

Agriproduct Supply-Chain Management in Developing Countries

**Proceedings of a workshop held in Bali, Indonesia,
19–22 August 2003**

Editors: **G.I. Johnson and P.J. Hofman**

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Foreword

A major theme of many ACIAR projects is 'linking farmers with markets'. In a complex, global market, price and supply fluctuations for rural produce affect resource and infrastructure planning and access to credit, at both farm and national levels. Production surpluses may not translate into higher incomes. The efficiency of enterprises is affected by the choice of commodity, product end-use or market, as well as sourcing of inputs such as fertilisers, seed, pesticides and technology.

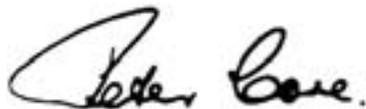
Rural communities and governments must become more 'market smart'. They need to forecast, interpret and respond to supply signals from domestic and global markets, and to capitalise on consumer preferences for perceived nutritional benefits, novelty and convenience. They must balance sustainable resource use and demands for quality with the challenges of higher food safety standards and long and complex supply chains.

Progressing beyond self-sufficiency, whether at the farm or national level, requires the capacity for reliable production and profitable marketing of products sought by consumers. The challenge is to provide rural communities with the capability and resourcefulness for social adjustment and improvement of enterprise profitability during their integration into the global community. The need is especially acute for small, remote and resource-poor communities because of their small production bases and greater vulnerability to natural disasters, new pests, political instability and other 'shocks'. Developed countries must be proactive in enabling remote communities in developing countries to obtain a fair share of global prosperity.

ACIAR considers that, in the face of globalisation, rural community progress and resilience will depend increasingly on their understanding of and access to markets, the flexibility and strength of their financial base, and the quality, efficiency and versatility of their production, processing, distribution and marketing systems.

ACIAR will support research that enables improvements in product integrity, processing and storage, and quality assurance and supply-chain management.

The papers in this proceedings were presented at a workshop in Bali in August 2003. Many of them report on work carried out in ACIAR projects. More information is available through ACIAR's Linking Farmers With Markets, electronic newsletter (www.lfwm.net).



Peter Core
Director
Australian Centre for International Agricultural Research

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Opening Address

Supply-Chain Management in Indonesia: Prospects for Methodological Adjustment and Practical Applications

Ahmad Dimiyati

Secretary,
Indonesian Agency for Agricultural Research and Development
(IAARD)

Background

The Ministry of Agriculture of the Republic of Indonesia has defined two core programs of national agricultural development, namely improving food security and enhancing the development of competitive, sustainable, people-centred and decentralised agribusinesses. The two core programs require better understanding and implementation of a systems approach in identifying, analysing and improving problematic situations in agricultural development. Therefore, the application of the supply-chain management (SCM) concept in agribusiness is quite in line with the current needs of the agriculture sector's decision-makers and practitioners.

Supply-chain management has been widely used in the manufacturing industry. Its use in agribusiness has been initiated in a study entitled 'Market-based analysis of constraints for the development of banana industry in Indonesia and Australia'. The study was carried out by the Indonesian Center for Horticulture Research and Development (ICHORD) in collaboration with Queensland Department of Primary Industries (QDPI), with joint funding of the Government of Indonesia and the Australian Centre for International Agricultural Research (ACIAR).

The introduction of the SCM concept within ICHORD programs coincided with the introduction of another systems approach method, named 'soft systems methodology' (SSM) developed by Peter Checkland of the University of Edinburgh, Scotland. Our research team tried to combine and integrate the two methods in analysing and improving the problematic situations pertaining to the development of horticulture in Indonesia.

Lessons Learned

The six principles of successful SCM were used to measure the performance of banana production and marketing systems in several locations in the provinces of Banten, West Java, and Jakarta. The six principles are: (1) understanding and meeting customers' and consumers' needs; (2) getting the products right; (3) creating and sharing values; (4) logistics and distribution; (5) information and communication; and (6) effective relationships among supply-chain members.

The results of the study will be reported in detail in later sessions of this workshop. However, it is necessary to underline several lessons learned from this study. After discussing various problems and constraints in the banana industry, new ideas to improve research and development programs in horticulture were revealed. On-farm oriented research, which has dominated research programs for years, was supplanted by market-oriented research programs, such as consumer preferences, components and determining factors of fruit quality, and packaging, storage and processing. New ideas for on-farm research also emerged, such as selection of better varieties and planting material, and cultural practices related to fruit qualities.

Our short experience in applying the supply-chain concept also revealed that, between different chains, variation is possible in the emphasis on different principles in achieving success. One supply chain may emphasise the creation and sharing of new values to improve income and welfare of the members, while another SC may emphasise the importance of open and fair information flow and efficient communication.

The success of applying the supply chain concept and improvement of SCM depends largely on effective contributions by various members of an interdisciplinary, or even a cross-functional, team. No single scientific discipline or professional field can claim all the credit for success. Researchers in various disciplines, extension workers, practitioners and policy makers should collaborate in analysing the problems, formulating the improved schemes and designing the actions needed to implement them.

Since SCM is a holistic approach with human-activity systems, similar to soft systems methodology (SSM), we found it possible to integrate SCM with SSM. Such integration permits:

1. mapping the situation of SCM in a richer picture according to SSM, to make it richer and more dynamic than the linear flow charts usually used in SCM
2. use of interactive and iterative multilateral dialogues among supply chain members
3. characterisation of the chain, using SWOT (strengths, weaknesses, opportunities, threats) analysis and root definition of the systems
4. mapping of narrative areas for improvement of SCM in the conceptual models used in SSM

5. formulation of follow-up actions based on SWOT analysis can be further elaborated using the SSM approach to define actions and changes that are logically desirable as well as culturally and politically feasible.

Both SSM and SCM require an interactive and iterative egalitarian dialogue that suits Western culture. Their application in the Indonesian cultural setting will need adjustment of the style of dialogue. One of the drawbacks of the two methods lies in the nature of decision-making process in the supply-chain systems. Supply-chain improvement requires the decision of various 'equally authorised' partners. Hence, the process is owned by these various partners. Multiple ownership of the processes and the diversity of stakeholders, make the processes of improvement slow and complicated.

Both SCM and SSM have good prospects for wider application in agribusiness development. Among the areas that will benefit from the use of the two methodologies are:

- analysis of constraints to agribusiness development made by various central Directorates within and outside the Ministry of Agriculture
- assessment of location-specific and commodity-specific agribusiness models as components of action research conducted by 26 provincial Assessment Institutes for Agricultural Technology
- commodity-based 'Action Programs' conducted jointly by the Indonesian Agency for Agricultural Research and Development (AARD) and Directorate General of Horticulture Production Development
- integration of the two methodologies in the education and training curricula related to the agribusiness development.

Since we are still in the early learning stage, we are expecting the workshop to make a large contribution to the enhancement of SCM application in Indonesia, particularly within AARD. Among possible contributions are:

- exchange of lessons learned in diverse social and economic conditions
- improvement and enrichment of the concept
- refinement of the procedures
- suggested adjustments for varied cultural situations and commodities
- strategy and tactics for wider application.

Finally, I wish you all productive deliberations and an enjoyable stay in this country. Thank you.

Preamble

An adequate and stable supply of agricultural commodities is the keystone of food security and economic development. Globalisation and trade liberalisation can help communities to improve rural incomes, but these benefits may be compromised by inadequacies in infrastructure or governance, by difficulties in controlling postharvest deterioration or by an inability to produce competitive products.

ACIAR considers that, in the face of globalisation, the progress and resilience of rural communities will depend increasingly on their understanding of and access to markets, the flexibility and strength of their financial base, and the quality, efficiency and versatility of their production, processing, distribution and marketing systems. Rural communities and governments must become more 'market smart'. They must balance sustainable resource use with the challenges of quality requirements, higher food-safety standards and long and complex supply chains.

At the international workshop at which the papers in these proceedings were presented, experts outlined the theory, methods and approaches of supply-chain management (SCM), and practitioners discussed their practical experience in SCM. The workshop then considered how SCM can best be used in developing countries to optimise benefit flows.

The main focus of ACIAR support for supply-chain projects has been to consider whether evaluating an industry using the supply chain as a foundation (that is, looking at all aspects from farm to plate) would better indicate the areas that need to be targeted to improve industry efficiency and profitability, for the individual members of the supply chain and the chain as a whole. An important priority of the ACIAR projects (listed later in this preamble) has been to identify whether and how changes in SCM can ensure that the benefits extend to farmers.

This workshop provided a forum for discussing how SCM can assist in developing appropriate systems from farm to plate, to the mutual benefit of all involved, and what implications there are for

governments and communities. In addition, it sought to assess whether this approach can assist in identifying the most important constraints to these improvements. These constraints would then be the areas that R&D providers and policy makers could focus on in order to assist industry development.

Workshop Objectives

The workshop sought to achieve:

- a greater understanding of the potential benefits and application of the SCM approach to increasing returns to smallholders
- an enhanced capability for supplying produce to the higher-returns supermarket and hospitality trades, by increasing product quality and supply efficiency
- a better identification of the real constraints to improvements in the targeted industries, so that R&D activities can be implemented more effectively
- an understanding of the implications of increasing market sophistication for governments, industries and communities
- publication, in the ACIAR Proceedings series, of the papers presented. The papers in this volume cover the theory of supply chain R&D and practical experiences in application of the supply-chain approach in developed and developing countries.

Participating Projects

The projects described on the following pages provided the support for many of the papers presented at the workshop. The information was collated by ACIAR, using the best information available at the time of preparation, for use as a resource in the workshop. Further information on the projects can be obtained from the contact person listed in the project summary.

ACIAR Project PHT/1997/161 — Market based analysis of constraints to banana industry development in Indonesia and Australia. Active to 31/12/2003.

This small project developed a participatory process to identify the major constraints to the competitive performance of a horticultural industry in Indonesia and Australia to:

- assist in industry development
- more effectively direct R&D to priority areas with the greatest potential for improving producer profitability.

The project tested the feasibility of using the concepts of product market performance and supply-chain management both as drivers of industry development and to guide the contribution of R&D to industry development.

Commissioned organisation: Queensland Department of Primary Industries, Brisbane (P.J. Hofman, Email: <Peter.Hofman@dpi.qld.gov.au>). **Collaborators:** Central Research Institute for Horticulture, Indonesia; University of Queensland, Australia; Indonesian Agricultural Postharvest Technology Research Institute (Indonesia); Directorate of Fruit Plantation (Indonesia); Central Research Institute for Socio Economic Development (Indonesia); Directorate of Marketing of Horticulture (Indonesia); Central Research Institute for Vegetables (Indonesia).

The market for seed potatoes, fresh potatoes and processed potato products in Vietnam (AusAID CARD and other funds)

Funded initially under the CARD project, this project sought to identify the principal source of seed, the costs of seed, the various criteria farmers used in their decision to purchase seed and the extent to which the seed available met the farmers' expectations.

Based on the performance of seed imported from Western Australia, it was readily apparent that improved seed had a significant positive impact on yield, lifting the average yield of 12 tonnes per hectare to more than 30 tonnes per hectare. Since most of the potato crops in the Red River Delta are harvested within an eight-week period, concern were expressed as to what impact the improved productivity would have on prices in the fresh market. Various exploratory studies were then undertaken to examine the downstream implications on the wholesale market. Discussions focused on current wholesale prices, the seasonality of demand, competitors

(in China and Da Lat, Vietnam), tuber quality and size, postharvest storage and the extent to which the potatoes available in the Red River Delta met the market intermediaries' needs. Various discussions were also undertaken with small-scale potato processors and the food service sector.

In presenting the results to a potato industry workshop in November 2001, the German technical assistance agency Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) advised that it was about to embark upon a more extensive investigation of the entire supply chain, including consumers. As a result, the two research programs were combined. It was proposed to interview consumers in both northern Vietnam (the Red River Delta) and southern Vietnam (the Mekong River Delta) and to undertake an analysis of both the domestic market and export market for potatoes cultivated in the Red River Delta. Information was sought on consumers' attitudes towards fresh potatoes, substitute crops (taro, sweet potato and radish), the frequency of consumption, how the product was used, how much consumers paid to purchase potatoes, consumer preferences, and the demand for both processed potato products and potatoes that were consumed away from home (restaurants). Various demographic variables were also collected to evaluate such measures as the income elasticity of demand.

A comprehensive analysis of the supply chain for potatoes in both the Red River Delta and Mekong River Delta was undertaken. Both quantitative and qualitative interviews were conducted with farmers, traders, wholesalers and retailers, and various food service outlets. Information was collected on the prices paid to purchase potatoes, the various activities undertaken, the costs of performing those activities, and the prices at which the potatoes were sold. Information was sought on how prices varied over the year, between the different grades, the different suppliers (China and Da Lat), and the extent to which the quality of the potatoes sold met the buyers' needs. The final aspect of the research included a number of relational dimensions (trust, satisfaction, commitment, power-dependence and relationship-specific investments) to explore to what extent market intermediaries were satisfied with the exchange relationship.

Commissioned Organisation: Agriculture Western Australia (Peter Batt, Email: <p.batt@curtin.edu.au>).

Collaborating Organisations: Food Crops Research Institute Vietnam; Curtin University of Technology; GTZ.

ACIAR Project PHT/1998/140 — Postharvest handling and disease control in melons in China and Australia. Active 1/1/2002 to 31/12/2004.

ACIAR funded an earlier small project, 'Postharvest handling and disease control in melons', which affirmed the priorities for melon industry development in western China and the scope for improvements in disease control and supply-chain technologies. This project follows on from that research. It is aiming to improve postharvest disease control and market quality of melons and other cucurbits, and improve returns to growers in China and Australia. Project activities include the strategic application of preharvest treatments to boost natural defence mechanisms in melons, and postharvest treatments to control disease and maintain quality. Researchers are also developing and testing interventions that improve supply-chain management, analyse the economic benefits associated with using modern postharvest technologies and transport systems, and identify the most practical options to improve profitability for farmers.

Commissioned Organisation: University of Sydney, Australia (Dr Robyn McConchie, Email: <McConchieR@agric.usyd.edu.au>). **Collaborating Institutions:** Gansu Agricultural University, China; China Agricultural University, China; Sydney Postharvest Laboratory, Australia; Xinjiang Department of Agriculture, China; University of Queensland, Australia; Xinjiang Agricultural University, China.

ACIAR project ASEM/2001/037 — Improving the marketing system for fresh produce of the highlands of PNG. Active 01/01/2003–31/12/2005.

The Papua New Guinea (PNG) Highlands region represents a unique environment in which high quality temperate-zone horticultural produce is grown year-round. The region has the potential to meet produce needs of populous coastal cities of PNG as well as to supply offshore markets. The main drawback to fulfilling this potential is an inadequate marketing system, and marketing improvements have been given a high priority in the PNG Government's National Food Security Policy, 2000–2010. Project researchers will map the marketing system and its institutional environment (governmental and infrastructural), identify the constraints and capacities for change, and evaluate the potential for improvement. They will facilitate a process of change, focusing on two particular supply chains —

a land/sea chain (bulky, less-perishable produce) and a land/air chain (highly perishable, high-value produce).

Commissioned Organisation: University of Canberra, Australia (Dr John Spriggs, Email: <jspriggs@comedu.canberra.edu.au>). **Collaborating Institutions:** National Agricultural Research Institute, Papua New Guinea; Fresh Produce Development Corporation, Papua New Guinea.

ACIAR Project ASEM/2000/101 — Improving the efficiency of the agribusiness supply chain and quality management for small agricultural producers in Mindanao. Active 01/01/2001–31/12/2003.

This project examined the factors affecting the performance of the agribusiness supply chain for selected fresh vegetables produced by smallholders in Mindanao, Philippines, with particular emphasis on the potential for farmer cooperatives to perform the agribusiness functions and deliver greater benefits to the farmer. The project involved rapid appraisal and case study methods to assess the performance of the current marketing arrangements and sought to identify impediments to the functioning of the supply chain. The researchers aimed to determine whether there is adequate information flow between market intermediaries and farmers, to reflect the market requirements for quality management. Training programs, workshops and seminars with farmer groups and institutional participants aimed to facilitate the adoption of quality management systems and improve the success rates among agricultural cooperative groups.

Commissioned Organisation: Curtin University of Technology, Australia (Dr Murray McGregor, Email: <murray@muresk.curtin.edu.au>). Project website: <<http://www.curtin.edu.au/curtin/muresk/aciarmindanao/>>. **Collaborating Institutions:** University of the Philippines, Mindanao, Philippines.

ACIAR Project PHT/1997/017 — Reducing aflatoxin in peanuts using agronomic management and bio-control strategies in Indonesia and Australia. Collaborating Countries: Indonesia and Australia.

Several ACIAR bilateral projects have investigated aspects of aflatoxin assessment and significant progress is finally being made in developing integrated control strategies. This project builds on this and other work on drought tolerance (a trait that was found to reduce contamination risk). Advances in

agronomic management of aflatoxin since the earlier projects means that reduction of aflatoxin contamination risk in peanuts, including the use of drought-resistant peanut cultivars, is now feasible. This project will determine the extent and relative importance of pre- and postharvest aflatoxin contamination in peanuts, and develop biocontrol, management and crop/fungus modelling strategies to minimise the impact of aflatoxins in both Indonesian and Australian cropping systems. Scientists will evaluate a number of crop management and varietal methods to control 'on-farm' aflatoxin contamination. As well, a simulation modelling approach — integrating the interaction between crop, soil, environment and *Aspergillus flavus* (the fungus producing the aflatoxin) — will enable assessment of the probability of aflatoxin formation at various stages during growth, harvest and storage of peanuts.

Commissioned Organisation: Queensland Department of Primary Industries, Australia (Dr Graeme Wright, Email: <graeme.wright@dpi.qld.gov.au>).

Collaborating Institutions: Research Institute for Legumes and Tuber Crops, Indonesia; Assessment Institute for Agricultural Technology, Indonesia; Gadjah Mada University, Indonesia; University of Sydney, Australia; SEAMEO Regional Centre for Tropical Biology, Indonesia.

ACIAR Project ASEM/1999/013 — Improved marketing of mandarins in East Nusa Tenggara in Indonesia and northern Queensland. Completed project.

Regional horticultural farmers in East Nusa Tenggara (NTT) and northern Queensland operate on a small scale and lack a systematic marketing strategy for their products, which are often of poor and inconsistent quality. The Indonesian farmers have additional problems associated with poor infrastructure and lack of investment. The project focused on small-holder mandarin farmers in NTT and northern Queensland. The aim was to assist farmers to improve quantity and quality of fruit production, define specific market requirements and improve marketing strategies. The findings of the project were also applicable to East Timor.

Commissioned Organisation: The University of Queensland (Dr Sherrie Wei, Email: <s.wei@mailbox.uq.edu.au>). **Collaborating Institutions:** Universitas Nusa Tenggara; Queensland Department of Primary Industries; Metaram University, Lombok.

Improving the performance of the fruit industry in Tien Giang and Tra Vinh Provinces. AusAID CARD (Capacity-Building for Agriculture and Rural Development) Project for Vietnam. July 2001–July 2003.

This project focused on the mango industry in the Mekong Delta area of Vietnam and aimed to:

- enhance the capacity of agribusiness marketing of the Southern Fruit Research Institute (SOFRI), provincial agricultural services, selected farmer associations and farmers
- strengthen the capacity of farmer associations in service delivery, quality assurance management and group marketing
- upgrade the capacity of SOFRI and provincial agricultural services in fruit tree propagation, production and protection, including expanded capacity for certifying planting material to meet market demand.

Four farmer groups were established and they worked with Australian partners (including mango farmers from Queensland) to develop a trial of QA standards for the 2003 season and other group functions.

Commissioned Organisation: University of Queensland (Sherrie Wei, Email: <s.wei@mailbox.uq.edu.au>).

Collaborators: Southern Fruit Research Institute, Vietnam; Curtin University of Technology; Queensland Fruit and Vegetable Growers; Cantho University.

Victorian Government and Australian Department of Agriculture, Forestry and Fisheries (AFFA) Project VG MIS: Indonesian vegetable supply chains: case studies. Active to 30/09/2003.

This one-year project used a case study approach to introduce farmers, packing house staff and consumers (via retailers) to the concepts of food safety and meeting customers' expectations. The project was proposed as a five-year project and was extremely ambitious. Activities undertaken to achieve this included:

- selection of supply chains and personnel in five locations to participate in case studies after lengthy discussions with senior MOA staff in Jakarta and provinces
- a training-of-trainers (TOT) workshop for 10 MOA staff at CSA, Jakarta on food safety for packing houses, including packing-house HACCP analysis, development of a packing-house HACCP manual, and accreditation preparation

- TOT for selected MOA staff and experienced farmers at five locations, on integrated pest management (IPM) and farmer field school (FFS) methodology
- FFS for farmers in each supply chain (425 farmers currently in FFS)
- packing-house food safety awareness for the community at each supply chain's location
- packing-house food safety training and HACCP analysis for manager, staff and farmers supplying packing houses at five locations
- training in product handling and storage for retail fresh-produce buyers, managers and senior store staff of one of the supply chains.

It is too early to evaluate the impact of the project, but change has occurred at farmer, packing-house and retail sectors of the case study supply chains

Commissioned Organisation: Victorian Department of Primary Industries (Dr Wendy Morgan, Email: <Wendy.Morgan@dpi.vic.gov.au>). **Collaborators:** Indonesian MOA's Centre for Standardisation and Accreditation (Mr Syukur Iwantoro), FIELD Indonesia (Ibu Alifah Sri Lestari), MOA & Dinas staff in five provinces: East Java, South Sulawesi, Bali, South Sumatra and West Java.

Rural Agroenterprise Development Project: International Center for Tropical Agriculture (CIAT). Active. <http://www.ciat.cgiar.org/agroempresas/ingles/projectdescript.htm>

This global project is promoting rural business development and encouraging improved business and market orientation in small rural producers' organisations and support service organisations. Small-scale farmers and entrepreneurs face numerous barriers that prevent them from taking full advantage of marketing opportunities. Usually, economic models and policies do not favour them; they have little business experience, and lack information on technologies, markets, and prices; and receive little support in terms of training, advisory services, and credit. The mission of the project is to promote the linkage of small farmers with growth markets, and motivate the adoption of conservation practices through the development of methodologies, tools, information, and models of institutional organisation for establishing and strengthening rural agro-enterprises and their complementary support services.

Currently, the project works with five modules that integrate the essential elements for developing rural agro-enterprises: marketing, postharvest technology,

business organisation, integrated agro-enterprise projects (organised around commodity chains) and local support systems, and training and strategic planning. The project's direct clients are civil society NGOs and CBOs (community based organisations), public sector development agencies and institutions involved in building human capital. The project has developed a methodological framework based on a 'territorial approach to rural business development', which consists of four phases:

1. formation of a work team interest group) and development of a common vision
2. identification of market opportunities
3. design of integrated agroenterprise projects (i.e. oriented towards improving the commodity chain)
4. proposal for strengthening the local support system.

This methodology is implemented in reference sites in collaboration with public and private-sector development agencies. The project is decentralised, having regional coordinators in Africa, Asia, Central America, and the Andean region of northern South America.

In Asia, the project has previously undertaken research in Vietnam on clusters of root crop starch-processing enterprises (understanding and enhancing local innovation systems) and has conducted two regional agroenterprise development training courses with SEARCA and UPWARD (Los Baños 2001 and Ho Chi Minh City 2003).

A new SDC-funded agro-enterprise development project for Laos and Vietnam started in 2003. The SDC project goal is 'to develop sustainable agroenterprise initiatives with upland rural communities that generate income and employment opportunities through diversifying and adding value to local natural resources'. The objectives embody the process that will be followed in facilitating agro-enterprise development, ensuring its sustainability, and setting the context for extension of the approaches developed, viz:

- i. identify and evaluate market opportunities for agroenterprise development through local stakeholder interest groups
- ii. design and facilitate the implementation of agroenterprise initiatives with supply-chain actors
- iii. establish a strategy and local capacity for promoting agroenterprises and strengthening local business support services

iv. institutionalise the agroenterprise development process at district, provincial and national levels.

Project Agency: International Center for Tropical Agriculture (CIAT) (Project Manager Dr Rupert Best, Email: <r.best@cgiar.org>; Asian Regional Coordinator: Dr Dai Peters, Email: <d.peters@cgiar.org>; Consultant: Dr Chris Wheatley; Email: <c.wheatley@tasman.net>). **Collaborating Agencies:** Various national and regional partners.

IFPRI — The development of postharvest activities and agroindustry as a strategy to improve rural livelihoods. Project completed.

<www.beaf.de/download/IFPRI_Katalog.pdf>

This project aimed to develop recommendations for the continued expansion and development of the fruit and vegetable sector in Vietnam. Outputs sought were:

- preliminary assessment of postharvest constraints and selection of product groups for in-depth study
- identification and characterisation of household and community management of postharvest operations and agrofood-based rural industrialisation
- identification and characterisation of market structure, marketing, and processing enterprises involved in postharvest operations and agrofood-based rural industrialisation
- identification and characterisation of institutional mechanisms involved in lowering the transaction costs and increase the access of rural households to information, markets, and assets
- empirical analysis of economic behaviour, adoption of technology and institutional mechanisms
- analysis of impact of alternative policies and strategies at the rural household level, at the market level, and at the institutional level
- intensive dissemination of results in the country and internationally.

Project Partners: Vietnam Ministry of Agriculture and Rural Development (MARD); International Food Policy Research Institute (IFPRI), Nicolas Minot; Email: <n.minot@cgiar.org>; International Agrifood Consulting Company.

ACIAR Project ADP/2000/100 – Contract farming, smallholders, and rural development in East Java, Bali and Lombok. Active 01/01/2001–30/06/2003.

This research aimed to examine contract farming arrangements between smallholders and agribusiness firms in Indonesia. Contract farming helps to over-

come problems of imperfect markets in developing countries, and has been successfully adopted in Latin America. The agribusiness firms ensure a guaranteed source of supply and reduce transactions costs, while the farmers are given access to input supplies (such as credit, information on new technologies) and guaranteed prices. However, there are concerns that small farmers may not appropriate much of the benefit from these arrangements, and this project collected baseline information on the use of contract farming in Indonesia, with particular emphasis on opportunities for smallholders in East Java, Bali and Lombok. The results from the study should also have relevance to agribusiness firms and government decision-makers at both local and national levels.

Commissioned Organisation: University of New England, Australia (Dr Phillip Simmons; Email: <psimmons@metz.une.au>). **Collaborating Institutions:** Balai Pengkajian Teknologi Pertanian, Indonesia; Bogor Agricultural University, Indonesia; Brawijaya University, Indonesia; Udayana University, Indonesia.

Technical assistance on market promotion and development of the Philippine fruit export winners

This proposed project would aim to foster the development of a thriving Philippine fruit export industry that will help create jobs and improve the lives of the people through a two-pronged approach of formulating the needed strategies and corresponding actions that will enable the country to gain market access in developed countries and to improve further product quality and competitiveness of its export winners. The specific objectives are:

- To promote agricultural winners, specifically tropical fruits, in key international markets through:
 - the conduct of marketing activities that promote Philippine fruits and negotiate tariffs on imports and
 - the identification and evaluation of legal and technological barriers to agricultural trade in target markets.
- To ensure adoption of continuing product and product quality improvement in the fruit export industry through:
 - the conduct of industry assessment focusing on product and product flow (supply chain), to identify areas for quality and efficiency improvement and

- the establishment of an institutional mechanism that will convene the stakeholders as well as facilitate the interface between export industry leaders and government agencies.

- To formulate policy recommendations in line with the strategies identified.

Proponent: SEAMEO Regional Center for Graduate Study and Research in Agriculture (SEARCA)

ACIAR Project ADP/2001/066 – Strengthening agricultural market information activities in Vietnam. Active 01/01/2003–30/06/2005

Vietnam faces many challenges in the area of agricultural marketing but lacks experience and capacity in market-based research. This project will develop a framework to analyse agricultural marketing issues. Researchers will describe (and quantify) the current marketing channels for pigs, vegetables and canned fruit in Vietnam, and identify the role of the public and private sectors in marketing these products. They will also compare the experiences of public and private agricultural marketing services in China, Thailand and Australia with the situation in Vietnam. The researchers will work with the Information Centre for Agriculture and Rural Development (ICARD) – the market research and market information unit of Vietnam’s Ministry of Agriculture and Rural Development — to determine how the Centre can provide ongoing market information services to these and other industries.

Commissioned Organisation: University of Western Australia, Australia: (Associate Professor Michael Burton; Email: <mpburton@agric.uwa.edu.au>). **Collaborating Institutions:** Ministry of Agriculture and Rural Development, Vietnam; Department of Agriculture, Western Australia, Australia

Other initiatives

PHT/1996/004 – Monitoring mycotoxins and pesticides in grain and food production systems for risk management in Vietnam and Australia

PHT/2000/102 – Selection for improved quality and resistance to Phytophthora pod rot, cocoa pod borer and vascular-streak dieback in cocoa in Indonesia

Australia–Indonesia Working Group on Agriculture and Food Cooperation (WG AFC)
<www.affa.gov.au/exportgrowth>.

The Working Group on Agriculture and Food Cooperation (WG AFC) was established by the Australia–Indonesia Ministerial Forum in November 1992 to identify opportunities for greater cooperation in agriculture and food between both countries and to facilitate trade and investment. This mechanism has provided a valuable opportunity for developing linkages between high-level government officials and private sector interests of both countries. Most of the cooperative activities of the WG AFC are undertaken by its four task forces: Meat, Dairy and Livestock; Horticulture; Food Processing, Storage, Transport and Distribution; and Agribusiness Support Systems, although activity is not necessarily limited to these sectors. The task forces comprise mainly industry representatives but are co-chaired and facilitated by Australian and Indonesian government representatives. Several commercial joint venture opportunities and areas for collaborative training and research were identified at its July 2003 meeting.

Supply-Chain Management: Understanding the Concept and Its Implications in Developing Countries

Elizabeth J. Woods*

Abstract

During the 1990s, academic and commercial interest in supply-chain management (SCM) in agribusiness rose in Europe and the USA. The driving forces included the trend towards consolidation of organisations (at farm input, farms, processor and supermarket levels), along with government deregulation of agribusiness markets. Interest was also rising in quality-management systems and food safety, and competition in markets was increasing, associated with global trade in agribusiness products. SCM as a field of study draws contributions from several disciplines including transaction-cost economics, relationship marketing, agency theory and systems studies. This paper analyses the role of SCM in the context of concepts of operational effectiveness and strategy put forward by M. Porter in 1996.

SCM implies managing the relationships between the businesses responsible for the efficient production and supply of agribusiness products from farm level to consumers, to reliably meet consumers' requirements in terms of quantity, quality and price. In practice, this often includes the management of both horizontal and vertical alliances. Meeting customers' requirements involves integrated management of the transactions and relationships between firms as well as processes within firms. Managing these relationships provides an opportunity for overtly negotiating the shares between chain members of the value produced within the chain. More importantly, joint planning of collaborative strategies is possible, to grow the shared value. The latter contrasts with the usual conflict between agribusiness suppliers and buyers about their relative shares of the value generated.

Traditional supply chains in developing countries typically involve many players, and are tightly linked with long-standing social structures. As developing countries enter into World Trade Organization arrangements their agricultural industries will be subject to increasing competition in their domestic markets, and have greater incentives to meet global standards in export markets. SCM provides one approach to planning the improvements needed in the management of their agricultural production and marketing systems to meet future challenges.

During the 1990s, academic and commercial interest in supply-chain management (SCM) in agribusiness rose in Europe and the USA. The concept and its

application have become one of the key areas of research and commercial focus in agribusiness for the past decade. Interest has spread in the past five years to include not only SCM in agribusiness practice in Western countries, but also the potential and implications of the concept in developing countries.

This paper outlines the background to rising interest in the concept of SCM. It presents working definitions of the concept, and describes the theoretical contributions that have guided the development

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of the concept and the field of study. The paper presents arguments which show that SCM in its practical application straddles the concepts of operational effectiveness and of strategy, both of which are critical to business success.

SCM provides a useful framework for analysing the relationships between businesses engaged in both vertical and horizontal alliances as a means to pursuing consumer responsiveness, and is concerned with the development and nature of relationships between businesses in the supply chain. This includes the contribution to the development of value by the chain and the way in which value is shared between the chain partners. The role of new technologies in enabling SCM is also noted.

Finally, the potential application and value of the concept in planning, developing and managing agribusiness in developing countries are explored.

Background

Several changes in the operating environment of the food and agribusiness sectors contributed to rising interest in SCM, but it can be argued that the heart of the development was growing intensity in the competition for consumer expenditure. In line with other retail developments, greater differentiation of food products, improvements in product quality, and the ability to transport products in cost-effective ways provided consumers with a greatly increased array of products from which to choose. At the consumer level, the driving forces changing agribusiness included increasing consumer sensitivity to quality, safety, health and nutritional aspects of food products, and consumer interest in place of origin and means of production, including non-food values such as environmental sustainability and animal welfare. Consumers responded by exercising their ability to choose, and by this means, began to exert greater power than previously over the food production and marketing systems. In turn, it became clear to food suppliers that market success depended on responsiveness to consumer demands.

A term coined to describe this reorientation—chain reversal or consumer-driven chains—emphasises that the rise of consumer power spelt the end to the prevailing assumption at farm and agribusiness level that the job was simply to supply a product without concern about the consumers' requirements or the existence of a market for the product. Traditional agricultural and food businesses that had

focused strongly on price were not equipped to respond to a widening range of consumer demands. Individually, they lacked the means to deliver effective consumer response. Each represented only part of the processes involved in production of an agribusiness product and its subsequent transport, processing and retailing to the consumer. SCM provided a means to conceptualise management of the changes required in the system to efficiently respond to consumer needs, based on integration and co-ordination of the efforts of all the business units involved in the production and delivery processes.

Changes in the macro environment were occurring parallel to the changes at consumer level. These included a trend towards consolidation of organisations (at farm input, farm, processor and supermarket levels), principally to drive down the costs of production through economies of scale, but also to gain market share and competitive strength in an increasingly global market place. Preparing for global trade also led to deregulation of agribusiness markets by government withdrawal from marketing in several countries. This created the opportunity to rethink the business strategy, and create new supply-chain relationships.

Australia's recent deregulation of the dairy industry is an excellent example of change in a domestic market responding to the requirements for international trade, as mediated through the World Trade Organization (WTO). The deregulation process resulted in the commercial renegotiation of supply-chain relationships that had previously been subject to heavy government intervention and regulation. Consolidation following deregulation has provided one approach to the new competition between supply chains for market share and scale, and to generating efficiencies which could support greater investment in differentiation, brands and marketing of products, than had been possible within regulated markets.

Underpinning Theories

Supply-chain management simply refers to the management of the entire set of production, distribution, and marketing processes by which a consumer is supplied with a desired product. Folkerts and Koehorst (1998, p.385) define a supply chain as:

...a set of interdependent companies that work closely together to manage the flow of goods and services along the value-added chain of agricultural and food products,

in order to realize superior customer value at the lowest possible costs.

Some authors prefer the term *demand chain* as more clearly focusing on the consumer's requirements. The related term, *value chain*, highlights the contribution of functional parts of the chain (either within an enterprise or across a supply chain) to the development of customer value across the chain. While consumers do determine the market size and preference, they do not play an active role in the management of the chain. Implementing practical improvements to allow the chain to be more competitive and more responsive, requires active management initiated by one or more members of the supply chain, and supports the focus on supply-chain *management* as a basis for moving actively towards delivery of improved chain performance. In other words, all products reach consumers through a supply chain but not all chains have sufficient commitment and interaction to consistently improve efficiency, customer value and competitiveness through integrated management.

It is important to note that, in developed countries, SCM implies a focus on agribusiness units and business-to-business relationships. This differs from the industry or commodity focus traditionally adopted in agronomic research or in agricultural economics analyses of business improvement. It also differs from the community and participatory models that commonly form the basis of regional economic development and natural resource management studies. This focus on business units tends to lead to most SCM work being with larger industry players, and in markets where products are valuable and differentiated, rather than in commodity markets.

SCM as a field of study draws on several disciplines. These are summarised briefly below, with reference to literature through which the topics can be more fully explored.

- *Transaction-cost economics* analyses the costs associated with the exchange of goods and services (Hobbs 1996). This includes the costs of acquiring information, costs associated with negotiating and enforcing contracts, definitions of property rights, and the monitoring and changing of institutional arrangements which define the processes by which business transactions occur between companies. Transaction-cost economics emphasises asset specificity. The underlying assumption is that the more specific an asset is, the greater the incentive to develop long-term cooperation and

relationships which will enable the asset to make a long-term contribution to profitability.

- *Agency theory* involves defining the most appropriate forms of contract to protect the relationships between chain members (Eisenhardt 1989). The aim is to produce a contract or agreement which achieves a balance in relation to information asymmetry between chain members, uncertainty of outcomes, and the different levels of risk aversion held by chain members,

The agency theory approach is complementary to transaction-cost economics; together they focus on improving the economic efficiency of doing business between firms.

- *Power and power relationships* between businesses within a supply chain, and between the chain members and the government, have been studied by political scientists (French and Raven 1959). Boehlje et al. (1998) argue that the power of one business over another is dependent on the economic structure of the relationships. Power is related to dependency, and dependency is related to the availability of alternatives. The more alternatives a firm has, the less dependent it will be and the smaller the chance that it will be unduly affected by the power (real or perceived) of another firm.

The consolidation of agribusiness firms over the last two decades has much to do with attempting to gain real or perceived market power. At the upstream end, the small and fragmented businesses of smallholders have very little individual power, which may provide them with a strong incentive to work together.

- *Relationship marketing* refers to the move away from adversarial buyer-seller relationships to cooperative and collaborative marketing strategies, to deal with increasingly fierce competition (Gronroos 1994; Morgan and Hunt 1994). Relationship marketing recognises the importance of commitment and trust in business-to-business relationships, and that such relationships are dynamic and can develop only over time.
- *Network theory* recognises the reality that if *A* does business with *B* who then does business with *C*, *A* can affect *C*'s business performance despite the fact that they never do business together. The strategic networks concept emphasises that firms can gain stronger competitive positions by

working cooperatively than they can by operating individually (Easton 1992), and that networks with long-term supply-chain relations featuring trust and knowledge sharing are well positioned to deliver lower business costs than firms relying solely on spot transactions. As well as emphasising the importance of skills in managing relationships, the concept of networks emphasises the development by each firm of capabilities that are unique and hard to copy, thus ensuring that the firm will continue to be in demand as a chain partner able to fulfil specific functions.

- *Production/operations management and logistics* emphasise operational efficiency through minimising inventory and just-in-time supply. They have contributed to SCM as a management approach for planning gains through operational efficiencies. Some authors (Westgren (1998), for example) view the disciplines of operations management and logistics as the initial source of SCM studies.

SCM is a holistic approach that moves past the level of the individual manager or business to address all the processes from the initial assembly of raw materials to the final retail processes that provide the customer with access to the product. In that sense, it is a systems approach (Beers et al. 1999). It represents a significant step forward from analysis at the level of an individual farm or agribusiness in isolation from its wider context. It could be viewed as a parallel to the step between crop or animal husbandry research and the study of farming systems, where the latter has greater potential to optimise both production outcomes and protection of natural resources (at the system level).

SCM: for Operational Effectiveness or Strategy?

Porter is recognised as a leading figure in the study of strategic management in the late part of the twentieth century. In his seminal paper ‘What is strategy’ (Porter 1996), he draws the distinction between the pursuit of operational effectiveness and the development of strategy. He argues that, by their nature, many popular management tools of the last 20 years—including benchmarking, best practice, and quality systems—are designed to match competitors in operational effectiveness. Along with the trend to

greater outsourcing (which can lead to competing firms sourcing key inputs from the same supplier) these approaches contribute to greater uniformity between industry competitors and reduced consumer choice.

Given the diversity of consumer interests and the desire of consumers to choose products that match their needs, perceptions and values, strategies which result in a move towards greater industry uniformity are unlikely to lead a business to a successful market position. Hence, operational effectiveness is a necessary but not sufficient condition for improving business performance. Many aspects of SCM (improved logistics, shared information systems and better information flows, reduced transaction costs, preservation of product quality, standards and integrity throughout the chain) are, at their heart, efforts to improve the operational effectiveness of a chain. Adopting these approaches is important in matching competitors and increasingly they are a necessary condition for access to certain markets (export markets, supplying to supermarkets). However these approaches will not guarantee a sustainable competitive advantage.

By comparison, Porter argues that the crux of strategy is doing something different that is hard for competitors to match. Critical to developing sustainable competitive advantage is recognising that choices need to be made, since doing more of one thing will necessitate doing less or none of another (termed trade-offs). The more that activities or functions within a firm or a supply chain can be made self-reinforcing (to deepen the strategic position), or the more they depend on human capabilities and relationships, the more likely it is that the strategy will lead to sustainable competitive advantage, because these approaches are intrinsically hard to copy.

SCM provides opportunities to develop strategies that meet these criteria. Potential strategies include:

- reducing market risks by working towards interdependency (where business activities are interdependent to the point that the costs of switching to a new supplier or customer are sufficiently high to inhibit the development of new relationships)
- cooperating to learn how to create value together and then collaborating to consistently utilise the new value as a source of competitive advantage (Collins et al. 2002)

- using the established relationship as a platform to build additional product lines or new markets; that is, to innovate together.

Porter's concept of strategy has relevance in the discussion of SCM as a useful management concept. The key to development of chain relationships is commitment to longer-lasting relationships instead of spot transactions (which may offer short-term advantages in certain parts of the price cycle). Chain relationships are built on the relationships developed at a range of levels between two firms (typically between senior managers, distribution/receivables, sales/accounts, sales/production). Developing relationships requires significant effort, and the maintenance of the relationships is an ongoing commitment. As the investment in a relationship grows, so the cost grows to duplicate a similar relationship. Hence, the cost of leaving a relationship increases over time, leading to interdependency. It is in the interests of a chain member to proactively work with its chain partners to ensure their mutual ongoing viability, because the alternative (creating new relationships) is too costly.

Application and Implications of Supply-Chain Management

Recent studies of supply chains in Australia identified six key principles of successful SCM (AFFA et al. 2002). These are:

- a focus on customers and consumers
- the chain creates and shares value with all its members
- making sure the product fits the customers' specifications
- effective logistics and distribution
- an information and communication strategy that includes all chain members
- effective relationships that give leverage and shared ownership.

The discussion in this section on the application and implications of SCM will be structured around these six features.

Since the driving force behind the developing interest in SCM was the need for new strategies to achieve sustainable advantage in increasingly competitive agribusiness markets, a critical factor to success is how effectively the chain addresses customers' wants and needs. The value built by a chain (which can then sustain the future operations of the

chain members) depends on coordinated responsiveness to customers' requirements.

In principle, SCM can shift the traditional conflict between supply-chain partners about their relative shares of benefits to a focus on increasing the total value available to be shared. This should be attractive, because potentially there are better gains for all in this approach. In practice, all levels of the chain must derive value from the chain and from potential improvements, to ensure all chain members agree to proposed change.

