smallholders are involved in a large number of enterprises as a risk management strategy for subsistence (and indeed survival) so are unwilling to focus more on plum production where the price is highly variable. The season during which premium or reasonable margins can be obtained is short, often as short as 7-10 days (the last two years) and no longer than 30-35 days AND this period is highly variable in timing, moving from early May to mid-June. This means that:

- No-one in the chain makes much money out of plums so they are reluctant to invest effort/money in improving the chain;
- Chain improvements have little time to be implemented and tested for effectiveness;
- The large number of small retail outlets meant that it was difficult to achieve the volumes necessary to capture a market segment and meet the original project projections of a target volume of 900 tonnes (the project has yet to achieve much more than three tonnes).

The variable season results in plums overlapping with the season of a number of highly substitutable fruits (e.g. Lychees, Longans, other sorts of plums) so if the price is too high and/or the volume is low people simply buy something else. There is little recognition nor desire for understanding the provenance of plums beyond knowing that they are safe to consume. That is not to suggest that regional identification could not be developed but there are also several other provinces that are major producers of plums.

Price is highly variable and driven by a number of uncontrollable factors:

- Green plum price in China which is driven by climatic conditions in China that drives their own supply
- Price and volume of competing fruits in Vietnam which are driven by climatic conditions and volume of supply

Plums are marketed mainly through a large number of small greengrocers and 'wet markets' and make a very small contribution to store profit. Hence, the specialty grocers have little incentive to engage in chain coordination as they can buy the small amounts they need cheaply from wet markets and grade plums themselves to achieve the quality they want.

Supermarkets have little interest in plums as a seasonal profit leader because there is too much uncontrollable seasonal and genetic variation and they do not want the risk associated with supply chains based on large numbers of uncoordinated suppliers. Consumers, on the other hand, do not consider supermarkets as a major outlet because they perceive their fresh produce to be inferior quality to wet markets.

The consumer value attributes of redness, sweetness and size are highly variable and not physiologically associated. That is, red plums are not always sweeter or green plums more

sour. Thus, attempts to create a 'premium brand' will have difficulty establishing brand integrity, particularly regarding quality. However, in some areas it is easier to produce nicely coloured and sweet plums so more specific area specific branding may be possible. For example, 'Ban On Premium Plums' or '19th May Premium Plums'. The real premium prices come in the first week of the season and the Hi-Q chain had trouble responding quickly enough to get its product to market during this period. Despite the effort at grading by collectors, retailers regularly complained about the variation in quality and most graded the product a second time in-store adding to input costs.

For the other complementary crops, pumpkin, soybean, rice bean and mung bean, there appears to be significant problems at this time in integrating them into the cropping regime for supplying commercial value chains. Whilst there appears to be farmer interest in being involved in adopting new technology, when it comes to a more firm expression of interest in growing a specific new crop, there is less commitment to the concept. Their lack of financial capability, water and adequate roads to the surveyed communes appear to be important limitations on implementation. The land area available is small and production appears to largely have been for household use so there is little experience with commercial production. Farmers have not considered collaboration to enable them to grow more commercial quantities and have little concept of how to proceed to achieve a commercial level of production for either fresh market or processing. Whilst some of these limitations can be addressed by training and support, the motivation to attempt this change appears to be a significant issue for achieving any changes in rotational practice. Changing these key factors appears to be a task that would extend beyond the scope of this research and development project.

Given these industry characteristics, the 'value chain complementary crops' component of AGB/2008/002 appears to have only partially achieved its original objectives. It has been very successful in developing an understanding of the market mechanisms, constraints and opportunities (Objective 1.1) as well as identifying and prioritising the market opportunities for improved smallholder profitability (Objective 2.1).

Unfortunately it has failed to develop four competitive value chains as originally conceived (Objective 3.1). In part, this may be attributable to a failure to identify and engage appropriate large wholesalers from the Mộc Châu plum industry and large distributors in Ha Noi to assist the project during the Scoping Study or in the early stages of the project. A number of studies have highlighted the importance of wholesalers to the development of modern retailing systems in Developing Countries and the moderate level of margins (approx.. 10-15%) they extract compared to Developed Countries (Reardon & Berdegue, 2008; Reardon, Timmer & Minten, 2012). This led directly to the project's inability to get sufficient volume of plum throughput to take advantage of the margins demonstrated by the research.