Implementation of SCM in Western countries has emphasised participatory and/or facilitated processes that build relationships and increase understanding and trust between chain members in the process of developing shared plans and identifying opportunities for long-term collaboration. A skilled outsider may facilitate such processes. In practice, there is also a need for 'chain champions'. These are members (or a member) of the chain with a vision of the opportunities that could arise from closer collaboration and with the energy to organise and drive processes of relationship building and collaboration. In new agro-industry development, building a supply chain has been demonstrated to be just as critical to the success of the industry as establishing adequate agronomic and pest-management practices.

As noted earlier, SCM provides a framework for the analysis and recognition of power in supply chain relationships and for the discussion of how to share the value generated by the chain. Achieving more efficient SCM often requires horizontal collaboration at levels in the chain where there are multiple small players. This reduces the transaction costs between the vertical levels in the chain and may reduce power imbalances that occur in interactions between large powerful players (such as supermarkets) and small individual growers.

Closer relationships and better understanding of the chain and customer value may provide opportunities for farmers to extend their operations along the chain. For example, additional grading that improves product shelf life and reduces wastage (and the associated labour costs for retailers to 'pick over' shelves) represents extra value added by the farmer and may be recognised with higher payment by retailers, offset by their savings in labour costs. Similarly, a farmer who develops the capacity to pack into consumer-friendly trays is helping the retailer to manage product safety and reduce the risk of in-store contamination of the product. If the farmer's packs also carry

a bar code, the costs of weighing product at the check out and of training retail staff to identify fresh produce can also be saved.

SCM enables the development of quality systems and product-integrity systems throughout the chain. When they focus on the features that customers value, such systems are the tools by which transactions costs may be decreased and operational effectiveness increased. Similarly, SCM allows for sophisticated management of logistics including optimisation problems and through chain inventory control. There are opportunities to minimise waste (shrinkage) along the chain, which is often a major cost in marketing fresh food items.

Working in the supply chain context may offer participants new insights into the relative importance of alternative products and markets. In the absence of an attempt to achieve integrated management, most supply chain members will have regular contact and communication with only their immediate supplier and immediate buyer.

SCM may lead to detailed descriptions, and mapping of flows of product, information, and revenue throughout the chain. It also provides an opportunity to examine activities undertaken and services performed at each level in the supply chain, enabling all the participants in SCM to gain a broader understanding of the way in which customer value is developed in the chain, and the possibilities to develop new value or develop value more effectively. SCM can provide similar insights to scientists whose usual focus is on technical issues at a particular level in the chain, and to economists who routinely analyse the industry at one level in the chain (e.g. production economics at farm level), but not the business or business-to-business interactions. Government policy makers have also utilised SCM to identify factors that may inhibit chain development and performance, and to conceptualise policy measures that might assist businesses to overcome barriers and achieve more competitive export performance (see, for example, Gifford et al. (1998)). The Australian Government has initiated a research, training and industry program in SCM in response to its realisation that despite growing export opportunities in Asia, Australia's market share for both commodity and processed food products was declining in these markets.¹

The nature of chain relationships is informed by substantial business and management literature on strategic alliances, and by an increasing literature on

SCM in relation to agribusiness. Relationship issues to be considered may include:

- agreeing to share long-term development goals and seasonal business planning
- developing relationships between operational staff within the businesses on issues such as, for example, timing, amount, ripeness and temperature of deliveries
- developing shared quality and safety standards and agreeing how and when they will be measured and monitored
- linking information systems to track product flows and standards.

In SCM the focus is usually on long-standing relationships based on informal or trust arrangements rather than ownership or contract relationships. The former are valued because they allow flexibility and they constantly reinforce how each partner will benefit from collaborating to ensure a successful and competitive chain.

Rising interest in SCM has been strongly supported by the capabilities of new technologies. In particular the application of information systems can improve information flows and, with the addition of e-commerce facilities, can facilitate revenue flows. Satellite positioning system technologies are an example of technology can be used to monitor product flows. Conversely, well-developed SCM is contributing to the management of other frontier technologies. SCM enables management of supply chains where the products have embedded intellectual property (e.g. unique germplasm), through its potential to tightly control product flows and maintain clearly differentiated lines of product with unique and valuable characteristics.

SCM: What Value in Developing Country Agribusiness?

Finally, in this section the potential application and value of the SCM concept in planning, developing and managing agribusiness in developing countries is explored.

Farmers in the developing world face a similar cost-price squeeze to that affecting farmers in the

¹ Publications arising from this program are listed on the AFFA website, <<http://www.affa.gov.au/content/output.cfm?ObjectID=D2C48F86-BA1A-11A1-A2200060B0A01607>>.

developed world. The need to feed rapidly growing populations tends to result in policies to keep food prices low, making innovation and investment unattractive even if the capital and management capacity needed are available.

However, there are opportunities for developing country farmers in the expanding total population and increasing urban populations, and hence a growing consuming class. At least in the short term, this group can be expected to spend more on higher quality and more varied produce than do people at lower income levels. Projections on future trends (Coates et al. 1997) suggest that, in terms of volume, most of the growth in demand for food will be middle-class consumption in the large countries of the developing world including China, India, Indonesia and large countries in South America (termed World 2 in their scenario). Much of this demand will be met domestically (by World 2 countries) but against competition from exporting countries. The primary basis of competition will be price but the presence of exporting competitors will also mean the gradual adoption of 'world' quality standards. This represents an incentive for better SCM in developing countries.

This effect is enhanced by the increasing implications of the WTO for developing countries. The priority to increase the competitiveness of domestic agriculture and agribusiness is demonstrated by the following extract from a publication of the Indonesian Ministry of Agriculture (MOA 2001):

...liberalisation of international trade that has been happening or is still in the process of being established is a challenge facing agribusiness development. WTO/GATT commitments to reduce or eliminate various forms of protection, tariff or non-tariff, mean opportunities as well as challenges. For nations with the ability to improve their competitive strength, the opportunity is open to increase domestic and international market share. Conversely, for nations with no capacity to

improve their competitive strength, it means adverse effects, the challenge to recede and step down. For this reason, there is no option for Indonesia but to accelerate strengthening competitive capacity.

In helping developing country farmers take advantage of the growth opportunity to supply the consuming classes, the aim should be to build the capacity of domestic producers to match the products that exporting countries will be aiming to put into Asian markets. SCM provides one conceptual approach to meet this need. To not assist developing country farmers to participate would see them cut out of the major growth sector in food markets in the world. Their displaced product would depress domestic prices for lower class consumption and further exaggerate the cost-price squeeze.

Many authors, including Heilbron and Larkin (1995), have commented on the developing dualism in food markets in Asia. Traditional markets continue to provide for the bulk of the population through delivery to wet markets and subsequent distribution by a variety of small retailers. These chains are characterised by multiple levels, fragmentation, highly variable standards, and poor infrastructure and logistical support. In parallel, large Western style retailers are providing global standard goods and services to the elite and middle classes in major cities. These retail developments were begun by Japanese retailers in the 1980s and followed in the 1990s by Western food retailers. The Asian economic crisis provided many of these Western companies with opportunities to rapidly expand their foothold at low prices (DFAT 2002).

Supermarkets are most profitable when they are located in areas of high rate of population growth of people with consumer incomes, high-income growth rates, and low supermarket penetration. This is the precise description of the long-term trends in much of Asia. SCM practices for this sector might be expected

Table 1. Projected population growth to 2025 (in billions).

	1994	2025
Total world	5.6	8.4
World 1: the affluent, advanced nations, e.g. Europe, the USA and Japan	1.0	1.3
World 2: middle countries with needs and resources in balance, e.g. China, India, Indonesia, large countries in South America	3.5	5.1
World 3: the destitute countries, e.g. sub-Saharan Africa	1.1	2.0

Data sourced from Coates et al. (1997).

to be similar to Western supply chains at the downstream end. At the upstream end, consolidation could be expected, relative to traditional supply chains, to achieve reliable supply and consistent quality. International retailers will also seek to provide food safety and health standards similar to their operations in the West. The risk of a major accident is serious for a global retailer, both in terms of their international reputation and because their pockets are perceived to be very deep in relation to compensation and penalty payments.

Studies of the traditional supply channels in developing countries often focus on issues of lack of power of farmers, linked to the lack of timely information flows. The traders or merchants are usually identified as powerful and able to extract value at the expense of farmers who are cash and information poor. However, there are alternative views. Kono and Goto (2002) in a study of marketing channel development in the banana industry in Indonesia, conclude that all parties—growers, collectors and traders—must contribute to developing pluralistic and reliable marketing channels. Woods et al. (2000) noted a workshop situation in which a trader motivated farmers *to strive for good products, being competitive and becoming a champion*. Hence, traders have been observed to play a mixed role—of channel manager, information supplier, co-investor and extension officer—suggesting a mutual benefit rather than a win–lose relationship may exist with smallholders, at least in some circumstances.

In situations where trust already exists, the most profitable application of SCM may be to improve operational effectiveness. Options for improvements might include training to increase the skills and capacities of chain members so that they are more able to adapt to change, improved infrastructure and logistics, and better information flows, especially in relation to markets and consumer preferences. Improvements that took traditional supply chains in these directions might provide a step towards the possibility of these chains developing export capabilities.

Trienekens and Beulens (2003) present a research agenda on innovation through food supply chains and networks in developing countries. Based on case studies that investigate supply chains involving upstream production in developing countries for export, or for Western style retailing in developing countries, they identify the following three key questions:

- Do innovations at the consumer end induce innovations at the upstream (farmer) end of supply chains in developing countries?
- Are there any system effects, for example, on economic development, sustainable development and standards, of innovations at the consumer end of the chain?
- Which institutional arrangements within chains and networks are best able to survive in developing countries and why?

Similar questions need to be asked about the potential impacts of improving traditional supply chains in developing countries. Questions for a research agenda might include:

- Can improved management of traditional supply chains improve the quality of life of smallholders?
- Can improved management in traditional supply chains improve the supply and quality of food for increasing numbers of urban residents in developing countries?
- Which institutional arrangements are best able to deliver benefits, and how can these benefits be shared to encourage further improvements?

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Incorporating Measures of Satisfaction, Trust and Power-dependence into an Analysis of Agribusiness Supply Chains

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Abstract

Using transaction cost analysis, gap analysis and the key dimensions of long-term buyer–seller relationships (satisfaction, trust and power-dependence), it is possible to demonstrate that the supply chain for potatoes cultivated in the Red River Delta (Vietnam) is surprisingly efficient. While the price paid to the farmers is ultimately determined by supply and demand, the price that farmers receive from traders and collector agents is influenced by tuber quality and the costs of transportation. Contrary to expectations, farmers are generally satisfied with the exchange and display considerable trust in their preferred trading partner. Farmers are seldom dependent upon their preferred trading partner and indicate that numerous alternative traders are available to purchase the potatoes they have harvested. While the traders similarly enjoy a strong positive relationship both with farmers and collector agents and their downstream customers, wholesalers report that they are much less satisfied in their exchange relationship with both traders and retailers. Wholesalers are more dependent upon their upstream and downstream trading partners and more dissatisfied and less trusting of exchange partners.

In most developing countries, the agricultural marketing system is characterised by a highly atomistic production side (where there are many small widely dispersed farmers growing perishable crops) and an oligopolistic marketing system (where there are only a few traders) (Mendoza and Rosegrant 1995). Marketing costs are high because of an inefficient transport system, inadequate cool-storage capacity, and significant variations in product form, variety and quality (Harris-White 1995). The supply chain itself is often long and protracted, involving a large number of market intermediaries (Lele 1981). Furthermore, information and locational factors potentially limit the number of intermediaries available to

transact with primary producers (Pomeroy and Trinidad 1995). In other instances, various credit arrangements may lock farmers into long-term business-to-business relationships where the farmer is, to varying degrees, more or less dependent upon the market intermediary (Mendoza and Rosegrant 1995).

There is also a growing recognition that economic exchange is embedded within various overarching social institutions including locality, class, ethnicity, religion, gender and age (Zucker 1986; Fukuyama 1995; Harris-White 1997). The importance of trust and social capital as a means of reducing risk and facilitating exchange is being increasingly recognised when producers and market intermediaries have limited access to the legal system as a means for redress (Mendoza and Rosegrant 1995; Fafchamps 1996; Humphrey and Schmitz 1998).

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Using three alternative methods of evaluation, this paper seeks to examine the efficiency of the marketing system for fresh potatoes in the Red River Delta (Vietnam). It is proposed that before any intervention is contemplated, the supply chain must be examined to identify the marketing margins extracted by the various market intermediaries, the extent to which suppliers are able to fulfil the needs of their downstream customers, the constraints that adversely impact upon the suppliers' ability to meet customers' needs, and the nature of the long-term relationships that exist between suppliers and their customers.

Analysing Performance in Marketing Channels

Developed primarily by Williamson (1979, 1985), transaction cost theory assumes that various costs are associated with an exchange. These costs are comprised of the costs of obtaining and processing information, negotiating contracts, monitoring agents and enforcing contracts. These costs may become significant in the presence of information asymmetry, uncertainty and transaction-specific investments.

Although there are several different approaches for measuring transaction costs, the market is said to be efficient if the price consumers ultimately pay adequately reflects storage costs, transportation costs and differences in price due to product form (Harris-White 1995). Since price data are usually the most readily available and most reliable source of market information in developing countries (Goletti and Christina-Tsigas 1995), the performance of the supply chain is most often evaluated using price margins. However, a large marketing margin may result in little or no profit for an actor and may even result in a trading loss, depending on the buying and selling prices and the costs of marketing (Mendoza 1995). Marketing margins will also fluctuate according to the perishability of the product, the number of actors involved in the exchange, the marketing services provided, and the risk and uncertainty borne by each actor (Pomeroy and Trinidad 1995).

Industrial purchasing theory suggests that customers will seek to purchase goods from those suppliers who are best able to deliver the desired quantity, within predetermined quality specifications, on time, at an agreed price (Monczka et al. 1998). In describing quality, Gronroos (1990) finds it

necessary to differentiate between technical quality and functional quality. *Technical quality* describes the customer's specifications. This is a physical description of the product in terms of its size; shape; colour; freedom from pests and diseases; purity (in terms of its freedom from chemical contaminants, pathogenic organisms and genetically modified plants); maturity or freshness; and the manner in which the product is packed. *Functional quality* describes the way a supplier goes about delivering the product to the customer. While this fundamentally means being able to deliver the product when the customer wants it — by implication, it involves many inter-related activities such as production scheduling, storage and warehousing, logistics, ordering and invoicing. Since most market intermediaries purchase products in the expectation that they will be able to sell them on, the timely and efficient receipt of goods is critical to the success of most downstream manufacturing and retail operations.

More recently, Parasuraman (1998) has introduced a third dimension called service quality. *Service quality* describes the extra things a supplier is willing to do to retain the customer's business. While the exact meaning of the term 'service' varies with the nature of the product and the requirements of the buying organisation, service may include such variables as providing technical assistance, innovative suggestions, credit arrangements, support for special needs, or providing advance notice of impending price changes or shortages in supply (Hutt and Speh 1995).

In measuring the extent to which suppliers are able to meet the needs of their customers, Parasuraman et al. (1985) proposed the concept of a service gap. The service gap is a measure of how well the service level delivered by a supplier matches a customer's expectations. An integral part of this analysis is concerned with the identification of the constraints that prevent the supplier from fulfilling the customer's needs. It is only after these constraints have been identified that the supplier can improve their performance.

The Emergence of Relationship Marketing

Traditionally, in order to cut costs, customers have gone out of their way to identify the cheapest supplier (Monczka et al. 1998). The traditional approach to purchasing required the buyer to take three or more

bids, then to play one supplier off against another until they got the lowest price. Since this approach relied primarily upon the use of short-term contracts, it led to what can best be described as an adversarial relationship. Both customers and suppliers sought to extract as much as they could from the transaction, knowing that at any time, if either party found a better deal, the contract would be cancelled. However, such short-term opportunism stifles innovation and provides few incentives to invest in productivity improvements or new technology.

Technology is the reason for interaction between firms (Thomas and Ford 1995). Since technology may substantially alter the value chain and the way the value chains are linked, strong mutual interdependencies arise, so that the level of technology in one firm will influence the product and process technologies of its partner. As a result, a firm's unique market position, power and competitive advantage is created through its interactions with suppliers, customers and other third parties.

Firms are establishing relationships with their suppliers because these enable them to be more efficient and to be more effective (Kalwani and Narayandas 1995). By developing relationships with their suppliers, buyers and sellers can achieve cost savings through: reduced search and evaluation costs; reduced transaction costs (Hakansson 1982); and the learning effects and relationship-specific scale economies (Gundlach et al. 1995). However, the primary reason for establishing relationships with suppliers is that customers realise that suppliers create value (Kalwani and Narayandas 1995). Developing long-term relationships can improve access to markets and reliable market information (Low 1996) and customers can anticipate improved access to a more reliable supply of production inputs (Hakansson 1982), improved product quality and performance (Han et al. 1993), and a higher level of technical interaction in the form of information exchange, potential product adaptations and technical assistance (Cunningham and Homse 1982).

Through becoming closer to customers and better understanding and satisfying customers' needs, suppliers can achieve greater customer loyalty and higher repeat sales (Kalwani and Narayandas 1995). Relationship marketing provides a stronger, longer-term customer benefit that is more difficult for competitors to match and it becomes more difficult for competitors to enter the market (Hakansson 1982). Buyers become less sensitive to price competition

and suppliers may even benefit from higher prices (Kalwani and Narayandas 1995). Suppliers benefit from being able to better plan and forecast production schedules (Lohtia and Krapfel 1994), coordinate deliveries, and undertake joint promotions (Easton and Araujo 1994). However, the greatest benefit arising from long-term relationships is the reduction in uncertainty (Arndt 1979; Hakansson 1982; Noordewier et al. 1990).

While much has been written about the development and maintenance of long-term buyer-seller relationships, the greatest support has emerged for the key constructs of satisfaction and trust (Anderson and Narus 1990; Anderson and Weitz 1992; Morgan and Hunt 1994). However, in context of the developing countries, where farmers are often subject to exploitation by opportunistic traders, the power-dependence construct is expected to become quite influential in governing the farmers' relationships with preferred trading partners.

Satisfaction

Satisfaction lies at the very foundation of modern marketing thought. Satisfaction is derived from the result of a comparison between the preferred supplier's performance and the customer's expectations (Fornell 1992). Whenever performance exceeds expectations, satisfaction will increase, but whenever performance falls below expectations, customers will become dissatisfied.

Since satisfaction is defined as a positive affective state resulting from an appraisal of all aspects of a firm's working relationship with another (Frazier 1983), Geyskens et al. (1999) propose that satisfaction should capture both the economic and social aspects of the exchange. Economic satisfaction is defined as the channel member's positive affective response to the economic rewards that flow from the relationship with its partner. An economically satisfied channel member considers the relationship a success when it is satisfied with the effectiveness and productivity of the relationship with its partner and the resulting financial outcomes. Social satisfaction is derived from the channel member's positive affective response to the non-economic aspects of the relationship in that interactions with the exchange partner are fulfilling, gratifying and easy. A channel member satisfied with the social aspects of the exchange appreciates the contact with their exchange partner and, on a personal level, likes working with

the preferred partner because they believe the partner is concerned, respectful and willing to exchange ideas.

Trust

For any particular potential exchange, trust will be critical if two situational factors are present — risk and incomplete buyer information (Hawes et al. 1989). Since most sales transactions present some degree of risk and uncertainty to the potential buyer, without some degree of trust, the perceived risk may be too great for the transaction to occur. More specifically, trust becomes important whenever there is a high level of performance ambiguity, and poor product performance will have a significant, adverse impact on the value derived by the buyer (Singh and Sirdeshmukh 2000). In such circumstances, trust acts as an information resource that directly reduces the perceived threat of information asymmetry and performance ambiguity.

However, trust also relates to the focal firm's intention to rely upon its exchange partner. Ganesan (1994) describes this component as benevolence, because it is based on the extent to which the focal firm believes that its partner has intentions and motives beneficial to it. A benevolent partner will subordinate immediate self-interest for the long-term benefit of both parties and will not take actions that may have a negative impact on the firm. Singh and Sirdeshmukh (2000) describe trust as a belief that an exchange partner will act in a manner that is responsible, with integrity and without injury to the focal firm.

In building trust, Sako (1992) finds it necessary to differentiate between trust at three levels. *Contractual trust* is an expectation that the exchange partner will abide by their written or oral contractual obligations and act according to generally accepted business practice. *Competence trust* is derived from the assumption that the entrusted firm will carry out the activities competently and reliably. *Goodwill trust* arises where both parties have developed mutual expectations that the other will do more than what it is formally committed to perform. Here, the firm not only expects the other not to act opportunistically, but that it will, altruistically, go out of its way to help (McCutcheon and Stuart 2000).

Power-dependence

When the outcomes obtained from the relationship are important or highly valued; when the outcomes from the relationship are better than the outcomes available from alternative suppliers; and when fewer alternative sources of exchange are available to the firm, dependence is said to increase (Heide and John 1988).

Whenever a channel member controls resources that another channel member needs, various power relations emerge that potentially enable the party controlling those resources to exert some influence or power (Andaleeb 1996). With greater dependence comes greater vulnerability, for the more powerful exchange partner may be in a position to create more favourable terms of trade for itself (Heide and John 1988). Since this may include access to markets or access to capital, farmers are often more dependent upon their preferred trading partner(s).

Dependence is also increased when the outcomes available from the relationship are comparatively better than the outcomes available from alternative relationships. Firms dealing with the best trader are more dependent because the outcomes associated from dealing with that trader are better than those available from alternative traders. In this context, dependence is a measure of the overall quality of the outcomes available to the focal firm from the best alternative exchange relationship (Anderson and Narus 1990).

In general, firms will seek to reduce their dependence on other firms and to increase the dependence of other firms upon themselves (Lohtia and Krapfel 1994). Firms may either seek to reduce and manage dependence by purposely structuring their exchange relationships with other firms (Heide 1994), or to transact with multiple entities (Ganesan 1994). Where there are many alternatives, the need to interact is reduced, but as the number of alternative exchange partners declines, the need to interact will increase (Andaleeb 1996). Hence, when fewer alternative sources of exchange are available to the focal firm, or when replacing or substituting a current exchange partner is difficult because there are fewer potential alternatives, dependence will increase (Heide and John 1988; Frazier et al. 1989).

Background to the Analysis

Potatoes have been cultivated in Vietnam since 1890, when they were first introduced by the French colonialists. In 1980, Vietnam was the largest producer of potatoes in Southeast Asia, with more than 100,000 hectares under cultivation (Schmiediche 1995). However, in the absence of a reliable supply of good-quality seed, productivity per hectare declined and the area of potatoes cultivated subsequently decreased. Today, only some 35,000 hectares of potatoes are cultivated in Vietnam, primarily in the Red River Delta (Tung and Ho 1995).

Potatoes are the second most important crop in the Red River Delta and, understandably, are a priority crop for development by the Vietnamese Government. Potato is an alternative food crop to rice — capable of feeding an expanding population and providing both a valuable source of nutrition and a valuable source of income for many impoverished rural families.

The majority of potato farmers in the Red River Delta are very small family enterprises, cultivating fewer than 0.15 ha of potatoes. Most farmers plant potatoes in either October or November and harvest their crops in January. With such a short cropping season, inclement overcast weather during most of the growing season, poor quality seed, soil compaction, and the inappropriate use of chemicals and fertilisers, the average yield in the Red River Delta is just 16.7 t/ha (Batt 2002).

For most potato farmers in the Red River Delta, collector agents and traders provide the major mechanism for the disposal of the potato crop. However, traders purchase only the large and extra-large tubers — farmers generally retain some proportion of the medium-size tubers for seed, and the small tubers are primarily used for stock feed. Not unexpectedly, the price that farmers receive for the potatoes they have harvested is dependent upon supply and demand and tuber size. As potatoes provide the majority of on-farm income for most farm households in the Red River Delta, any reduction in the prices received will have a significant adverse impact on the household. With 88% of potato farmers earning less than USD67/month (Batt 2002), most farm households in the Red River Delta are severely cash constrained.

The function of the various traders is to collect the potatoes from the farmer's property and to transport and deliver the tubers to wholesalers in the major metropolitan centres throughout Vietnam. The

majority of traders are also small enterprises, with most purchasing fewer than 1500 kg of vegetables per week. However, during the potato season, there is a marked increase in the quantity of product purchased, with most traders handling more than 10 t of potatoes per week (Batt 2002).

In some potato-growing districts, collector agents provide an intermediary function. It is the function of the collector agent to aggregate potatoes from a number of small growers, to pay the growers, and to store the potatoes until the traders come to collect them. Quite clearly, by aggregating the tubers in one place, the traders do not have to travel to as many farms to fill their truck. In most cases, the collector agents are potato growers themselves.

In comparison to the traders, the wholesale enterprises are significantly larger, with most handling in excess of 5000 kg of fresh vegetables per week. Wholesalers deal with traders and collector agents rather than farmers, as traders and collector agents are more able to provide tubers of the desired variety in the required quantity and desired size. Traders and collector agents offer a more competitive price and are able to deliver the potatoes when the wholesalers require them (Batt 2002).

Wholesalers operate in the supply chain as market intermediaries, but unlike traders and collector agents, whose function it is to source potatoes from many small farmers and to aggregate these into larger quantities, wholesalers break the consignment down into quantities sufficient to meet the needs of retail customers and the food service sector.

Excluding sales to the food service sector and processing industries, retailers provide the final link with household buyers in the supply chain for fresh potatoes. However, the scale of retail operations has been found to vary enormously between the rural and metropolitan areas and between and within the major metropolitan cities. Businesses range in size from those selling fewer than 500 kg of fresh vegetables per week, to those selling in excess of 5000 kg/week. The price at which retailers both buy and sell potatoes also differs markedly between and within the regions, depending upon the source of supply, supply and demand (Batt 2002).

Data Collection and Analysis

In analysing the supply chain for fresh potatoes in the Red River Delta, detailed interviews were conducted with 60 potato farmers using a structured question-

naire. Information was sought on the cultivation and postharvest practices adopted by the farmer and the average price farmers received for the potatoes they sold by month, tuber size and variety. Farmers were then asked what criteria they believed a market intermediary would use in choosing to purchase potatoes from them. The questionnaire was based on the industrial purchasing literature, and farmers responded to 15 statements about the quality of their offer on an importance scale of 1 (not at all important) to 6 (very important). Farmers then rated their ability to meet these same criteria on a scale of 1 (not at all well) to 6 (very well). Farmers were then asked to indicate why they perceived they were unable to meet the market intermediary's needs and the various constraints that prevented them from improving their offer quality.

In the final section of the questionnaire, farmers were asked to describe the nature of their relationship with their preferred trading partner and to respond to 24 prepared statements. The various statements, developed from the literature on buyer-seller relationships, were divided into three groups (satisfaction, trust and power-dependence). Farmers were asked to respond on a six-point scale where 1 was 'I disagree a lot' and 6 was 'I agree a lot'. Twenty potato farmers were interviewed from each of the three major potato-producing provinces in the Red River Delta (Hai Duong, Thai Binh and Bac Giang). Enumerators were instructed to interview four farmers from a minimum of five districts and to interview no more than two farmers from any one village. Interviews were conducted by research staff from the Food Crops Research Institute, Gia Loc.

At the conclusion of the interview, farmers were asked to identify the trader with whom they most frequently interacted. Based on the number of names received, ten traders in each province were randomly selected for interview. Traders were asked to indicate the average quantity of potatoes purchased and from whom they purchased those potatoes. Information was sought on the prices paid to purchase potatoes by month, tuber size and variety. Traders were then asked to indicate whether they graded the potatoes or stored the potatoes before resale and the prices at which those potatoes were sold to market intermediaries. Traders then described the various criteria they used in choosing to purchase potatoes from a farmer or collector agent. Traders then responded to the same 15 questions about the quality they expected from suppliers and the extent to which their current

suppliers were able to meet their needs. Traders were then asked to describe the nature of their relationship with the farmers and collector agents from whom they most often purchased potatoes and the nature of their relationship with the market intermediaries to whom they most frequently sold potatoes.

At the conclusion of the interview, traders identified the potato wholesaler with whom they most frequently interacted. From the names received, ten wholesalers were randomly selected for interview in Hanoi. Information was sought on the average quantity of potatoes purchased and from whom they purchased those potatoes. Information was sought on the prices paid to purchase potatoes by month, tuber size and variety. Wholesalers were then asked to indicate whether they graded the potatoes or stored the potatoes before resale and the prices at which those potatoes were sold. Wholesalers then described the various criteria they used in choosing to purchase potatoes from a potential supplier and the extent to which current suppliers were able to meet the same criteria. Wholesalers then described the nature of their relationship with the various traders and collector agents from whom they most often purchased potatoes and the nature of their relationship with the retailers to whom they most often sold potatoes.

Finally, 25 random interviews with retailers were undertaken: ten in Hanoi and five in each of three provincial centres. Information was sought on the average quantity of potatoes purchased and from whom they purchased those potatoes. Information was sought on the prices paid to purchase potatoes by month, tuber size and variety. Retailers were then asked to indicate whether they graded the potatoes or stored the potatoes before resale and the prices at which those potatoes were sold. Retailers were also asked to describe the various criteria they used in choosing to purchase potatoes from a supplier and to indicate the extent to which current suppliers were able to meet these same criteria. Retailers were then asked to describe the nature of their relationship with the supplier from whom they most often purchased potatoes.

Data were entered into the SPSS program (Version 10.0) for analysis. Although the mean ratings across the supply chain were analysed using one-way analysis of variance (ANOVA), the sample sizes were generally too small to enable any meaningful statistics to be calculated. Hence, the majority of the analysis undertaken is descriptive.

Examining the Price Margins in the Supply Chain

Since few farmers and market intermediaries maintain any written records of the prices at which they buy and sell potatoes, some errors in reporting are inevitable. Furthermore, since there is a degree of confidentiality associated with the reporting of market prices, respondents may deliberately choose to overvalue the prices at which they have purchased potatoes and to undervalue the prices at which they have been sold to reduce their perceived profit margin.

Farmers in Hai Duong indicated that they sold potatoes to traders for an average price of VND1385/kg (USD0.092/kg). Traders indicated that they purchased potatoes from farmers for an average price of VND1470/kg and sold those potatoes to both wholesalers in Hanoi and retailers in Hai Duong for an average price of VND1770/kg. In Hai Duong, retailers indicated that they purchased potatoes from traders for VND1795/kg and then sold those potatoes for an average price of VND2150/kg. However, in Hanoi, wholesalers sold these potatoes for an average price of VND2180/kg to retailers who sold the potatoes for an average retail price of VND2920/kg (Table 1).

In Bac Giang, there was a difference of VND200 between the reported price at which farmers sold potatoes and traders purchased potatoes. No doubt this was the result of intervention in the market by collector agents. Collector agents are responsible for sourcing the potatoes from many small farmers and arranging for the transportation of those potatoes to some central collection point. Farmers are paid in cash for their potatoes when the collector agent takes possession of the product. The potatoes are then graded and stored for between 5–7 days until the trader comes to pick them up. Depending upon the level of service provided by the collector agent,

traders appear willing to pay an additional VND50–200/kg (Batt 2002).

While there was a difference of VND145/kg between the price at which traders indicated they sold the potatoes and retailers purchased the potatoes, this was attributed to sampling error, for the retail margin was reported to be VND385/kg; a figure that was consistent with other estimates.

In Thai Binh, it is apparent that farmers grossly over-reported the prices at which they sold potatoes, for both the traders' margin and the retail margin were consistent with the other two potato-growing districts. This was supported by anecdotal evidence and various unstructured interviews with growers undertaken during the preliminary phase of this research project. Furthermore, and similar to Bac Giang, the majority of potato farmers transacted with collector agents rather than traders.

An examination of the marketing margins along the supply chain reveals that the marketing margin increased as the product moved closer to the consumer. Traders were able to extract an average marketing margin of VND260/kg, or 19%. In the rural areas, retailers extracted an average marketing margin of VND410/kg (or 25%). However, in Hanoi, wholesalers were able to extract a marketing margin in the region of VND395/kg (or 22%), and retailers were able to extract a marketing margin of VND615/kg (or 27%). However, the marketing margin that market intermediaries were able to extract was not consistent over the season. At both the beginning (December) and the end (February) of the harvest season, the marketing margins declined. Conversely, in January, during the peak harvest period, the marketing margins for all market intermediaries increased. Such pricing behaviour has been reported by Batt and Parining (2000) who accredited the reduced marketing margin during times of reduced supply to the increased competition between traders to secure the farmers' produce. At the consumer level, research undertaken by

Table 1. Prices (VND/kg) along the supply chain for potatoes produced in the Red River Delta of Vietnam.

Location	Farmer		Trader		Wholesaler		Retailer	
	Sell	Buy	Sell	Buy	Sell	Buy	Sell	
Hai Duong	1385	1470	1770				1795	2150
Thai Binh	1420	1280	1450				1465	1950
Bac Giang	1170	1370	1680				1535	1920
Hanoi					1785	2180	2305	2920

Batt (2002) reveals that the consumers in the rural areas seldom purchase potatoes for more than VND2200/kg and in Hanoi, consumers are unlikely to purchase potatoes at prices exceeding VND3500/kg.

While traders may be able to extract an average marketing margin of VND260/kg, the traders must not only grade and store the tubers they have purchased, but also pay for the costs of transporting the tubers from the farm to the various wholesale and retail markets. Although most of the potatoes purchased by the traders had been graded by farmers and collector agents (59%), a significant proportion were purchased ungraded. Furthermore, over 54% of traders indicated that they regraded the potatoes they had purchased before resale. Although the costs of grading ranged from VND10–50/kg, the market was willing to pay a significant price premium for larger tubers.

At the farm level, farmers received an average price of VND1385/kg for the large tubers (5–8 tubers per kg). For the extra-large tubers (3–4/kg), farmers received a price premium of VND185/kg and for the medium-size tubers (9–15/kg), the price was reduced by some VND180/kg. For the small tubers (more than 16 tubers per kg), farmers received only VND500/kg — hence, most farmers retained the small tubers for feeding livestock. As the product moved through the supply chain, not only did the price premium increase for the larger tubers but the disincentive for smaller tubers became more pronounced (Table 2).

Despite the differences in price, 74% of wholesalers and 70% of retailers reported that they did not regrade the potatoes they had purchased before resale. Presumably, having purchased the tubers from traders and collector agents, wholesalers and retailers had no recourse; what they could not sell, they would either have to eat themselves or incur the loss. No doubt, in the absence of any enforceable quality standards, wholesalers and retailers sought to reduce the perceived risk by transacting with reputable traders and collector agents.

While the majority of traders (70%) stored potatoes for 5–7 days, no doubt as an integral part of the process of consolidation, the majority of wholesalers (63%) indicated that they did not store potatoes. Conversely, some 57% of retailers indicated that they stored potatoes for up to one month. Presumably such storage practices were undertaken to accommodate the abrupt reduction in the supply of potatoes in February–March. Storage losses generally ranged from 1–5% and, quite surprisingly, were not related to the storage duration. This would suggest that the storage losses incurred were the result of either damaged or diseased tubers being placed in storage, rather than any contamination occurring during the storage period.

Transportation costs consumed a significant proportion of the traders' marketing margin. Of the three areas studied, Hai Duong was the closest to Hanoi. Hence, traders were able to pay a significantly higher price and to transact directly with the farmers. Since both Bac Giang and Thai Binh were located at a greater distance, farmers were paid lower prices to accommodate the higher transportation costs. While it is unclear whether prices in Hanoi are set at the wholesale level or the retail level, traders apparently work backwards, subtracting the costs of transport and the profit margin they seek to arrive at a price they are prepared to pay the farmers and collector agents.

On the other hand, since most wholesalers neither regrade nor store the potatoes they have purchased, a much greater proportion of the marketing margin will be profit. However, given the significant price disincentive for small tubers, should wholesalers inadvertently purchase a large quantity of small to medium-size tubers, they may be exposed to a potential trading loss. Being the last market intermediary in the chain, the retailer has no recourse. Having purchased the potatoes, they must sell them, lose them to infection by disease, or consume them themselves.

Table 2. Prices differentials at which tubers are purchased by tuber size (VND/kg).

Tuber size	Farmers sell	Traders buy	Wholesalers buy	Retailers buy
Extra large	+185	+170	+240	+450
Large	1385	1595	2180	2550
Medium	-180	-170	-480	-885

Gap Analysis

Traders want to buy potatoes that are free of chemical residues, free of pests, diseases and physical injury, of the desired size (large), and which provide an acceptable shelf life. In order to meet the needs of their downstream customers, traders need to buy sufficient quantities of potatoes at a competitive price and to be able to pick them up when required (Table 3).

Table 3. Mean rating for what market intermediaries desire from upstream suppliers (where 1 = 'not at all important' and 6 = very important).

Factor	Traders	Retailers
Free from chemical residues	5.74	5.21
Free from pests and disease	5.70	5.37
Desired size	5.52	5.42
Long shelf life	5.52	5.37
Sufficient quantity	5.45	4.68
Meet immediate needs	5.39	5.47
Good reputation	5.39	5.42
Competitively priced	5.35	5.26
Deliver when required	5.30	4.74
Free from physical injury	5.27	5.42
Desired variety	4.87	3.79
Proximity (close)	4.48	3.32
Well graded	4.26	5.05
Appropriately packed	3.48	3.00
Supply a wide range of fresh vegetables	3.39	3.06

Regrettably, while a very simple methodological error resulted in the enumerators failing to collect data from the wholesalers, retailers' expectations were not greatly dissimilar to those of the traders. However, retailers did place greater emphasis on the ability of suppliers to meet their immediate needs. Since retailers purchased in much smaller quantities, being able to secure sufficient quantities of potatoes was much less important. Similarly, since most purchased from market intermediaries rather than directly from farmers, geographical proximity to their source was much less important. However, retailers placed more importance on purchasing a consistent, well-graded line of potatoes. Variety was of little importance to retailers, presumably because most of their customers did not differentiate between varieties. While the market preferred large, evenly shaped tubers, the principal criteria consumers used in their decision to purchase were skin colour and

flesh colour. Over many years, consumers had learned to associate yellow skin and yellow flesh with potatoes that tasted good and cooked well.

Traders indicated that the collector agents were generally better able to meet their perceived needs than farmers. As the principal function of the collector agents is to aggregate the potatoes from many small farmers and to grade those potatoes before collection, such is not unexpected. However, since even this most fundamental task requires some effort, collector agents will only undertake these activities if they are adequately rewarded. As a result, traders report that it is more expensive to purchase potatoes from collector agents (Table 4).

Farmers were generally perceived as being unable to deliver sufficient quantities of potatoes that were free of pests and diseases, physical injury, of the desired size and to deliver tubers of the desired shelf life. Although the traders placed little importance on packing, most reported that the manner in which farmers packed potatoes was significantly below their expectations.

Even although collector agents regraded the potatoes before resale, shelf life and freedom from physical injury remained a problem for the traders. Since the majority of potatoes in the Red River Delta are harvested before they are mature (Batt 2002), the skin is unlikely to have hardened sufficiently. As a result, the tubers are more susceptible to damage, dehydration and decay. The high incidence of physical damage is no doubt related to harvesting practices.

Although no data were collected that quantified the wholesalers' expectations, it was apparent that most wholesalers were dissatisfied with both the technical quality and the functional quality of the product they received from traders and collector agents. Wholesalers reported that the tubers they received were often too small and excessively damaged by both pests and disease and physical injury. As a result, the shelf life of the product was generally too short. Suppliers were often unable to meet the wholesalers' immediate needs and variations in product quality at the farm level made it difficult for traders and collector agents to provide potatoes of consistent quality. While the inability to meet wholesalers' immediate needs was no doubt the result of geographical distance — since both the traders and collector agents operated in the rural areas — most wholesalers reported that the prices that traders and collector agents expected for the potatoes they sold were too expensive (Table 5).

Conversely, for the majority of retailers, suppliers either met or exceeded their expectations. Although problems were reported in the same key areas — tuber size, freedom from physical injury, shelf life and price — it was only the inability of suppliers to provide tubers that were substantially free from pests and diseases that proved to be significantly different.

The high price of potatoes was recognised as a major constraint by two of the three market intermediaries (Table 6). Traders indicated that it was too expen-

sive to purchase potatoes from both farmers and collector agents; retailers indicated that it was too expensive to purchase potatoes from wholesalers. Since wholesalers did not indicate that it was too expensive to buy potatoes from traders, this would imply that wholesalers, being in perhaps the most powerful position in the market, were able to extract the margin they desired irrespective of the purchase price and to pass these higher costs onto the metropolitan retailers who had no alternative source of supply.

Table 4. The extent to which farmers (F) and collector agents (CA) meet traders' needs.

Factor	Trader wants	Trader gets		Probability ($p = 0.05$)	
		F	CA	F	CA
Free from chemical residues	5.74	5.30	5.55	0.066	0.056
Free from pests and disease	5.70	4.87	5.05	0.034	0.061
Desired size	5.52	4.74	5.32	0.005	0.545
Long shelf life	5.52	4.70	4.91	0.013	0.015
Sufficient quantity	5.45	4.43	5.27	0.021	0.480
Meet immediate needs	5.39	4.91	4.86	0.077	0.030
Good reputation	5.39	4.91	5.14	0.164	0.284
Competitively priced	5.35	5.04	4.91	0.259	0.107
Deliver when required	5.30	4.91	5.64	0.025	0.096
Free from physical injury	5.27	4.13	4.86	0.005	0.016
Desired variety	4.87	4.91	5.05	0.803	0.436
Proximity (close)	4.48	5.04	4.77	0.163	0.521
Well graded	4.26	4.14	4.91	0.751	0.313
Appropriately packed	3.48	2.17	3.45	0.001	0.910
Supply a wide range of fresh vegetables	3.39	3.43	2.85	0.877	0.438

Table 5. The extent to which upstream suppliers meet wholesalers' (W) and retailers' (R) needs.

Factor	Want		Get		Probability ($p = 0.05$)
	W	R	W	R	
Meet immediate needs		5.47	4.70	5.63	0.420
Good reputation		5.42	4.40	5.26	0.578
Desired size		5.42	4.80	5.26	0.625
Free from physical injury		5.42	4.40	5.00	0.119
Free from pests and disease		5.37	4.50	4.68	0.015
Long shelf life		5.37	3.80	5.16	0.429
Competitively priced		5.26	4.80	5.11	0.506
Free from chemical residues		5.21	3.70	5.32	0.695
Well graded		5.05	5.00	5.05	1.000
Deliver when required		4.74	5.00	5.58	0.038
Sufficient quantity		4.68	5.30	5.53	0.061
Desired variety		3.79	3.80	4.16	0.309
Proximity (close)		3.32	3.40	4.05	0.105
Supply a wide range of fresh vegetables		3.06	2.60	3.22	0.721
Appropriately packed		3.00	3.80	3.37	0.185

From the wholesalers' perspective, the major problem they experienced with traders was the narrow range of vegetables delivered. This would imply that wholesalers sought to buy more than just potatoes from the traders, but since most traders bought and sold potatoes only when potatoes were available from the farmers, this would not seem possible. Various other problems were experienced with the quality of the tangible product, including inappropriate varieties (to meet the customers' intended use), tubers infected with disease and contaminated with chemical residues, small tuber size, and a high incidence of physical damage to tubers. Problems with the functional quality included poor packing and an inability to deliver sufficient potatoes so that the wholesaler could satisfy their customers' needs. No doubt, since the traders operated in the rural areas and presumably, since wholesalers were not able to readily communicate with their suppliers, excessive distance was perceived to be a major impediment.

For the retailers, while wholesalers could generally supply sufficient potatoes to meet their needs, wholesalers were unable to respond to their immediate needs. Retailers also experienced more problems with inconsistent tuber quality.

Comparing the various impediments that traders experienced with purchasing potatoes from farmers and collector agents provided some interesting results. Traders deemed that it was more expensive to purchase potatoes directly from farmers. Presumably this resulted from farmers demanding a high price,

yet they presented the trader with only small quantities of largely ungraded tubers. Thus, the traders experienced more quality problems when transacting directly with farmers. However, when dealing with collector agents, traders experienced more problems with inappropriate varieties, small tuber size, physical injury and tubers being infected with disease. The only plausible explanation for this would seem to be derived from the ability of the trader, when purchasing directly from farmers, to select for himself those tubers he wants to buy and to reject others. Conversely, when purchasing from a collector agent, the trader must purchase the entire quantity. It would also seem highly likely that, since collector agents store potatoes for 7–10 days, any problems regarding tuber decay would be more likely to show up after a short period of storage rather than immediately after harvest.

While traders indicated that they experienced more problems with poor packing when purchasing directly from farmers, farmers acknowledged that poor packing was one the major impediments that prevented them from meeting the needs of their downstream customers (Table 7).

Poor grading, contamination by disease, a high incidence of physical injury, poor appearance and small tuber size were also perceived to be problematic. However, that variable which farmers believed most prevented them from meeting the needs of downstream customers was the high purchase price.

Table 6. Why suppliers fail to meet downstream customers' needs (%) (F = farmer, CA = collector agent, T = trader, W = wholesaler, R = retailer).

Factor	T > F	T > CA	W > T	R > W
High price	75	48	10	50
Poor grading	21		10	18
Inappropriate varieties		33	50	16
Narrow range of vegetables			78	16
Poor quality	41			13
Small tuber size	8	24	10	11
Not free of physical injury		24	10	11
Cannot meet immediate needs				11
Poor packing	17		22	10
Not free of disease	13	29	30	8
Poor storage capability				8
Poor reputation	8			
Not free of chemical residues		5	33	
Cannot deliver required quantity		10	30	
Excessive distance		10	56	

Farmers believed that the major factor contributing to their inability to meet customers' perceived needs was insufficient capital (62%), which impacted adversely upon their ability to purchase good-quality seed and to purchase sufficient quantities of inputs to maximise productivity (Table 8).

Nevertheless, various other agronomic constraints affected the farmers' ability to produce good-quality potatoes, including heavy rain and the cropping pressures under which farmers found themselves operating, for many farmers reported that the compost applied had not broken down completely. At some point in time, it must be recognised that the agro-ecological environment of the Red River Delta is far from optimal for the production of potatoes. However, it is also readily apparent that not all farmers possess the skills necessary to know how to improve productivity. If such is true and farmers are operating below their full potential, costs per unit output will be proportionately higher.

Lack of knowledge was also perceived to be a major problem for the traders. While it is readily apparent that farmers would benefit most by improving their agronomic knowledge, traders may

not have the knowledge to differentiate between varieties, to identify infected tubers, to know how to store tubers or to understand the dynamics of the market.

Downstream Relationships in the Potato Supply Chain

Contrary to expectations, it is apparent that most farmers had a very positive relationship with their preferred trading partner. The majority of farmers were very satisfied with their trading partner and most farmers trusted their preferred trading partner. Farmers reported that their preferred trading partner was always honest and kept their promises. Since their preferred trading partner seldom acted opportunistically, farmers had confidence in their preferred trading partner and generally believed the information provided. Most farmers maintained that they had a close personal friendship with their preferred trading partner (Table 9).

It is also apparent that most farmers were able to act independently of their preferred trading partner. Most farmers indicated that they could readily choose an alternative trading partner, although most

Table 7. Variables that prevent suppliers from meeting customers' needs (%) (F = farmer, T = trader, W = wholesaler, R = retailer).

Factor	F > T	T > W	W > R
Insufficient quantity			32
Inappropriate varieties	5	29	26
Not free of diseases	17		21
Insufficient range			21
Too far from customer			21
Not free of physical injury	18		16
Small tuber size	2		16
Price too high	48		
Poor grading	33	38	
Tubers not packed	20		
Poor appearance	8		
Cannot source better quality		25	

Table 8. What prevents suppliers from better meeting customers' needs (%).

Factor	Farmer	Trader	Wholesaler
Lack of capital	62	29	
Inability to buy good-quality seed	35		
Agronomic issues	32		
Lack of knowledge	12	42	
Do not have the desired variety		8	

wished to maintain their relationship with their preferred trading partner because they made the best offer relative to the alternatives. Furthermore, most farmers indicated that their preferred trading partner seldom had all the power in the relationship, nor did they control all the information. Consequently, the preferred trading partner was seldom able to coerce the farmer into making decisions that were not in their best interests.

The traders' relationship with their most preferred wholesale trading partner was also quite positive, with most traders indicating high levels of trust and satisfaction in the exchange. However, it was apparent that the traders were more dependent upon their preferred wholesale trading partner, even though they did not necessarily provide the best offer. Traders perceived that their wholesale trading partners had more power and controlled more of the information, although they were less willing to provide financial assistance or to share the risks.

Conversely, the majority of wholesalers indicated very low levels of both satisfaction and trust in their relationships with retail customers. Transactions entailed a high degree of risk and there was a greater possibility of being exposed to opportunistic behaviour and conflict in the relationship. There was minimal cooperation between wholesalers and retailers and minimal trust. As a result, most wholesalers indicated that their retail trading partners had a poor reputation. Wholesalers were not only more dependent, but retailers also wielded more market power and controlled more of the information.

Upstream Relationships in the Potato Supply Chain

In reviewing their relationship with farmers and collector agents, the majority of traders also indicated that they experienced high levels of satisfaction and

Table 9. Mean ratings of relationship variables for downstream relationships between market intermediaries (1 = 'I disagree a lot', 6 = 'I agree a lot'; F = farmer, T = trader, W = wholesaler, R = retailer).

Factor	F > T	T > W	W > R
Satisfaction			
Trading with preferred partner is less risky	5.82	5.83	4.20
Good cooperation with preferred trading partner	5.64	5.70	3.70
Expect to continue to trade with partner	5.61	4.40	4.64
Preferred trading partner meets expectations	5.55	5.43	3.10
Treats me fairly and equitably	5.49	5.77	4.10
Adequately rewarded	5.44	5.57	4.30
Quick to handle complaints	5.22	4.10	3.10
Much conflict with preferred trading partner	2.09	2.47	2.90
Trust			
Confidence in preferred trading partner	5.58	5.03	3.90
Always keeps promises	5.54	5.20	4.00
Always honest	5.53	5.37	4.00
Good reputation	5.46	5.33	2.70
Trust preferred trading partner	5.36	4.93	4.30
Believe information provided	5.05	4.53	3.70
Close personal friendship	5.03	4.77	3.80
Trading partner always considers best interests	3.81	3.10	3.30
Power-dependence			
Free to choose another trading partner at any time	5.71	4.90	2.90
Has best offer relative to alternatives	5.31	4.57	4.30
Must adhere to partner's demands	2.78	2.37	3.78
Trading partner has all the power	2.28	2.83	4.30
Trading partner controls all the information	2.21	2.40	3.00
Trading partner often acts opportunistically	2.15	2.03	3.22
More dependent on trading partner	2.07	2.37	4.50

trust with the exchange. Understandably, because the collector agents accumulated potatoes from many small farmers, traders generally felt they could rely more upon the collector agents than they could upon individual farmers. However, somewhat surprisingly, traders indicated that they were more dependent on farmers than they were upon their collector agents. Since the farmers could choose the trader to whom they sold their potatoes, farmers generally exercised more power and controlled more information (Table 10).

Just as the wholesalers reported that their relationship with their downstream trading partners was not entirely satisfactory, the wholesalers indicated that they were equally dissatisfied in their relationship with the traders and collector agents. Wholesalers reported that traders seldom treated them fairly and equitably and on many occasions, failed to meet their expectations. Traders were slow to respond to the

wholesalers' complaints and there was evidence of only moderate levels of cooperation in the exchange. Wholesalers also reported that despite the opportunity to choose from several alternative suppliers, traders and collector agents had more power and controlled more of the information. Nevertheless, wholesalers indicated that they were neither dependent nor did they have to adhere to the trader's demands. This was achieved because most wholesalers (68%) purchased potatoes from more than two traders and collector agents (Batt 2002).

No doubt because of the potential variation in the quantity and quality of the tubers delivered by traders and collector agents, wholesalers demonstrated the least amount of trust in their relationship with their upstream suppliers. Wholesalers believed that traders and collector agents were more dishonest and less likely to keep their promises. Wholesalers also seemed less willing to believe in the information pro-

Table 10. Mean scores on relationship variables for upstream relationships between market intermediaries (1 = 'I disagree a lot', 6 = 'I agree a lot'; F = farmer, T = trader, CA = collector agent, W = wholesaler, R = retailer).

Factor	T > F	T > CA	W > T	R > W
Satisfaction				
Trading with preferred partner is less risky	5.83	5.55	3.90	5.40
Good cooperation with preferred trading partner	5.70	5.68	4.10	5.45
Preferred trading partner meets expectations	5.48	5.32	4.60	5.60
Treats me fairly and equitably	5.48	5.68	3.50	5.50
Adequately rewarded	5.41	5.41	4.70	5.10
Expect to continue to trade with partner	4.82	5.18	4.60	5.13
Quick to handle complaints	4.26	4.77	2.70	4.90
Much conflict with preferred trading partner	2.17	2.27	2.60	2.05
Trust				
Trust preferred trading partner	5.35	5.00	4.40	5.16
Always honest	5.17	5.29	4.00	4.90
Good reputation	4.95	4.68	4.00	4.60
Always keeps promises	4.91	5.23	4.10	4.85
Confidence in preferred trading partner	4.87	5.27	4.20	5.10
Close personal friendship	4.68	4.73	4.20	4.42
Believe information provided	4.10	4.23	4.10	4.95
Trading partner always considers best interests	3.04	3.18	3.50	2.70
Power-dependence				
Free to choose another trading partner at any time	4.77	5.10	4.40	5.80
Has best offer relative to alternatives	4.05	4.14	4.60	5.25
Trading partner has all the power	2.91	2.59	3.30	3.70
Trading partner controls all the information	2.82	2.27	2.80	1.90
Must adhere to partner's demands	2.77	2.32	2.60	2.30
More dependent on trading partner	2.36	2.23	2.70	2.45
Trading partner often acts opportunistically	2.36	2.00	2.33	2.20

vided by traders and collector agents and perceived them to engage more frequently in opportunistic trading. Such would suggest that price was of considerable importance in the transaction. Wholesalers believed that if traders and collector agents could obtain a higher price from an alternative customer, they would be more likely to abandon their relationship. In turn, traders and collector agents could readily blame their inability to deliver on the inconsistent supply from farmers.

While the wholesalers were generally dissatisfied in their relationship with their retail customers, retailers expressed quite high levels of satisfaction and trust in their relationship with the wholesalers. Indeed, most retailers intended to continue to trade with their wholesale trading partner, even although there were plenty of alternatives, noting that their current wholesale supplier provided the best offer relative to the alternatives. However, retailers expressed some doubt as to whether wholesalers always acted in their best interests.

Conclusions and Implications

With the majority of the potatoes harvested in the Red River Delta being derived from some 235,000 small farmers, there is considerable uncertainty with regard to both the quantity and quality of tubers available. In the absence of any definitive quality standards and in order to secure a more reliable supply of potatoes, each of the market intermediaries agreed that transacting with their preferred trading partner was significantly less risky.

However, in a market where more than 85% of the crop is harvested in just one month, the market will demonstrate considerable price volatility. While a long-term relationship may reduce some of the uncertainty associated with procuring a more reliable supply of good-quality potatoes, the relationship is unable to provide any price certainty. As a result, each of the actors may abandon their relationship from time to time to secure a better price. Within such an environment, one would expect the various actors to engage in opportunistic trading practices, yet — with the exception of the wholesalers, who reported dissatisfaction with both their suppliers and their customers — there was little evidence of market exploitation.

While market intermediaries may find that they have occasionally paid too much to purchase potatoes, they are in a position to respond to the market

and to modify their buying and selling practices in order to reduce the extent of the loss. However, since the potatoes are often dug immaturely and have only a limited shelf life, farmers must accept the prevailing market price at the time of harvest. While farmers will ordinarily transact with those traders who offer the best price, since the average farmer has less than 1.5 t of potatoes at their disposal (Batt 2002), there is some doubt as to what benefit the farmer will derive from selling to an alternative trader. Since most Vietnamese potato farmers are not constrained by any pre-existing credit arrangements that might limit their ability to choose an alternative trading partner, farmers choose to stay with their preferred trading partner because they want to, not because they have to.

Within the supply chain itself, it is apparent that the market intermediaries have adopted a cost plus pricing approach. To the purchase price, the market intermediaries add the various costs of grading, storage and transportation, plus their desired profit margin. In a market where there are many small traders, wholesalers and retailers, few switching barriers and few barriers to entry and exit (with the possible exception of the wholesalers), competitive market forces will prevent the market intermediaries at any one level in the supply chain from being able to extract an extraordinary price margin. Both Fafchamps (1996) and Lyon (2000) make similar conclusions from their respective analyses of the fresh vegetable industries in Ghana.

Nevertheless, it is at the wholesale level where most of the dissatisfaction arises in the supply chain and, no doubt, it is at this level that there are the greatest barriers to entry. Perhaps much of the wholesaler's relational dissatisfaction is derived from their inability to exercise greater market power and to extract a greater economic rent. However, despite being the most concentrated sector, wholesalers exercise minimal control over the traders that supply them. Unless the wholesalers have made some pre-existing arrangement to purchase all the potatoes from a particular trader, the trader will park their truck in a designated area in the wholesale market and sell potatoes to whoever wants to buy them, providing they buy no less than one sack (Batt 2002). While larger retailers can also buy directly from the truck, many of these might be better described as secondary wholesalers, for they will distribute the potatoes to various retail markets throughout the metropolitan area. That then leaves the wholesalers

very much dependent upon their local customer base, who it seems may use that knowledge to their advantage.

In conclusion, it is apparent that the prices that farmers in the Red River Delta receive for the potatoes they have grown is determined more by supply and demand than by the exercise of any coercive power by market intermediaries.

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Banana Supply Chains in Indonesia and Australia: Effects of Culture on Supply Chains

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Abstract

Research on banana supply chains (BSCs) was conducted in 2001 and 2002 through two case studies, BSC1 (Indonesia) and BSC2 (Australia). BSC1 supplied local banana varieties from small farmers in the Bayah District in Banten Province to traditional markets in Jakarta through the Jakarta central market. In BSC2, Cavendish bananas from growers in North Queensland were marketed through a wholesale agency in Sydney to supermarkets and other high-quality retailers. This paper discusses the effects of culture on the operation of both chains. Data were derived from interviews with chain members and observation of their daily activities, and transcripts were categorised using qualitative software.

In both chains, strong and long-term relationships formed the basis of all chain activities, however the nature of relationships between the chain members differed significantly between those in BSC1 and BSC2, particularly at the upstream (farmer and village) levels. Culture affected the way in which members related and communicated their ideas to each other. Relationships in BSC1 villages were dominated by traditional value systems, social stratification and indebtedness that encouraged paternalistic approaches by the buyers toward the sellers. Chain members' relationships in BSC2 were more egalitarian and in some cases developed into strong friendships. The culture, as expressed through the nature of these relationships, affected the pricing mechanisms and farmers' bargaining inclination. Despite the differences, each chain performed relatively effectively, adapting to its needs within its cultural environment.

Supply-chain management (SCM) concepts originated from the fields of production/operations management and logistics (Westgren 1998), particularly in the United States of America (USA) (Wilson 1996). SCM drew from the lean management approach practised by the Japanese automotive industry in the 1970s and 1980s, including non-confrontational ways of undertaking exchanges and just-

in-time distribution. The concepts can generally be divided into two groups — traditional and the new concepts of SCM. The traditional SCM concept views the supply chain as a means of obtaining the lowest possible initial purchase price while assuring supply (Spekman et al. 1998). Hence, SCM is characterised by the presence of multiple partners who are evaluated based on purchase price, arms-length bargaining, formal short-term contracts, and centralised purchasing. In such situations, fierce horizontal competition among suppliers is encouraged because the prevalent assumption is that suppliers would behave opportunistically once the buyers become dependent on their products.

The new paradigm of SCM, on the other hand, emphasises the importance of good coordination of all phases within the chain to transform raw materials

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into finished products or services and distribute them to the end consumers (Spekman et al. 1998; Dunne 1999). This includes “designing, developing, optimizing and managing the internal and external components of the supply system ...” (Spekman et al. 1998, p. 54). Baatz (1995) goes even further to include recycling or re-use of the product, though this inclusion is still relatively uncommon in SCM literature. Viewed as a system, the chain should also be managed as a whole (Beers et al. 1999). Hence, in SCM, the competition is no longer between business units at the same level, but between chains operating in the same or alternative industries.

The majority of SCM literature, including in the agri-food industry, focuses on the application and implementation of SCM in developed countries. The differences in the nature of agri-food industries in developed and developing countries mean that SCM concepts derived from experiences in developed countries cannot be easily applied in developing countries without understanding the differences in the nature of the industries in both types of countries, caused by factors such as culture, and the systems and regulations in place. Many SCM authors, for example, Wilson (1995) and Fearné (1998), believe that SCM is all about managing good relationships among the chain members, with the financial gains distributed according to the distribution of value added. This paper focuses on the relationship nature of the supply chain and the effects of culture, rather than the issue of value-sharing within the chain. Understanding how culture might affect supply chains in particular countries is critical because of the effects it might create in the logistic-relationships management of supply chains. Culture here refers to “the context of symbols, norms, interpretation models and values shared by a social group. Values form the core of culture and concern what is good/bad, clean/dirty, normal/abnormal, logical/illogical, rational/irrational, fair/unfair etc.” (Aquilon 1997, p. 77). Two dimensions of culture described by Hofstede (1993, 1997), power distance and individualism, will be used to describe the differences in the Indonesian and Australian culture that might affect the management of the chains and relationships between their members.

In the following sections, the similarities in the banana industries in Indonesia and Australia will be briefly explained, followed by a description of the research methods used in the study. The two case studies are then described, focusing particularly on

the logistic management occurring within each chain. The following sections describe the effects of culture on banana supply chain logistic-relationships and the chain members’ bargaining inclination. Finally, a brief conclusion and implications of the study are provided.

Banana Industries in Indonesia and Australia

Although each chain studied is unique and has its own characteristics, both operate in the banana industries within their respective countries, and share some similar features. At the production end, the industries are made up of mainly small family farms, although large plantations also exist in each industry, particularly in Australia, where less than 5% of growers produce 70% of Australian bananas. For many small banana farmers, growing bananas formed an important part of their income. Since bananas are grown as a monoculture in Australia, they were the main source of income for the farmers, while in Indonesia bananas are grown together with annual crops and contributed to farmers’ regular income, although not necessarily as their main source of income. Bananas are produced mainly to serve domestic consumption in each country.

At the marketing end, the banana industries in both countries are part of the global fruit-marketing industry. Imported fruit has been making its way to Indonesia, and applications have been made to import bananas into Australia. In Indonesia, imported fruits can be found easily, not only in supermarkets in the cities, but also in traditional markets in urban towns. These high-quality fruits are competitors to the local bananas. As markets become more competitive, small farmers can easily become uncompetitive. To be successful in this environment, good collaboration between all members of the chain is critical to ensure competitive quality, quantity, and price of their product to meet the changing consumer preferences.

The banana industries in both countries are characterised by informal, non-contractual relationships, with farmers being price-takers and exercising the least power compared to other members of the chain. Those at the front-line interface with end consumers normally benefit from the information to hand, and hence often exercise power over others and create dependency. The long and complex chains may also

discourage good communication and information-sharing among members of the chains. Most members communicated only with those at the previous and following level.

Research Methods

Two banana supply chains (BSCs) were studied, one in Indonesia and the other in Australia. The Indonesian BSC (BSC1) involved farmers from three villages in the Bayah District of Lebak Regency in the Banten Province in West Java. The main fruit commodity in Lebak Regency is banana, and it is one of the largest banana production centres in West Java, together with Sukabumi and Cianjur Regencies. The three villages were selected on the recommendation of the Bayah Agricultural office, banana production statistics, and access to study their systems. The Australian chain (BSC2) was selected based on its comparability with the Indonesian banana industry through consisting of small banana family-farms, its attempts to operate competitively and innovatively to survive in the

industry, its supply to supermarkets (the most common retail outlet for Australians to buy bananas), and its willingness to provide access to the researcher.

Data were collected in a series of interviews with channel members and by observing them while working. Interviews and observation findings were transcribed and analysed with the assistance of NUD-IST (Non-numerical Unstructured Data Indexing, Searching, and Theorizing) software, which was useful in allowing theory to emerge from the data (Richards and Richards 1991). A summary of findings was verified by the chain members for accuracy.

Description of BSC1 and BSC2

As typically occurs in developing countries, BSC1 was characterised by the existence of multi-layers at both the upstream and downstream levels of the chain. BSC1 supplies local banana varieties from three villages, end consumers in Jakarta and neighbouring cities such as Depok and Bogor through the central

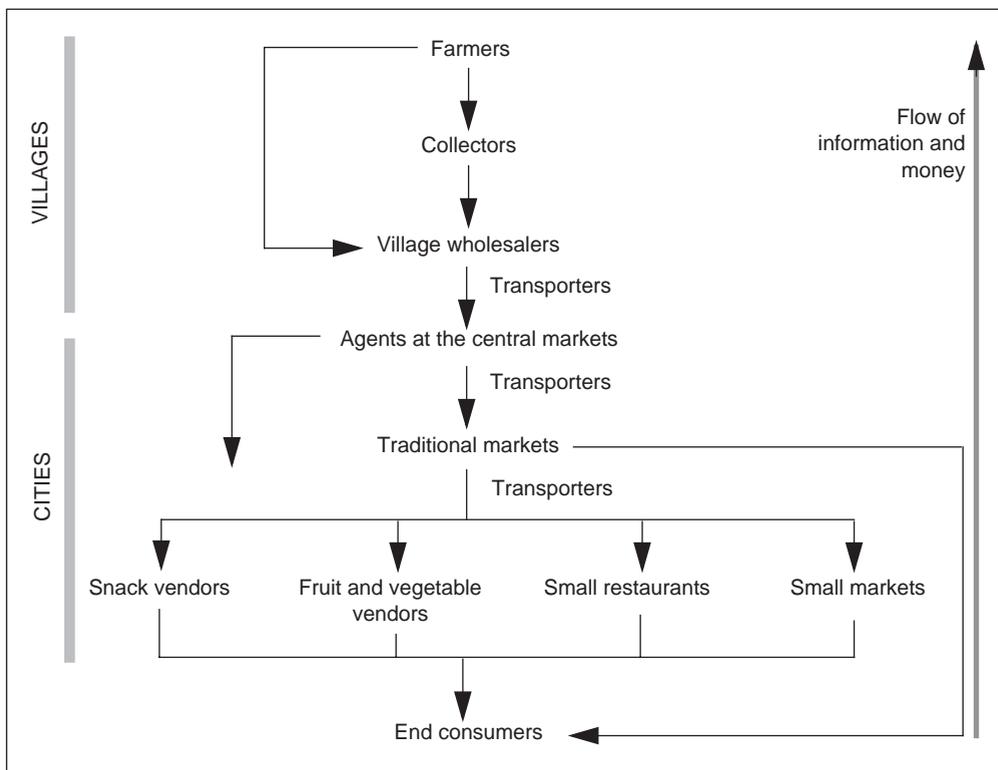


Figure 1. Logistic flows of banana supply chain 1 (BSC1), Indonesia.

market in Jakarta (PIKJ – Pasar Induk Kramat Jati or Kramat Jati Central Market). The logistic flow within BSC1 is shown in Figure 1. Bananas were commonly grown in the villages with minimal input and attention from farmers, on their rice banks or mixed with hardwood trees/annual crops.

In BSC1, farmers sold their bananas to their regular buyers — either collectors or directly to village wholesalers — and only occasionally to others. Two selling methods existed, weight-based and tree-based. In the weight-based method, banana bunches were carried on foot to the buyers' warehouses to be weighed and priced according to one of the buyers' standard four price groups. In the tree-based method, collectors actively searched around the villages for young or mature bunches to be bought on the tree. While a fixed-price system ruled almost all transactions in the weight-based method, bargaining governed the transactions in the tree-based method. Competition among wholesalers ensured relatively fair prices to suppliers. Banana ripening was conducted using traditional methods, such as smoking (burning dried coconut leaves) or carbide, at the village wholesaler level. Bananas' movement within BSC1 was always accompanied by a change of banana ownership at each chain level, apart from at the central market, where the banana agents operated on a 10% commission basis. No formal grading standards existed within BSC1; bananas were graded somewhat differently at each level using subjective assessment of parameters such as bunch weight, maturity, finger length, and cosmetic appearance.

A banana wholesale agent in Sydney was the focal point that linked growers in North Queensland with buyers in Sydney (BSC2). The predominantly Cavendish bananas were sold to major supermarket chains, both high-quality and price-sensitive independent retailers, and other wholesalers. The bananas were sourced from specialised growers who produced high-, good- and average-quality bananas. Supply from small-scale, average-quality growers was discouraged. Growers typically consistently supplied to two or three agents to spread their risks and obtain market information from different cities. Growers were paid on each consignment, several weeks after delivery to the agent, who worked on a commission basis. Growers graded unripened bananas by removing defective fingers that fell outside the product specification, and categorised the hands or clusters based on the finger length. They trusted the agent to decide which customers their bananas should supply, based

on assessment of the quality and consistency of the ripe fruit. The characteristics of each chain are summarised in Table 1.

Effects of Culture on Logistic Relationships

In both chains, most chain members had known their buyers/sellers for a relatively long time. In fact, strong and long-term relationships formed the basis of all activities in the chains. However, the nature of relationships between the chain members differed significantly between those in BSC1 and BSC2, particularly at the upstream (farmer/village) levels. Culture affected the way members related and communicated their ideas to each other. In turn, this affected the pricing mechanisms and farmers' bargaining inclination. This paper focuses only at the effects of culture on chain members' relationships and pricing mechanisms at the upstream end of both BSCs. The effects of culture on the logistic relationships of chain members in this paper are viewed using Hofstede's power distance and individualism dimensions (1993, 1997).

Power distance dimension

Power distance index (PDI) is a measure of the inequality among people that is considered normal in a country, from the perspective of the least powerful partners in the relationship. Using a scale of 11 (small power distance) to 104 (large power distance), less powerful members of a group in a country with a low PDI accept that power is distributed relatively equally, which encourages interdependence. On the other hand, high PDI refers to cases where the less powerful members of a group depend emotionally on the more powerful members. The PDI of Indonesia is 78, while Australia's is 36. If these scores are indicative of how people from both countries perceive equality among themselves, it might explain some of the attributes of chain members' relationships within each chain.

In high-PDI societies, inequality is considered as the basis of societal order (Hofstede 2001). People with social status, prestige, wealth, or simply greater age, may be treated with a mixture of respect and fear in these societies. In BSC1, social stratification existed in the villages. Wholesaling is quite a respected occupation, which positioned the wholesalers relatively high in the village societies. Wholesalers earned villagers' respect because of their business success, wealth, or simply their personality.

For example, the inequalities among BSC1's farmers, collectors, and village wholesalers were apparent through the differences in materialistic possessions among them — wholesalers commonly lived in relatively large houses equipped with a television and antenna to receive TV channels from Jakarta, something that many small farmers in BSC1 could only dream of owning.

Koentjaraningrat (1967) argued that Sundanese villages, such as those in this study, tended to have social stratification based on occupations and positions within the village. Thomas (1975), who studied villagers' perceptions of social stratification in three villages in West Java in 1965, also found occupation to be one of the most significant determinants of social prestige and power in village society. As a result, supplier-buyer relationships are often characterised by paternalistic attitudes by the buyers, which make small farmers reluctant to bargain in a straightforward manner. Similar, status-based relationships were also found among the Madaymen farmers and middlemen (Russel 1987). That these relationships have continued to exist from the 1960s to 2002 in Sundanese villages suggests they are rooted in stable social values.

Suppliers' indebtedness toward their buyers, which stemmed from the buyers' role in guaranteeing a market for their bananas and the credit provision given to suppliers whenever they needed extra cash, contributed to the inequality between suppliers and buyers in BSC1 villages. Buyers offered loans because they predicted that the future benefit of having the farmers' voluntary commitment to sell only to them exceeded their current costs. However, unlike in Thomas' 1975 study of Sundanese villages, where credit often caused conflicts because of the high interest rates charged, credit in the villages studied here was given without interest and without an enforced repayment schedule. For many, the feeling of indebtedness reduced their propensity to bargain with the wholesalers. But for some (particularly farmers who owed only a little money to their buyers), it had less impact on their propensity to bargain. They did not consider their financial ties a barrier to bargaining or even to selling their bananas to others if the buyers failed to meet the prices they demanded. Some farmers who used to be collectors and were still paid slightly higher than other farmers also felt indebted toward their wholesalers, which decreased their inclination to bargain.

As depicted by its relatively low PDI, relationships between people in Australia tended to be based on

egalitarian principles. Such perception of equality among people (such as the farmers and the agent in BSC2) in a country with low PDI was also associated with more modern agricultural practices, more social mobility, and better education (Hofstede 1997). In BSC2, communication between two parties could be conducted in a relaxed atmosphere where neither of them dominated the interactions. Conversation topics between BSC2 farmers and the agent covered not only bananas but also other interests such as sport or sharing of jokes. BSC2 farmers saw themselves as equal to the agent in social status, which allowed friendships to develop from the trading relationships. The four farmers interviewed have supplied the agent for a long period of time and have turned their trading relationships into friendship, although the distance between their places of work meant face-to-face meetings could only be conducted occasionally, when the agent conducted his annual visit to production centres in North Queensland. One of the farmers was already the agent's friend before also becoming his supplier.

Jap et al. 1999 assert that friendliness in buyer-seller relationships encourages them to share openly and collaboratively and this provides a basis for increased trust, which has to be continually worked out between them. Batt (2003) concluded that growers must have a certain minimum level of trust in an agent before considering him/her as a potential exchange partner. Compared to other horticultural industries, trust is an even more critical issue in the relationships between farmers and their agents in the banana industry in Australia (and also in the mango and avocado industries), because of the agent's important role in ripening the fruits before selling. Quality-conscious independent retailers interviewed claimed that banana condition (ripeness) was the single most important criterion in banana selling them. It was the agent's responsibility to ensure that the bananas were handled and ripened properly to achieve the ripening stage desired by customers. This meant that the agent must be capable of selling the right fruit to the right customers at the right price, and also of transforming the unripe bananas into ripe ones. On the other hand, the agents depended on the farmers to supply them with good-quality bananas that were sought by their customers. This encouraged interdependency between both the farmers and the agent, and increased the importance of trust in their relationships, since each party had little or no control over the way the other did their job.

Table 1. Characteristics of the banana supply chains studied in Indonesia (BSC1) and Australia (BSC2).

Characteristics	BSC1	BSC2
Distance between production area and markets	Approximately 130 km	Approximately 2600 km
Length of chain	Three levels at the upstream and at least three levels at the downstream	One level at the upstream and three levels at the downstream
Marketing	Selling exclusively to a single buyer regularly in the villages (only occasional shift to other buyers)	Selling to multiple buyers regularly
Selling units	Upstream: bunch Downstream: bunch, hand, finger	Carton
Key functions		
Production	Farmers	Farmers
Ripening	Village wholesalers, retailers	Agent, major chain
Grading	Collectors, village wholesalers, agent, traders	Farmers, agent
Assembly	Collectors, village wholesalers, agent	Agent, major chain's distribution centre
Distribution	Agent, middle-size traders	Agent, major chain's distribution centre
Retailing	Retailers (small traders/vendors)	Retailers
Knowledge of other chain members	Upstream members do not know downstream members and vice versa (apart from village wholesalers and agents in the city)	Upstream members know the agent and some of the retailers
Communication	Face-to-face between members at two connecting levels	Mostly by phone between farmers and agent; farmers occasionally visit the wholesale markets and some retailers; face-to-face and phone between agent and buyers
Credit ties	Upstream: buyers lend money to suppliers Downstream: credit payment from regular customers to agent	Credit payment from agent to farmers (consignment system)
Price mechanisms	Upstream: mostly fixed price in weight-based transactions; bargaining in tree-based transactions Downstream: bargaining	Agent pays farmers based on bargaining results between him and buyers (farmers as price-takers)

Individualism dimension

Hofstede's individualism dimension refers to the degree to which people in a country prefer to act as individuals rather than as members of a group (Hofstede 1997). Indonesia scored 14 here, while Australia scored 90, within a 0 to 100 range. What these numbers tell is that Indonesians tend to be loyal to their groups, while Australians tend to be more individualistic. Loyalty to the group also means sharing resources. This is well expressed through the peasant solidarity existing in BSC1 villages, which focuses on the wellbeing of everybody in the group, rather than the individual.

As most chain members in the villages had been living in the same village all their lives, they knew each other relatively well. Like many other peasant societies in Indonesia, they valued high solidarity among themselves and emphasised the sharing of resources, mutual help, and the right to subsistence for everybody (Alexander 1987). Peasant solidarity stems from the *gotong royong* community spirit long existing in many villages in Indonesia (Koentjaraningrat 1967). Self-sacrifice for the common benefit is highly appreciated, while individualism is highly disapproved of. Cooperation was the basis of social interactions among villagers, with implications for the way bananas were traded in the villages. The two most common features of peasant solidarity shown among BSC1 members in the villages were the right to subsistence and trust.

Many in the villages believed that everybody should be given a chance to earn money for their families. The common manifestation of this belief was farmers' acceptance of the practice by village wholesalers of paying collectors a slightly higher price for bananas compared to the prices given to farmers who supplied directly to the same wholesalers. Wholesalers who tried to take over other wholesalers' collectors by offering them higher prices were regarded as greedy by villagers and were considered disrespectful of the other wholesalers' right to earn money. In the spirit of respecting his former collector's right to earn money, a wealthy farmer refused to supply directly to a wholesaler (hence disregarding a chance to earn more money for himself); rather, the farmer preferred to share the increased prices offered to him by suggesting the wholesaler buy his bananas through the collector.

Such values in village life encouraged people to trust each other. When selecting buyers for their

bananas, many farmers considered mainly the distance between their field and the buyers' warehouses, rather than whether or not the buyer was a trustworthy person. By default, farmers believed that as fellow villagers, the buyers would respect their right to earn money and act in the best interest, price-wise, of both parties most of the time. In a system where most transactions were not recorded formally (apart from those by village wholesalers who dealt with large quantities of bananas), trust acted as an assurance that the trading relationships were intended to bring profit for both parties.

Consequently, many farmers believed the act of bargaining risked being interpreted as lacking trust in the wholesaler's judgement. Bargaining could also be interpreted as a direct confrontation with the buyers, which was usually avoided in a society that respected harmonious relationships. Suppliers (farmers and collectors) tended to believe that most of the time they would receive fair prices according to market prices in the city and they could accept occasional delays in receiving price increases. So strong was the trust that many suppliers did not feel it necessary to search for updated market information. They also believed that forcing wholesalers to buy bananas beyond their prices might cause losses for the wholesalers, which in the long term would disadvantage the suppliers themselves. Hence, suppliers might prefer to trust the wholesalers' judgement on appropriate prices and risk the amount of profit they could get in the short term in favour of long-term sustainable relationships. After all, bananas were seen as a means of providing security and stable income for most people in the villages.

In line with Australians' tendency to be individualistic, a farmer in BSC2 would rate his business wellbeing as a higher priority than the whole chain's success. Farmers' attempts to bargain with their agents over prices were not considered as a confrontation but as an honest expression of disappointment in the agent's failure to satisfy their expectation, and as such, did not necessarily affect the relationships negatively. Each stated openly what they expected of the other to progress their business. However, because of the nature of the industry, wherein trust developed slowly over time, costs of switching between agents were high; it was in the best interest of both parties to maintain a good relationship between them. As transactions were repeated, trust also increased, resulting in decreased need to bargain and increased need to maintain the relationship (cal-

culated trust). BSC2 farmers managed their risks by consistently supplying a certain amount or percentage of their bananas to several agents regardless of their daily price differences. Any extra bananas they produced would, however, always be sold to the agent who gave them better prices in the previous week. This practice is also common among other horticultural producers in Australia (Batt 2003). Good relationships with each agent were particularly critical to ensure a market for farmers' bananas in times of over-supply, which usually coincide with the summer fruit season. Farmers who pursued a spot-transaction approach might find difficulties marketing their bananas during those times.

In contrast to the high switching cost in BSC2, the switching cost in BSC1 was low. In BSC1 villages, trust was considered to be pre-existing in any farmer-buyer relationship due to the collectivist nature of the relationships within the village community. This trust, combined with the low production costs and the guaranteed market for bananas, resulted in farmers' confidence in their capacity for one-off selling or if necessary, shifting permanently to another buyer. However in practice, farmers did not switch easily or supply more than one buyer consistently. The latter was due mostly to farmers' small production scale. Even large-scale village wholesalers only supplied regularly to a single agent in the city. The loyalty ethos embedded in a collectivist society as in Indonesia meant that anybody who consistently supplied more than one buyer would be labelled as disloyal and their relationships would tend not to last. Fortunately, because of the competition for banana supply, reliance on a single buyer would not necessarily decrease a supplier's bargaining power, but would increase the risk should the buyer's business collapse.

Supply-chain literature suggests that high ease of switching between buyers is not consistent with attaining chain integration and interdependency. However, in practice, chain members in the villages have established supply-chain values through their socio-cultural value systems. Pre-existing trust and respect for each other's right to earn money has integrated the chain, particularly at the village levels, as has the provision through the chain relationships of an informal system of micro-credit. In this sense, traders are established in the role of chain champions.

Implications

The creation of Western-style supply chains in Indonesia to secure supply to large supermarkets may challenge the established socio-cultural norms. A focus exclusively on superior, standardised quality would represent a shift away from the current situation where all bananas find a market. Such a shift would potentially divert income flows which currently seek to ensure that all farmers and collectors are able to earn income (effectively an informal welfare system). Losing their access to informal credit and to cash payments (through moving to delayed payments which are the norm from supermarkets) would also be difficult for many small-holders to sustain.

In the Australian case study, established cultural values and risk-management strategies were shown to favour multiple simultaneous supply-chain relationships by banana farmers. By contrast, Indonesian banana farmers already operate within supply chains with a high degree of trust and stability. Understanding how these current Indonesian supply chains operate and the culture and the deep-rooted values which underpin them, should assist both academics and practitioners to adapt Western supply-chain practices associated with the growing supermarket sector in Indonesia. The opportunity is to design supply-chain practices which better fit with the societal needs as well as meeting the needs of supermarket owners and their customers.

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Supply-chain Management and the ‘One Dragon’ Approach: Institutional Bases for Agro-industrialisation in China

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Abstract

A supply-chain approach for food and fibre industries has been widely discussed and practised with well-known success stories, particularly in developed countries. Interest in supply-chain management (SCM) among developing countries has risen in recent years as they aim for international standards with a view to exporting their food and fibre products overseas.

Since the economic reform of the 1980s, the Chinese government and academics alike have promoted a method of SCM for agro-industrialisation: vertical integration at the grower and wholesaler level. They have popularised the phrase ‘one dragon of production and marketing’ — the head and body of the dragon are integrated. This type of integration has been encouraged in two ways: one way is for large distribution corporations to integrate back with contracted growers, or for the corporation to extend its supply-chain function to production. The second common method comes from government-assisted grower cooperatives that extend their chain function from growing to marketing their products.

The first stage in developing a supply-chain methodology is to understand the network and the environment of the supply chains involved. This study looked at the drivers of SCM in China and used the concepts of ‘new institutional economics’ to look at the social infrastructure for SCM in China. In 2000, O. Williamson described four levels for the economics of institutions: embeddedness, institutional environment, governance, and resource allocation. We conclude that the conditions of social infrastructure necessary for SCM are yet to be developed in China. It will only be possible to extend the ‘one dragon’ approach to SCM when the institutional environment is ready to support SCM requirements.

A supply-chain approach for food and fibre industries has been widely discussed and practised, with well-known success stories. Supply-chain management (SCM) simply refers to the management of the entire set of production, distribution and marketing processes by which a consumer is supplied with a

desired product (Woods et al. 2002). Rather than a transactional or dyadic-based (one-to-one) orientation, as traditionally used in conducting businesses, the focus of SCM is on more coordinated supply among agribusiness units for desirable products. The approach offers an opportunity for supply-chain partners to see where they fit into this bigger picture and how they need to position themselves to take advantage of emerging trends and developments.

At this stage, the supply-chain approach has been successfully applied in many industries in developed countries, such the Netherlands, United Kingdom, the United States of America and Australia. Interest

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in SCM among developing countries has increased in recent years as they aim to meet international standards with a view to exporting their food and fibre products.

Harland et al. (1993) pointed out a decade ago that the first stage in developing a supply-chain methodology is to understand the network and the environment of the chain involved. It is relevant to examine the drivers or antecedents of SCM and its institutional basis. Williamson's (2000) concepts of 'new institutional economics' are particularly useful in looking at the social infrastructure for SCM in China. Williamson described four levels for the economics of institutions: embeddedness, institutional environment, governance, and resource allocation.

From the current study, we believe that the social infrastructure for effective SCM is yet to be developed in China. The Chinese government's recent 'one dragon' policy for agro-industrialisation is an alternative to SCM that does not make as much demand on social infrastructure as the SCM approach. However, the outcomes of the 'one dragon' policy have been mixed. Its experiences, both positive and negative, are relevant for policy-makers in other developing countries interested in agro-industrialisation. This study makes particular reference to the melon industry in western China as it is a well-known crop in western China and has the potential to regain the fine reputation it had in the past.

Institutional Basis for SCM in China

China and drivers of SCM

Research has identified several drivers in the external environment of developed countries that contribute to a more consolidated approach between agribusiness units vertically involved in the same supply chain. They include:

- cost-price squeeze in the larger environment of globalisation
- increased demand for 'traceability' for food safety and quality
- increasingly specific demands by consumers for certain attributes, such as 'green', or ethically sound products.

Since its accession to the World Trade Organization (WTO), China has been under pressure to open up its agricultural markets, however this process is happening very modestly. The drivers of SCM in

developed countries stated above are not imminent in China as yet, despite warning and recurring comments in the media and from academics.

Cost-price squeeze

China possesses lower costs of production, such as land and labour costs. Although more farm households are now using chemicals and commercial seeds, many still use minimal farm inputs to save on production costs. The cost of food in China is generally inexpensive. Local agricultural products of low to mid-range value still have a substantial share in the Chinese market.