However, despite this, the project has developed one chain that demonstrated the potential of a high quality plum chain to improve stakeholder profitability although not to the extent that it significantly impacted on their overall incomes.

The strategies and mechanisms of engagement have been developed to achieve scale-out but these have not been trialled (Objective 3.1).

The conclusions and lessons emerging from this component of AGB/2008/002 will be outlined in Section 7.

3 Conclusions and recommendations

The AGB/2008/002 Temperate Fruit and Complementary Crops Component Team has faced many challenges in this investigation and has gathered enormous amounts of data on the nature and performance of the highly dynamic Mộc Châu Tam Hoa Plum industry, the supply chains from the project areas and the challenges faced by a high quality plum value chain in particular. From this a number of conclusions and recommendations can be made based on what we have learned.

3.1 Conclusions

- There is sufficient profit margin for all the chain participants to establish a sustainable niche value chain if sufficient volume throughput can be achieved;
- Engaging with large collectors and wholesalers is important for improving smallholder systems;
- There are few opportunities for farmers to ‘add value’ and so share in the benefit of ‘premium prices’;
- Products are highly substitutable presenting difficulties for establishing large, stable coordinated chains;
- Opportunistic production and marketing are very difficult to coordinate;
- When engaging very large numbers of small stakeholders, coordination of production and marketing become even more important than usual in value chain management;
- Where the opportunity and motivation to improve is low then chain members will not be willing to invest;
- The market price is highly dynamic, dependent on diverse, uncontrollable conditions and therefore risky for smallholder investment;
- This product was inappropriate for chain improvement due to:
 - Opportunistic production;
 - Highly variable prices driven by Chinese market & substitute products;
 - The product is inherently highly variable & very difficult to attain consistent quality output & brand integrity.

3.2 Recommendations

- Not all supply chains are suitable for coordinated supply, so future scoping studies for value chain oriented projects should pay particular attention to:
 - The characteristics and capacity of the industry –scoping studies should consider the overall dynamics of the industry. Opportunistic production and supply, high substitutability and large numbers of producers are difficult to coordinate. Further, if premium branding is an aim of the project, then the best production areas should be the focus for selection;
 - The selection of the product to be investigated – not all products are suitable for standardising volume and quality. Products with high genetic variation or are highly substitutable introduce levels of uncontrollable variation into the chain that may undermine the chance of success. Further, short production seasons, as in this case, do not provide sufficient opportunity for process improvement and action learning to occur;

- The selection of the chain to be investigated – this should focus on the numbers of people involved at each level of the chain, their level of motivation and capability (experience with the product, resources etc). This point should not be interpreted to mean an exclusion of small farmers. However, it is important that projects achieve early success and so should commence with the most capable and the most motivated. Scale-out strategies can then address those motivated but less capable through training, mentoring and other support strategies to assist them to reach scale and capacity. Selection criteria that include explicit or tacit non-chain production/marketing factors or that uniformly impose rigid parameters (e.g. geographic area) on participation may undermine project success;
- The incentives of the chain members to engage with the project. It is essential that prospective participants understand and recognise the opportunity that the project is addressing. The selected participants should be motivated to participate and understand their contribution and any risks that might be involved.
- Generally, value chains have a single organisation that leads and coordinates the chain's activities; that includes providing the incentives for the upstream partners, ensuring they have adequate information necessary to produce and consistently supply the required quality and volume of the product etc. Future value chain projects based in smallholder production systems should pay particular attention to the 'aggregators' and 'distributors' in the system; that is, those wholesalers who gather the produce from hundreds or even thousands of small producers AND those who distribute the product to the marketplace. It is critical that large regional wholesalers in the region of production are identified who have the capability and motivation to coordinate an appropriate level of supply. Similarly, it is also critical to engage a distributor in the major market who has the capability to gain the required access to retailers to market the target volume and the capability to motivate and coordinate sufficient upstream chain participants to supply the desired product.