Traceability

In China, any initiatives pertaining to food safety issues are currently imposed by the government rather than demanded by communities. There is a lack of effective consumer groups pressing for safe foods and this situation is not likely to change in the near future.

'Green' and ethically sound products

There is little awareness of 'green' (inflicting no or minimal environmental damage) products among Chinese consumers even though some provincial and city governments have the procedures for certification of such products. It is still difficult to gauge to what extent consumers are willing to pay more for products that are produced using environmentally friendly practices. In China, there is currently no consideration given to the ethical issues implicit in production, such as worker exploitation, animal testing etc.

In developed countries, drivers for SCM have forced small players out of business and consolidated supply-chain partners at each level. In China, there is little consolidation at any level as yet. There is a myriad of small players at each level of the supply chain. For example, in the melon industry in Gansu Province, there are many small-farmer households with an average of 2/3 ha of honeydew melon per household. At the wholesale level, hundreds of traders travel to Gansu from other provinces during the peak season seeking melon supplies (Zhang and Wei 2003).

A lack of institutional basis for SCM in China

Williamson (2000) described four levels in the economics of institutions. The higher level imposes

constraints on the level immediately below. They are summarised as follows:

- level 1, **embeddedness** — this consists of informal institutions, customers, traditions, norms and religion. It takes centuries to change in any significant way. It is spontaneous and often non-calculative and as such has no manifestation in teleology.
- level 2, **institutional environment** — this consists of formal rules of the game; for example, contract laws. It takes decades to change. The purpose of the rules is to get the institutional environment right.
- level 3, **governance** — this is the play of the game. It takes several years to change with a view to getting the governance structure right.
- level 4, **resource allocation** — this relates to continuous, everyday transactions which result in prices and quantities. The teleology is to get the marginal conditions right.

SCM and the embeddedness in the Chinese society

In China, as in many other societies, informal rules and values have a pervasive influence upon the long-run character of the economy. There are various elements in Chinese society that impact on how businesses are conducted. A few of these are highlighted below.

Low social status for traders — traditionally, the Chinese had a hierarchy for different professions: the gentry, the peasants, the labourers and lastly the traders. There was a general low regard for traders or businesspeople as they were perceived to be making profits through tricky tactics. While today China is actively involved in world trade, this low regard for businesspeople is still entrenched in the culture. It is somewhat accepted even today that businesspeople need to have tricky strategies to outsmart their competitors. There is little room for righteousness in business, which the traditional Chinese culture emphasised.

This perspective may not necessarily be the same in other developing countries. One study found that traders in Indonesia were normally well respected by villagers for several reasons, such as their ability to perform beyond the village level, their broader knowledge of the industry, and their wealth (Wei et al. 2001). The Chinese situation is quite different. In the melon industry, for example, traders move around the country for product supply in different

seasons of the year. Farmers are unlikely to respect these wholesalers, as they do not know them well, and the traders seek to purchase their produce at the lowest possible price.

This prevailing attitude among the Chinese as contributed has contributed, to a certain extent, to the difficulty of adopting a SCM approach to doing business. In order to be prudent, business people generally adopt a transactional-based and short-term dyadic relationship with their suppliers and customers.

Homogeneity of ideas as the foundation for social order — traditional Chinese concepts of social order were based on homogeneity of ideas through a deep socialisation process, rather than on a forced obedience to laws (North 1978). Such ideas of Confucianism were deeply entrenched among the Chinese people, forming a society with homogeneous ideas to a considerable extent. Good government derived from the people's acquiescence to their roles in society. Confucian scholar-officials known as *mandarins* ruled China in the name of the Emperor until the beginning of the twentieth century (Rajendra et al. 1995). Confucian teachings have had great influence and control on the Chinese people, just as religion has done.

The implication for China in business relationships is that the respect for law has not been nourished. Agribusiness issues affected include the implementation of forward contracts, branding of products and quality standards, to just name a few.

Collectivism, harmony and the disuse of conflict — as part of the influence of Confucianism, the Chinese culture emphasised collectivism and harmony. Empirical research in management areas showed that the Chinese favoured harmony and compromise approaches to conflict rather than a direct give-and-take collaboration (Kirkbride et al. 1991). Research also showed that task conflict or conflict management over issues reinforces interdependence where people value each other's abilities and resources. Interdependence facilitates communication, exchanges and mutuality that in turn results in collaboration between negotiators (Lawler and Yoon 1993). Parties who avoid conflict come to deny that they need to rely on others or to resolve conflict to move forward in a mutually beneficial way. Conflict resolution may take the form of competition at another level (Deutsch 1973).

The implication for SCM in China is that mutuality and give-and-take between business partners is diffi-

cult to develop. Supply-chain learning based on information exchange at all levels is difficult to achieve.

Close ties between family and friends, but weak social ties — the Chinese show clearly differential treatment between people they do and do not know well. Largely due to this influence, family businesses are common among the Chinese, including those who have been overseas for generations. The sociological theory of weak ties suggests that people who are less well known to each other are more likely to divulge needed information. Many Chinese business owners and farmers may acquire superfluous or useless knowledge as they are securely linked to a few sources of information.

In the melon industry in western China, farmers regularly send their produce every season to their relatives who work at government institutions or universities to sell to colleagues. This also occurs in the bok choy industry where the expression ‘patriotic bok choy’ refers to the purchase of bok choy by the employees of these organisations.

In the supply-chain context, close working relationships with suppliers and customers who are not friends or relatives can be difficult if partners cannot perceive the mutual benefits of divulging needed information. Insufficient attention to weak ties may also contribute to a general reluctance to coordinate across organisational boundaries. Potential innovations involving more than one level in the supply chain can also be difficult to achieve.

SCM and the institutional environment

The institutional environment refers to the formal rules of the game that set the parameters for the play. The definition and enforcement of contract laws are important features. China has less than 100 years’ experience of being a republic. It was a traumatic experience to break away from its past and establish a new legal system. Moving from a centrally planned economy to a market economy in the mid-1980s, China has even a shorter history of utilising market mechanisms. Its legal system to define and arbitrate disputes is yet to be perfected. Practical details such as what constitutes a contract, relationship parameters, cooperative laws, and sanctions for default are largely left to the individual parties involved. Business relationships rely on goodwill, but this is not backed-up by state laws.

In China, there have been incidences of strategic behaviour of default by farmers when dealing with

agribusiness corporations in forward contracts. Individuals and firms have been often able to get away with default without adequate sanction. Widespread negative experiences have discouraged the use of a more collaborative approach such as SCM in doing business in China. As a consequence, business is conducted on-the-spot on a cash basis with little after-sale service or information feedback in the supply chain. This has increased both the risks and costs of doing business and reinforced a transactional-based approach to doing business in China.

SCM and governance structure

The governance structure is the play of the game. Approaches to business relationships, such as SCM, may be described under this level. “Governance is an effort to craft order, thereby to mitigate conflict and realise mutual gains” (Williamson 2000).

As discussed above, cultural and institutional elements essential for a supply-chain approach are not present in China. It is difficult for supply-chain partners to realise the benefits of mutuality, exchange and to learn to collaborate toward long-term goals. The current Chinese governance structure in business also lacks some drivers of SCM found in developed countries. A successful chain often has an effective ‘channel manager’ — a role often taken by supermarkets in developed countries. While the supermarket sector is growing slowly in China, it is yet to become a driver for SCM.

There is little horizontal integration at each supply-chain level to facilitate exchange and collaboration. The population of farmers numbers nearly one billion in China. In the melon industry, there is also a large number of small-scale wholesale businesses and numerous retailers (Zhang and Wei, these proceedings).

SCM and resource allocation

This level refers to day-to-day transactions and continuous adjustments to prices and output. In the Chinese melon industry, there are no defined supply chains. Businesses are based on short-term profits. Competition is predominantly based on price and undifferentiated lower or mid-value products. The *ad hoc* nature of business operations may protect supply-chain partners from some unfavourable market forces in terms of entry and exit flexibility. Transactions may be efficient in terms of offering lower prices, but not effective in terms of delivering desirable products to consumers.

The Chinese Approach of Vertical Coordination: the ‘One Dragon’ Policy

In the mid-1990s, as China experienced oversupply of agricultural products, agribusiness marketing concepts received more attention. Both the government and academics promoted agro-industrialisation through vertical integration. The slogan ‘one dragon of production and distribution’ was soon popularised — the head and body of the dragon are integrated. In practice, this refers to the vertical integration of production and wholesale operations under a corporate structure, thus saving the need for coordination between farmers and wholesalers. Leading corporations, or ‘dragon-head corporations’, are charged with the privilege and responsibility of ‘dragging’ along the body and tail.

The ‘one dragon’ policy of integrating production and wholesale distribution is a step forward from previous agricultural policies that emphasised production alone. Earlier policies resulted in an oversupply of low-value agricultural products. The ‘one dragon’ policy is different from the previous ones in that the emphasis is on distribution as well as production of mid- or higher value products. This policy of supply-chain integration has been pushed by administrative intervention rather than pulled by agribusiness actors.

The ‘one dragon’ approach to agro-industrialisation has been implemented in two major ways. One common method has been for large distribution corporations to integrate back through supply contracts with farmers, or for corporations to extend their supply-chain function to production under a corporate structure. An example of this is for leading corporations to provide improved varieties of seeds to farmers or farmer groups and then buy their produce from those farmers. Under this method, the focus is on integration at the upper end of the supply chain, rather than coordination of the chain as a whole. The expectation was that these leading corporations would set an example that other corporations would follow in other villages and hence lead to wide adoption on the path to agro-industrialisation. But the implementation of ‘dragon-head’ corporations has had mixed outcomes in efficiency and effectiveness. Many of the leading corporations were state-owned enterprises or jointly owned, receiving subsidy and preferential treatment. As a consequence, many of

them were not managed according to market principles and modern management concepts. In other instances, farmers defaulted on their contracts for short-term gains.

The second means of implementing the ‘one dragon’ approach is a more broad-based one of setting up state-directed farmer groups. These groups were to extend their chain function from growing to marketing their products by administrative intervention. For the marketing, the groups sent their products to a consolidator, which could be a relevant local government office or a state corporation. The produce was sold under the village name or brand. The emphasis was on developing products over which villages had a comparative advantage. It was hoped that each village would best utilise its advantage under the slogan ‘one village one product’.

Directing farmers into groups was well justified. It is believed that China, with a huge rural population and proportionately inadequate farmland, is not fit for large-scale farming. While some of the rural population is moving to urban areas, this process is occurring very slowly, as unemployment in urban areas has been a serious issue. The problem of providing work to a huge number of surplus rural labourers will be the greatest obstacle for large-scale agricultural production. The agricultural policy of directing farmers into groups serves multiple purposes of production and marketing as well as rural development. In practice, there are only a few success stories of state-directed farmer groups — for example, one group in Shouguang County of Shandong Province has been able to supply vegetables to supermarkets in Beijing. In some instances, failure has been due to inadequate planning and monitoring, such as farmers packing inferior products which consolidators are still obliged to accept as they have the responsibility to take all supply from farmers.

Conclusion and Discussion

In the Chinese ‘one dragon’ of production and distribution approach to agro-industrialisation, the government assumed a large role in the process. There are two related assumptions in the ‘one dragon’ policy: the inability of supply-chain partners to coordinate the supply functions of production and distribution under market conditions; and the capacity of the government to plan and implement these functions effectively.

The heavy state role in agro-industrialisation is consistent with the lack of 'soft infrastructure' for SCM, as discussed above. There is little expectation, under the current institutional bases in China, that agribusiness actors in an increasingly decentralised market system can coordinate their supply-chain activities to deliver products that meet market requirements.

While product distribution was emphasised in the 'one dragon' policy, it was implemented through administrative intervention. This required comprehensive planning, based on predictions of market forces, including supply, demand, consumer trends, and other market intelligence. Dragon-head corporations and farmer groups were able to set up quickly through state directives. However, success stories were isolated rather than widespread (Waldron et al. 2003).

In light of Williamson's (2000) four levels of institutional bases discussed earlier, one recommendation came through this study — that the government could improve the institutional infrastructure for agro-industrialisation if it works on the second level of improving the institutional environment, and facilitates changes in governance structure (at the third level). At the institutional (second) level, this includes devising mechanisms for more effective implementation of accreditation programs, quality assurance standards (there are already hundreds of them) and contract laws. At the third level, horizontal integration at the farmer level may be encouraged through establishing government-facilitated farmer groups. However, the emphasis needs to be on self-managed farmer groups with the government playing only a facilitative role — it may be appropriate to use participatory techniques as have been used by non-governmental organisations (NGOs) and other aid projects in China. Horizontal integration at the farm level is likely to bring about consolidation at the wholesale level over time by squeezing out uncommitted wholesalers. This will improve the likelihood

of exchanges and collaboration between farmer groups and wholesalers in China. This may be the first driver towards SCM in China.

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Analysis of the Constraints to Banana Industry Development in Indonesia Using the Supply Chain Concept

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Abstract

Banana is the highest production fruit in Indonesia. The fruit is sold mostly on the domestic market. A supply-chain approach was used to analyse constraints to banana industry development in Indonesia, with a view to determining research and development (R&D) priorities. Two supply chains were characterised through participatory interviews and discussions involving the research team and the respective participants in the chains. The first supply chain was a traditional banana supply chain from the Cikalong subdistrict, Cianjur district, West Java, supplying mainly the traditional markets in Bandung and Jakarta. The second supply chain was that of 'company X' supplying bananas to supermarkets in the Jakarta, Bogor, Tangerang and Bekasi metro areas. The chain characteristics were mapped to describe the flow of product, funds and information. SWOT analysis was performed to identify areas for improvement in the chains. The suggested improvements were compiled and classified under the six principles of supply-chain management (SCM): knowing customers and consumers; creating and sharing value; getting the product right; logistics and distribution; information and communication; and effective relationships. The research team and representatives of the supply chain selected the five most-important issues for both supply chains. The results indicated that the most-important constraint in both supply chains was getting the product right. This indicates that the current emphasis of research and development on improving on-farm production and postharvest practices should continue. However, there are other factors that need to be addressed, such as getting adequate supply of the right product, and making sure that improvements do not impair sociological and other aspects of the chain.

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Production of banana in Indonesia is the highest of all fruit crops. For example, banana production was 4,384,384 t in 2002, compared with 1,402,906 t for mango and 968,132 t for citrus (Badan Pusat Statistik 2002). The main banana production areas are in Java, Sumatra, Celebes, Bali and, increasingly, Kalimantan. In Java, production occurs in West, Central and East Java. West Java includes the districts of Sumedang, Tasikmalaya, Lebak and Cianjur. Central Java includes Cilacap, Grobogan, Brebes and Kendal, and East Java includes Bojonegoro, Sumenep, Jember and Pasuruan.

The markets for banana are located in cities on the producing islands, such as metropolitan Jakarta, Bandung, Semarang, Yogyakarta, Surabaya and Malang for Java. There are also holiday resort areas like Bali and, potentially, neighbours like Singapore which is close to Sumatra. Distance from the producing areas to these markets can be short, such as from West Java to Jakarta or Bandung, or long, such as from Sumatra to Java. There are two main types of market: the traditional, long-established markets, and the rapidly expanding supermarket businesses such as Matahari, Carrefour, Goro, Hero and Kemchicks.

In Indonesia, there are two broad groups of farmers. The smallholder farmer has 0.5–5 ha of banana. These farmers often use low technology. They are the main clients for the technology produced by the Indonesian Agency for Agriculture Research and Development (IAARD), in close collaboration with extension workers. The large-scale farmers have more than 5 ha (in one case up to 2000 ha). They often use more production and postharvest technology than the small farmers. In some instances, the technology is sourced through collaboration with larger producers such as Chiquita and Del Monte.

Justification

The Indonesian government is eager to improve the banana industry and incomes to growers. In the past, emphasis has been mainly on improving production practices. However, with the growing supermarket sector, it is important to reassess the R&D effort to ensure it is addressing the main areas that are affecting the performance of the industry.

The focus of the Indonesian R&D effort is on smaller growers and their supply chains. These chains involve a large number of members, with both economic and sociological characteristics. In developed countries, the supply chain or value chain is

increasingly being analysed and treated as the whole unit rather than as individual components, on the basis that the chain is an interdependence of members seeking to develop a competitive advantage for the whole chain (Woods 1999; Anon. 2003). However, in developing countries the chains have rarely been studied as a whole unit, but rather as individual links.

Methods

The method was developed by considering both the concept of supply-chain management (SCM) and the nature of the banana industry in Indonesia (empirical evidence). The supply chain concept itself is more established in the manufacturing industry sector than in agriculture. Therefore, to apply the SCM concept to the banana industry, the concept needed some adjustment, so that it could be adopted in the circumstances applying in Indonesia. Previous experience and the results of the desk study confirmed that evaluation of banana industry development required a more-comprehensive and systematic approach. Previous banana-industry studies focused heavily on the production sector (agronomy, cultivation etc.), while only some touched briefly on socioeconomic aspects (marketing, socioeconomic characteristics of the producers and consumers etc.).

Relatively little has been written about the process engendering chain management in Indonesian agriculture, especially in banana growing, where overall production is scattered and involves very small-scale farms.

At a first workshop, held at IAARD, Indonesia, the concept of SCM and the empirical evidence came together, which ensured that the final methods used would be relevant to smallholders and would be participatory in nature. The workshop was attended by representatives of key members of the Indonesian supply chains (small growers, traders, traditional markets, and supermarkets), as well as members of both the Indonesian and Australian project team. At the workshop, the research team strategically identified case-study locations (Cikalong representing SC1, and company X representing SC2). During the workshop, the team identified the relevant partners from each of the supply chains and collected baseline information on the nature of banana supply chains in Indonesia. It also gathered data on the banana industry, including previous R&D activities.

As a result of workshop 1, the Indonesian team developed the framework for their study. The frame-

work was then refined during discussions with the Australian project team to provide the final methods used.

In the case studies, the Cikalong supply chain (SC1) was chosen because it is the major producer of banana to Jakarta, the chain has the potential to improve, with benefits to the members, and because it is a good example of how the local government ('Pemda through Otonomi Daerah') has enthusiasm to take the initiative to create new value and greater competitiveness for the banana industry in its region.

Company X (SC2) was chosen because it is innovative and is a key driver in the chain to increase the flow of benefits to the members from any improvements made to the chain.

Information was gathered through individual discussions with members of the supply chains, and through discussion groups with representatives of several sectors of each chain.

At a second workshop, held at the Department of Primary Industries (DPI), Brisbane, Australia, the results of the two case studies were presented and dis-

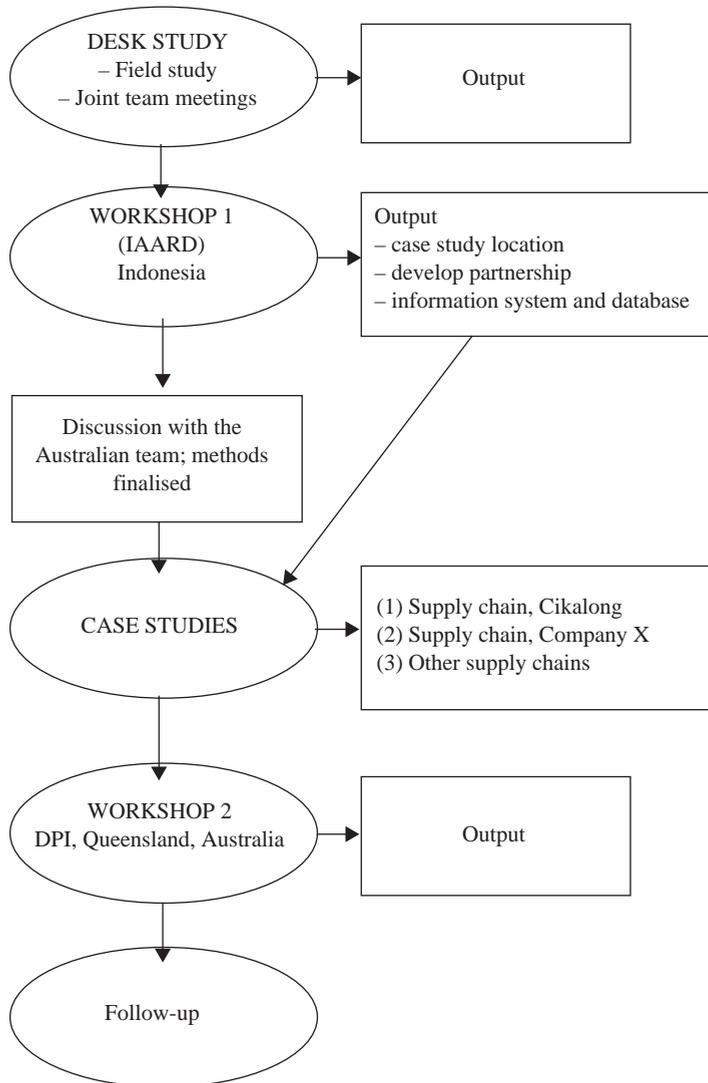


Figure 1. Outline of the methods used in the supply chain analyses.

cussed. The workshop was attended by the Indonesian and Australian teams, as well as a trader representative from Cibedug, Ciawi, Indonesia, and one representative of local government from the Agriculture Service of Cianjur District, Indonesia. The objectives of the second workshop were to develop and test the SCM method for the banana industry. The six areas of SCM were used to develop a list of potential improvements for both case studies (SC1 and SC2), and prioritise these improvements in relation to their potential to improve the industry.

Results and Discussion

Background data

Desk study

Information regarding the general overview, statistical data, and previous research results on breeding, crop management, crop protection, postharvest, and agri-economics were collected during the desk study. The results are briefly presented as follows:

Indonesian banana production is mainly by smallholders, with the average area of farmers' plantations less than 0.5 ha. Banana production was about 4,384,384 t in 2002, about 68% of it from Java. Banana-production systems in Indonesia can be categorised into backyard, mixed crop, commercial smallholder and agribusiness enterprises.

Indonesia is part of the centre of origin of banana. There are more than 325 banana cultivars, with about 14 cultivars being commercially grown. Among these are Ambon Putih, Ambon Lumut, Emas, Raja Bulu, Raja Sere, Badak and Lampung (table bananas) and Tanduk, Uli, Nangka, Kepok, Siem and Kapas (plantain).

Although banana production has increased from 1997 to 2002, the production area has declined from 1997 to 1999. This has been caused by the outbreak of several pests and diseases, especially in the main areas of banana production such as Central Java, East Java, Sumatra, and Sulawesi. The major banana diseases in Indonesia are Panama disease (*Fusarium* wilt disease), blood disease and moko disease (bacterial wilt disease).

Banana research has been receiving more attention lately because of the increased domestic demand for good-quality fruit.

Research in breeding

Very little research in banana breeding has been done in Indonesia. This is understandable, considering

the wide diversity of banana germplasm existing. Breeding has been done through hybridisation, somaclonal mutation and selection. The Indonesian Fruit Research Institute (IFRURI) had established two cultivars, Ketan-01 and Raja Siem, which are tolerant to bacterial wilt. Two promising cultivars, i.e. Barifita 01 (mutant from cv. Barangan which is productive and dwarf) and Sepatu Amora (tolerant to the vector of bacterial wilt). The assessment of *Fusarium* resistance via in vitro selection has also been done to find resistant cultivars to this disease.

Crop management

The characteristics of banana production in Indonesia are small-scale, minimum technological inputs, high variability of the cultivars, little capital, no irrigation and planting material coming from suckers.

Crop protection

Reported pests are leaf curler (*Erionatha thax* L.), pseudo stem borer (*Cosmopolities sordidud*, Germar), stem borer (*Odoiporus longicollis* Oliv), thrips (*Chaetanapothrips signipennis*), scab moth (*Nacoleia adasema*), and nematodes such as *Rhizopholus similes* Cobb, *Pratylenchus* spp., *Helicotylechus multicinctus* Cobb and *Meloidogyne* spp.

The main diseases are *Fusarium* wilt, bacterial wilt, leaf spot/black sigatoka and bunchy top. The other diseases are anthracnose, Panama, Cordona and rotten young fruit.

Postharvest

In developing postharvest technologies for Indonesia, there are still some gaps for research such as the characteristics of plantains, more applied research on improvement of ripening, and disease resistance of the peel. Socioeconomic aspects have received little attention.

Agro-economy

A study of agro-economics by Sudaryanto et al. (1992) described the circumstances of the international and domestic markets in mainly Jakarta, and reported two different marketing channels for bananas coming from Lampung and from South Sumatra. This study also investigated the marketing margin in West Java and gave examples of the flow of bananas from the major producing centres in West Java to a major consuming centre in Bandung.

Field study

Both teams visited the Lampung banana-producing centre to collect additional information. They

visited the regional agriculture authority, Nusantara Tropical Fruits (NTF), a small farmer at Padang Cermin, West Lampung, a banana crisp company, and a truck driver at Bakahueni port (connecting Java and Sumatra). One aspect of improvement was more rapid movement of trucks through the port.

Workshop 1

Recommendations from the workshop were as follows:

In developing the banana industry in Indonesia, a breadth of information is required, such as knowledge of banana production, including the agro-ecological zones (AEZ), farmer behaviour and organisations in relation to improving knowledge and practices, and research on production, postharvest and processing practices.

There were two types of farmer in Indonesia: large-scale farmers such as NTF, and small-scale farmers. Large-scale farmers need little assistance, whereas the small farmer still requires assistance. Small-scale farmers had characteristics such as subsistence with little technological inputs, scattered location, low productivity and low-quality product. The main pests and diseases are Fusarium and bacterial wilt, there are many varieties of bananas grown, and low adoption of research results.

Improvement of postharvest handling practices cannot be made without considering on-farm practices. There are still research gaps. Banana-crisp processors can produce high-quality product and establish good markets even though the quality of fresh produce remains low.

The percentage of the retail price received by the farmer was considered to be low. Thus, increasing the market or retail price in the market may not increase the price to the farmer.

Cikalong, Cianjur was recommended as a location for a case study since Cianjur is a model for banana agribusiness development and there are loosely organised and structured grower groups 'Gapoktan Serba Pisang'.

Supply-chain case studies

Cikalong (Cianjur) supply chain (SC1)

Product flow. Bananas are distributed from farmers to consumers in wet markets and supermarkets in the big cities through village collectors, large traders or supermarket suppliers. Some farmers sold their best-quality product directly to street vendors.

The percentages of product sold to the wet markets, supermarkets and street vendors are ca. 95, 4 and 1%, respectively.

Cash flow. Village collectors were the primary buyers of farmers' product. They bought the product from farmers at harvest in cash, or made an advance payment before harvest and the balance at harvest. Many village collectors received funds from large traders in the consumer markets, but some used their own capital.

Information flow. The main information shared by every member of the chain was the quality required by customers and consumers, both wet market and supermarket. The quality requirements were determined by the variety and maturity. The highest prices were for varieties Tanduk and Raja Sereh, followed by Raja Bulu, Ambon Lumut, Muli and Nangka in that order. For all varieties, the more mature the harvest, the higher the price.

Information about price was limited to the large trader level. Collector-traders and farmers were price takers.

Although farmers knew that the price received for bananas was influenced by variety and maturity, most of them did not direct their production strategy to fulfil consumer demand because of the cash needed and lack of security. Farmers preferred to grow the Muli and Nangka varieties because of their early maturity and high yield, so that they can get a cash return quickly. Farmers were reluctant to delay harvesting to increase maturity because of the risk of theft of the crop.

Activities to add value. Farmers often harvested and sold their banana before they were mature. Collecting agencies and chain stores and wholesalers do most of the ripening, grading etc., but generally the collectors do very little of this (only about 5%). Two reasons why growers do not ripen their crop are because they get little increase in price for adding value, and ripening too early in the chain will result in transporting ripe fruit with greater risk of damage. Collectors were paid for the transportation costs from the farmers field to their base.

Services. Credit arrangements are the major service collectors provide to growers. Information is not a major part of the services offered.

What determines price? Size, variety, maturity (usually based on how angular the shape is) and ripeness (if the fruit are starting to colour) are the main determinants of price, with variety and size being the most important.

Relationships. Very strong relationships exist between the collecting agent at the subdistrict and district level, and between the district collector and the wholesaler. Several of the relationships are weak, but this does not always mean that they need improving.

How value is created. Most of the value is added from the collecting agency at district level and onwards. Most of the bananas stay on the bunch until they reach the wholesaler.

Key decision-makers. Wholesalers are the main determiners of price, with decreasing influence from retailers, traders and, last of all, the growers. Growers have very little control over price.

SWOT analysis: Cikalong

Strengths. There is a strong capacity to expand the supply chain, because there are many potential players in the supply chain and there is the potential to increase the number of players. There is also the capacity to increase production. Farmers are familiar with growing bananas, so they could increase production if they are rewarded for it. Local government is ready to support the expansion of banana production because banana is one of the top government priorities for further development. It is also the vision of the district government to expand banana production in the district. There is an 'association of banana farmers' in Cikalong, but this is not active at the moment. There are no such associations in other production regions.

Weaknesses. Poor cultivation techniques is a major issue. Because of the lack of capital, the farmers would need to combine resources to buy fertilisers and other inputs.

In 2001, a training program organised by the Agriculture Service's office instructed growers on the benefits of fertilising, but the farmers said it would be of little benefit since the plants would not produce good yields. They would prefer to apply the fertiliser to the higher-value inter-cropped crops directly.

Opportunities. There is an opportunity to develop larger banana orchards to increase the production of high-quality bananas for the supermarket trade, possibly by establishing a larger management structure for banana growers in the same area. This could be on a village basis or involve several villages. There is support available from local government to assist with this.

The potential market for processed banana could be expanded, including processing of other banana

varieties. At the moment, only one variety is processed.

Threats. Among the threats are poor regulation to restrict the movement of diseased plants, competition from banana imports, and the discriminatory policies on banana trade of European countries such as the application on higher import tariffs for non-EU countries.

Company X supply chain (SC2)

Product flows. Previously, bananas from Cikalong and Lebak were delivered to the collectors in bunches. However, beginning in 2003 Company X requested some of the collectors to supply fruit in hands, so as to reduce fruit damage and allow better packing of bananas in the trucks and reduced wastage at the markets. Fruit from Cikalong and Lebak represent about 70% of the fruit supplied to Company X, with the remainder coming from several growers from Cicurug. These growers have about 2–5 ha of banana, and Company X works closely with these growers to produce high-quality fruit. On occasion, Company X obtains banana fruit from the wet markets when normal supplies are low.

Company X separates the fruit according to quality at its main holding facility.

The fruit are delivered to the supermarkets as hands in plastic crates.

Some 55–60% of Company X fruit goes to about five medium-size supermarkets. The company does not supply the larger supermarkets such as Hero and Carrefour because it does not have a large enough supply. Some 5–10% of its fruit go directly to street vendors. Rejected fruit are sent to traders who supply fruit stalls, and also to local wet markets.

The retail shelf space given to local banana is very small because of the low supply of good-quality fruit, even though there is sufficient consumer demand to justify increasing the shelf space. Thus, there is a large gap between supply and demand for good-quality local banana varieties. As a result, the supermarkets give more shelf space to Cavendish and imported bananas.

Company X has started to process some of the rejected bananas suitable for processing. The processed product is sold directly to food stalls.

Cash flow. Company X usually pays cash directly to the collectors on delivery of the banana. For the growers that deliver directly to Company X, because they are larger growers, payment is normally one day later by bank transfer. One problem is that supermar-

kets promise a delay of 2 weeks between delivery and payment, but this has sometimes blown out to 6 weeks.

Prices paid by the supermarkets are set by negotiation between Company X and the supermarkets. It is not a fixed price. However, there is a fixed price for its processed product.

Some of the supermarkets require a payment from the trader to secure shelf space. This is usually a one-off payment at the beginning. Every 3 months the supermarkets asks the traders to join a discount (specials) program. The supermarkets determine the price of specials and the traders have to comply, sometimes taking a loss.

Services. Collectors collect fruit from the growers and deliver to Company X. Some of the collectors are starting to de-hand. Sometimes the collectors actually do the harvesting. Some growers harvest themselves and deliver to the market directly.

Company X provides education to collectors and traditional wet-market sellers on how to handle banana to prevent damage, and also some training to growers on how to grow well and how to the bananas for quality (in Lebak only). Company X supplies promotional material to all of its outlets. It transports the fruit to the supermarkets, and collects fruit from its larger growers and, occasionally, from the traditional markets.

Company X does not consider that it is its responsibility to educate its supply chain members, but considers it to be the role of the provincial and district public-sector staff.

Information flow. Company X considers itself as an 'information resource'. Company X had very good information flow to all supply chain members such as collectors, traders at the wet markets, and traders in Ciawi. Company X also collects information from supermarkets. However, the information flow was strong only between Company X and the street vendors. Between the company and supermarkets, traditional markets, and consumers of processed and fresh product information flow was quite good, while with traders it was marginal.

How effective are the information flows? The closer one gets to the growers the less effective is the information flow.

Having effective grower groups would make it more worthwhile and efficient providing information to these groups. Also, the grower groups could also create a larger 'production unit', which could improve security and production practices.

How well does Company X know its customers? Company X knows its customers well, but it needs to mobilise its collectors to better educate the growers. The government will facilitate this mobilisation. If the company knew its supermarket clients better it might not have to pay the shelf fee and payment for fruit might become more rapid.

How effective are the relationships? Relations between Company X and growers do not exist, except for the two larger growers that live near its facilities. These are the ones that provide good-quality fruit.

How right is the product? There are always quality and quantity problems with respect to local varieties for the supermarkets. The supply of the lower-quality fruit required for the wet markets is not a problem because of its greater supply.

Some of the larger food caterers would also like to include bananas in their food packs for factory workers etc., but they often cannot get enough good-quality fruit. This may be a potential, new client group.

Company X SWOT

Strengths. Strengths are the education provided by Company X to its supply chain members, good relationships with supermarkets and collectors, reputation for supplying good-quality fruit, short distance to the markets, good leader to develop the chain, good knowledge of fruit-quality requirements, good relationships with government institutions, a good management team and good collectors.

Weaknesses. Every supermarket in Indonesia has its own quality standards. There needs to be more standardisation.

Opportunities. There are nevertheless opportunities to provide better education to the supply chain members. It is not enough to just tell the farmers how to improve, there needs to be someone living in the villages to continually assist the farmers. Company X would like to do this but it needs assistance to do so from government or non-government organisations.

Workshop 2

The second workshop was attended by the full Indonesian and Australian team, including Dr Dimiyati (Director, Centre Research for Horticulture) and Dr Winarno (Director, Fruit Production Directorate), Ms Mega (Agriculture Service, Cianjur District), Udih Samanhudi (banana trader/supplier representative for the wet market, Cibedug, Ciawi)

and Dr Greg Johnson (ACIAR) (see Ledger et al. 2002). The objective was to develop and test the SCM method for analysing banana-industry development in Indonesia using the information collected in the above activities, with a view to identifying and prioritising the medium and long-term R&D requirements based on the market requirements and opportunities of the banana industry as a whole agribusiness unit.

The information gathered during the desk and field studies was presented. During the ensuing discus-

sions, areas for improvement were listed and grouped under the six principles of SCM: knowing customers and consumers; creating and sharing value; getting the product right; logistics and distribution; information and communication; and effective relationships.

Each workshop attendee then voted for what they considered to be the five issues that would have the biggest impact in improving the supply chain. The results are presented in Tables 1 and 2.

For the Cikalong supply chain, the issues that received the highest votes were:

Table 1. Voting on steps to improve the Cikalong banana supply chain.

Improvement	Number of persons who voted		
	Supply chain members	Indonesian team	Australian team
Getting the product right			
Village local management – grower groups to increase security, supply and quality	3	7	7
Improve standardisation of product			2
Expand area of production; existing banana growers and additional growers	1	1	1
Improve growers knowledge and practices; cultivation techniques, immaturity, orchard management	2	1	2
Improve local varieties – breed new varieties			
Improve postharvest handling	2	5	6
<ul style="list-style-type: none"> • loading and unloading systems • collecting places (temperature, sun exposure) • handling of bunches. 			
Knowing customers and consumers			
Better information about consumers	1	3	1
Develop niche markets			
Develop new processing markets e.g. baby foods and chips		2	1
Develop export markets e.g. to the Middle East and China etc.		3	
Creating and sharing value			
Growers capture more value – de-hand – ripen		1	4
Logistics/distribution			
Agribusiness terminal	1		1
Improve infrastructure – e.g. roads.	2	3	
Improve delivery system – reduce time lag			2
Information/communication			
Better information from wholesaler – market intelligence signals			2
Better information to growers – standards	1	1	3
Better information from grower up the chain		3	2
Effective relationships			
Improve wholesale × grower interaction.	1	3	1
Other			
Better regulation to protect Indonesia from imported fruit	1	3	

1. village local management – grower groups which could increase security, supply and quality (17 votes)
2. improvement of postharvest handling, loading and unloading systems, collecting places – temperature, sun exposure, and handling on bunches (13 votes)
3. all actors in the supply chain need to participate in knowing about and achieving the necessary standards for the particular markets (10 votes).
For Company X the issues that received the highest votes were as follows:

Table 2. Voting on steps to improve the Company X banana supply chain.

Improvement	Number of persons who voted		
	Supply chain member	Indonesian team	Australian team
Knowing customers and consumers			
A better understanding of what consumers want	2	4	
Educate consumers to recognise and demand higher quality	1	1	1
If growers knew the desired product and had the necessary technology and resources (Rp) they could decide whether to respond	1	2	2
Need to expand market for quality bananas (the market segment is so small it limits investment, despite the opportunity)	1	4	
Creating and sharing value			
Need more Company Xs (innovative)		4	2
Opportunity to increase supply to street vendors, traders, caterers (new customers)		6	
Need collectors to de-hand to increase supply (may be done by terminals)		1	1
Indonesian banana supply chain needs to be competitive with imported bananas/other fruit	1	1	
Getting the product right			
Increase all aspects to get high quality	1	1	3
Ability to ripen bananas more quickly and consistently	2		1
Improve supply in low-supply months (5 months)	1	2	1
All actors in the supply chain need to participate in knowing about and achieving the necessary standards for the particular markets.	1	5	4
Logistics and distribution			
Improve packaging of de-handled bananas to prevent damage during transport		2	2
Information and communication			
Need to educate/empower traders, and through them the growers, to increase high quality supply		1	6
Increase information flow to small growers by forming grower groups for improve information flow and crop management	1	3	4
Effective relationships			
Note system dynamics – not just commercial opportunities		2	1
Potential improvements for those who support/facilitate chains			
Government should facilitate easy access to financial institutions able to assist	2	3	3
Many actors limited by lack of access to capital (Company X, collectors, growers)			4
Better environment for new investments (incentives for new plantations from local government)	1	3	

1. all actors in the supply chain need to participate in knowing about and achieving the necessary standards for the particular markets (10 votes)
2. increase information flow to smallholder growers by forming grower groups to improve information flow and crop management (8 votes)
3. government should facilitate easy access to financial institutions to assist.

For both supply chains (Cikalong and Company X), most of the issues receiving the highest votes related to 'Getting the product right', using approaches such as:

1. formation of local grower groups improving post-harvest handling (loading and unloading systems, collecting places, and handling of bunches)
2. active participation of all actors to agree on the necessary standards for particular market segments.

It was interesting to note similar voting patterns between the Indonesian and Australian team members.

Conclusions

Analysing the Indonesian banana industry using a supply-chain concept provided many insights in relation to constraints to industry development. In addition, the SCM concept represents a conceptual framework within which strategies could be developed to analyse the competitiveness of the banana industry, and to identify and prioritise the R&D activities required to improve the banana industry.

According to Indrajit and Djokopranoto (2002), there are several stages in the development of supply chains:

1. independence between among the members of chains
2. integrated planning among several members of the chain
3. integrated planning and monitoring
4. supply chain integration in planning, implementation and monitoring.

On the basis of the information collected in this study, the two supply chains examined were at stage two.

The methods used in this study could be improved by getting more information and input from all members of the supply chains, and involve their rep-

resentatives in the decision process for identifying the main constraints. In the Indonesian context, this input may be better obtained by having one-on-one discussions with members, or discussion groups with peers. Discussions with several sectors of the chain may result in reduced participation from those sectors perceived to have less 'power' in the chain.

The concept developed in this study is being applied to other horticulture situations in Indonesia. The SCM concept is being combined with soft-systems methodology to analyse problems and solutions in the citrus and pepper industries in eight provinces, and the concepts are being presented and discussed in a number of different forums. Continual assessment and improvement of these methods would be valuable.

Acknowledgments

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Improving the Marketing System for Fresh Produce from the Highlands of Papua New Guinea

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Abstract

As the title suggests, the aim of this research project is “to improve the marketing system for fresh produce from the PNG Highlands for the benefit of all stakeholders.” Note that the aim is not to do a study about the problems of marketing fresh produce, but rather to bring about change that intentionally will improve the marketing system. As such, the methodology being used for this project does not follow the traditional scientific research approach, but rather follows in the mould of *critical action research*. In this paper, we provide an introduction to the problems of the marketing system for fresh produce in the Papua New Guinea (PNG) Highlands. This is followed by a discussion of the methodology used in the project, how the project has unfolded during the first year (it is a 3-year project) and, finally, the conclusions are given.

Papua New Guinea (PNG) has been struggling in recent years. If we look at the index of economic prosperity (Figure 1) we can see that the average person is not as well off today as they were a few years ago.

The International Monetary Fund (2003) recently blamed this on:

- growing governance and law-and-order problems
- a lack of new mineral exploration activities
- deteriorating physical infrastructure in the rural areas (that has inhibited agricultural production)
- the Asian crisis (that has reduced export demand).

Given the prospect of further declines in the mining sector, the National Government of PNG is looking to other forms of economic activity to help reverse this downward trend in prosperity. Chief

among these is an export-oriented agricultural sector, of which fresh produce is an important part. Following the above-mentioned International Monetary Fund report, it also recognises that a major difficulty in achieving this is the deterioration of physical infrastructure in rural areas.

The National Government’s strategy for the future prosperity of PNG provides an important backdrop to this project, but this project is more than just generating increased gross domestic product (GDP) for PNG. It is about generating cash income for the people who most need it.

The PNG Highlands region is home to more than half the total population of PNG. It is also a region in which rural poverty is widespread. Cash income is required by these rural families to provide for such things as education and health care. The production and sale of fresh produce of the PNG Highlands represents one of the few sources of cash income for a very large number of rural families. Moreover, the production and marketing of fresh produce is very much an activity in which rural women can and do play an important role. This is significant because

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cash income in the hands of rural women is much more likely to be used on family needs than is the case of cash income in the hands of rural men.

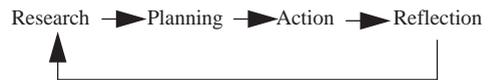
The fresh produce grown in the PNG Highlands is dominated by traditional foods like sweet potato and taro. But increasingly, farmers are turning to European-style vegetables, such as potatoes, cabbage, broccoli, cauliflower, capsicum, spring onions, zucchini, carrots, tomatoes, and lettuce. The PNG Highlands region is unique in that it is one of the few places in the region that has a temperate climate and where high-quality European-style vegetables can be grown organically all year round. The region has the potential to meet the needs not only of consumers in the Highland area but also of the coastal cities of PNG as well as to supply offshore markets. According to preliminary interviews with stakeholders in the fresh-produce industry (both buyers and sellers), the main drawback in fulfilling this potential is the marketing system. Many farmers told us that they know how to grow fresh produce but they do not have the markets. Super-market managers in Port Moresby told us that they would love to buy more fresh produce from the Highlands but they were unable to get a consistent supply of good-quality produce. A fairly general comment we heard was that the marketing system was fragmented with poor coordination and communication between the different players in the marketing system.

Methodology

This is not the first project to examine the marketing system for fresh produce in the PNG Highlands.

There have been several such studies, including Scott and Atkinson (1989), Fresh Produce Development Company (1997), Burden (1998) and Epstein (2000). These studies all end with *recommendations* for change, but do not actually engage the change process *per se*. Hence, their capacity to make a difference is limited. Methodologically, they are examples of positivistic science in which hypotheses are tested and conclusions drawn in a linear research process. Positivistic science is a powerful approach when dealing with natural phenomena such as plants and animals. However, most social scientists would regard this as inadequate when attempting to research human social behaviour.

The present project is different in that engaging the change process is an integral part of the project. To achieve this, the project adopts the methodology of *action research*. Action research involves a cyclic process of:



In this approach, the research team generates understandings of the marketing system (reflection/research) and, working with stakeholders in the system, facilitates change (planning and action). In its facilitative role, the research team is cognisant that the process itself and any changes to emerge from the process are owned and directed by the stakeholders.

Action research has been widely used in the fields of social change and education (including agricultural 'extension'). However, the use of action

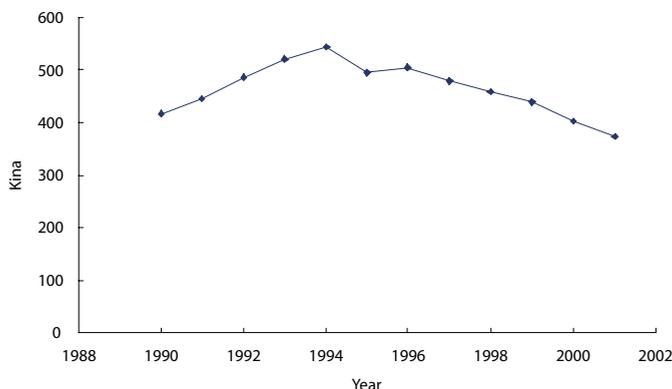


Figure 1. Economic prosperity in Papua New Guinea (real GDP per capita), 1990–2001.

research in exploring and improving supply-chain relationships is relatively new. We have used it in previous research (Spriggs et al. 2002) and there is some work ongoing in the United Kingdom (e.g. at Sheffield University).

During this 3-year project, we expect to pass through two or three phases (action research cycles or spirals). During the first phase we expect to:

- carry out a comprehensive situation analysis (mapping) of the marketing system as it currently exists and examine potential areas for improvement (this is the initial *research* element of an action research cycle)
- facilitate a workshop comprising all the stakeholders in the marketing system for fresh produce — this workshop is carefully constructed to encourage collaborative discussion of problems and strategies and ends with an action plan for change (this involves the *planning* and start of *action* of an action research cycle)
- develop and work with a steering committee of stakeholders to ensure that the action plans determined by the workshop participants are carried out (this is the *action* element of the action research cycle)
- hold a meeting of the research team with the steering committee to reflect on the actions taken and to develop the next phase of research (this is the *reflection* element of the action research cycle).

Project Work to Date

The project began with a 2-week training program for the for four PNG members of the research team. The training program was conducted at the University of Canberra and covered the topics of marketing, supply-chain management, action research and workshop facilitation. The methodology of workshop facilitation was used during the training course to determine an action plan for the situation analysis (i.e. the mapping exercise which is the research element of the first phase of the action research cycle). This action plan consisted of a number of activities including:

- background data (history, types of fresh produce, quantities, prices)
- environment (economic, government, socio/cultural, technological, natural)
- process mapping (data loggers, process record)
- profitability analysis (marketing costs)

- semi-structured interviews (all stakeholders)
- consumer questionnaire (at supermarkets).

During the first year of the project, all of these activities were carried out except for the consumer questionnaire. The other activities provided valuable information, which was provided to the various stakeholder participants of the first workshop.¹ The following is a brief overview of the findings of that research.

- Broadly, there are two types of marketing system for fresh produce from the PNG Highlands: the open market and direct marketing. The open market is often called the informal market. Farmers set up a stall with their produce and buyers come around and purchase their requirements, but there is no long-term relationship between buyer and seller. Direct marketing is where a final buyer (e.g. a supermarket) buys directly from a supplier without going through the open market. In the latter, the buyer and seller build up a relationship, which tends to lower transaction costs.
- The fresh-produce sector in PNG is currently restricted to the domestic market; there are no fresh-produce exports. The present marketing system is fragmented, with poor communication and coordination and little attention to quality control. Currently, the domestic marketing system is not in sufficiently sound shape for PNG fresh produce to be competitive in the very demanding export market. From a business strategy perspective, it makes sense to focus first on improving the domestic direct-marketing system with a view to using this improved system as a springboard to the export market. The direct-marketing system has the potential to become an appropriate model where the critical characteristics of consistent quality and reliability of supply can be encouraged in a way not possible with the open market. Within this direct-marketing system, sales to local supermarkets are most important, as they are the most demanding buyers of fresh produce.
- Special attention needs to be paid to the potential importance of women in the fresh-produce marketing system. They are heavily involved in

¹ At the time of the Bali workshop, the workshop for stakeholders of the fresh produce marketing system was only in the planning stages. It has since been successfully concluded and is discussed briefly on page 73.

the production of fresh produce and are also importantly involved in selling at the local open markets. However, concerns about their physical security and lack of facilities in the open markets inhibit their greater participation. An earlier workshop on Women's Voices in the Food Chain (run by the National Agricultural Research Institute) (NARI, undated) showed that women were experiencing significant problems at urban and rural markets — lack of toilet facilities, no running water, no shade from the hot sun etc. It also revealed that women tend to be marginalised in PNG society.

- The Fresh Produce Development Company (established by the National Government with the aim of assisting in the development of the fresh-produce industry) has begun working with grower groups to provide training in production and postharvest management of the produce. It has also assisted them in finding buyers for their produce.
- The two main supply chains for moving fresh produce from the Highlands to Port Moresby supermarkets has been by road/sea and by air. There is no road leading from the Highlands to Port Moresby. Thus, produce must either be airfreighted or transported by road to Lae on the north-eastern coast of PNG and then shipped by boat from Lae to Port Moresby. Airfreight is the more expensive (at about PGK2/kg), but may be cost-effective for high-valued, highly perishable fresh produce. The flight time is less than 2 h. Road/sea transport is less expensive (at about PGK0.60/kg) and, if all goes well, takes a minimum of 3 days.

- The potential comparative advantage for the Highlands is in organically grown, temperate-climate fruits and vegetables. However, most temperate-climate vegetables are highly perishable and the optimum temperature for storage after harvest is between 0°C and 4°C. This creates a problem, as refrigeration is expensive and only professional marketers currently have the capacity for this. There is a rough rule of thumb that for every 10°C above the optimum, shelf life drops by a factor of two to three. For example, with broccoli, the ideal storage temperature is 0°C and at this temperature, the shelf life is about 24 days. At 10°C, the shelf life drops to about 8 days, and at 20°C, the shelf life is about 3 days. At 30°C, the shelf life is about 1 day.
- Currently, there is one significant professional marketer of fresh produce by road/sea and one by airfreight. They both use refrigerated transport to maintain the quality of their produce. There are also many growers and grower groups marketing their own produce to Port Moresby without the benefit of refrigeration. They either take small loads with them on the plane or they take produce by road to Lae (on unrefrigerated trucks) and then put it on a container ship for the journey to Port Moresby. Figures 2 and 3 show the type of unrefrigerated truck that is often used to transport produce to Lae.
- In Figure 3, notice the sacks used to carry cabbages and other produce. These provide no protection for the produce and often require it to not only support the weight of the produce itself, but also the weight of those looking after it!



Figure 2. The type of unrefrigerated truck that is often used to transport produce to Lae.



Figure 3. Interior of unrefrigerated truck, showing unprotected produce.

- Self-marketing is inefficient and often the produce is badly damaged by the time it reaches its destination. Figures 4 to 6 show the results of temperature trials on unrefrigerated road shipments of fresh produce by a self-marketer from Goroka (in the Highlands) to Lae.
- Notice that by the time they reached Lae, all three loads had reached temperatures of around 30°C, which meant that the shelf life was certainly less than that required to make the journey to Port Moresby (at least 2 days). It seems clear that a successful, quality-based domestic marketing system cannot be based on a system involving self-marketers.
- Grower groups were asked why they were not already using professional marketers in the Highlands. The most plausible answer was a lack of competition — even with all their quality losses and high transaction costs, growers thought they could do better marketing themselves.

The insights gained from the mapping exercise were fed into a workshop of stakeholders of the marketing system for fresh produce. This workshop had not taken place by the time of the Bali workshop.

However, by the time of writing this revised paper, the stakeholder workshop had been held. We would like to just offer a few comments on this workshop.

- It was decided to hold a separate meeting of women stakeholders in the marketing system before the stakeholder workshop. This was intended to obtain their perspective on the issues as well as their suggestions for strategies of improvement. This decision was taken because of the fear that the women might tend to be marginalised in the larger workshop and their concerns not heard. It was expected there would be 15 women participants at this meeting. In fact there were 24. The meeting was facilitated by two of the authors (Associate Professors Barbara Chambers and Carole Kayrooz).
- The workshop was limited to a cross-section of stakeholders with a view that numbers would be limited to 30 participants. In fact, we had 36 participants, including representatives of grower groups, wholesalers, transporters, supermarkets in Lae and Port Moresby, national government (led by the Secretary of Agriculture) and provincial government (from the Highland provinces).

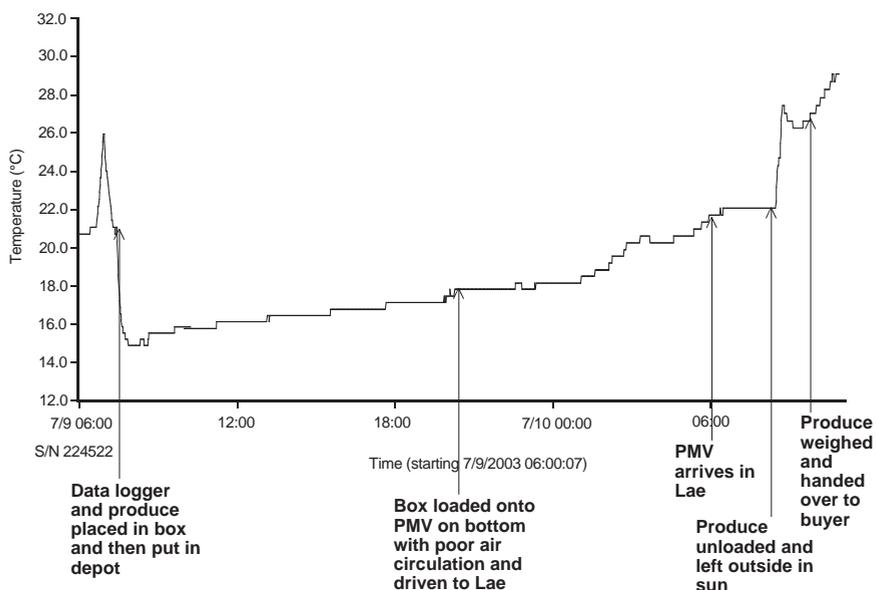


Figure 4. The results of temperature trials on unrefrigerated road shipments of fresh tomatoes from Goroka (in the Highlands) to Lae by a self-marketer (PMV = public motor vehicle).

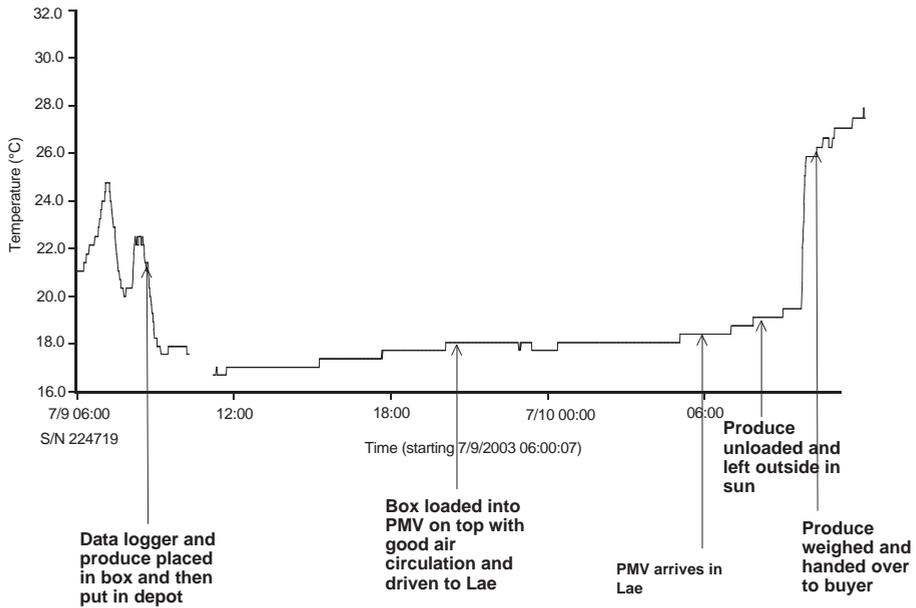


Figure 5. The results of temperature trials on unrefrigerated road shipments of fresh lettuce from Goroka (in the Highlands) to Lae by a self-marketer (PMV = public motor vehicle).

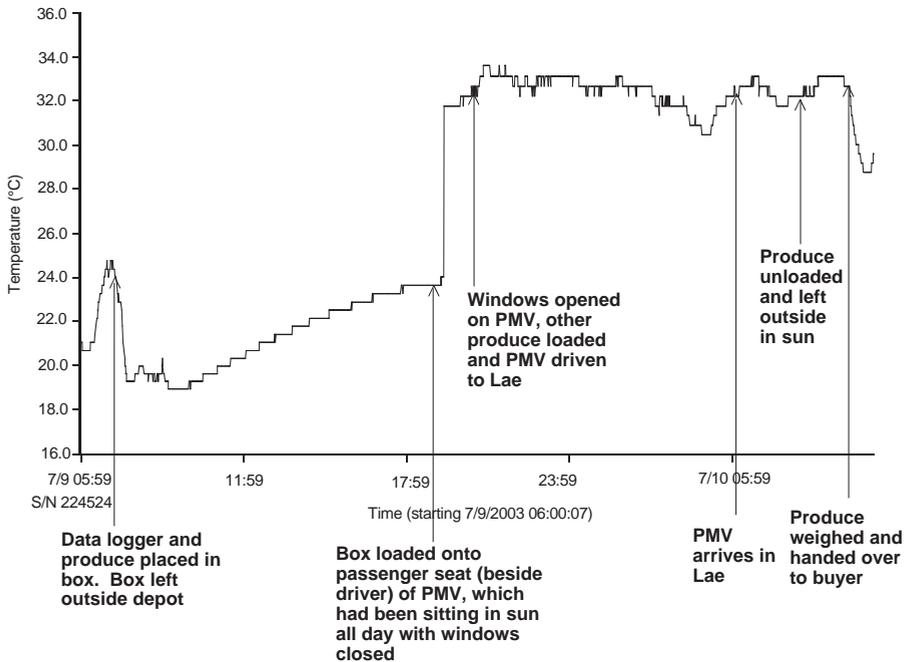


Figure 6. The results of temperature trials on unrefrigerated road shipments of fresh beans from Goroka (in the Highlands) to Lae by a self-marketer (PMV = public motor vehicle).

- The workshop was professionally facilitated (by Barbara Chambers and Carole Kayrooz) using robust techniques intended to encourage collaborative participation and decision-making.
- At the beginning of the workshop, one of the authors (John Spriggs) presented a summary of the findings from our mapping exercise and also presented a report on the women's group meeting, prepared by the two facilitators. (Five of the women who were participants at the women's group meeting were also participants at the workshop.)
- Following this, John Spriggs proposed that the aim of the workshop should be "to improve the marketing system for fresh produce from the PNG Highlands for the benefit of all stakeholders" and proposed the following as our vision:
 - to recognise the important role of women in the fresh-produce industry in the Highlands
 - to encourage a professionally managed marketing system (to improve efficiency and effectiveness)
 - to ensure that a significant share of the benefits from a professionally managed marketing system accrue to rural households in the Highlands
 - to encourage government policy initiatives that are supportive of these vision statements.
- Discussion ensued on the proposed aim and vision and these were accepted by consensus of the workshop participants. The facilitators then led the workshop participants through a process of discussion of the issues, the development of strategies and an action plan.
- At the end of the workshop, the participants chose a steering committee (which John Spriggs was asked to chair) to carry on the work to ensure that the action plan is put into effect.

Conclusion

This project differed from earlier studies of the marketing system for fresh produce of the PNG Highlands. Those earlier studies were more in the mould of positivistic science, while this one is in the mould of action research. We believe this approach is more appropriate when dealing with issues concerned with socioeconomic change. We (in the Institute for Regional Community Development, University of Canberra) have previously used this approach successfully in Australian settings. However, this is our

first attempt to use it in a different and cross-cultural setting. It may be noted that the PNG case study involves a cross-cultural setting where grower groups involve PNG nationals, while other players in the supply chain (wholesalers, transporters, super-markets) tend to come from a western cultural background. Our experience to date suggests this approach is robust and effective in this different and cross-cultural setting.

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Developing Systems to Maintain Quality through the Supply Chain: Getting the Product Right for the Customer

George Beers*

Abstract

This contribution is about designing and building, in a business environment, supply chains that can deliver top-quality products. The concept of co-innovation is explained as a structure in which companies and knowledge institutes are joining forces to use and obtain the sorts of knowledge and expertise that are required to build high performance, competitive supply chains. Some of these large-scale, co-innovation programs focusing on chains and networks have operated in The Netherlands for the past 8 years. Some characteristics and experiences with these public-private partnership programs for agribusiness chain development will be discussed.

An important part of the agribusiness chain program is the development of cross-border supply chains. The projects are developed for Dutch food companies that operate internationally and which are implementing logistic and quality systems for agricultural products all over the world. Examples of the building of advanced logistic systems, food safety and quality programs throughout the whole supply chain will be presented from projects in Thailand, Brazil and Ghana. Capabilities of all supply chain partners have to be matched with the added value they have to deliver, and with an adequate participation in costs and benefits and governance structures involved. The step from the current situation to a supply chain with high-quality, certified products is usually too big and involves too many uncertainties. The projects therefore use growth strategies and evolutionary approaches. The realisation of a well-balanced partnership for the project (local-international and business-academics) has proven to be an important factor in meeting the ambitions of the companies. The roles of national and international government in this type of project will be discussed.

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Consumer Sovereignty: Exploring Consumer Needs

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Abstract

In the transitional economies, international aid agencies have traditionally focused on improving productivity. While the introduction of improved seed, agronomic practices and improved postharvest handling systems may indeed result in significant improvements in productivity per unit area, this is no guarantee that producers will benefit financially. In a market where prices are determined primarily by supply and demand, any marked increase in production may exert significant downward pressure on price. The extent to which this eventuates will be determined by the perishability of the product, the availability of postharvest storage systems, the consumer demand for the product, product quality, and the cost and availability of substitute products. This paper argues that even in the transitional economies, the adoption of the marketing concept is as equally applicable as it is in the industrialised nations, given the increasing globalisation of agribusiness food chains.

Most primary producers, especially those in the transitional economies, are primarily concerned with seeking to improve productivity per unit area. Since many rely upon the sale of fresh produce as their sole source of income, improving productivity is the most readily available means of improving household income. As most farms are quite small, any increase in production at an individual farm level is unlikely to have any significant impact on the market. However, if, as a result of adopting some improved technology, productivity increases across an entire industry, producers may find to their dismay that prices have declined. In an industry that still relies primarily on manual labour, there are few economies of scale to be gained in the majority of the transitional economies. While output prices may decline, the costs of labour may even increase, thus eroding any financial benefit the farmers might have otherwise achieved.

However, of equal concern but so often ignored by farmers, is the extent to which the product produced

will satisfy buyers' needs. Satisfying buyers' needs is perhaps the most basic concept underlying modern marketing thought. Most marketing textbooks indicate that the most successful firms are those most able to determine the wants and needs of target markets and to deliver the desired satisfaction more effectively and efficiently than competitors. Even within the transitional economies, while it is often assumed that the market is driven primarily by price, not only are there significant variations in product quality, but significant variations in buyers' propensity to pay.

To take advantage of these differences, farmers must acknowledge that markets are not homogeneous, but comprised of an indeterminate number of smaller sub-markets or segments. While buyers occupying the same segment have similar needs, those buyers who occupy other segments may have quite different needs. At a consumer level, these segments may be aggregated on the basis of differences in demographic variables (age, income, occupation, education, race); geographical variables (place of residence); psychographic variables (values and lifestyles); and behavioural variables (purchase occasion, benefits sought, usage rate, loyalty).

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However, few producers sell directly to consumers: most must transact with one or more market intermediaries. Depending upon the role each intermediary plays in the marketing process, various criteria will be more or less important in the decision to purchase. While various collector agents and traders endeavour to aggregate the product from a multitude of small farmers, to grade and repack the produce and when necessary to store the produce, wholesalers usually disaggregate the consignment into smaller parcels to meet the needs of individual retailers, restaurants and food service outlets. Even at this level, different buyers may express quite different needs with respect to the desired cooking characteristics, maturity, variety and size and even the source or place of origin.

Using the results from a number of supply-chain studies conducted in both Australia and various countries in Southeast Asia, this paper will explore the various criteria used by consumers in selecting fresh fruits and vegetables from a retail store. Regrettably, very little information is from the transitional economies, thus preventing any meaningful comparison. The paper then continues to explore how actors' perceptions of consumers' needs differ along the supply chain. It is anticipated that those market intermediaries closest to the final purchaser are generally the most able to accurately determine consumers' needs. Conversely, those closer to production are more often embroiled in agronomic problems and issues relating to the orderly supply of consistent-quality produce to downstream customers.

A Review of Consumer Sovereignty

The concept of consumer sovereignty rests on the premise that economic activities aim to satisfy consumers' needs (Hansen and Schrader 1997). Needs arise primarily from an unfulfilled desire. Derived primarily from labour relations (motivation) theory, consumers have various needs that must be fulfilled. At the most basic level, there are the physiological needs for food, clothing and a place to live. Once these needs have been fulfilled, safety and security needs become more important, leading in turn towards the various social needs for belonging and affection and finally, individual needs for knowledge and self-expression.

When a need is unsatisfied, a consumer may do one of two things: either look for an object to satisfy the need, or reduce their desires and satisfy them-

selves with what they already have. Assuming in this instance that the consumer is able to maximise utility by making a decision to purchase, the product the consumer ultimately buys will be influenced by the culture, individual personality and the consumer's financial resources. Taking food as an example, to satisfy hunger, whether the consumer chooses rice, pasta or potatoes will largely depend upon the society within which they have been raised. Nevertheless, as a society evolves, the wants of its members will expand. As people are exposed to more objects that arouse their interest and desire, producers try to provide more products and services to satisfy those wants. However, while it is most often assumed that consumers have identifiable needs and wants before consumption, these needs and wants can be as much a consequence of marketing and other supplier activities as they are a property of the individual themselves. Furthermore, many consumers do not know what they want. Needs often emerge only when provoked by the product itself.

However, while most consumers have unlimited wants, most are constrained by limited financial resources. Consumers therefore must make choices and, according to the utility maximisation theory, they will choose those products that best satisfy their needs. This assumes that consumers are not only fully informed, but that they are both knowledgeable and interested in the products on offer. However, in reality, most consumers are unable to accurately judge quality, especially for intangible products such as fresh fruits and vegetables. Since fresh produce is inherently variable, the various search attributes commonly used such as size, colour, variety, freedom from blemishes and even characteristics such as freshness, may not necessarily result in a favourable consumption experience. Furthermore, various external marketing signals including price, promotion and the presence (or absence) of suitable alternatives may also impact upon the consumer's decision to purchase. For other consumers, the decision to purchase may be based on the reputation of the firm (brand) or convenience.

Nevertheless, in a competitive market and more so within a saturated market, since consumers are able to choose between alternative suppliers' offers, consumers wield the majority of power. It thus becomes the responsibility of producers and various market intermediaries to offer those goods and services that will best satisfy consumers' needs to the extent that it is profitable to do so, or at least to match the compe-

tion. However, as consumers' needs are continuously changing, producers may find they are more successful if they have fewer competitors. Such will provide the incentive to invest in the development of innovative products and new markets.

What Do Consumers Want?

Marketing theory suggests that consumers will favour those products that offer the most quality, performance and features (Kotler et al. 1994). However, the products must not only be affordable, they must also be available.

Within Australia, numerous studies have been undertaken to identify the various criteria that consumers use in their decision to purchase fresh fruits. Flanagan (1991) indicates that consumers generally have very positive attitudes towards fresh fruits. The products are seen to provide a nutritionally valuable, convenient snack. However, most consumers regard fruits as discretionary items rather than essential items in the food budget. Whereas fresh vegetables are considered staple foods, fresh fruits are luxury items.

One of the reasons Flanagan (1991) gives for the apparent paradox is the inability of consumers to self-select good-quality fruits. Many of the physical attributes commonly used by consumers to choose fresh fruits are poor predictors of eating quality and thus many consumers are dissatisfied with the consumption experience. Variations in quality exist

between growers, between each piece of fruit, and between retail stores. Consequently, selecting fruits becomes a high-risk decision. These self-doubts will have a negative influence on the quantities of fresh fruits consumers buy. When disappointed with the eating quality of fresh fruits, consumers will either withdraw from the market or purchase fruits in smaller quantities.

The Horticulture Research and Development Corporation (1990) identified a number of important attributes that consumers used to select their fruits including freshness, quality, firmness, colour, variety, price and size. Yuen et al. (1994) identified size, colour, freedom from blemishes, crispness and taste as being the most favoured variables. However, point-of-sale information such as brand name, variety, nutritional value and origin were also helpful. Surprisingly, less than 10% of respondents appeared to be concerned with price.

Drawing upon the results of a number of undergraduate and postgraduate student projects conducted in Perth, Western Australia, it appears that the most important variables influencing the consumer's decision to purchase fresh fruits are freedom from blemishes, firmness, colour, variety, price and size (Table 1).

In only one of the five cases (oranges) did price appear as the most important variable, indicating that the quality of the fruit offered for sale was generally more influential than price in the consumer's decision to purchase.

Table 1. Importance of the criteria used by consumers in their decision to purchase fresh fruits (% = proportion of respondents who indicated unaided that they used this criterion in their decision to buy fresh fruit; 'rank' signifies the order of importance of the criteria as perceived by the respondents).

Criterion	Apples 1		Apples 2		Bananas		Oranges		Mangoes	
	%	Rank	%	Rank	%	Rank	%	Rank	%	Rank
Freedom from blemishes			12		34	1				
Firmness	27	2	17	5			16	4	56	2
Colour	20	4	20	2	32	2	22	3	51	3
Variety			31	1						
Price	22	3	19	4	12	3	36	1	25	4
Size	19	5			8	4	7	5	19	5
Appearance	13		14				31	2		
Crispness	29	1	19	3						
Taste	17		5							
Aroma			4						74	1

Sources: apples 1, Stewert-Dawkins (1995); apples 2, Sadler (1997); bananas, Daniel (2000); oranges, Hoblely (2003); mangoes, Hickey (1998).

For exotic fruits such as mangoes, while they are expensive (at least in Western Australia; WA), they are not ordinarily considered unless the consumer can afford to purchase them. In this instance, providing the fruit is in good condition, price becomes relatively unimportant. However, as the quantity of fruit available in the market increased and prices declined, consumers were observed to purchase significantly greater numbers of fruit (since mangoes are generally sold by piece rather than by weight) (Hickey 1998)(Table 2).

The price elasticity of demand is expected to have some influence on the consumer's decision to purchase, especially when there are marked variations in the retail price from week to week. However, most consumers are unlikely to sacrifice quality for price. Furthermore, there is evidence to suggest that a lower price for one commodity will result in a reduction in the demand for one or more alternative fruits. Known as the cross elasticity of demand (Cramer and Jensen 1988), a reduction in the price of bananas (for example) is likely to result in a reduction in the quantities of apples and oranges purchased. This occurs because the consumer is generally purchasing either for themselves or their family who, in any given week, will consume a fixed quantity of fruit. It is also highly likely that consumers will allocate a fixed proportion of household expenditure to the purchase of fresh fruits. Since there is much variation in both fruit quality, prices and the availability of preferred varieties from week to week, consumers are therefore expected to allocate these funds to the various fruits offered for sale, depending upon quality, price and availability in-store.

While ranked of only moderate importance, the size of the fruits presented for sale is believed to be more influential than the ranking suggests. The fruit size sought is very much dependent upon the ultimate consumer, culture and the financial position of the purchase decision-maker. While there is some positive relationship between fruit size and price (as size increases, price increases), where the fruits are largely consumed as snacks by children or placed in school lunch boxes, there is an increasing demand for smaller pieces of fruit that a child can eat. To their dismay, most parents find that if the fruit is cut into smaller pieces, the child refuses to eat it because it has discoloured. However, when the fruit is purchased as a gift (especially among Asian cultures), large-sized fruit is preferred so that all members of the family may participate in its consumption. Yet in Malaysia, because of low household incomes, the demand is for smaller fruits.

At least in Australia, this relationship between quality and price means that most small fruits are sold in pre-packed bags of between 1–2 kg, depending on the product. However, there is a universal perception among consumers in WA that pre-packed fruits are second-quality fruits. Within the pre-packed bags, consumers often find misshapen, blemished, poorly coloured and damaged fruits. Hence, most consumers prefer to self-select fruits from the retail shelves.

While less research has been conducted on vegetable products, there is some evidence of the perceived relationship between quality and size. In Vietnam, significant price premiums are paid in both the wholesale and retail markets for larger tubers (Table 3).

Table 2. Price elasticity of demand for fresh mangoes in Perth, Western Australia.

Price per piece (AUD)	Number of pieces of fruit purchased ^a					
	0	1	2–3	4–5	6–10	10+
0.50	2	26	54	61	34	85
1.00	20	32	75	68	35	33
1.50	54	43	92	40	23	11
2.00	99	53	76	22	10	2
2.50	147	55	44	13	3	–
3.00	194	45	13	8	2	–
3.50	232	15	11	2	2	–
4.00	242	14	5	–	–	–
4.50	242	6	2	–	–	–

^a Numbers in the body of the table signify the numbers of people surveyed who purchased the given numbers of fruit pieces at the corresponding prices.

Source: Hickey (1998).

Table 3. Price differentials at which tubers are purchased by tuber size (VND/kg).

Tuber size	Farmers sell	Traders buy	Wholesalers buy	Retailers buy
Extra large	+185	+170	+240	+450
Large	1385	1595	2180	2550
Medium	-180	-170	-480	-885

Source: Batt (2002).

However, there is some anecdotal evidence to suggest that consumers prefer to buy the large rather than the extra large tubers, because the extra large tubers are often hollow inside and some consumers perceive that they have been treated with growth-promoting chemicals. Similarly, among the food service industries, the demand is for smaller tubers, presumably because they are less expensive to purchase.

Staying with the consumer market for potatoes in Vietnam, in asking consumers what criteria they used in their decision to purchase, 24% of consumers reported that freedom from chemical residues was one of the most important criteria. However, in the reported studies on the fresh fruit industry in WA, freedom from chemical residues was seldom an issue unless consumers were prompted. As a latent variable, freedom from chemical residues will only become an issue when visible residues are present on the fruits, thus bringing it to the consumer's attention, or when consumers specifically want organically grown produce.

Within most of the world's industrialised economies, there is an increasing desire to purchase fresh produce that is not only healthy and nutritious but also beneficial for the environment and society at large. As consumers become more affluent and find themselves able to make more choices, consumers also become increasingly concerned about environmental and social issues. This is leading towards the concept of 'triple bottom line' reporting, where financial performance, concern for the environment, and social equity are given equal consideration (Sprigel 2001). As a result, there is an increasing demand for organic produce, although there is evidence to indicate that consumers in Australia are unlikely to pay more than 10% extra (Batt and Giblett 1999).

However, more fundamental than this is the consumer demand for safe product. Following an alarming increase in the incidence of food poisoning, most governments have responded by enacting a raft of legislation which requires retail buyers to take all

reasonable steps to ensure that the food they sell is safe (Wilson 1996). As a result, most major supermarkets now require fresh produce to come from suppliers who have an appropriately accredited quality-management system. A genuine and visible quality-management program is a prerequisite for any fresh produce company who wishes to supply the supermarkets (Fearn and Hughes 1999).

In Australia, most consumers show little concern towards the possible presence of chemical residues, because most wash the fresh fruits and vegetables they have purchased before consumption (Batt and Giblett 1999). However, there is also an implicit assumption that under the various quality-management systems that most modern supermarkets operate, and random in-store sampling of the produce by the Department of Health, that growers have adhered to the prescribed withholding periods and applied chemicals at the appropriate rates. Within many of the transitional economies, given the chemicals currently available, the growers' lack of knowledge and the high incidence of pests and disease, such assumptions are ill-founded. Anecdotal evidence from Kapatagan (a *barangay* on the slopes of Mt Apo in southern Mindanao, Philippines), suggests that farmers seldom eat the vegetables they have grown because of the high quantities of chemicals applied.

In most industrialised countries, consumers are protected under legislation that requires producers and manufacturers to not only ensure that the products available for sale are not hazardous to health or life, but that consumers also have the right to expect products to perform as promised and the right to be informed. While potentially this means that consumers are entitled to return fruits to the store from which they were purchased and to expect a refund when fruits fail to meet their expectations, very few consumers actually do. Largely because consumers are unable to accurately self-select fruits that not only look good but also eat well, many simply withdraw

from the market or purchase significantly fewer fruits (Sadler 1997). Often, retailers do not even know there is a problem, for as long as the product continues to look good and does not deteriorate on the shelf, there is no reason for them to suspect that there is anything fundamentally wrong with the product. Poor eating quality is normally associated with that fruits which have been harvested early (and often immature) in order to capture high prices in the wholesale market and fruits (particularly apples) that have been stored for extended periods of time.

While food manufacturers must provide information on the date of manufacture and advise consumers on the likely expiry date, producers of fresh produce are under no such obligation. Food manufacturers must also provide consumers with information on the various ingredients, preservatives and processes used and, increasingly, to provide information on the country of origin. With greater concentration and aggregation in the food-processing industries, manufacturers are able to search the world to identify the most reliable supply of high-quality inputs for the most competitive price. Given that many of these global suppliers are able to provide the product at prices substantially below the domestic costs of production, domestic growers often embark upon various promotional programs to differentiate their product, appealing to the superior benefits of the local product (freshness). For example, Australian consumers differentiate between imported and reconstituted orange juice (from Brazil) and local product. In this regard, consumers must also be protected from fraudulent, deceitful or deceptive information and advertising.

One of the other foundations upon which modern consumerism is built is competition. Consumers must be given the right to choose, but equally important, is that consumers may not be discriminated against on the basis of age, gender, race, religion or political affiliation. Competition generally ensures that consumers have access to good-quality produce at a lower price. However, competition may also elevate some costs. Rising prices reflect improved services that consumers want such as more convenience, greater choice and larger stores. Furthermore, consumers not only want functional products but many also seek psychological value. While many argue that brands and the associated cost of packaging and promotion only add psychological value, brands give consumers greater confidence. Brands

imply a certain quality for which many consumers are willing to pay.

While the use of brands — particularly generic, in-store brands — is rapidly increasing in the retail sector (Fearne and Hughes 1999), branding fresh produce remains problematic. In Australia, most growers are labelling apples, irrespective of the quality, resulting in mixed grades and no guarantee of delivering premium quality (Batt and Sadler 1999). However, other variables are involved. The product is perishable, thus irrespective of quality at the time of branding, the product will deteriorate because of inappropriate postharvest treatments or poor product handling. With each grower having their own perception of quality, fruits of vastly different quality standards will emerge on the retail shelf, so even if individual growers do differentiate between grades, quality differences will be lost at the retail level.

While nutritionists recommend that we should eat seven serves of fresh fruits and vegetables per day (Moxon 1999), most Australians eat only 4.1 serves per day. Many fruits, including oranges, mangoes and pineapples, present a problem for consumers — fresh fruits are inconvenient, expensive and inconsistent (Hughes 1999). Furthermore, with more women in the workforce, household incomes are steadily increasing. With more personal disposable income, consumers are not so much cash-constrained as they are time-constrained. Hence, consumers are constantly searching for new innovative product solutions that will reduce the amount of time required to purchase, prepare, cook and consume their food.

What Do the Market Intermediaries Want?

For most retailers, fresh produce is regarded as the key determinant in the consumer's choice of store because it provides an attractive, fresh and colourful display and is a symbol of the pervading quality standards throughout the store (Retail Business 1997). While shoppers accord great importance to the quality, price, range and availability of fresh produce (Hughes and Merton 1996), fresh produce also generates some of the highest profit margins of any product category in-store. However, while fresh produce is high profile, the products are highly perishable and very sensitive to mishandling and damage at all levels of the supply chain (White 2000).

Quality, price and the ability to deliver are generally regarded as the most important criteria by which organisational buyers evaluate potential suppliers (Cunningham and White 1973; Lehmann and O'Shaughnessy 1974; Dempsey 1978; Wilson 1994). Where there is no difficulty in accurately specifying the exact nature of the product and there are several reliable suppliers in the market, a buyer can simply choose that supplier who offers the lowest price from among all those suppliers who fulfil the functional requirements (Hakansson et al. 1977). However, where a number of alternative suppliers have equalled one another in terms of quality, delivery and price, various attributes such as the supplier's reputation, financial position, communication and attitude towards the buyer may become decisive (Dempsey 1978).

Hutt and Speh (1995) suggest that when industrial buyers purchase a product, they purchase not only a package of benefits derived from the physical product features, but also a bundle of services attached to the product. While the exact meaning of the term 'service' varies with the nature of the product and the requirements of the buying organisation, service may encompass such things as just-in-time delivery, the provision of technical assistance and support, innovations and adaptations, credit arrangements, support for special needs, or advance notice of impending price changes or shortages in delivery. Leenders and Fearon (1993) suggest that preferred suppliers will endeavour to find new ways of developing products and services that will allow customers to perform their activities more economically. A preferred supplier should react favourably to unforeseen needs such as suddenly accelerated or decelerated volumes of business, changes in product or deliver specifications, service problems or any other legitimate request. They will provide technical support and other expertise when requested by customers or whenever the supplier believes it can assist the purchaser to remain competitive.

However, while a great deal has been published on the various criteria customers use in choosing between alternative suppliers, very few studies have sought to examine how members at different stages in the distribution chain perceive the quality of the products offered. Fundamentally, it is assumed that supply chains operate to maximise consumer satisfaction. However, quality can be assessed in various ways according to various objective or subjective criteria. Since quality expectations may also be influ-

enced by the actual context in which the buyers and users are embedded, their perceptions of product quality may vary. Furthermore, as product quality may change during the distribution process, quality assessment becomes even more complicated.

How chain members perceive quality and the quality desired by downstream customers will influence the quality they try to obtain. In other words, if chain members perceive quality in different ways, they will pursue different quality standards (Korneliussen and Grønhaug 2003). To bring products from a producer to consumers, a variety of activities have to be performed. Many of these activities are performed in a sequence: for example, the grower produces the product, hands it over to a trader who organises transportation to and makes contact with a wholesaler and so on. Together, this can be considered an activity chain where the various activities and their performance are interdependent. The value of these activities is heavily dependent on the extent to which the product offered satisfies the requirement of all the chain members (including the producer) that makes the complete set of activities valuable.

Nevertheless, the total value generated by the chain will ultimately depend upon the extent to which it is able to deliver products and services desired by consumers. The importance of a market or customer orientation as the basis for continuous creation of superior value for customers is well known in marketing (Kohli and Jaworski 1990). According to Narver and Slater (1990), customer orientation includes all the activities involved in acquiring information about buyers in the target market and disseminating it throughout the supply-chain participants. According to Day and Wensley (1988), being customer-oriented implies that a seller understands a buyer's entire value chain. In order to be customer-oriented, an upstream supplier may need to be able to identify each of the customers downstream in the chain as well as the end consumer and to understand what each of them wants. At present, there is little empirical knowledge of what companies actually know about the chains of which they form a part (Storer et al. 2003).

Drawing upon the results of a supply-chain study in Vietnam (Batt 2002), while it is abundantly clear that retailers have a good appreciation of the consumers' needs, the other market intermediaries are significantly more detached (Table 4).

Farmers were found to undervalue the importance of skin colour, tuber size and tuber shape. Conversely, farmers overvalued the importance of storage characteristics and cooking characteristics. No doubt, the overvaluing of storage characteristics is related to the various problems farmers experience themselves, for unlike the other intermediaries who generally hold the potatoes for only a few days, farmers must retain a proportion of their harvest for seven to eight months to provide seed for the next crop. Consumers, on the other hand, will generally only purchase sufficient potatoes to satisfy their family's need in the immediate future.

The high importance attributed to the cooking characteristics is no doubt related to the farmers tendency to either consume those potatoes that are damaged, poorly shaped or considered unfit for sale themselves, or to feed the tubers to livestock. The importance of potatoes as an alternative food crop in the Red River Delta is widely acknowledged. Nevertheless, it is interesting to note that both taste and the cooking characteristics of the tubers are deemed to be of little importance in the national potato-breeding program in Vietnam. Much greater attention has been directed towards improving the productivity per unit area, imparting greater resistance to various pests and disease, and extending the length of the dormancy period (to overcome the problems associated with the need to store seed for seven to eight months).

Both traders and wholesalers were found to significantly undervalue the importance of presenting tubers for sale that were substantially free of pests and disease and physical defects. While not only reducing the shelf life of the tubers, potatoes that

have been damaged by infection by pests and disease or physical injury are both cosmetically less attractive and the cooking qualities and taste may be impaired. Furthermore, while both traders and wholesalers undervalued freedom from physical defects, they overvalued the importance of tuber shape. This can only mean that there is much variation in the quality of the tubers delivered from the farmers to the market intermediaries. In surveys of traders and wholesalers, procuring sufficient quantities of potatoes that were free of pests and disease and physical damage were among the most frequently cited impediments (Batt 2002).

Noting both the inability of the traders to provide potatoes that were less expensive and the pressure retailers put on wholesalers to procure a less-expensive source of potatoes, wholesalers overvalued the importance of price to the consumers. Retailers indicated, however, that price was perceived to be of least importance to the consumer. Consumers purchased potatoes because they wanted to, not because they had to. While this would suggest that numerous alternatives were available, Batt (2002) reports that for many consumers, potatoes are too expensive, hence they are simply not considered in the consumer's decision to purchase. Nevertheless, as prices decreased, consumers were found to purchase greater quantities of potatoes (Table 5).