4 References

4.1 References cited in report

- Bonney, L., Clark, R., Collins, R., Dent, B., & Fearne, A. (2009). Sustainable value chain analysis: an agri-food chain diagnostic (pp. 38). Adelaide, South Australia: Primary Industries and Resources South Australia.
- Collins, R. J., & Dunne, A. J. (2008). A rapid supply chain appraisal approach for agribusiness development projects. *Acta Hort (ISHS)*, 794, 73-80.
- Cao-Van, P., & Chau, N. M. (1999). Deciduous fruit production in Vietnam. In M. K. Papademetriou & E. M. Herath (Eds.), *Deciduous fruit production in Asia and the Pacific*, FAO/RAP Publication (1999/10 ed., pp. 90-96). Bangkok, Thailand: Food and Agriculture Organization of the United Nations Regional Office for Asia and the Pacific. Retrieved from <ftp://ftp.fao.org/docrep/fao/004/ab985e>.
- Heron, J & Reason, P 2001, 'The practice of co-operative inquiry: research 'with' rather than 'on' people', in P Reason & H Bradbury (eds), *Handbook of action research: participative inquiry and practice*, 2004 edn, Sage Publications Ltd, London, pp. 179-88.
- Jiang, Y., Zhang, Z., Joyce, D. C., & Ketsa, S. (2002). Postharvest biology and handling of longan fruit (*Dimocarpus longan* Lour.). *Postharvest Biology and Technology*, 26, 241–252.
- M4P. (2008). Making value chains work better for the poor: a toolbox for practitioners of value chain analysis Retrieved from <http://www.valuechains4poor.org>
- Meilgaard, M. C., Civille, G. V., & Carr, B. T. (2007). *Sensory evaluation techniques* (4th ed.). New York: CRC Press.
- Nguyen, T. D., Truong, T. M., & Dao, T. A. (2005). Analyzing Thieu Litchi value chain in Thanh Ha District, Hai Duong Province (pp. 38): Vietnam Agricultural Science Institute and GTZ-MOT-METRO.
- Reardon, T., & Berdegue, J. A. (2008). The retail-led transformation of agrifood systems and its implications for development policies. Background paper for the WDR.
- Reardon, T., Timmer, C. P., & Minten, B. (2012). Supermarket revolution in Asia and emerging development strategies to include small farmers. *Proceedings of the National Academy of Sciences*, 109(31), 12332-12337.
- Singh, S. P., Singh, Z., & Swinny, E. E. (2012). Climacteric level during fruit ripening influences lipid peroxidation and enzymatic and non-enzymatic antioxidative systems in Japanese plums (*Prunus salicina* Lindell). *Postharvest Biology and Technology*, 65(0), 22-32. doi: <http://dx.doi.org/10.1016/j.postharvbio.2011.10.007>
- Spriggs, J., & Chambers, B. (2007). Improving the marketing system for fresh produce from the highlands of Papua New Guinea *Agriproduct Supply-Chain Management in Developing Countries* (pp. 67). Canberra, ACT: Australian Centre for International Agricultural Research.
- United Nations. (2002). Millennium development goals: bringing the MDGs closer to the people: Hanoi: United Nations in Vietnam.
- United Nations Development Programme. (2013). The rise of the south: human progress in a diverse world. In K. Malik (Ed.), *Human Development Report*. 1 UN Plaza, New York, NY 10017, USA: United Nations.

4.2 List of publications produced by project

- Russell, I., Collins, R., Dao, T. A., Hoang, T. T., King, C., Nguyen, H. N., & Wandschneider, T. (2010). Guidelines for value chain development and linking farmers to markets in the uplands of Vietnam. *Acta Hort. (ISHS)*.
- van de Fliert, E., Vuong, P. T., Hien, D. T. M., Thomas, P., & Nicetic, O. (2010). *Out of comfort zones, into realities: research for development with upland ethnic minority communities in North West Vietnam*. Paper presented at the 9th European IFSA Symposium, Vienna.