While no meaningful relationship could be found between income and either the frequency of purchase or the quantity of fresh potatoes purchased, as household income increased, consumers tended to eat more potatoes away from home (in restaurants) and to consume greater quantities of processed potato prod-

Table 4. Ranking of the importance of purchasing criteria for potatoes in the Red River Delta (Vietnam) (F = farmers, T = traders, W = wholesalers, R = retailers, C = consumers).

Criterion	F	T	W	R	C
Flesh colour	2	2	2	1	1
Freedom from pests and diseases	1	5	7	2	2
Skin colour	6	4	4	3	3
Freedom from physical defects	3	6	9	4	4
Tuber size	7	3	3	6	5
Tuber shape	9	1	1	7	6
Taste	8	7	8	5	7
Cooking characteristics	5	8	6	8	8
Variety	10	10	10	11	9
Storage characteristics	4	11	11	9	10
High price relative to other vegetables	11	9	5	10	11

Source: Batt (2002).

ucts (crisps). Van der Zaag (1990) noted that as household income increases, potatoes move from a staple food to a snack food.

In a study undertaken in Perth, WA, Sadler (1997) noted comparatively little difference in the purchasing criteria between wholesalers, retailers and consumers for fresh apples (Table 6).

With the exception of the wholesalers, who undervalued the importance of price and overvalued the importance of the grower, the selection criteria were all accorded very similar rankings. Although yet to be verified, it is assumed that in a more developed economy, information between the market intermediaries and consumers is more readily exchanged, especially where wholesalers are supplying the major supermarkets. Nevertheless, from the wholesaler's perspective, since there is a significant variation in the quality of the fruit presented for sale by alternative growers, wholesalers will endeavour to trade with those growers who provide the best-quality

fruits on a consistent and reliable basis. In business-to-business markets, price is generally of less importance than quality (Wilson 1994).

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Table 5. Price elasticity of demand for potatoes in the Red River Delta, Vietnam.

Price (VND/kg)	Quantity of tubers purchased (kg) ^a							
	0	0.5	1.0	1.5	2.0	2.5	3.0	>3.1
1000	37	7	20	4	70	1	35	46
1500	38	6	40	12	62	3	20	39
2000	17	26	59	22	53	3	14	26
2500	41	34	68	17	35	10	6	10
3000	75	27	68	23	14	5	2	6
3500	98	47	49	11	11	–	1	3
4000	161	39	16	2	1	–	–	1
4500	202	13	4	1	–	–	–	–
5000	220	–	–	–	–	–	–	–
5500	220	–	–	–	–	–	–	–

^a Numbers in the body of the table signify the numbers of people surveyed who purchased the given tuber quantities at the corresponding prices.

Table 6. Ranking of importance of purchasing criteria for apples in Perth, Western Australia.

Criterion	Wholesalers	Retailers	Consumers
Firmness	2	1	1
Freedom from blemishes	1	2	2
Variety	4	3	3
Colour	3	4	4
Price	8	6	5
Size	6	5	6
Brand	7	8	7
Grower	5	7	8

Source: Sadler (1997).

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Aflatoxin in Indonesian Peanuts: How Can the Contamination within the Food Chain Be Managed?

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Abstract

Among the various raw and processed peanuts collected from different points of the delivery chain (farmer, *penebas*, collector, processor and retailer) in Pati Regency, Central Java, the highest *Aspergillus flavus* infection and aflatoxin contamination were found in raw kernels of peanuts collected from retailers in traditional markets.

Postharvest handling methods prior to peanuts being delivered to retailers and especially at the retailer level in traditional markets severely impact on the level of aflatoxin contamination in the Indonesian food chain.

Some potential initiatives to minimise aflatoxin contamination, both at the pre and postharvest stages, are discussed in this paper. Critical to the further development of this work is a concentrated effort to monitor postharvest handling methods carried out by farmers, collectors and retailers in traditional markets and identify the critical control points for potential changes needed in their procedures.

Aflatoxin is a human carcinogen that can contaminate peanuts and hence is a major food-safety problem throughout the world. It is particularly severe in developing countries such as Indonesia. It occurs when kernels become infected by *Aspergillus flavus*, *A. parasiticus* and *A. nomius*, under drought stress before harvest, during the drying phase in the field, or under unsuitable storage conditions.

Based on the report of the 23rd Session of the Joint Food and Agriculture Organization of the United Nations/World Health Organization (FAO/WHO)

Food Standards Programme, held in Rome, Italy, 28 June – 3 July 1999, the Codex Alimentarius Commission adopted 15 parts per billion (ppb) as the maximum level of total aflatoxins in peanuts intended for further processing. In Australia, the maximum allowable limit of aflatoxin in peanut and peanut products is 15 ppb (QDPI 2000).

As part of an ongoing Australian Centre for International Agricultural Research (ACIAR) project on management of aflatoxin in Indonesia and Australia (PHT 97/017), a survey has been conducted to

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monitor aflatoxin contamination in peanuts and assess the critical hazard points along the market supply chain in the Pati Regency in Central Java. In this regency, the peanut delivery chain can be classified into five levels — farmer, *penebas* (one who buys crops before harvest), collector, processor (factory) and retailer.

Occasionally farmers may deliver the peanuts directly to a local market or collector who buys the peanuts from the farmers before harvest. To prepare flour-coated kernels, processors also buy peanut kernels from other regencies or other countries (China, India and Vietnam).

This paper describes:

- the results of interviews with farmers, *penebas*, collector/traders and factories concerning pre and postharvest handling of peanuts
- the results of a research project entitled ‘*Aspergillus flavus* and aflatoxin in peanuts at various stages of the delivery chain in Pati regency, Central Java’
- what initiatives should be carried out to overcome the aflatoxin problem in Indonesian peanuts.

Methodology

During the survey, interviews using questionnaires with farmers, *penebas*, collectors and processors (factories) on pre and postharvest handling of peanuts were conducted, together with random sampling of various kinds of peanuts and peanut products.

Interviews and sampling were carried out during the wet (January 2002) and dry (August 2002) seasons. The number of respondents at farmer, *penebas* and collector levels in each season was 48, 10 and 4, respectively. The number of samples of wet raw pods at farmer, *penebas* and collector levels were 48 (derived from 48 farmers), 30 (derived from 10 *penebas*) and 12 (derived from 4 collectors), respectively. The samples were obtained from the interviewed respondents. The number of interviewed farmers, *penebas* and collectors were determined in proportion to the numbers of each group in the districts where peanut samples were collected. The determination of the districts where peanut samples were collected was based on their high peanut production. This information was obtained from the Indonesian Government’s Regional Office of Agricultural Crop and Animal Husbandry in Pati. In each district, peanut samples were collected from peanut

farms or *penebas* located in the scattered areas. The questionnaires consisted of questions about pre and postharvest handling of peanuts. Interviews were conducted using the Indonesian language or dialect.

At the farmer level, each peanut sample derived from a peanut farm. About 20 peanut plants were selected randomly; they were then pulled out manually to obtain about 2 kg of wet raw pod peanuts. At the *penebas* level, three samples (= three replicates) of wet raw pod peanuts (about 2 kg/sample) were collected randomly from each *penebas*; the peanuts had been placed in woven polypropylene bags or they were still in piles. At the collector level, three samples (= three replicates) of wet raw pod peanuts (about 2 kg/sample) were collected randomly from each collector; the peanuts had been placed in woven polypropylene bags.

Results

Results of interviews regarding pre and postharvest handling of peanuts

Interviews with farmers

Forty-eight farmers of Pati Regency were interviewed either during the wet or dry seasons. Some of the farmers interviewed during the wet season were the same individuals as interviewed during the dry season. Most of the farmers (85% and 96% of the respondents interviewed during the wet and dry seasons, respectively) sold the peanuts to *penebas* before harvest, while 15% and 4% of the respondents, respectively, harvested the crop themselves. The harvesting method was the same in either case — peanut plants were pulled out and stripped manually, and the peanuts were not dried. In the latter case, farmers sold the crop directly to the collectors. All respondents (100%) were unaware of the aflatoxin problem in peanuts.

Interviews with penebas

Ten *penebas* of Pati Regency were interviewed either during the wet or dry season. Some of the *penebas* interviewed during the wet season were the same individuals as interviewed during the dry season. Harvesting was carried out by pulling the peanut plants manually as well as by manual pod-stripping. Drying and storing of peanuts were not carried out before sending them to collectors or factories. All respondents (100%) were unaware of the aflatoxin problem in peanuts.

Interviews with collectors

Four collectors of Pati regency were interviewed either during the wet or dry seasons. Of the respondents interviewed during the wet and dry seasons, 50% and 20%, respectively, stored peanut pods before sending them to the factory. During the wet season, peanuts were stored in woven polypropylene bags for one night (25% of the respondents) or up to a maximum of 7 days (25% of the respondents). During the dry season, peanuts were stored by spreading them on a paved floor for 4–30 days. During both seasons, most peanut pods were sold to factories in the form of ‘fresh’ raw peanuts. All respondents (100%) were unaware of the aflatoxin problem in peanuts.

Interviews with factories (processors)

The results of questionnaires were based on a visit to the PT Garuda Food factory in Pati, Central Java (Dharmaputra and Maysra 2003). The processing steps undertaken for different products are outlined below.

Flour-coated peanut processing:

- *sorting* — peanut kernels derived from collectors are sorted according to kernel colour using ‘sorteks’ (machines that sort on a visual basis)
- *storage* — raw peanut kernels are stored in a grain Cooler Silo
- *coating* — peanuts are coated with a mixture of salt, tapioca flour, sugar and garlic (the garlic is imported from China) in a container made from stainless steel, fitted with a rotation system
- *frying* — peanuts are fried in palm oil (1 t flour-coated peanuts takes 30 minutes to fry); the oil is used for 24 h and then discarded
- *packing* — peanuts are packed by weight, i.e. 20 g, 100 g etc.
- *product storage* — flour-coated peanuts are stored in cardboard boxes on shelves; the maximum storage period is 7 days before the peanuts are distributed to retailers (supermarkets and traditional markets)
- *monitoring of aflatoxin contamination* — this is undertaken every 3 months using the enzyme-linked immunosorbent assay (ELISA) method.

Roasted peanut processing — peanuts (in the form of wet, raw pods) should be processed within 24 h of harvest:

- *grading* — this is conducted based on the soil attached to the pods and pod colour

- *pre-cleaning* — wet, unshelled peanuts derived from *penebas* in the Pati region are washed manually using well water, while those derived from collectors in other regions are washed in four stages
- *cooking* — the peanuts are cooked using water mixed with salt
- *drying* — the peanuts are dried at $\pm 80^{\circ}\text{C}$ using ovens
- *grading* — peanuts are sorted both manually and mechanically into one of three grades
 - grade I, two seeds and mature
 - grade II, two seeds and mature–young, or three seeds and mature
 - grade III, almost mature seeds
- *storage* — roasted peanuts are stored for a maximum of 7 days after processing, before they are distributed to retailers (supermarkets and traditional markets).

Results of sampling within the supply chain

Dharmaputra et al. (2003) reported moisture contents, the incidence of *A. flavus*, and aflatoxin B₁ contamination of raw and processed peanut products collected from different points of the delivery chain in the Pati Regency in Central Java during the wet and dry seasons in 2002.

Fresh pod samples were collected from farmers’ fields (48 samples), *penebas* (30 samples) and collectors (12 samples). Nine samples of roasted kernels were collected from peanut factories. Three samples of raw and flour-coated kernels, and various roasted pod samples were collected from the markets in Pati, Bogor, Yogyakarta and Malang cities. In all, during each season, 135 samples of various kinds of peanuts and peanut products were collected for analysis (Table 1).

Moisture content, the percentage of peanut kernels infected by *A. flavus*, and aflatoxin B₁ content were determined using the oven method, plating method on *Aspergillus flavus* and *parasiticus* agar (AFPA) medium, and ELISA method, respectively.

Moisture content

The results showed that moisture contents of peanuts collected from farmers’ fields, *penebas* and collectors were generally very high, i.e. 46.7–48.5% (wet season) and 40.1–47.5% (dry season), roasted peanuts collected from factories or retailers were 3.1–3.8% (wet season), and 2.1–2.9% (dry season), and flour-coated kernels collected from retailers

Table 1. Location of samplings, type and number of peanut samples collected from different stages of the delivery chain during the wet (January 2002) and dry (August 2002) seasons (Dharmaputra et al. 2003).

Stages of peanut delivery chain	Type of peanuts	Wet season						Dry season					
		Location of peanut sampling			Total no. of samples	Location of peanut sampling			Total no. of samples				
		Bogor	Pati	Yogya-karta		Malang	Bogor	Pati		Yogya-karta	Malang		
Farmer	Wet raw pod	0	48	0	0	48	0	48	0	0	48		
Penebas	Wet raw pod	0	30	0	0	30	0	30	0	0	30		
Collector	Wet raw pod	0	12	0	0	12	0	12	0	0	12		
Processor (factory)	Roasted pod	0	9	0	0	9	0	9	0	0	9		
Retailer	Raw kernel	3	3	3	3	12	3	3	3	3	12		
	Flour-coated kernel	3	3	3	3	12	3	3	3	3	12		
	Roasted pod	3	3	3	3	12	3	3	3	3	12		
Total		9	108	9	9	135	9	108	9	9	135		

were 3.8% (wet season) and 2.9% (dry season). Raw kernel samples collected from retailers in traditional markets were 8.4% and 7.0% during the wet and dry seasons, respectively. Mean moisture contents of peanut kernels derived from various kinds of peanuts collected from different points of the delivery chain during the wet and dry seasons are presented in Tables 2 and 3 and Figure 1.

Incidence of *A. flavus*

Peanut samples from farmers' fields, *penebas* and collectors were generally significantly lower in *A. flavus* infection than those found among processors and retailers, i.e. 17–25% (wet season) and 25–40% (dry season). During the wet season, *A. flavus* infection in roasted peanut samples collected from processors and retailers was 11% and 50%, respectively, while those collected during the dry season were 89% and 17%, respectively. Raw kernel samples collected from retailers in traditional markets had 100% infection with *A. flavus* during both seasons. The highest mean percentage of kernels infected by *A. flavus* in infected samples in both seasons was found in raw kernels collected from retailers in traditional markets, i.e. 53.1% (wet season) and 30.4% (dry season) (Tables 2 and 3). The mean percentage of peanut samples infected with *A. flavus* from various types of raw and processed peanuts collected from different points of the delivery chain during the wet and dry seasons are presented in Tables 2 and 3 and Figure 2;

while those mean percentages of kernels infected by *A. flavus* in infected samples are presented in Tables 2 and 3 and Figure 3.

Aflatoxin contamination

In general, the aflatoxin B₁ content of peanuts collected from farmers' fields, *penebas*, and collectors and processed samples were low (less than 15 ppb). The highest aflatoxin B₁ contents were found in peanuts collected from retailers in the traditional markets, with the range of 2–124 ppb and <4–342 ppb during the wet and dry seasons, respectively (Table 4). The percentage of raw kernel samples contaminated with aflatoxin B₁ (exceeding 15 ppb) collected during the wet and dry seasons was 33% and 25%, respectively (Table 4, Figures 4 and 5).

Discussion and Conclusions

Potentially there are some strategic areas where efforts could be carried out to overcome the aflatoxin problem in Indonesian peanuts. This is regardless of whether the problem is generated via pre and/or post-harvest handling practices, or from domestic versus imported production. The high incidence of *A. flavus* infection immediately postharvest and the subsequent high levels of contamination of *all* peanuts after processing in local markets or retailing operations suggest that much of the problem is of local Indonesian origin.

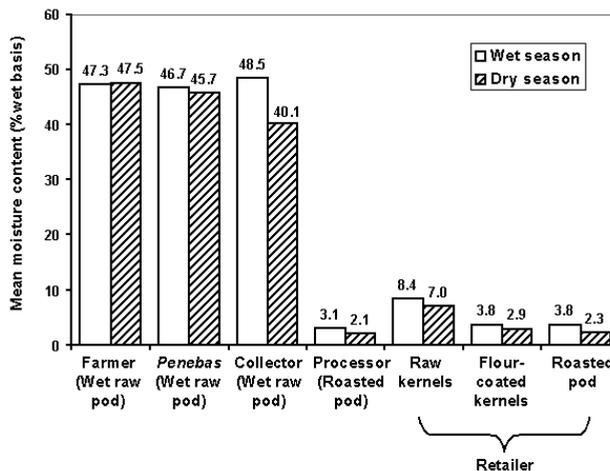


Figure 1. Mean moisture content of peanut kernels derived from various types of peanuts collected from different points of the delivery chain during the wet and dry seasons (Dharmaputra et al. 2003).

Table 2. Moisture content, *Aspergillus flavus* infection, and aflatoxin B₁ content of peanut kernels derived from various types of peanuts collected from different points of the delivery chains during the **wet** season (January 2002) (Dharmaputra et al. 2003).

Chain level	Type of peanuts	Number of samples	Range (mean) of moisture content (% wet basis)	Number (%) of sample infected with <i>A. flavus</i>	Range of % infection in infected samples	Mean % of infected kernels in infected samples	Range of aflatoxin B ₁ content (ppb)
Farmer	Wet raw pod	48	36.98–58.63 (47.27)	10 (20.8)	1–2	1.10	<3.6–9
	Wet raw pod	30	37.33–51.89 (46.69)	5 (16.7)	1–5	2.00	<3.6–11.4
	Wet raw pod	12	45.72–51.78 (48.50)	3 (25.0)	1–2	1.33	<3.6–6.2
	Roasted pod	9	2.50–3.56 (3.06)	1 (11.1)	Only one infected sample with 4% of infected kernels	Only one infected sample with 4% of infection	<3.6
Retailer	Raw kernels	12	6.71–11.56 (8.43)	12 (100)	17–100	53.08	1.7–124
	Flour-coated kernels	12	3.43–4.08 (3.79)	10 (83.3)	1–33	8.60	<3.6–5.7
	Roasted pod	12	2.94–4.84 (3.75)	6 (50)	1–7	2.83	<3.6–4.5

Table 3. Moisture content, *Aspergillus flavus* infection, and aflatoxin B₁ content of peanut kernels derived from various types of peanuts collected from different points of the delivery chain during the **dry** season (August 2002) (Dharmaputra et al. 2003).

Chain level	Type of peanuts	Number of samples	Range (mean) of moisture content (% wet basis)	Number (%) of samples infected with <i>A. flavus</i>	Range of % infection in infected samples	Mean % of infected kernels in infected samples	Range of aflatoxin B ₁ content (ppb)
Farmer	Wet raw pod	48	38.04–62.67 (47.48)	17 (35.4)	1–5	1.65	<3.6–196.5
	Wet raw pod	30	40.14–52.28 (45.66)	12 (40.0)	1–4	1.33	<3.6–19.6
	Wet raw pod	12	15.23–50.25 (40.07)	3 (25.0)	Three infected samples with 1% of infected kernels, respectively	1.00	<3.6–6.9
Processor (factory)	Roasted pod	9	1.40–2.40 (2.08)	8 (88.9)	1–5	2.75	<3.6
Retailer	Raw kernels	12	6.50–9.41 (7.01)	12 (100)	1–100	30.42	<3.6–342.1
	Flour-coated kernel	12	2.59–3.23 (2.89)	2 (16.7)	1–6	3.50	<3.6–141.2
	Roasted pod	12	1.40–2.96 (2.30)	2 (16.7)	1–4	2.50	<3.6–11.4

The results of the survey showed that the highest percentages of samples infected by *A. flavus* and mean percentages of infected kernels in infected samples, and the highest aflatoxin B₁ contamination were found in raw kernels collected from retailers in traditional markets in Pati, Bogor, Yogyakarta and Malang cities. The raw kernels may have been sourced from farmers or collectors in their respective regencies. There is, however, the possibility that con-

taminated raw kernels were imported from other countries, such as China, India and Vietnam, and it is difficult to determine the exact source. Despite this possibility, it is clear that in Indonesia, both pre and postharvest handling methods prior to peanuts being delivered to retailers (and especially at the retailer level in traditional markets) severely impact on the level of aflatoxin contamination in the Indonesian food chains.

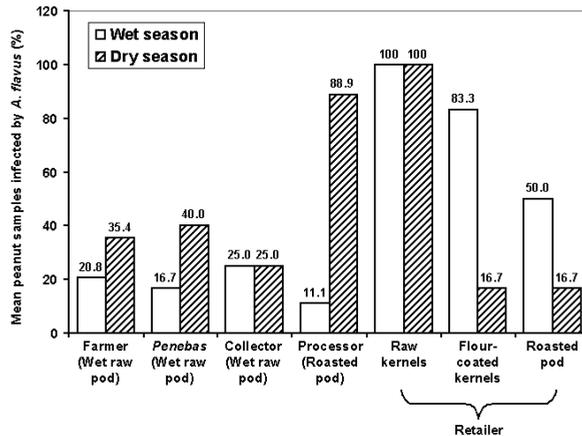


Figure 2. Mean percentage of peanut samples infected with *Aspergillus flavus*. Samples were derived from various types of peanuts collected from different points of the delivery chain during the wet and dry seasons (Dharmaputra et al. 2003).

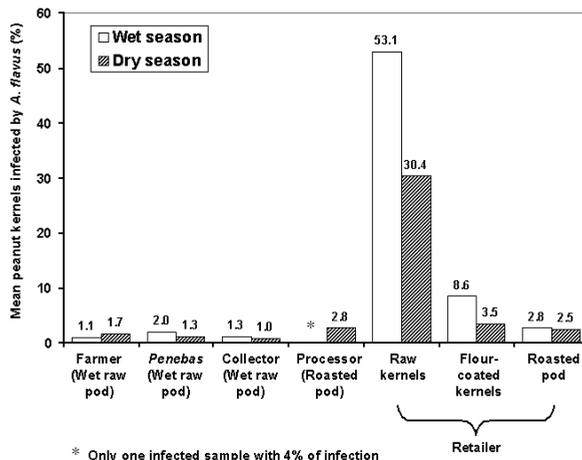


Figure 3. Mean percentage of kernels infected by *Aspergillus flavus* in infected samples. Samples were derived from various types of peanuts collected from different points of the delivery chain during the wet and dry seasons (Dharmaputra et al. 2003).

Table 4. Percentage of peanut samples collected during the wet (January 2002) and dry (August 2002) seasons, and contaminated with different levels of aflatoxin B₁ (Dharmaputra et al. 2003).

Peanut delivery chain	Type of peanuts	Wet season			Dry season		
		Number of samples	Aflatoxin B ₁ content (range in ppb)	Percentage (%) of peanut samples contaminated with aflatoxin B ₁	Number of samples	Aflatoxin B ₁ contents (range in ppb)	Percentage (%) of peanut samples contaminated with aflatoxin B ₁
Farmer	Wet, raw pod	48	≤5	81.25	48	≤5	72.92
			>5 ≤ 15	18.75		>5 ≤ 15	10.42
			>15 ≤ 50	0		>15 ≤ 50	12.50
			>50 ≤ 124	0		>50 ≤ 342	4.16
Penebas	Wet, raw pod	30	≤5	86.67	30	≤5	70.00
			>5 ≤ 15	13.33		>5 ≤ 15	23.33
			>15 ≤ 50	0		>15 ≤ 50	6.67
			>50 ≤ 124	0		>50 ≤ 342	0
Collector	Wet, raw pod	12	≤5	91.67	12	≤5	66.67
			>5 ≤ 15	8.33		>5 ≤ 15	33.33
			>15 ≤ 50	0		>15 ≤ 50	0
			>50 ≤ 124	0		>50 ≤ 342	0
Processor (factory)	Roasted pod	9	≤5	100	9	≤5	100
			>5 ≤ 15	0		>5 ≤ 15	0
			>15 ≤ 50	0		>15 ≤ 50	0
			>50 ≤ 124	0		>50 ≤ 342	0
Retailer	Raw kernels	12	≤5	25	12	≤5	58.33
			>5 ≤ 15	41.67		>5 ≤ 15	16.67
	Flour-coated kernels	12	>15 ≤ 50	16.67		>15 ≤ 50	8.33
			>50 ≤ 124	16.67		>50 ≤ 342	16.67
Roasted pod	Roasted pod	12	≤5	91.67	12	≤5	83.34
			>5 ≤ 15	8.33		>5 ≤ 15	8.33
			>15 ≤ 50	0		>15 ≤ 50	0
			>50 ≤ 124	0		>50 ≤ 342	8.33
	12	≤5	100	12	≤5	91.67	
		>5 ≤ 15	0		>5 ≤ 15	8.33	
		>15 ≤ 50	0		>15 ≤ 50	0	
		>50 ≤ 124	0		>50 ≤ 342	0	

Preharvest practices

Preharvest management plays an important role in reducing the risk of aflatoxin contamination in Indonesian peanuts. It is well known that although the aflatoxin-producing fungus, *A. flavus*, is widely distributed in soils, it invades peanut pods/kernels only when the shell is physically ruptured, either mechanically via splitting during severe end-of-season drought stress, or as a result of injury via soil-insect damage. Even though the *A. flavus* fungus is present in pods and kernels, aflatoxin contamination will only occur under very special conditions of kernel moisture content (below about 30%, Mehan et al. 1986) and temperature. Cole et al. (1985) and Sanders et al. (1985) reported that preharvest afla-

toxin contamination will only occur when pod-zone soil temperatures are in the range of 25–32°C, with associated drought conditions during the last 30–50 days of the growing season.

To maintain healthy peanuts that can resist *A. flavus* infection and subsequent aflatoxin production, it is therefore important that a series of agronomic management practices are implemented in farmers' fields, including the following:

- Pods should be grown with adequate soil moisture during the last 30 days of pod growth to avoid pod splitting arising from drought stress. Where irrigation is available, watering should be undertaken every 10–15 days, depending on the evaporative demand.

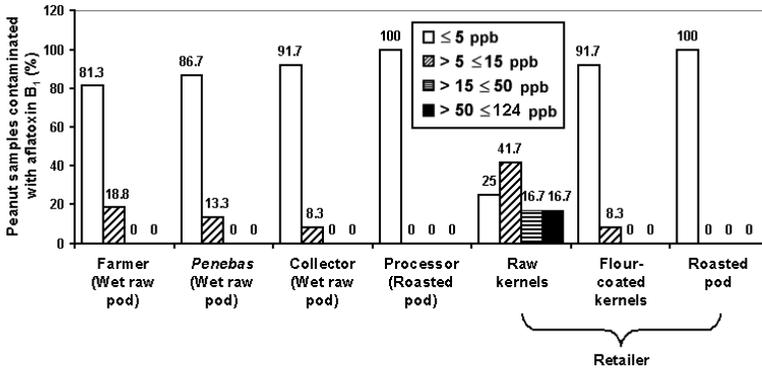


Figure 4. Percentage of peanut samples contaminated with different levels of aflatoxin B₁ during the wet season 2002. Samples were derived from various types of peanuts collected from different points of the delivery chain (Dharmaputra et al. 2003).

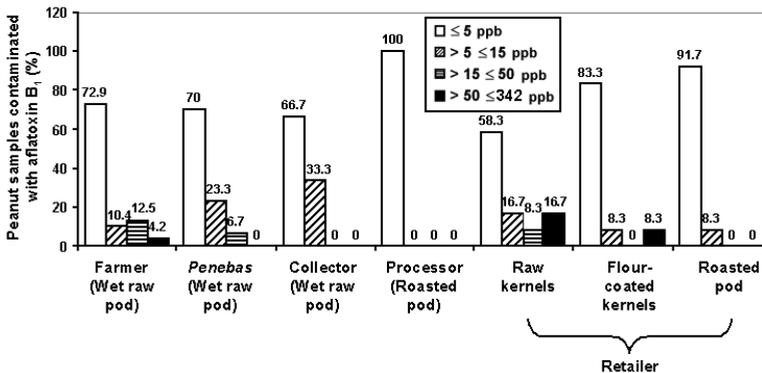


Figure 5. Percentage of peanut samples contaminated with different levels of aflatoxin B₁ during the dry season 2002. Samples were derived from various types of peanuts collected from different points of the delivery chain (Dharmaputra et al. 2003).

- Pods should be free from mechanical injury resulting from field implements such as weeding equipment. In Indonesia, this practice is relatively rare, as farmers usually conduct weeding operations around 20–40 days after sowing. Care should be taken during the harvesting operation to prevent pod injury when plants are pulled manually.
- Pods should be free of soil-pest infection, such as white grubs, in a range of peanut cropping systems. Some farmers broadcast the pesticide Carbofuran onto the soil and then apply irrigation water. Most farmers, however, tend to leave crops without doing any pest management.
- Pods should be harvested at optimal maturity. Late harvesting will result in higher susceptibility of kernels and shells to fungal invasion (McDonald and Harkness 1967). Under very hot and severe end-of-season drought conditions, it is recommended that crops even be harvested 1–2 weeks early to avoid crop water deficits and the associated high risk of aflatoxin contamination (Nageswara Rao et al. 2002; Rahmianna et al. 2003).

Postharvest practices

To overcome, or at least minimise, aflatoxin contamination in Indonesian peanuts, effort is warranted in the following areas:

- obtain more information on postharvest handling of peanuts in other peanut-growing areas in Indonesia
- monitor postharvest handling methods carried out by farmers, collectors and retailers (especially in traditional markets)
- obtain more information on the supply chain for imported peanuts and ensure that regulators have the knowledge and capacity to reduce the importation of inferior-quality product
- monitor the quality of imported peanuts, especially their aflatoxin content, in an effort to help define the extent of the problem and contribution being made by domestic versus imported production
- identify the most effective means of informing the postharvest-handling industry sectors about aflatoxin and its potential management
- develop information and training packages for processors and retailers to inform them about the

dangers of aflatoxin and the handling methods that can reduce the problem

- encourage collectors and processors to place emphasis on improved production and handling techniques by farmers and *penebas*
- publicise to the wider community the potential health problems associated with consuming poor-quality peanuts.

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Improved Marketing of Mandarins for East Nusa Tenggara in Indonesia

Sherrie Wei,* Damianus Adar,† Elizabeth J. Woods§ and Herman Suheri¶

Abstract

In the highland areas of West Timor, where the climate is relatively cool, the mandarin variety Keprok Soe is widely grown in the districts of Timor Tengah Selatan (TTS) and Timor Tengah Utara (TTU) in Nusa Tenggara Timur (NTT) Province. Largely due to its economic value and popularity among local consumers, the Indonesian Government adopted some measures to promote Keprok Soe. Good grades of Keprok Soe fetch a premium price in direct competition to imported mandarins from various countries including China, Pakistan, Israel and Australia. Basically, there are two supply chains for mandarins grown in West Timor. About 90% of the mandarins are sold locally, with only 10% sold to other provinces. In general, there are three methods by which farmers can sell their mandarins: forward-sale by tree, per tree sale at harvest and per kilo sale after harvest. Farmers' use of different selling methods is often related to the size of their mandarin farm, income, price of mandarins in that year, availability of family labour, farmers' educational experiences, length of farming experience, and distance from the farm to the local market.

Established traders play a key role as channel managers in the supply chain, especially for the inter-island supply chain. Quite exceptionally, traders have motivated farmers to strive for good products, be competitive and become 'champions'. Hence, the traders have been observed to play a mixed role of channel manager, information supplier, co-investor and extension officer. These activities and alliances suggest that a reciprocal rather than a win-lose relationship exists.

Supply-chain constraints include production (cultural production, plant protection), poor infrastructure, and postharvest losses (20%). Potential strategies for chain improvements include horizontal integration at the farmer level, enhancement of the capacity of traders as supply-chain coordinators, and branding of Keprok Soe. In relation to improving the likelihood of implementing these strategies, this Australian Centre for International Agricultural Research (ACIAR) project conducted production and marketing workshops, and broadcast information and knowledge by radio.

In the highland areas of West Timor, where the climate is relatively cool, the mandarin variety Keprok Soe is widely grown in the districts of Timor Tengah Selatan (TTS) and Timor Tengah Utara

(TTU) in Nusa Tenggara Timur (NTT) Province. Keprok Soe was first planted in the 1970s, but commercialisation of the product started only in the 1990s. In some of the villages of the two districts,

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Keprok Soe (literally 'mandarin from Soe') constitutes the main source of income (70%) for subsistence farmers with farms less than one hectare.

In recent times, the price of Keprok Soe has steadily risen. While part of this price rise has been due to the influx of refugees from East Timor and Ambon and United Nations personnel, another important factor has been the increased appreciation and consumption of the locally grown fruit by local residents since the 1990s.

In contrast to most other domestic mandarins in Indonesia, Keprok Soe has a mixed gold-and-green skin colour, and is easy to peel, juicy and relatively sweet in taste. To encourage farmers in the region to focus on this variety, and perhaps for administrative reasons, the government discourages the planting of other varieties. Keprok Soe has not performed well in trials in other production areas (such as Java), meaning that the variety is exclusive to West Timor. Good grades of Keprok Soe fetch a premium price in direct competition to imported mandarins from various countries, including China, Pakistan, Israel and Australia. Mandarins are in high demand in Indonesia and the supply of Keprok Soe is largely demand-pull. Nevertheless, the presence of imported fruit indicates that the Keprok Soe chain is already competing with import chains to maintain its price premium.

Largely due to its economic value and popularity among local consumers, the Indonesian government adopted some measures to promote Keprok Soe. They included providing free seedlings and discouraging farmers from planting other varieties of mandarins. Some non-governmental organisation (NGO) projects in West Timor have also provided free seedlings and irrigation assistance to expand the current production of Keprok Soe. With a substantial increase in production area, the outturn of Keprok Soe is expected to double in a couple of years. Hence, market competition will increase. Moreover, as Keprok Soe already competes with imported products, the quality of competitors' products can be expected to improve.

According to a recent survey conducted in five villages in TTS (Tobu, Netpala, Bijeli, Oelbubuk and Fatumnasi), the average age of farmers growing mandarins in TTS was about 46 years (range 26–68 years old). The average experience in growing Keprok Soe was about 18 years (range 5–30 years). The average number of trees owned by each farm household was about 90. The average production was 55 kg per tree,

with a maximum of 68 kg per tree. About 68% of the yield of Keprok Soe was sold to make a living, with the rest used for social purposes, such as gifts for friends and relatives, church ceremonies and own consumption. In the villages of Oelbubuk and Netpala, 80% of total mandarin production was used to make a living. The main reason why their crops could make a higher contribution to household income was because these villages are closer to the subdistrict market and transportation is less of an issue compared to other villages (Leki and Wadu 2000).

Methods of Selling Keprok Soe

In general, there are three methods by which farmers can sell their mandarins: forward-sale by tree, per tree sale at harvest and per kilo sale after harvest. For the last method, farmers are generally responsible for taking the fruit to the venue of the trader or to local markets by themselves.

Forward-sale by tree

Sales using this method generally occur 2–3 months before harvest, when farmers are in need of cash. Around January, February or March, when there are mandarins on the trees, farmers go to a local trader in their village and ask the trader to have a look at the mandarins on their trees. After negotiation, and if a deal is made, the trader pays half of the price to the farmer. The balance will be paid at the harvest time. Traders can also pay by goods, such as food, clothes, radios, tape recorders etc. After half-payment by the trader, the crop is then owned by the trader and the farmer is obligated to look after the trees to prevent such things as stealing and attack by pests. Price per tree is generally very low. For example, the price per tree was about IDR40,000/tree in Netpala village. In contrast, when farmers sell mandarins by weight, they can get over IDR200,000/tree at harvest time — five times more than from forward-sale (Leki and Wadu 2000).

This method of sale is practised when farmers are in urgent need of cash for food, medical, or educational expenses, or even for paying taxes. With more involvement by NGOs in the form of training workshops to assist in farm credits and to inform farmers about the undesirable nature of forward-selling, this method of sale is decreasing over time. According to one survey in the two subdistricts of North Molo and

South Molo in TTS, 3% of farmers used this method in 2000 (Leki and Wadu 2000).

Per tree sale at harvest

This method is used at harvest time — mandarins are sold by the tree, and farmers are not involved in the packaging, transport and sale of individual fruit. When mandarins are ready to harvest, farmers go to traders, or vice versa, and ask for the price per tree for the mandarins. Traders may harvest in stages, depending on the ripeness of the fruit on the trees. In general, traders harvest twice. As in the forward-sale situation, traders own the crop after agreement and farmers are obligated to look after the trees between the first and final harvest. According to one survey in TTS (Leki and Wadu, 2000), the price is about IDR75,000/tree, but according to one farmer leader, the price could be about IDR150,000–200,000 in Oelbubuk village. Farmers are generally content with this price because it is close to what they can get if they sell by themselves, after taking into account all the expenses, e.g. transport, packaging, renting a stall etc.

There are several reasons why farmers sell by per tree rather than by weight at harvest time:

- there are no harvesting costs to farmers
- farmers are saved the trouble of transportation, grading and postharvest loss
- farmers have little information about the price of mandarins in town — selling by tree avoids the risk of receiving an unexpectedly low price
- farmers can sell in a larger volume by tree than by weight, hence saving labour costs.

There are two other social reasons that farmers choose this method of sale. Selling by the tree at harvest time is possible when the farmers and traders involved have a long-standing, good relationship. The trader needs to trust that the farmer will look after the trees after the first harvest and that no stealing will occur. Farmers, of course, rely on traders to give a fair offer. Financially better-off farmers are more likely to use this method because taking mandarins to markets by themselves lowers their social status. Farmers with some prestige are not supposed to be seen to toil themselves and to compete with less better-off farmers in making a living.

Per kilogram sale after harvest

In this method, farmers harvest their own fruit. If required, occasionally they also grade and package

the fruit. Farmers or their family members either take their mandarins to traders in the village or town, or directly to markets. In this method of sale, farmers assume several functions in the supply chain and are rewarded more in return.

Factors affecting farmers' choice of selling method

Farmers' use of different selling methods is often related to the size of their mandarin farm, income, price of mandarins or trees at the time, availability of family labour, farmers' educational experiences, length of farming experiences, and distance from the farm to the local market (Leki and Wadu 2000).

Farmers with larger mandarin farms have lower costs per tree and the differences between selling by the tree and by weight are also greater. Hence, farmers with more mandarin trees tend to sell by weight. As stated before, farmers with higher incomes tend to sell their mandarins by the tree at harvest time. Higher prices during the season encourage farmers to sell by weight, as reflected in the recent years. Larger farm households that have more helping hands during the harvesting season are more likely to harvest themselves and sell by weight. Farmers who have more education (formal or informal) are more likely to sell by weight. Similarly, more experienced farmers are more likely to sell by weight. Transport is an issue for farms far away from the subdistrict, district or provincial market. Many villages in North Molo and South Molo are not connected to good roads. Farmers often take mandarins to the market on foot. This is rather inconvenient, as the weather is still a bit wet at the start of the harvesting season in April. Farmers with farms closer to markets are more likely to harvest themselves and sell by weight at the markets.

Supply Chains of Keprok Soe

As indicated in Figure 1, there are two supply chains for mandarins grown in West Timor. About 90% of the mandarins are sold locally; the other 10% are sold to other provinces. In drought years, none are available to sell to other provinces.

Local supply chain

Farmers have several avenues through which they can sell their mandarins in the NTT Province. They

can sell by themselves at street stalls at any time, or sell at the subdistrict markets that open once a week. Their fruit can appear at the subdistrict, district, or provincial market through the business activities of traders. The most desirable avenue for growers is to sell directly at the Kupang provincial market run by the government, but no farmers can sell through this channel at this stage. An eligible retailer in the government market must purchase the space of a stand and farmers cannot afford the cost.

At present, there are about 15–20 local traders dealing with mandarin farmers. Some of them sell to retailers and others sell directly in the local market. There are also about 15–20 mandarin retailers at the daily Kupang wet market.

Inter-island mandarin supply chain

Selling mandarins to other, more prosperous islands is the aspiration of the industry in West Timor. This occurred a few times since 1997 when two traders embarked on the venture with farmer groups in Bijeli and Oelbubuk villages. The traders sold to the central market in Jakarta, supermarkets and the food service industry in Bali.

This supply chain currently represents only a small proportion of the outturn. As the supply of Keprok Soe is still not sufficient even to meet current local demand, there is no urgency to work on this supply chain. However, if production increases in the near future as predicted, it will be necessary to address the issues involved. According to the traders, farmers were unable to supply to specifications for the desired maturity level, grading and packaging requirements. Another issue is payment terms. Growers operate on a ‘no cash, no goods’ principle, which makes it difficult for traders to do business as their customers require credit for a few weeks.

Traders as supply-chain managers

Established traders play a key role as channel managers in the supply chain, especially for the inter-island supply chain. The incentive for traders to undertake supply-chain management is partly that Keprok Soe is a premium variety and exclusive to West Timor. For example, one established trader has been actively involved in upstream external resource management with farmers. Under the auspices of NGOs, traders conduct workshops for farmer groups

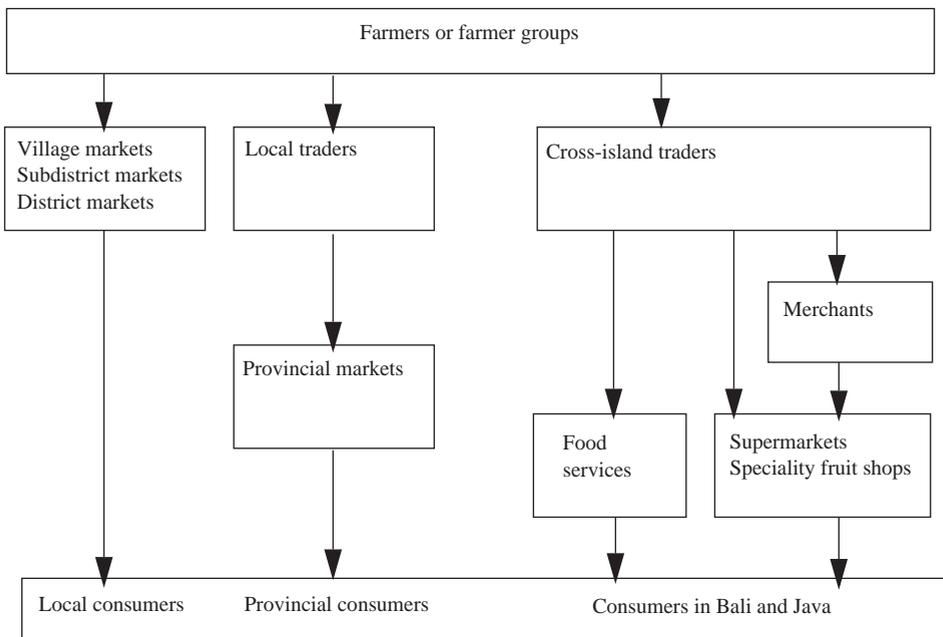


Figure 1. Mandarin supply chains in West Timor.

in various areas, covering fruit fly control, organic farming principles, re-use of water and postharvest handling to meet market requirements. The traders' requirements for mandarins at the farm level include grading by size and appearance, packaging preferences and maturity level for harvesting. In another instance, a trading company taught farmers how to make wooden boxes, and provided grading guidelines and definitions of maturity levels. Apparently simple guidelines on picking, grading and packing can be difficult for subsistence farmers whose attention is distracted by their immediate need for cash. The entrepreneurial actions that traders have initiated to address farmers' cash shortages include offering working capital and fertilisers to farmers. Repayment is deducted later from the sale of mandarins back to the trader. The presence of NGOs moderates the potentially adversarial relationship between traders and farmers.

It is quite exceptional that traders have motivated farmers to strive for good products, to be competitive and to become champions. Hence, the traders have

been observed to play a mixed role of channel manager, information supplier, co-investor and extension officer. These activities and alliances suggest that a reciprocal rather than a win-lose relationship exists (Brandenburger and Nalebuff 1996; Moore 1996). From a power perspective, such a relationship is likely to represent a high barrier to market entry for other serious traders, and thus an advantage of a closed market for the established traders (Cox 1999).

In the recent past, one trading company with a subsidiary in West Timor tried to work with farmer groups to sell mandarins to Java. A complicated model was tested where the company and the farmer groups had a joint account for the payment from Java. Unfortunately, the relationship did not last, mainly for two reasons: improper packaging by farmer groups, and perceived unfair distribution of subsequent loss by farmers. The careful selection of traders or trading companies and the sound functioning of farmer groups are antecedents for a good working relationship between farmer groups and their trading partners.

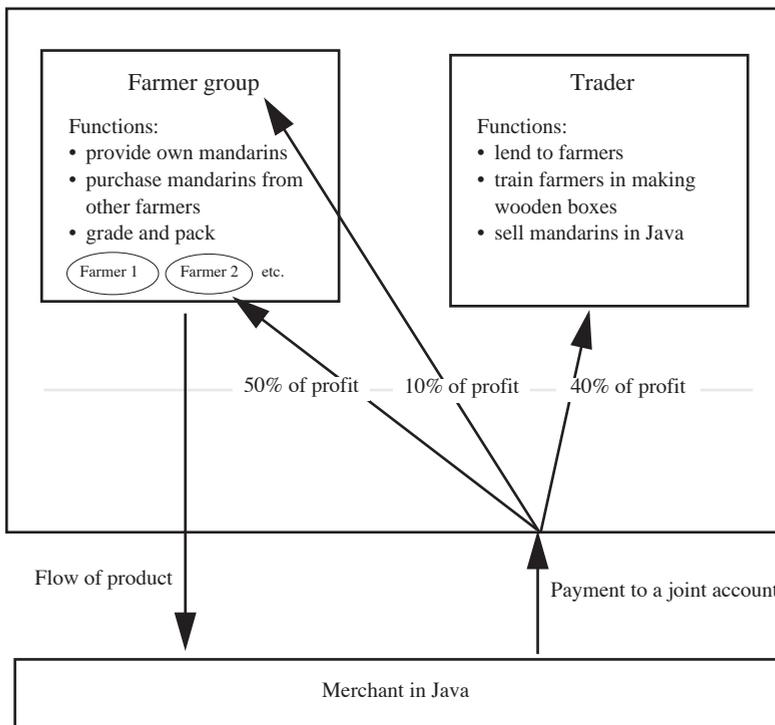


Figure 2. A trial model of alliance between farmers and a trader.

In the late 1990s, an inter-island trading company, with the support of an NGO, tried an alliance model with the farmers (Figure 2). Under this model, the trading company provided training to farmers on grading, packaging and manufacture of wooden boxes. The company also provided loans to farmer groups to purchase mandarins from other farmers. Farmer groups sent products directly to the central market in Jakarta. Payment was sent to a joint account with the agreed breakdown of profits as 50% to farmers, 40% to the trading company and 10% to farmers' groups. However, according to the trading company, due to improper packaging and grading, the price for Keprok Soe was slashed, causing losses to the joint effort. The farmers, suffering from great losses, disagreed on the reason and suspected fraud in the deal.

There are several explanations as to why the alliance did not work out. To start with, it was a rather complicated model for businesses that had never worked together before. Many scenarios were not envisaged, such as the allocation of payment when there were losses. The transaction between the West Timor trading company and the merchant in Jakarta was not transparent to the farmers. As there was no contact between farmers and the merchant in Jakarta, farmers later did not trust the actual amount of payment from the merchant. Farmers needed at least a season to perfect grading and packaging practices before selling their products to markets in other islands that had strict requirements.

Farmers' relationships with local traders

Unlike the relationship with inter-island traders, farmers' relationships with local traders are more transaction-based. According to our interviews, local traders often hid from farmers the price information at the Kupang provincial market. Farmers were often told that the market in Kupang was sluggish and the prognosis would be worse if they would not sell quickly at the price set by traders. Farmers are generally price-takers rather than price-negotiators in this supply chain. One reason that farmers would sell with any price suggested by traders is that farmers generally do not have a good idea about the costs of producing mandarins, hence there is no bottom-line price as a guideline for a desirable price. In fact, many farmers see almost no cost for their produce because there is little farm investment apart from labour and land.

Distribution of benefits

The value chain is not readily available, as most farmers do not keep a record of their costs. Many farmers do not use farm inputs and often ascribe no costs to the production of mandarins if they have not hired any labour. The inter-island value chain shown in Table 1 has been approximated by including the equivalent costs of labour and median-level farm inputs to produce a good grade of mandarins. Interestingly, the farmers' share in the value chain is larger than the traders. As in many other developing countries, traders in Indonesia are not just engaged in

Table 1. A value chain for mandarins in West Timor.

Chain members	Costs and price/kg (IDR)	Margin/kg (IDR)	Relative share (%)
Farmers	Farm-gate price: 4000 Costs: 2000	2000	29
Traders in West Timor	Price: 10,000 Costs: mandarins, 4000 transport, 4000 damage, 500 packaging, 500	1000	14
Traders in other islands	Price: 11,000 Costs: 10,000	1000	14
Retailers	Price: 15,000 Costs: mandarins, 11,000 overheads and damage, 1000	3000	43
Total		7000	100

trading one line of product. They have multiple sources of income by trading in several areas where they see the potential for making a profit. While the farmers' share is about 30% of value created in the chain, this income from mandarins is the main source of revenue for many farmers in TTS and TTU.

Supply-chain Constraints

Production

The mandarin industry in West Timor faces several constraints in the production of Keprok Soe. Overall, farmers lack proper cultural skills and do not use farm inputs to grow good fruit. The area is generally short of water and can be affected by drought, as in 2000. Several NGO projects were designed to install irrigation facilities but for management reasons were not successful in addressing the issues. The industry also faces serious disease challenges, including *Diplodia* canker, pink disease, sooty mould, *Phytophthora*, powdery mildew, citrus greening etc. Inappropriate harvesting methods, involving pulling the fruit from the tree, are still used by farmers — this causes exposed flesh and stress to the tree.

Poor road infrastructure and transport

Currently, fruit is transported on foot, via the public transport system or using the traders' own trucks. With public vehicles, passengers and produce are transported together. Public vehicles run only during the daytime, and only two bags are allowed per passenger. This means of transport is less than ideal, as the daytime heat contributes to fruit losses. In addition, people often sit on the fruit, causing more losses.

Subdistrict markets open once a week (e.g. Thursdays in Kapan subdistrict) and district markets open daily (e.g. the market in Soe — the capital city of TTS — about 20 km from Kapan). Depending on the location of the farm, on average it takes about an hour to take fruit to the subdistrict markets.

Farmers can transport their mandarins by traders' truck, for a fee, but there is a maximum of 10 bags, i.e. 400 kg (per farmer), because traders need to load other fruits and vegetables, such as avocado, banana, onion and pumpkin. The maximum load of one truck is 6000 kg.

When asked why farmers cannot consolidate fruit and hire a private truck, one farmer leader said that they have not looked into this option. However, he expressed that farmers are willing to pay for IDR200,000 for a 3 t load pick-up for fruit to go to Kupang — in other words, about IDR70/kg (or 2% if the price is IDR3500/kg) for transport.

Postharvest losses

Postharvest losses were estimated to be 20%. Most of the losses were due to a lack of proper cold storage. Keprok Soe is planted in the highland areas of 800 m in TTU or above 1000 m in TTS. As the fruit is transported from cooler areas to warmer and humid lowland areas during the daytime heat, fruit ripens fast and unsold fruit deteriorates quickly under ambient conditions.

For fruit sold to other islands, no refrigerated containers were used. There was a shortage of refrigerated containers and priority was given to high-value products, such as meat and seafood.

In 2000, one NGO — Winrock — worked with one trader to refurbish and redesign a second-hand cold storage of a 6 m container with 6 t capacity. Second-hand storage is adequate for fruits and vegetables since they do not require storage below 0°C. However, cold storage is generally unavailable for fresh produce.

For inter-island trade, fruit was graded and packaged twice, either at Kupang, the capital of West Timor, or at the central markets in other islands. At this stage, farmers are unable to set a common standard to meet the grading needs of their customers. This function is unlikely to be fulfilled without the sound performance of farmer groups.

Potential for Chain Strategies

Horizontal integration at the farmer level

There are various kinds of informal social groups in Indonesia, such as youth groups, women's groups, veterans' groups etc. Similarly, in villages, there are informal farmer groups. Members of a farmer group help each other during busy times of crop cycles, such as harvest seasons. They might share equipment with each other. In West Timor, farmer groups are also affiliated with church; one church might have a few farmer groups. Many of the activities of an NGO in West Timor are based on existing farmer groups,

as members already know each other well and are easier to mobilise as most of them go to the same church. NGOs' soft-loan programs for farmer groups capitalise on existing farmer groups for implementation through the network of churches.

For farmers to be effectively integrated to improve the efficiency of the supply chain, groups need to develop norms for their members. A popular model of group development described that groups usually go through four stages: (1) the forming stage; (2) the storming stage, where interpersonal conflicts emerge as people try to express their individuality and resist the emerging group structure; (3) the norming stage, where the group starts to evolve methods of working together; and (4) the task-performing stage, where members accept their own and others' abilities and limitations, and organise activities to achieve their goals (Tuckman 1965). It is fair to say that most of the farmer groups in West Timor are in the middle or leaving the second stage. There was some evidence that in certain groups, individual farmers were having problems that affected the activities of the whole group. The challenge for the farmer groups is to recognise and accept group structures and develop norms to organise activities and achieve group goals.

The policy implication is to train extension officers and key farmers in group management skills in addition to production techniques. This support is necessary until group members and the leader have gone through the dependent, the counter-dependent and at the interdependent phases (Banet 1976).

Traders as managers of inter-island supply chains

Keпок Soe was first introduced to other islands in Indonesia by a trader in West Timor, who stated, "I travelled to Java and compared Keпок Soe with mandarins from Madura and Lumajang. I felt Keпок Soe is superior because of its taste, juiciness and skin colour." Traders have been targeted by NGOs for participation in various activities, including training, micro-finance and logistics management. There appears to be a mutual interest for farmers and traders to work cooperatively to improve the production, harvesting, and packaging of Keпок Soe, with a view to selling beyond the local market. The mandarin supply chain in West Timor is operating in a lightly contested environment between cross-island traders and a reciprocal environment between farmers and traders. Certain circumstances facilitated

the development of such a relationship between farmers and traders. The demand for Keпок Soe exceeds supply. The exclusive production of Keпок Soe in West Timor assures that both parties retain the benefits of a reciprocal relationship at least in the short term, and the existence of a social network among farmer groups means traders need to communicate effectively with only the groups' leaders. The involvement of NGOs as third parties in the chain provides funding and opportunities for traders and farmers to interact and to address the serious disease problems which threaten the medium-term sustainability of the industry. Finally, at this stage, both farmers and traders will not and could not integrate backward or forward to further appropriate value in the supply chain.

In developing countries, as products are pushed through the channel, the business skills and foresight of traders are crucial to the linkage between farmers and retailers, and consequently the success of a chain. Traders can work better with farmer groups that are at the task-performing stage, or at least at the norming stage.

Branding

Until now, Keпок Soe has been marketed under the traders' own names, losing its identity. While Keпок Soe is considered as a superior product, no effort has been made to market the product. Because of the high transportation costs and the exclusiveness of Keпок Soe to West Timor, an ultimate marketing strategy would be to sell the product as 'Keпок Soe' (mandarins from Soe) rather than just as Keпок (mandarins). This would reduce the risks and uncertainties for consumers and businesses purchasing the fresh produce. In this environment, a good, consistent product identifiable by a brand may lead to a marketing advantage (Owen et al. 2000). However, one issue is that such effects might be difficult to gauge, as the identity of the produce can be lost at the retail level since fresh produce is often not packaged.

To build capacities for developing these strategies, this project implemented two hands-on training workshops on marketing and production, and radio-broadcasted related issues. The project purposefully invited an inter-island trader to conduct training on production, packaging and grading. Awareness of the benefits of horizontal integration at the farm level was raised through farmers working together under the project activities. Preharvest and postharvest

training workshops have provided the industry with the necessary knowledge and skills for potential branding of Keprok Soe.

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Getting Farmers to Work Together: the Experiences of Mango Growers in the Mekong Delta Region of Vietnam

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Abstract

In September 2001, The University of Queensland (UQ), Australia, and the Southern Fruit Research Institute (SOFRI), Vietnam, embarked on an ambitious project funded under the Australian Agency for International Development (AusAID) Capacity-building for Agriculture and Rural Development (CARD) program, to establish four collaborative marketing farmer groups in two provinces in the Mekong Delta region of southern Vietnam. The four groups were established in the provinces of Tien Giang and Tra Vinh. In both provinces, over 80% of the population rely on agriculture as their main source of income and both provinces are known for producing superior varieties of mango, such as Cat Hoa Loc (considered to have the best taste), Cat Chu (high yield), Cat Trang and Cat Den.

The problems faced by the majority of mango farmers involved in this project are indeed no different from most farmers in developing countries. Factors such as small farm size, low level of knowledge relating to production techniques, and little or no knowledge of market pricing beyond the local collector agents were common challenges among project participants.

This paper reports on the success factors and challenges encountered with the establishment and maintenance of the farmer groups, supply-chain characteristics of the mango industry in southern Vietnam, and intervention strategies for the development of successful collaborative farmer marketing groups.

In September 2001, The University of Queensland (UQ), Australia, and the Southern Fruit Research Institute (SOFRI), Vietnam, embarked on an ambitious project funded under the Australian Agency for International Development (AusAID) Capacity-building for Agriculture and Rural Development (CARD) program, to establish four collaborative

marketing farmer groups in two provinces in the Mekong Delta region of southern Vietnam. The four farmer groups were established in the provinces of Tien Giang and Tra Vinh. In both provinces, over 80% of the population rely on agriculture as their main source of income and both provinces are known for producing superior varieties of mango, such as Cat Hoa Loc (considered to have the best taste), Cat Chu (high yield), Cat Trang and Cat Den.

This study discusses the experiences, over a two-year period (2001–2003), of getting mango farmers in the four villages of southern Vietnam to work together. While the groups are still in the process of developing, the first two years were most challenging and their experiences could be relevant to other crops in Vietnam and other developing countries with similar social and economic backgrounds.

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Background

The Mekong Delta of southern Vietnam is an important area for fruit production. In 2000, the area had 323,600 ha under fruit production, compared with the Vietnamese total of 544,700 ha. About 3 million t of various tropical fruits were produced in this region (Ministry of Agriculture and Rural Development 2002). Vietnam has less than 20 years of experience of being a market economy. As the fruit industry was deregulated very fast, many problems have since become evident.

At the nursery level, there was a shortage of planting material relative to market demand as many farmers quickly quit planting rice to growing cash-crop fruit trees. Many farmers also took the opportunity to sell fruit seedlings. These farmers had inadequate nursery hygiene practices and no propagation skills. Consequently, there was widespread distribution of diseased planting material, as well as problems associated with the authenticity of varieties. Amongst other problems, lack of access to reliable planting material has inhibited farmers from engaging in larger-scale production and marketing.

At the orchard level, problems include poor agronomic conditions, poor planning and lack of cultural skills. Because of the potential of increasing farmer income through fruit cultivation, many areas that were previously used for rice production have since been turned into fruit orchards. These new orchards often face problems due to unsuitable soil types, drainage problems and high watertables. Due to lack of experience in fruit-tree growing, new orchards are often planted with little knowledge of cultural practices, such as appropriate planting density, orchard layout, pruning and training techniques, plant nutrition etc. The average size of each farm is small (approximately 0.5 ha) and farmers often grow many types of fruit. All these factors combine to make produce unsuitable for large-scale marketing.

At the industry level, the key problems include lack of effective farmer organisations, poor postharvest handling, and inadequate agribusiness skills. Farmer associations and extension staff are poorly organised and have difficulty identifying and achieving group objectives and delivering potential services such as market information, sharing of equipment and establishing quality standards. Until the recent formation of the farmer cooperatives, farmers sold all produce individually and were

subject to price-setting by first-level fruit collectors. Limited knowledge of postharvest techniques and lack of appropriate packaging and storage materials result in farmers harvesting immature fruit in an attempt to extend the shelf life of the fruit and reduce transport damage. Lack of agribusiness skills, institutional problems and an overall poor understanding of free-market functioning has limited industry stakeholders (farmers, traders, extension personnel, researchers etc.) from fully embracing and implementing a market-oriented production system.

The aforementioned problems have had a negative impact on the efficiency of fruit production in the area. By working individually on small farms, fruit growers produce small quantities of produce, with high input costs, making their products uncompetitive and resulting in low farmer income. Retaining this situation, in the long term, they can neither establish a stable marketing system nor develop new markets.

This study included four mango-growing groups: Hoa Hung and Cam Son villages of Tien Giang Province; and Binh Phu and Nhi Long villages of Tra Vinh Province. The majority of Binh Phu village consists of Khmers who have similar customs to Cambodian Khmers. Hoa Hung and Nhi Long villages are mature production areas, whereas Cam Son and Binh Phu villages are new mango-planting areas. Each village has distinct needs and issues.

Establishment and Maintenance of Farmer Groups

By initially establishing farmer groups, then upgrading some of these groups to grower cooperatives, mango farmers involved in the project have begun to realise the benefits of working together. In a recent evaluation of the project, farmers were asked to identify any benefits they believe that they have experienced as a result of participating in the farmer group/cooperative. Key benefits highlighted were: access to technical production training, sharing of knowledge and experience in production with other growers, access to lower-priced inputs, sharing of price information, greater understanding of how the market functions, increased confidence when dealing with traders, increased understanding of fruit grading and basic quality assurance practices, higher fruit prices by selling through the cooperative, and greater community understanding.

Steps involved in group/cooperative formation

Cooperative farming under a centrally planned economy was practised in Vietnam during 1976–1980, but was unsuccessful for numerous reasons. This failure is still fresh in the minds of many farmers and hence this was a difficult mind-set to overcome when attempting to introduce the benefits of farmer groups and collaborative marketing. From the experience of the farmers and extension staff involved in the project, some guidelines for farmer group/cooperative formation have been identified. Five phases and their associated problems, needs and benefits of group formation were identified: learning, steering, forming, implementing and developing (Tuckman 1965; Banet 1976; Chamala 1995).

Learning

This was an important initial step conducted by the project team to identify potential farmers in each catchment with similar needs. At this stage, identified problems included lack of ideas, negative impact of variable market conditions and poor technical skills. As problems could not be solved individually, there was a need for funding to organise group meetings. At this stage, farmers experienced the benefit of group formation through access to technical training and sharing of production knowledge. In addition, agribusiness principles were introduced. The training workshops conducted proved to be critical to the success of later farmer-group formation, as they stimulated community interest and provided some immediate individual benefits via access to new information.

Steering

At this stage, a steering committee was formed by a handful of interested and respected farmers in the community who began by visiting the local-level government to request permission to begin the proceedings for the formation of a grower group/cooperative. Farmers in the area were visited by the steering committee to generate further awareness of current issues facing mango producers and gauge the interest of potential farmer-group members. Farmers were asked to decide if they wanted to register as members. Technical training continued during this stage to sustain and increase farmer interest, with emphasis on cooperative learning and sharing of experiences.

Key problems during this phase included a lack of skilled persons to form the steering committee and

poor understanding of provincial grower group/cooperative registration requirements and related laws. Depending on the skills of the steering-committee members and the individual farmers involved, this phase progressed rapidly or slowly for different groups according to the interest and commitment of the farmers. Group needs during this phase included permission from the local government to begin proceedings and funds to gather farmers together for registration and individual farm visits. The main benefits of group formation at this stage were increased identification and awareness of production-related issues and continuing to share production techniques and experiences amongst farmers.

Forming

At this stage, farmers had already registered to become a member of the farmer group or cooperative. Government approval and registration were achieved and the first meeting was held at which the management board was democratically elected. Cooperative law and government guidelines were read out at this meeting and the management board began to discuss roles and allocate tasks. During this stage, members decided how they wished the cooperative to function, including sale of cooperative shares to group members and the community to generate funds.

Key problems during this phase included heavy responsibilities placed on the management board, weak linkages between members who were still unsure of the potential benefits of participation, lack of group-specific rules and objectives, and no clear vision of where the group was heading. Needs included training in cooperative principles and functions, understanding of cooperative registration and local law, support from institutions to monitor group progress, provision of ongoing technical training to keep members involved, and skills training for the management board. Marketing concepts and the potential benefits of selling collectively were introduced again at this stage. Benefits of group formation included an improved understanding of cooperative functions, increasing technical knowledge and development of a good relationship with supporting institutions.

Implementing

This stage was the most complicated of the four phases thus far, as it required the farmer groups to design action plans and begin implementing strategies. It required the management board and members

to be able to conduct a situation analysis to determine common member needs. They used this analysis to identify key achievable goals, designed an action plan with set dates to achieve the goals, realised the action plan and evaluated the results. Critical problems included poor management skills resulting in inferior action plans which could not be implemented and evaluated, internal conflict amongst members who were often reluctant to commit to the group because they were unsure of the benefits to be realised, and poor facilities, such as lack of a set meeting place. At this stage, members needed to directly experience some benefits of group participation to solidify commitment.

Needs were extensive during this stage and significant institutional support was necessary to monitor the progress of the cooperatives and help them implement their action plans. Further training and upgrading of management skills were crucial, particularly focusing on financial management as the cooperative began to generate some income. Introduction to potential trading partners and basic quality-assurance training and introduction of practices were incorporated at this stage as the cooperative began to become more market-oriented. Benefits can take various forms depending on the developmental stage of the cooperative but should hopefully include increased income and stability for the marketing channel. Benefits realised by the four farmer groups in this project included:

- improved price for fruit by selling directly to the cooperative and bypassing intermediaries
- access to current price information through establishing an information channel amongst members
- cooperative seedlings purchased at low cost for members
- trialling of new production techniques and sharing the results.

Developing

None of our current farmer groups/cooperatives have reached this stage yet due to limited experience in cooperative functioning. The key objective for the future will be to build mechanisms for sustainability, including 'train-the-trainer' methods that will empower cooperative members and reduce reliance on external institutional support. Ongoing management training is essential to ensure cooperative principles are upheld throughout the developmental stage. As the farmer group/cooperatives continue to

develop, they are likely to encounter a number of internal problems for which they will need to develop guidelines and detailed business plans to cope. Quality-assurance practices should be upgraded with increasing sophistication according to domestic and export market requirements. Once they begin generating consistent income, they should be able to directly access the support they require by hiring external experts to provide training and services as needed.

Conclusions

Throughout the course of this project, much has been learnt about the formation and functioning of farmer groups or cooperatives in the Mekong Delta region of Vietnam. The aforementioned guidelines for the five stages — learning, steering, forming, implementing and developing — provide a framework for farmer group/cooperative formation from the experience gained. Each stage encountered its own list of problems, however one concept is clear — in order to maintain commitment and interest in the farmer group/cooperative, farmers must continue to recognise the increased benefits of working together. This required significant support from local institutions and extension staff. In the initial stages, access to ongoing technical training appeared to be sufficient to sustain commitment. In the latter stages, more emphasis was placed on reinforcing farmer group and cooperative principles. This included ongoing management training, helping to create commercial linkages between farmers and traders and beginning to work with both groups to increase understanding of market needs and to introduce basic quality-assurance practices.

Further work will be directed at building the social capital to support the sustainable operation of the cooperatives. This will involve continuing involvement in technical issues, such as training in improved production techniques, but an increasing emphasis on the development of management capabilities is seen as a key aspect of successful scaling-up. The Government of the Socialist Republic of Vietnam recognises that farmer cooperatives can play a key role in rural development. The preliminary success of the fruit growers' cooperatives in Tien Giang and Tra Vinh Provinces has attracted considerable attention within the country and there is mounting pressure for continued progress with the formation and development of further groups. It is essential to learn from the

experience of the existing cooperatives to assist them to survive and prosper. Continued input into the training of government staff and cooperative leaders will be necessary to achieve these ends.

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Fruit and Vegetable Production in Vietnam and the Role of Traders in Marketing

Tran Cong Thang*

Abstract

Over the past 10 years, Vietnam's agricultural production has grown at an average rate of 4.3% per year, one of the highest growth performances of agriculture in the world. Over the next 10 years, the policy emphasis will be on maintaining this high growth rate, while focusing on a more diversified agriculture. The fruits and vegetables subsector might well play an important role, as the potential world demand for these commodities is quite high and Vietnam might have a strong comparative advantage in their production.

The main objective of this paper is to describe the marketing of fruits and vegetables of Vietnam and the main constraints to fruit and vegetable commerce. Production trends in the fruits and vegetables subsector of Vietnam since the 1990s are reviewed, and the role of private traders (including assemblers, wholesalers and retailers) is discussed. At present, about 80% of fruit and vegetable output is sold to wholesalers and assemblers in spot market transactions. The constraints to marketing of fruits and vegetables in Vietnam are discussed. These include inconsistent quality, low per-capita consumption, high transportation costs, poor infrastructure, lack of facilities such as refrigerated vehicles for long-distance trade and cold stores for fresh fruits and vegetables; and especially uncertainty in the export market.

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Who Benefits from Enhanced Management of Agri-Food Supply Chains?

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Abstract

Improved management of agricultural supply chains affects the livelihoods and wellbeing of many different groups of people. Most obviously, it affects the different actors in the chain itself, and especially those most dependent on the produce or product, including producers, traders and processors. It also affects those actors who provide services to the chain, including input suppliers, equipment makers, credit providers, and research and development (R&D) institutions (e.g. extension, information and facilitation services). These effects can be beneficial — improved and/or more secure income, reduced use of pesticides, better food quality — but negative effects can also occur, for example, if some actors are excluded from the improved chains, or if increased market power for some actors results in reduced income for others.

Analysis of the balance of positive and negative outcomes from improving supply chains depends on a consideration of the wider context in which the chains are operating, and especially as regards the:

- rural community within which production occurs, and the impact of improving this supply chain on other agricultural and livelihood activities, and on the natural environment over time
- structure, conduct and performance of the wider market for the produce/products to which the chain adds value, especially considering changes in concentration within the subsector and of market power along vertically integrated chains (e.g. in the case of traders and retailers)
- overall impact on target (urban) consumers (considering food cost, quality and safety, and availability).

Mechanisms for enhancing the benefits that accrue to smallholder producers, including gaining access to specialised markets through alternative trading schemes, are discussed. Examples of strengthening agri-food supply chains in both Asia and Latin America, with which the International Centre for Tropical Agriculture (CIAT) has been involved, are presented to illustrate these issues.

Globalisation, urbanisation and the reduced role of governments in providing services are major trends affecting Asian agriculture. As markets become more important, the agri-food sector is increasingly concentrated (fewer, larger enterprises) and vertically coordinated. This expansion of the role and impact of organised supply chains is occurring internationally, but is also apparent at the national level across the region.

An excellent example and indicator of this is the rapid expansion in the role of supermarkets in Asia.

Supermarkets now account for a 15–20% share of the processed/packaged food market in Southeast Asia and for 30% in East Asia (ex-PR China, including the Philippines). In the People's Republic of China (PR China), the supermarket share of urban food markets grew from 30% in 1999 to 48% in 2001 (Reardon et al. 2003). Supermarkets provide an entry point for foreign investment in national economies of the region, with many national chains now owned by regional or global firms. In 2002, five global retail food chains invested USD120 million in Thailand alone (Jitpleechep 2002).

Over the last 20 years in both the European Union (EU) and United States of America (USA), food supply chains have become both more concentrated, especially at retail level, and vertically coordinated. The end result of this has been to make supermarkets

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the dominant power in these chains, increasingly able to set prices, product quality standards, production and postharvest practices, and terms of sale to food manufacturers and produce suppliers (Hughes 1994). For example, in the United Kingdom (UK), the five major retail chains' recent unanimous and coordinated decision to refuse to stock genetically modified (GM) food products has essentially pre-empted the government's pro-GM crop production strategy, by denying such produce and products access to the only retail market that matters (Morris 2003).

The growth of supermarket power across Asia illustrates the dramatic changes now occurring in the agri-food sector at local and national levels (let alone in global markets). This transformation of food retailing, coupled with increased vertical coordination of their supply chains, will have equally dramatic effects on the production components of these chains. Supermarkets are gaining great power to influence rural commodity and produce markets by the competitive pressures they face to reduce purchase and transaction costs, raising and assuring product quality and safety, and procuring year-round sources of supply. These factors all favour larger-scale producers, as do the adverse terms of trade (payment at 60–90 days) that they are frequently obliged to accept. Some of the mechanisms that retail chains use to achieve their goals are:

- centralisation of chain procurement (distribution centres)
- contracts and supply agreements specifying production and postharvest practices, and providing security over time (i.e. longer-term and more stable transactional relationships)
- logistics efficiency and technology — investments by suppliers for seamless interfaces
- growing use of specialised wholesalers to cut transaction costs and enforce private standards that trend towards international standards
- growth of private standards to harmonise product — as a substitute for absent public standards and for competitive advantage.

The picture across Asia is of increasing development of organised supply chains for agri-food products/produce and a strong drive to improve the performance of those chains along the lines detailed above. More organised and efficient supply chains are not, however, an end in themselves, but a means to enhancing the benefits derived from participation in those chains. Key issues are, thus: who partici-

pates; how the benefits are apportioned among participants; and why this is the case.

Development aims to improve the life and livelihoods of the poor. Agri-food supply chains involve two groups of poor as major participants — rural producers and urban consumers, and other chain actors who may also be poor — processors, farm labourers, and enterprise employees. The impact of the major changes in the agri-food sector on their livelihoods is critical to meeting (or not) global targets for poverty reduction. Implications also exist for environmental development goals.

Who? Actors and Stakeholders

Participants in the chain are those who directly produce, transform, handle or otherwise add value to the produce/products — this includes farmers/producers, processors, assembly agents, traders, wholesalers, transporters and retailers. Relationships between these actors are usually transactional, although not all of them necessarily take title to the goods, but may participate on a commission basis. Consumers can also be considered as participants.

Participants can also be looked at from an 'enterprise' or 'economic organisation' perspective, including informal household micro-enterprises, cooperatives and associations with social as well as economic objectives, and formal enterprises in various scales of operation and legal constitution. At the small scale, 'household' may be synonymous with 'enterprise', although one household can undertake more than one enterprise, especially in rural areas, when seasonal factors are important (e.g. crop-processing seasons).

Other stakeholders in supply chains are those who provide services to the main participants or actors. These can be input suppliers (of fertiliser, seeds and pesticides), credit providers, equipment makers/suppliers, extension services and other providers of technical assistance, marketing services, legal and accounting services, and so on.

A common feature of rural agri-food sector services is that they are often 'embedded', so that, for example, a trader may also provide some inputs, credit and technical assistance, covering the costs of such services through the marketing margin, rather than charging direct fees.

Finally, there are other stakeholders in the process who neither participate directly nor provide services, but whose income, wellbeing or livelihoods are

affected by the performance of the chain, or whose actions impact on the chain participants. Local government is one example — receiving (or not) tax income from participants, and perhaps regulating some aspects of the enterprises involved. The rural community in general is another stakeholder, through (for example) changes in land use, off-farm employment prospects, and the effects of by-products and wastes of any processing.

Figure 1 presents a complex supply chain — or system — found in a root crop, starch-processing

cluster in Dong Lieu, in peri-urban Hanoi, Vietnam. This system contains a number of direct participants (starch processors and traders, producers of added-value products from starch, pig producers using the by-products) as well as some key input and service providers (e.g. equipment makers). Two raw materials (cassava and canna) are used by small, household enterprises and two added-value products (maltose and noodles) made also at household level, as well as a refined starch product that enters several high-value industrial markets (textiles, paper). Starch

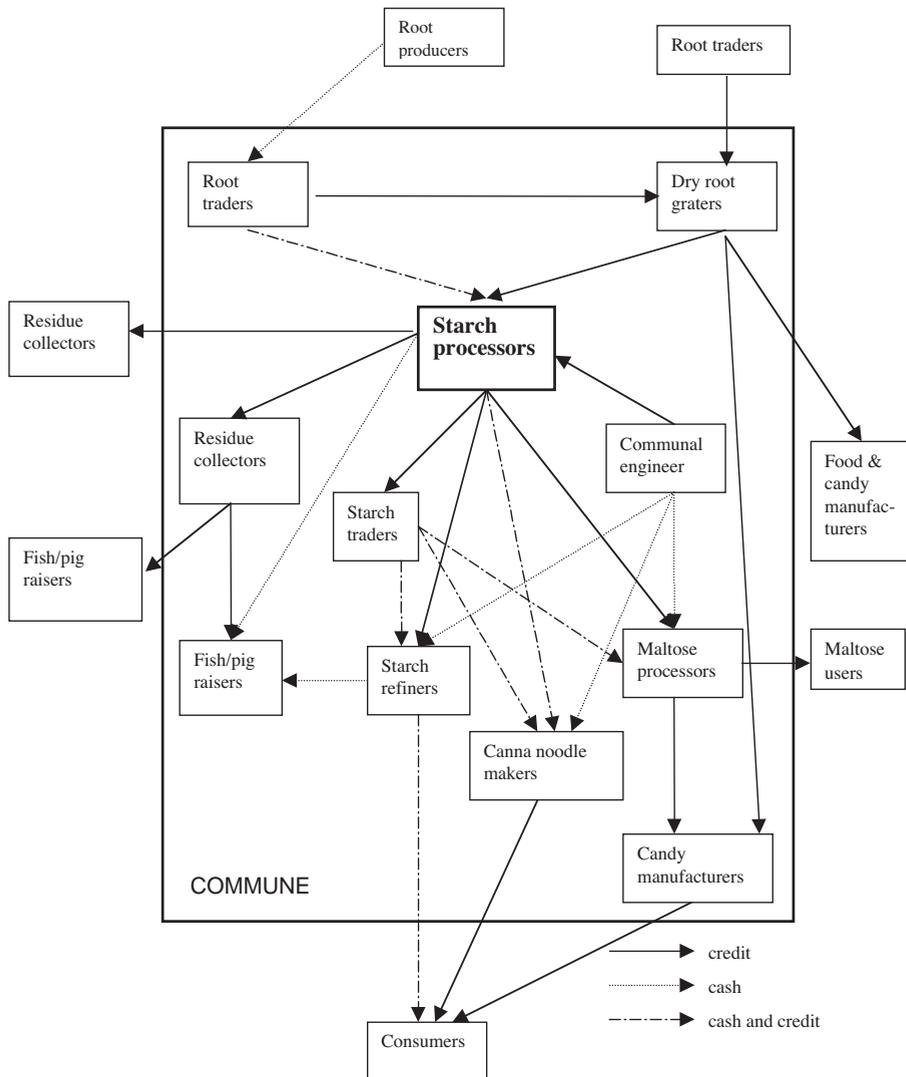


Figure 1. Root-crop starch-processing system in Dong Lieu, Vietnam (Peters et al. 2002).

is also sold to a large-scale starch producer, Vedan, in southern Vietnam, that in turn uses the starch to produce monosodium glutamate (MSG), high fructose syrup (HFS) and other derived products for the food market. The starch system thus supplies both traditional (noodles, maltose) and modern (starch derivatives) food markets.

What? Effects and Outcomes

The effects of improving supply-chain performance need to be identified and evaluated at three levels:

- the supply chain itself
- the market in which the supply chain operates
- the wider society (including rural livelihoods) and the natural environment.

The supply chain

According to Kaplinsky and Morris (2002), an understanding of the 'value chain' involves obtaining information, over time, on:

- gross output and net output (gross output less input costs) values
- physical and human resource flows along the chain
- employment (including disaggregation by gender, ethnicity and skills, as appropriate), sales destination and concentration among buyers, and imports/exports.

Net output can also be considered as the value added, and can be calculated for each stage in the supply chain. The distribution of this added value among the participants in each link of the chain is also crucial — perhaps one trader handles the bulk of the product, for example. Such profits are related to barrier to entry at that stage of the chain — higher barriers lead to less competition and greater profits. Trends over time in volumes, value added and profits of the participants are important.

The market

The market for a particular good may be composed of several distinct supply chains. Over time, this is becoming clearer as vertical coordination increases and each retail outlet is associated with preferred suppliers governed by long-term relationships. If one chain improves its performance through a particular innovation, this can lead to negative consequences for other managed supply chains operating the same market, and for participants who do not form part of

any integrated chain. As vertical coordination spreads though chains operating in a particular market subsector, there is potential for:

- marginalisation of those participants who remain outside the integration process
- relative differences in market share, profits and employment potential among the different chains.

This leads to the topic of industrial organisation, especially the relationships between market structure and conduct (strategic behaviour) and enterprise performance, and the analysis of market power.

Market structure affects competitiveness and market power and can be understood through information obtained on:

- number and size of enterprises in the market, and the market concentration ratio (the proportion of sales, value added, employment etc. due to the largest three, four or five firms)
- social networks between and within enterprises
- degree of product differentiation — something that makes substitution of other products more difficult, and thus increases concentration
- degree of vertical and horizontal integration
- barriers to entry of new firms or chains into the market
- barriers to exit — these are especially important in agriculture and lead to output levels that cause the market equilibrium to fall below the cost of production for many producers. Smallholder coffee production is a good example
- economies of scale and scope (making more than one product from a particular process, e.g. fruit processing) — these greatly influence enterprise size.

Market conduct (or behaviour) is important, especially under conditions of imperfect competition, as occur in vertically coordinated market situations. In such chains, the locus of decision-making in these areas is a key indicator of market power. Market conduct is essentially the balance between competitive and cooperative behaviours:

- competitive behaviours — pricing policies, levels of output, product designs, sales and promotion
- cooperative behaviours — processes of interaction and coordination of policies between competing sellers, influenced by numbers of enterprises in the market, product and cost homogeneity, substitution possibilities, and frequency of orders.

These are both affected by industrial and competition policies and their enforcement.

Market performance, the outcome of structure and conduct, is measured through:

- levels of technical efficiency (processes) and allocative efficiency (inputs, resource use)
- capacity utilisation
- innovation processes and incentives (for cost reduction, product improvement and consumer satisfaction).

This section provides a brief overview of the different aspects of the market for a particular good that may be affected by the operation of a coordinated supply chain. But the impacts of these chains go beyond any specific market to include effects on society and the environment in general.

The wider society and environment

Livelihoods of rural chain participants

In rural areas, the income and other benefits derived from involvement in any particular supply chain (as raw material/produce producer, small processor etc.) frequently constitute one of several components of household livelihood. Other components may be crop production, livestock raising, day labour for other farmers, off-farm employment and so on. Livelihood strategies can also be seasonal; responding to crop harvest and processing times.

In rural Asia, changes in a particular supply chain may impact on other livelihood options. If the chain becomes more competitive and demand for produce and processed products increases, this may increase the need for resources and time dedicated to that supply chain, and thus decrease the potential for deriving benefits from other livelihood options. The inability or unwillingness to forgo these options can also be a constraint to supply-chain growth. Thus, the benefit of improved supply-chain performance at the level of individual participants needs to be evaluated from a holistic livelihoods perspective, rather than just calculating benefits derived from chain participation itself.

An example of this can be found in Dong Lieu. Although root crop starch processing is a major source of livelihood (49% of income), the production of pigs using processing by-product as a feed is almost as important (45% of income). Improving the starch extraction efficiency of the process would enhance the technical efficiency of the starch chain, and hence its performance, but would impact negatively on the pig production system — by reducing the feed value of the by-product that is fed to the pigs.

An improvement of one component of rural livelihoods thus has a potentially negative impact on another equally important source of income. Starch processors have not prioritised improving starch extraction rates as an objective, focusing more on improving process efficiency to reduce time dedicated to the production of starch, and reducing pollution (Peters et al. 2002).

Other impacts on the rural economy and the environment

Supply-chain performance also affects demand for rural services, and thus the income and livelihoods of people who provide them. These backward linkages to such services as input supply (fertiliser, animal feed, technical services, accounting services) serve to stimulate rural employment in general. Increased incomes from direct chain participants and from these service providers can also enter the rural economy through forward linkages, as these people spend their incomes locally on other, unrelated goods and services. The opposite impact, where small producers are marginalised from supply chains as vertical coordination proceeds, will have knock-on effects for the rural economy in general unless other employment or income-generation opportunities emerge to replace them. Migration to urban areas is another option.

Improved chain performance may result in changes in farm practices and land-use patterns that impact on the sustainability of agricultural systems. If enhanced efficiency, as mandated by contractual arrangements, is derived from more intensive production practices, and a greater percentage of land area is devoted to a particular crop/commodity (i.e. replacement of multi- by mono-cropping) the long-term environmental impacts need to be assessed. Equally, if food quality and safety assurance practices control abuses of pesticides, these environmental benefits are positive outcomes that need to be included in any chain analysis.

Added-value processing often results in pollution from wastes and by-products. Improved technical efficiency, scale-up and capital investment may reduce this, and provide opportunities for converting these low-value outputs into raw materials for other value-added products (e.g. animal feed). Both environmental impacts and positive income-generation opportunities should thus be considered.

Urban effects

Market conduct — especially pricing policy and competitive behaviour — will play a great role in determining whether urban consumers benefit from improved supply-chain efficiency, or whether these benefits are captured by chain participants (especially retail chains). The potential certainly exists for urban consumers to benefit greatly from more efficient supply-chain management — production practices, distribution logistics, procurement — in terms of year-round product availability, product price, and also through enhanced product quality and safety. Employment will also be generated through these activities. Indeed, quantitative financial benefits to individual consumers need only be fractional in order to generate very significant benefits for urban populations in general.

However, as concentration advances at the retail level to approach the degree seen in the EU, for example, the potential for anti-competitive arrangements between chains may occur — to capture profits from enhanced efficiency rather than pass them on to consumers through lower prices, especially if competition law is weak or poorly enforced for regional or multinational retail chains.

How? Mechanisms for Enhancing Positive Developmental Outcomes

Current trends in agri-food chains and markets across Asia are tending to marginalise small farmers and processors. The same phenomenon that has already occurred in the EU and USA of increased retailer concentration and market power, combined with vertical coordination of supply chains, is making it difficult for small-scale actors to remain major participants in these chains. Supply-chain improvements run the risk of benefiting mainly urban retail chains and their rural agents, together (under favourable competitive market conditions) with urban consumers, rather than rural producers and processors. This is true for chains focused on both national and international markets.

Is this process largely inevitable? Are there any mechanisms that will enable small-scale chain participants to maintain or increase their level of activity in such chains as they develop over time?

This section will review some options, based on different levels of intervention:

- macro or policy level
- meso or institutional level
- micro or individual enterprise/household level.

Policy level

Since this meeting discussed policy in another session, this paper highlights the importance of industrial and competition (anti-trust) policy in ensuring a truly competitive market that limits the potential of chain participants with market power to capture excessive rent to the detriment of other chain participants and wider society.

Other relevant policies are:

- credit policy, especially for capital investment by small-scale enterprises — the lack of collateral and formal legal status can be a major barrier to investment and upgrading of equipment and practices
- trade policy — especially subsidies and tariffs for particular subsectors and products that can distort rational decision-making
- research and development (R&D) policy, especially the degree to which public-sector agencies align their priorities with the small-scale agricultural sector, and understand the need to re-orient both their clients and their own organisation towards market-based decision-making and priority-setting
- food safety and quality standards and regulations.

Institutional level

Organisational innovation is critical for rural producers and processors, aiming to reduce transaction costs involved in linking with vertically integrated supply chains. This involves community-level planning for production (volumes and year-round supply) and negotiation of contractual agreements with other chain actors. Benefits can also be found for the organised supply of inputs and other services (veterinary, technical assistance). Traditionally, farmer cooperatives have attempted, with mixed success, to accomplish these tasks. Another approach, using informal intermediaries (traders) with such experience, is another option and may be especially valuable if the intermediary also comes from the same rural community, so that trust is easier to establish.

Micro level

Another alternative is to prioritise and develop supply chains that do not link to concentrated retail markets, for example, to high-value, speciality products that depend more on quality than price. However, this involves investment in product differentiation and marketing that is usually beyond the capacity of rural organisations. Such services will need to be contracted in, or the capacity for them developed in-house. A variation of this is to develop markets that value the quality or other attributes of produce/products from a specific region (following the French concept of *terroir*). It also helps to focus on crops and products that, through their inherent production characteristics, are not amenable to economies of scale, e.g. where skilled labour requirements are high.

The process of deciding which supply chains to develop, from the perspective of a rural community, is one that needs much thought. It is easy to rush into new, market-based activities, only to find the market saturated because others are doing the same. Time spent in selecting the best options for any given community — taking market, farmer and environmental criteria into account — is a good investment. Methodologies for this exist (e.g. Ostertag 1999).

Alternative trade supply chains

Alternative trade markets have potential to benefit small-scale producers. Three types of alternative trade markets exist — organic, ethical and fair trade.

Fair trade

The following definition was agreed by the Fair-trade Labelling Organizations International (FLO International), the International Federation for Fair Trade (IFAT) and the European Fair Trade Association (EFTA). Fair trade is an alternative approach to conventional international trade. It is a trading partnership which aims at sustainable development for excluded and disadvantaged producers. It seeks to do this by providing better trading conditions, by awareness raising and by campaigning.

Fair-trade goals are to:

- improve livelihoods and wellbeing of producers by enhancing market access, producer organisations, paying a better price, and providing continuity to the trading relationship

- promote development opportunities for the disadvantaged (women, indigenous peoples) and protect children from exploitation
- raise consumer awareness
- set an example of trade partnerships
- campaign for trade rule and practice changes
- protect human rights.

Fair-trade schemes are the most attractive to small-scale producers/processors since scale and direct participation of the poor is one essential criterion for accessing these markets. Fair trade differs from standard trade in five principal ways (Traidcraft 2003). As an organisation committed to fair trade, Traidcraft focuses on:

- trading with poor and marginalised producer groups, helping them to develop skills and sustainable livelihoods through the trading relationships
- paying fair prices that cover the full cost of production and enable a living wage and other fair rewards to be earned by producers
- providing credit when needed to allow orders to be fulfilled and paying premiums to be used to provide further benefits to producer communities
- encouraging the fair treatment of all workers, and ensuring good conditions in the workplace and throughout the supply chain
- aiming to build up long-term relationships, rather than looking for short-term commercial advantage.

CafeDirect is the most frequently cited example, and is now the sixth largest brand of coffee in the UK. In total, sales of fair-trade agri-produce — coffee, bananas, tea, chocolate, fruit juice, cocoa, and honey sourced from around 0.5 million producers in the topics — exceeded USD70 million in the UK in 2001. A similar number of producers is now linked to fair-trade coffee markets internationally (Traidcraft 2003). Key fair-trade food products can be identified by the Fairtrade logo on their packaging. Accessing these markets thus requires certification and contacts with relevant organisations. Product quality is increasingly important. Thus, while fair trade is still only a very small proportion of the total agri-food market, it shows high rates of growth (24% in the UK in 2001–2002) and makes a difference to the livelihoods of millions of disadvantaged producers around the world. One point of note — in Asia, Traidcraft's producer partnerships are almost entirely in the small artisan and handicraft sector, not agriculture.

Ethical trade

Ethical trade is complementary to fair trade, and involves working with mainstream corporate firms, including multinationals, to ensure that they apply best practice in their relationships with suppliers, especially as regards labour law, e.g. exploitation of children, paying a living wage, rights to union membership and so on. The International Labour Organization (ILO) is important in setting these standards. Consumer pressure has been a major factor in driving compliance with these standards.

Organic supply chains

While fair trade is still a niche market, organic products are a USD20 billion segment of the global agri-food market, and are heading towards a 5% share of total sales in major developed countries, with 5–10% annual growth rates (Yussefi and Willer 2003) and a trend for the product range to expand from fresh to processed, added-value products. Fifteen per cent of this market is based on internationally traded goods and produce. The Japanese market alone is over USD3 billion/year. Other major markets in Asia are Taiwan, Hong Kong and Singapore, with rapid development also occurring in major urban centres of other countries. In Thailand, the organic market reportedly grew by 60% in 2001 (FAO 2002). A specific feature in some countries (Malaysia, Philippines, India) is the role of international supermarket chains in pushing the development of the organic sector (Yussefi and Willer 2003).

The Food and Agriculture Organization of the United Nations/World Health Organization (FAO/WHO) Codex Alimentarius Commission Committee on Food Labelling has proposed *Draft guidelines for the production, processing, labelling and marketing of organically produced foods*. According to their definition, “organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system.” This definition goes further than simply eliminating use of artificial pesticides and fertilisers, to encom-

pass issues relating to system sustainability, biodiversity, soil health etc.

From small beginnings, organic produce and products are now undergoing ‘mainstreaming’ into many international markets. As organic products progress from niche to mainstream supply chains, price premiums are falling and the scale of production is increasing. Thus, ‘organic agribusiness’ — which maintains the pesticide and chemical fertiliser-free status (and certification) while defaulting on the other, sustainable-systems aspects of organics (e.g. using monocrops, not multi-cropping) — has developed. Large-scale production of organic produce is thus a reality, and pesticide and fertiliser-free agriculture is no longer an area in which small farmers have advantages, except insofar as other sustainable production criteria are valued in the marketplace.

Two possible entry points exist for the development of organic agriculture in Asia, according to FAO (2002):

- input-intensive production systems, where yield has reached a plateau and environmental damage from excessive application of fertilisers and pesticides is apparent
- resource-poor smallholders, who have never used artificial fertilisers or pesticides (organic by poverty), making the transition to organic certification faster and lower-cost than for other producers, and offering potential for over 200% yield increases.

The latter of these two situations should provide real incentives for supply chains actively seeking to procure organic produce to invest in developing a relationship with these small-scale producers, but only if they:

- can be organised, to reduce the transaction costs of maintaining a commercial relationship
- produce reliable, good-quality produce — something that requires support services to provide technical assistance, credit and so on.

Certification costs are a major constraint for these small-scale producers. These costs can be reduced by development of group schemes that divide the cost among members of associations, and also by appropriate local (low-cost) certification services that are affiliated with and recognised by international bodies. This latter option has made progress in Thailand, for example (Organic Agriculture Certification Thailand), but not yet in the Philippines.

Scope for small-scale production of organic produce also exists in:

- local markets, usually not requiring certification
- high-value outlets in major urban centres (e.g. restaurants, high-income sector box schemes)
- supply chains that combine fair-trade and organic-production entry criteria.

Methodology

The methodology through which interventions are made to enhance chain innovation is important. At the International Centre for Tropical Agriculture (CIAT; Centro Internacional de Agricultura Tropical), the starting point is not a particular chain, but the rural community for which benefits are sought. ‘Working groups’ are formed in each community, comprising local organisations (e.g. government, non-governmental organisations (NGOs), farmers’ organisations) interested in agro-enterprise development. These groups take responsibility for facilitating change at the local level. The first joint activity is selecting the best options for supply-chain development — a process that combines market information and contacts, producer preferences and environmental criteria. Once a ‘basket of options’ has been identified, supply-chain development can proceed for each one.

Processes that are genuinely participatory, involving all chain actors, will allow scope for innovations that are relevant for smaller-scale rural actors. All participants can identify critical points in the chain where problems (or opportunities) are located, and use this information to generate solutions. Building trust among chain participants and good communication are critical. Traditional supply chains are usually characterised by very limited communication among actors in different links of the chain — something that results in misunderstandings and mistrust. This process can therefore benefit from neutral facilitation. The solutions generated through this process can translate into ‘projects’ that chain participants can themselves implement, with external assistance as needed, to improve the chain. These may be technology, organisation or investment related. This process also requires detailed information on the chain (chain mapping) as a basis for identifying critical points and solutions, which can be obtained in two ways:

- through formal surveys, by external agents — the information is analysed and presented to chain actors

- through group participatory exercises. Different types of actors can generate one map together, or separate maps can be produced by (for example) producers and traders — this approach allows each party to see the chain as perceived by others.

More information on these methodologies, together with detailed examples from Latin America and Southeast Asia, are given in the companion paper that was presented at the 21st ASEAN/3rd APEC Seminar on Postharvest Technology (Wheatley et al. 2003), and can also be obtained from the CIAT Agroenterprise Project (see <www.ciat.cgiar.org>).

Examples

These approaches to supply-chain improvement have been used by CIAT’s Agroenterprise Project, mainly in Latin America, but more recently in Southeast Asia. One example from Latin America (Yorito, Honduras) and one from Asia (Dong Lieu, Vietnam) are briefly presented here. In addition, during the recent Rural Agro-enterprise Development Training Course (CIAT-PHTI-SEARCA-UPWARD, April 2003) in Ho Chi Minh City, the participants were given an opportunity to trial the methodology during a two-day field visit to agri-food supply chains in Ninh Thuan Province. They were divided into three groups to focus on different chains (grapes, sheep and goats, and cotton), with the production component of each chain based in a different district. During this exercise, participants interacted with chain actors (producers, processors, traders etc.) and support services and agencies (including local government). Basic chain mapping was undertaken (from the perspective of different actors, in most cases), critical points were identified, and solutions to the problems developed with the chain participants. From this an action plan was developed, that involved:

- research and development
- short-, medium- and long-term actions
- actions that can be implemented using local resources and cooperation between chain members, plus those requiring external assistance.

Yorito, Honduras

In Yorito, where CIAT works with a local consortium of farmer organisations (CLODEST), the coffee supply chain was prioritised for attention, based on the potential to develop niche and alternative markets for a high-quality product. The existing chain was mapped using participatory methods that involved

producers and processors in one rural community. Based on this, critical points were identified, and communication between chain members increased (especially between the producer association and traders).

One short-term outcome of this was a negotiation with existing traders of higher prices for coffee beans. A medium-term outcome was the decision by the farmers' association to seek organic certification for its members (about 45 households). This was obtained in early 2003. As a result, the main local trader is now interested in working with the group to access high-value markets, in which he will not only provide marketing services, but also technical assistance and credit for capital investments needed to improve and standardise quality. No formal 'project' exists to achieve this, but it is nonetheless an outcome of a process that improved communication and trust between producers and the trader.

Dong Lieu, Vietnam

In Dong Lieu, a formal survey of the starch cluster of enterprises was made in 2002. This involved interviews with representative samples of all the different types of chain participants (Peters et al. 2002). Analysis of these results indicated a number of critical problems related to space limitations, disorganisation of procurement, and pollution. These were presented to a meeting of all the enterprises, together with local authorities. From this, the idea emerged to organise a study tour of a larger-scale root-crop starch cluster in southern Vietnam. Representatives selected for this mission were a processor, an equipment maker and a local government official. The visit was highly successful. The group reported back to the community in Dong Lieu, and a strategy for the development of the whole cluster has now been developed, based on practical solutions to the problems identified earlier. These solutions are basically organisational in nature, and involve re-ordering the territorial layout of the fresh root market in relation to individual processing households, and of the arrangement of processing operations at the household level, to reduce space limitations and improve waste and by-product management. Equipment modifications are also in process. A further study tour to China is also planned. One lesson learned from this participatory process is that identification of key actors (change agents) within the supply chain is critical. In this case, through working with a few individual equipment makers and traders (who themselves are not

among the poor), it has been possible to facilitate the introduction of innovations (identified by participants, not experts) that can potentially benefit hundreds of poor processing households and (through linkages to crop production) thousands of cassava and canna producers.

Conclusions

While current trends in the agri-food sector are not favourable for the sustainable development of the Asian small farm sector in general, several options exist that can counteract this, including policy development, institutional innovations, and expansion of participation in alternative trade supply chains.

A clear understanding of supply chains is needed, including who participates and is affected by them, how the economic and other benefits and costs of participation are apportioned among these actors, and how chain development affects other livelihood activities and the wider environment.

Participatory methods that allow the perceptions of different actors to emerge, and that facilitate communication, information exchange and building of trust (social capital) among chain members are essential for smallholder farmers to integrate equitably into these more managed supply chains.

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Farmers' Misconceptions about Quality and Customers' Preferences: Contributing Inefficiencies to the Vegetable Supply Chain in Southern Mindanao

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Abstract

A supply-chain framework encourages producers to ensure that their downstream customers are happy and satisfied. A study to determine vegetable growers' perceptions of vegetable quality and customer preferences was undertaken in Kapatagan, Digos City in southern Mindanao in the Philippines. Results revealed misconceptions about the nature of the demand for their products, reflecting the low farmers' awareness of their market's needs and putting these farmers at a disadvantage. Their divergent, often erroneous, ideas and concepts about vegetable quality and the market contributed to waste and inefficiency in the supply chain.

Correct information, a vital factor in maintaining balance and efficiency along the chain, is a rare privilege for the Kapatagan farmers. They do not have direct and valid information about market preferences and rely on the information provided to them by intermediaries in the chain. Generally price-takers, farmers produce on the basis of current availability of inputs and not on market demand. They are generally unaware of the characteristics of the market for temperate vegetables.

This paper discusses farmers' perceptions of vegetable quality and customers' preferences regarding attributes of quality vegetables, such as variety, size and shape, colour, taste, shelf life, and freedom from pests, diseases, physical damage and defects.

This study is a part of a research project which aims to understand the systems that small farmers in southern Mindanao employ to produce and market selected temperate fresh vegetables and which aims

to examine the efficiency of the agribusiness supply chain. There are numerous factors affecting the efficiency of the agribusiness supply chain for temperate vegetables, and this paper discusses only the extent to which farmers know (or do not know) their customers' preferences regarding the desired quality attributes for fresh vegetables. The differences in the perceptions of the farmers and their customers help to explain why farmers are not able to optimise the return from their produce. This paper also discusses perceptions of the farmers and their marketing intermediaries on the attributes of quality vegetables.

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Customers' perceptions of the quality of a product or service and their overall satisfaction have some observable indicators. The terms *customer satisfaction* and *perception of quality* are labels used to summarise a set of observable actions related to the product and/or service (Govindasamy 1997).

Opara (1999) defined quality of agricultural products, as "involving all of the attributes, characteristics, and features of a product that the buyer, purchaser, consumer, or user expects", and stated that quality assurance "involves those planned activities designed to consistently satisfy customer expectations by defining objectives, planning activities, and controlling variability".

One popular view is that quality is intangible, similar to truth, beauty, and goodness (Burrill and Ledolter 1999). It is also seen as a 'feature of excellence' or an ideal (Saunders 1997; APICS Dictionary; Burrill and Ledolter 1999). On the other hand, quality is seen as a combination of characteristics that are critical in establishing a product's consumer acceptability, including fitness of use, freedom from deficiencies and provision of satisfaction (Satin 1997; Saunders 1997; Juran and Gryna 1998, cited in Saunders 1997; APICS Dictionary, cited in Fredendall and Hill 2001).

The food industry defines quality as an integrated measure of purity, flavour, texture, colour, appearance, and workmanship (Satin 1997). This is an idea similar to total quality. "The concept of total quality, however, widens attention to include all aspects of the offering, including service and delivery time" (Saunders 1997, p. 187).

Marketers define quality as value or a consumer's perception of the worth of the product in relation to price (Satin 1997; Saunders 1997, pp. 184–187; APICS Dictionary, cited in Fredendall and Hill 2001). Quality also refers to a product's consistent adherence or conformance to a standard, specification or requirement (Satin 1997; Saunders 1997; Crosby 1979, cited in Burrill and Ledolter 1999; Fredendall and Hill 2001).

Collins (1994) believed that there are contradictory perceptions of quality due to differences in background and training. Hill and Chung (1995) stressed that a person's concept of quality depends on her/his approach to that understanding.

The differences in perceptions of quality between farmers and their marketing intermediaries contribute to market inefficiency. In southern Mindanao, market orientation among vegetable growers still

needs to be developed in order for the marketing system to become more responsive to customers' needs. Market efficiency includes the aspects of quality, quantity and price of goods and the cost of performing marketing functions. Although efforts have been made to promote market-orientated approaches to production, to enhance markets and marketing activities and to provide policy support, problems with efficiency, such as high production losses and product rejects still persist in developing countries like the Philippines (Masajo-Manalili 2000).

Methodology

Data for this paper came from a research project¹ funded by the Australian Centre for International Agricultural Research (ACIAR) and various data gathering methods were used. In Kapatagan, Digos City, southern Mindanao, key informants were interviewed, focus group discussions were conducted among farmers, agents, and storage operators, and surveys of households were undertaken using purposive sampling methods. There were three sets of interview schedules prepared for the household survey: crop production, social organisation and marketing. The majority of the data used for this paper came from the marketing survey. A total of 207 households were interviewed, accounting for 12.2% of the total households in Kapatagan.

Meanwhile, a downstream survey was conducted based on the names of the buyers mentioned by the farmers in the household survey. There were 47 respondents interviewed. Additional information from other players in the vegetable supply chain was taken from interviews with farmers from other temperate vegetable areas in southern Mindanao, central Mindanao, and northern Mindanao. Wholesalers from Divisoria, the largest wholesale market in Metro Manila, were also interviewed, as well as supermarket representatives in Davao City and Metro Manila.

¹ ASEM/2000/101: "Improving the Efficiency of the Agribusiness Supply Chain and Quality Management for Small Agricultural Producers in Mindanao."

The Project Site

*Barangay*² Kapatagan was created on 10 May 1971 under Republic Act No. 6210, despite the fact that it was declared as a National Park in 1932 by the Commonwealth Government. Logging operations started in the 1960s and continued to proliferate. When the logging workers started bringing their families, settlement areas were established. After the logging companies ceased operations, some of the workers remained. They started utilising the area for agricultural purposes, particularly for coffee plantations. Residents from nearby towns started coming because of the promise of fertile, productive and vast lands in Kapatagan. Modes of transportation both for the people and the products include horses, motorcycles, jeepneys, tricycles, trucks, and L300 vans.

As of January 2002, the total population of Kapatagan was 8193 with 1694 households. Most of the constituents were farmers (80%), while others were businessmen (15%), and professionals (5%).

The name *Kapatagan* means 'plains' or 'flat lands'. However, its topography ranges from level to gently sloping terrain (0% to 8%), strongly sloping (18% to 20%) and hilly areas (30% to 50%). The level terrain is in the centre of the *Barangay*. According to the *Barangay* records, its land use as of 2001 was 2500 ha or 37.45% of its 6675 ha total land area. It lies at the foot of Mt Apo³ at an elevation of around 1100–1600 m above sea level.

The climate is cool at 22–25°C, with no pronounced maximum rain period or long dry season. The prevalent wind direction is north-east to south-west throughout the year (Mercado et al. 2000). It is safe from typhoons because it lies outside the typhoon belt and is further protected by its mountainous borders.

Kapatagan is an ideal place for planting temperate vegetables (cabbage, tomato, bell pepper, Chinese cabbage, Kentucky bean, carrot), coffee, root crops and other agricultural products. Table 1 shows the primary crops planted by Kapatagan farmers in the first quarter of 2002. Most farmers in Kapatagan (38.2%) planted cabbages. Tomatoes (16.9%) and potatoes (16.4%) follow as the next most-planted crops in the area. Other crops planted in 2002 were

chayote, bell pepper, onion and eggplant. Generally, farmers from Kapatagan believed that cabbage was the most saleable vegetable in retail. While 31% tried to sell directly to retail markets, only 5% continued to do so. The rest sold through agents and wholesalers. The farmers, locally known as planters, brought their products from their farms or 'gardens' to the Trading Post, through the *karyador*.⁴ Marketing was done through the *ahente* or agent who received the produce from the farmers at the Trading Post in Kapatagan. Then the *ahente* passed on the produce to the wholesale buyers with a PHP1–2 per kilogram profit margin. Buyers mostly decided the price, while farmers were generally price-takers. In some cases, buyers pre-ordered some vegetables through the agents, who obtained the supply from various farms. Negotiations for the price took place during the day. Most of the vegetables were sold wholesale within a day, particularly in the morning. There were also owners and operators of *bodegas* or storage areas who bought the vegetables, especially potatoes and carrots.

Table 1. Primary crops planted in Kapatagan.

Crop	No. of farmers planting	Percentage
Cabbage	79	38.2
Tomato	35	16.9
Potato	34	16.4
Carrot	27	13.0
Chinese cabbage	11	5.3
Kentucky bean	6	2.9
Other	15	7.2
Total	207	100

Source: Survey of Kapatagan farmers, 2002.

Vegetables were marketed mainly to the surrounding cities, including Digos City, Kidapawan City, Cotabato City and Davao City. Other Mindanao buyers came from Cagayan de Oro City and Surigao and Agusan provinces. There were also some buyers from the Visayas, such as Tacloban City, Iloilo City and Cebu City.

Most transactions happened during the market days: Monday, Thursday, Saturday (Kidapawan City, Cotabato City, Surigao City, Tacloban City, Iloilo City, Cebu City etc.); every day for Davao City and Digos City.

² Village; the lowest local government unit in the Philippines.

³ Mt Apo is the highest peak in the Philippines with an elevation of 2954 m (9691 feet) above sea level.

⁴ People who transport vegetables on horses' backs.

Some Issues in the Kapatagan Supply Chain

Several issues became apparent in the Kapatagan supply chain. First, the sustainability of farms in Kapatagan was seriously challenged because of insecure land ownership. Farmers paid taxes on the use of the land but did not have title to the land because Kapatagan is part of a national park. Different government agencies had different ideas of whether the farmers should stay or not.

Second, the production of quality vegetables begins with the agronomic practices of the farmers. In Kapatagan, traditional farming was used and farmers generally had poor agronomic practices, basically because of a lack of technical knowledge or lack of finance for the proper farm inputs.

Third, farmers had very little market knowledge and relied mostly on what their *ahentes* or immediate buyers said about the market. Most of them saw their market as the person who took the goods off their hands, and rarely looked beyond this buyer.

Fourth, farmers were generally price-takers. They produced based on current availability of inputs and not on market demand. Since they did not have any storage or sophisticated postharvest facilities, especially for the leafy vegetables, they disposed of their products at any available price.

Fifth, Kapatagan had very poor road conditions and rough terrain. Until 2002, many of the roads leading to the farms were unpaved. *Barangay* Kapatagan received access to electricity only in 2000. Residents had no access to irrigation on the farms, nor plumbing in their homes.

Sixth, different stakeholders in the supply chain did not see each other as partners but as persons who need to be watched. While there was some degree of trust among several farmers and their buyers, other farmers felt that the traders may not be giving them the right price information (Batt et al. 2003).

These issues are typical in traditional supply chains of agricultural products in developing countries. Supply chains in developed economies are demand-driven, with ultimate consumers seeking benefits such as health and nutrition, safety, quality and convenience. In developing countries, traditional chains dominate, driven by traders who act as financiers for farmers at the same time. Examples of these are goods delivered to wet markets by *viajeros* (travellers). However, some chains in developing countries have begun to improve — brought about by

increasing urbanisation, globalisation, changing consumer preferences, and agribusiness consolidation. Examples of these are the exports of banana and tuna and some agribusiness ventures catering to the fast-food market.

Non-traditional vegetable supply chains in northern Mindanao supply the high-end market (high quality, high price). These are managed chains where small farm holders collaborate through marketing clusters.

To help improve the Kapatagan supply chain for temperate vegetables, members of the chain need to be market-oriented. This market orientation will lead to greater efficiency in response to customer preferences and lead to more competitiveness.

To begin to be market-oriented, farmers need to know what their customers want. In this study, farmers' perceptions of their customers' preferences or quality criteria are examined and compared with what their customers actually say they want.

Findings and Discussion

Desired attributes of vegetables according to farmers

Attributes to define quality in vegetables used in the survey came from the farmers themselves during the initial visits to the village. In preliminary face-to-face interviews with the farmers, they were asked to describe, in their own words and language, what quality in vegetables meant. Some would simply describe features of vegetables in general, while others would first state what vegetable they would like to describe. Those who proceeded to describe without qualifying the vegetable would give general comments like 'that which is not rotten' (*kanang dili lata*), or 'that which has a few worms'. These initial descriptions gave us a general sense of the level of quality awareness of the farmers of Kapatagan. They were primarily concerned only with wilting or freshness and pest infestation of vegetables.

Farmers described the vegetables they grew using descriptors in the vernacular and these descriptors were translated into English. Other attributes from secondary materials that define vegetable quality were added to the list. This list of attributes was used in the survey. Eleven attributes were used: shape, size, weight, maturity, colour, freedom from pests, no or little physical defect, no or little mechanical injury, cleanliness, freshness, and firmness. Farmers were

asked to rank the 11 attributes of quality in vegetables according to the order of importance, 1 being the most important and 11 the least important.

The attributes of vegetables that were important from the perspective of the farmers were those over which they had some degree of control, like maturity at harvest and freedom from pests (Table 2). The farmers decided when to harvest their crops and controlled the quality of their produce by preventing insect infestation through proper cultural practices. Maturity referred to the appropriateness of the maturity of the product at the time of harvest (Lizada 2000). This seemed to be an important quality attribute for the farmers for almost all the crops.

Table 2. Farmer rankings of desired attributes of vegetables (where 1 = most important and 11 = least important).

Attribute	Mean	Standard deviation
Shape	6.06	0.51
Size	5.34	0.76
Weight	5.78	1.01
Maturity	4.54	0.82
Colour	6.49	1.41
Freedom from pests	5.03	0.69
No or little physical defect	6.03	1.08
No or little mechanical injury	6.81	0.70
Cleanliness	5.35	0.98
Freshness	5.75	0.63
Firmness	6.45	0.89

Source: Survey of Kapatagan farmers, 2002.

There were also respondents who said that quality vegetables were those that were free of pests and diseases. During the in-depth interviews with farmers, some noted that vegetables with a few insects were of good quality. Farmers referred to the vegetables as *naay ulod* (with worms — since the insects were observed in the larval stage) and *tung naay buslot* (those with holes) for leafy vegetables. They explained that the presence of these insects was proof of food safety. If an insect survived, the vegetable was perceived to be free from chemicals. These farmers, however, clarified that there must only be one or two of such pests in each head of cabbage or lettuce. Beyond that, it was considered an infestation.

Size and cleanliness of the produce affected the price they received for their produce, hence farmers tended to give these quality attributes higher rank-

ings. Cleanliness meant that the vegetable was free from any dirt or stains. In the survey, most of the farmers who planted cabbages and carrots said these two vegetables should be clean to be of good quality.

Farmers gave very low ranks to attributes like no or little mechanical injury, especially for crops like carrot and Chinese cabbage. Mechanical injuries were those caused by careless handling, packaging or storage, such as damage caused by impact, pressure or compression, or vibration. This damage appeared as abrasions (especially in potatoes and tomatoes) bruising, distortions, cracks, cuts, punctures, skin breaks, skinning, or splitting (Lizada 1993). Many of the farmers did not give this quality attribute a high ranking. This may be due to the fact that the farm-to-market roads from Kapatagan to the retail markets were very bad and farmers felt powerless to prevent the mechanical damage.

There was a standard practice in Kapatagan of deducting 30% from the volume weight of leafy vegetables to allow risk and shrinkage, locally known as *reseko*. Shrinkage and other forms of mechanical injury affected the quality of leafy vegetables.

In Kapatagan, vegetables were packed in pink sacks, except for tomatoes, which were packed in crates. The sacks did not provide any protection against mechanical injuries, but did allow flexibility in the amount of produce tightly packed in. While packaging in sacks induced more mechanical damage, farmers were paid by the weight and size of the produce as well as the physical appearance. Farmers apparently did not perceive mechanical injuries during harvest or transit as variables affecting vegetable quality.

Overall, farmers in Kapatagan believed that quality was reflected in the physical appearance of vegetables. In an interview with a farmer from Marilog, another village in southern Mindanao, he believed that high-quality tomatoes should be good to look at — large and shiny. The emphasis on the physical characteristics of vegetables was the same for Marilog as it was in Kapatagan. The Marilog farmer also believed that cabbages and other leafy vegetables like lettuce should not be completely free of pests. The visibility of a few pests, he said, was proof that the vegetable had just the appropriate amount of chemicals.

Very few farmers in Kapatagan mentioned the nutritional content (salubrity) of their crops as a descriptor of quality. Most of their definitions of the quality of their produce rested on the physical char-

acteristics of the product — something that could be validated with their eyes, like shape and size. Taste was also mentioned only after some prodding. While some farmers related quality to price, this construct did not become part of the definitions that the farmers used to define quality.

Desired attributes of vegetables according to downstream customers

There were 47 respondents who came from the list of buyers identified by the farmers during the household survey. Most of these buyers were 20–59 years old. Around 23% belonged to 35–39 age group, while 2% belonged to 55–59 age group, and 44.7% of the respondents came from Kapatagan. Other buyers were from Davao City (21.3%), Tagum City (17.0%), Digos City (8.5%), Dujali (2.1%), General Santos City (4.3%) and Panabo (2.1%). Almost half of the respondents (46.9%) were wholesalers, while others were farmers (8.5%), farmer-agents (4.3%), agents (2.1%), retailers (34%) or food service suppliers (2.1%). The majority of the respondents (83%) primarily bought their produce from Kapatagan.

The downstream customers were asked to rank the importance of 21 criteria in their decision to purchase vegetables on a scale of 1 to 4 — where 1 was ‘not at all important’ and 4 was ‘very important’.

Table 3 shows that the respondents were unanimous in ranking freshness, good taste, and cooking characteristics as very important quality attributes in choosing which vegetables to purchase. This is consistent with what the farmers perceived the ultimate customers would want — freshness and good taste. However, while farmers believed that customers want well-graded vegetables, the downstream customers themselves did not assign this much importance.

Desired quantity and colour tied in second place with mean score of 3.98. Since the respondents also sold the products they bought, it was important for them to have enough in quantity to supply the demands of their downstream buyers. A good-coloured vegetable was also an indication of a visually appealing, fresh and saleable vegetable. Likewise, the immediate delivery of the products was considered to be more important than physical characteristics (size, shape, freedom from pests, freedom from physical and mechanical injury). The farmers did not mention this attribute during the in-depth interviews.

Farmers were not aware that on-time delivery is a quality consideration of the downstream customers.

Table 3. Desired attributes of vegetables as perceived by downstream customers.

Attribute	Mean	Standard deviation
Freshness	4	0
Good taste	4	0
Cooking characteristics	4	0
Desired quantity	3.98	0.15
Good colour	3.98	0.15
Well packed	3.95	0.21
Competitive price	3.95	0.31
Attractive, good-looking produce	3.93	0.26
Immediate delivery	3.91	0.29
Firm	3.91	0.48
Good size	3.86	0.41
Good shape	3.86	0.52
Well-graded	3.86	0.64
Freedom from pest/disease damage	3.84	0.53
Product that stores well	3.81	0.55
Desired variety	3.79	0.71
Freedom from chemical residues	3.73	0.77
Freedom from physical injury	3.71	0.72
Assortment of produce	3.70	0.71
Free of soil	3.59	0.92
Freedom from mechanical injury	3.66	0.73

Source: Survey of market intermediaries, southern Mindanao, 2002.

Downstream customers gave importance to competitive price but the farmers did not perceive this as important to the ultimate customers. Filipino consumers are price-sensitive (Agbayani et al. 2000) but the farmers are not aware of this.

Comparison of farmers’ responses with those of their customers

Table 4 shows the responses of the farmers and downstream buyers using 13 attributes. The farmers were asked to rank, on a scale of 1 to 6, what they think their customers want where 1 is ‘not at all important’ and 6 is ‘very important’. On the other hand, the downstream buyers used a scale of 1 to 4, where 4 is ‘very important’ to rank what they want. Since the farmers and downstream buyers used different scales, the lowest common denominator (6)

was derived and the responses were recomputed to have a standard measure.

The corresponding ranks and standard deviation were included to illustrate the different degrees of importance given by the farmers and downstream buyers. Although both the farmers and the buyers ranked freshness of produce as the most important criteria, all other attributes have different and opposite rankings. Using rank correlation coefficient calculations, the computed rank correlation was less than the critical value of $\alpha = 0.01$. Thus, the ranking of the responses of the farmers was significantly different from what their customers say they want.

The second and third most important attributes for the farmers were the proper grading of the produce and having the desired size(s), respectively, while together these were only the sixth most important for the buyers. The second most important attribute for the buyers was having produce available in the quantities required. Unlike farmers who only transact downstream, the buyers have to transact with upstream (farmers, traders) and downstream (retailers, wholesalers, institutions) customers, so they must have enough volume of products to maintain their business arrangements.

Meanwhile, farmers thought that having a wide range of produce of the desired variety was very important for their customers. However, the down-

stream buyers ranked this attribute much lower, therefore assigning it less importance.

The farmers put least importance on providing produce that is competitively priced. However, the customers considered it to be the third most important attribute. The farmers are more concerned with easy and early disposal of their products, since they lack facilities for postharvest storage. The faster it can be sold, the lesser the problem with wastage. However, the farmers will complain later that they got a low price for their products. Customers, on the other hand, have to set a lower price for the products since they will sell these products to their downstream buyers and they must get profit from this transaction.

Farmers and their customers seem to be emphasizing different aspects of vegetable quality. Farmers have several misconceptions about what their market wants, as manifested in Table 4, exhibiting their lack of market awareness. There is a need to coordinate farmer and customer product specifications so that there is increased efficiency in the chain.

Summary

The gap in perceptions of the farmers and the downstream customers was manifested in the results presented. The farmers defined quality according to the physical and biological characteristics of the vegeta-

Table 4. Comparison of the responses of farmers and downstream buyers to perceived importance of vegetable attributes, based on responses where 1 = not at all important and 6 = very important.^a

Desired vegetable attributes	Farmer			Buyer		
	Adjusted mean	Standard deviation	Rank	Adjusted mean	Standard deviation	Rank
Have fresh produce	5.832	0.78	1	6.0	0.0	1
Have produce that is appropriately graded	5.813	0.68	2	5.795	0.95	6.5
Have produce of desired size(s)	5.740	0.72	3	5.795	.61	6.5
Have wide range of produce	5.725	0.80	4	5.557	1.05	12
Have produce that is appropriately packed	5.563	1.05	5	5.932	0.32	3.5
Have produce of desired variety	5.637	1.02	6	5.693	1.05	10
Have produce available in quantities required	5.392	1.11	7	5.966	0.23	2
Have produce that is free from physical injury	5.225	1.30	8	5.591	1.04	11
Can deliver produce when needed	5.207	1.36	9	5.864	0.44	5
Have produce that is free of pests and diseases	4.824	1.76	10	5.761	0.79	8
Have produce with long shelf life	4.721	1.65	11	5.727	0.81	9
Have produce that is free of chemical residues	3.764	1.98	12	5.148	1.95	13
Provide produce that is competitively priced	3.350	1.96	13	5.932	0.45	3.5

^a Downstream buyer responses were actually given on a 1–4 scale and had to be adjusted accordingly (see text for further details). Sources: Survey of Kapatagan households, 2002; Survey of downstream buyers, 2003.

bles, such as maturity, weight, size, shape, pest/mechanical and physical damage/defects, cleanliness and freshness. Price was also mentioned as an indicator of quality. Farmers believed that the ultimate customer would want fresh vegetables that are well graded and taste good. They also thought that the consumer would be concerned with physical appearance, such as colour and defects caused by insect damage.

However, the downstream customers defined quality not only in the attributes described by the farmers, but most especially in terms of taste, freshness, cooking characteristics, colour, timely delivery and consistent supply. The right maturity of the vegetable, referring to the right timing of harvest, was important to the farmer but not to the downstream customers. Market intermediaries were concerned with mechanical injuries but the farmers were not. The market intermediaries connect the producer and the end user so they interact with both players. They are concerned with the delivery of goods so that they will have a consistent supply of merchandise with the proper assortment and in the desired varieties. Logistical issues are crucial to them because they bear the risk of carrying the inventory.

Furthermore, farmers' misconceptions of their customers' criteria were emphasised when the rankings of the farmers and the buyers on certain attributes were compared.

Conclusions

Farmers use quality attributes that are within their control — like the right maturity of the vegetable or the freedom from pest damage. Weight is an important attribute for farmers because it affects their earnings. However, the farmers do not feel that it is within their financial or physical power to consider other seemingly uncontrollable quality attributes.

Many of the problems related to the quality of the vegetables produced are due to the agronomic practices of the small farmers and the low level of their awareness of what is important to the market. Their primary focus is their income, which affects the survival of their family.

Improving quality in the vegetable supply chain from Kapatagan must begin with raising the capacity of farmers to produce quality vegetables and helping them to understand market requirements for quality. Their perceptions are based on their reality and their reality is the time of harvest and the physical

attributes, which they can control. The downstream customers, on the other hand, base their understanding of quality on their own reality which is the demand of the retailers and the reliability of their supply.

Helping both farmers and intermediaries see the entire supply chain rather than focusing on only their part of the chain can help to align their perceptions. The promotion of cooperation and partnership to sustain the entire chain will lead to improved supply-chain efficiencies. This will mean a reorientation for all stakeholders and capacity building for farmers to increase their production skills and market orientation.

Recommendations

The data showed that farmers and their customers had varying ideas on desired vegetable quality attributes. Quality perceptions of the farmers are not the same as the intermediaries. Farmers look at the physical characteristics of the product but intermediaries are more concerned with the consistency and promptness of delivery. With this differing perspective, a quality system infrastructure needs to be devised and implemented. A quality system infrastructure is the set of programs, policies and procedures aimed at defining the quality characteristics and standards of agricultural commodities and agri-based products, disseminating the standards to the producers, wholesalers, traders, retailers, consolidators, processors and end consumers, implementing these standards in the concerned sectors and monitoring the application and adherence to these standards along the entire supply chain. The quality system infrastructure requires that standards and quality assurance systems be in place, with adequate incentives, and communicated to farmers. Correct information is vital in ensuring the efficiency of the chain. With the current scenario, farmers are dependent on the buyers and agents for information.

Quality system infrastructure also requires increasing professionalism among farmers, traders etc. to get the product right, and collaboration to get the required volume. Downstream customers put high importance on having produce available in the quantities required. There is also a need for capacity-building for all chain members to ensure the efficiency and effectiveness of the supply chain in terms of training, livelihood seminars, market awareness exercises, and farmer education. Moreover, to ensure

efficient access to the market, the roads from farms to markets should also be good and passable.

When the quality system infrastructure is set up, farmers will be able to access correct information — a vital factor in maintaining balance and efficiency along the chain. They will have direct and valid information about market preferences, quality standards, training and livelihood programs. They will be aware of the characteristics of the market for temperate vegetables. If the farmer gets some degree of improvement from the quality system infrastructure being set up, this will trickle down to other members along the chain, thus creating an efficient and effective vegetable supply chain, where all chain members benefit.

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The Melon Value Chain in Gansu Province, Western China: Benefits to Growers from Improved Disease-Control Practices

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Abstract

Melons are widely grown in the Minqin County of Gansu Province in western China. Besides supplying consumers within the province, good grades of melons are transported over 1000 km to interstate markets. The current supply chains of melons have various constraints that prevent delivery of satisfactory and consistent products to consumers in the local as well as interstate markets. These include technical issues of pests and diseases and inadequate handling in cold-chain storage, packaging and quality standards. There are also management issues of growers harvesting their melons prematurely in order to capture an early-season premium price. As a consequence, the industry suffers from decreasing consumption, albeit slowly, and poorer price returns to growers. While these issues are recognised by the growers, no action has been taken to address the problems as growers are yet to be integrated for collective actions for common interests.

This study addressed the potential to deal with some of the industry's constraints in a collective way through controlling diseases, and improving cultural practices and selection of melon varieties. Extension workshops to address these issues, based on scientific research, can be used to encourage farmers to work together, and other supply-chain issues are also being targeted. The potential benefits to farmers include a bigger 'slice of the pie' in the value chain, but whether farmers can reap these benefits depends on the extent to which they can work together.

For centuries, Chinese consumers have regarded melon as a delicacy. Melons are grown in the irrigated arid remote areas of China, including the provinces of Xinjiang and Gansu. More recently, they have been planted in Mongolia and a few places in southern China during the off-season. Melons from western China are especially well known for their good taste and sweetness. Besides supplying the local market, good grades of melons from western China are transported over thousands of kilometres to interstate markets.

This study focused on Huanghemi melon (literally Yellow River melon), grown in the Minqin County of Gansu Province in western China. Huanghemi melon is a cross-breed developed by a team at Gansu Agricultural University. This variety is one of the very few research and development (R&D) products that have been successfully commercialised. However, like other melon varieties, Huanghemi melons suffer from downward price pressures. While this issue is recognised by growers and other supply-chain partners, due to its complexity, there has been little action to address the problem.

The objective of this study was to use value-chain analysis to look at the supply-chain issues in the Gansu melon industry and discuss grower benefits from a value-chain perspective. Value-chain analysis refers to the full range of activities that are required to

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bring a product from production to delivery to consumers. The costs and benefits of these activities at all levels in the supply chain are analysed and compared (Kaplinsky and Morris 2002). Value-chain analysis is useful in that it provides an indication of the relative power of chain partners (Cox 1999). Partners who gain the larger shares of the value created by the whole chain are, in theory, performing the most important functions in the chain and hence reaping larger rewards. In practice, they possess the power over their suppliers and customers due to their relative competitiveness (Porter 1980, 1985). Value-chain analysis also offers an insight into chain innovation. Partners with larger shares are more likely to invest in innovation than those with smaller shares. The application of new technologies for improved disease control by farmers requires a value-chain approach to better understand the incentive mechanisms for technology adoption.

Melon Supply Chains in Gansu, China

Over 80% of Huanghemi melons are sold in the interstate market. The partners in the supply chains include farmers, collectors, interstate wholesalers, and retailers in other provinces. There are various constraints within the current supply chains in the delivery of satisfactory and consistent products to consumers in the local as well as interstate markets. These include technical issues of pests and diseases, and inadequate handling in cold-chain storage, packaging and quality standards. There are also related issues of growers harvesting their melons prematurely in order to capture an early-season premium price.

Farmers

The average size of melon farms in Gansu is about 10 Mu or 0.67 ha (15 Mu = 1 ha or 1 Mu = 66.7 m²). Farmers have modest infrastructure for growing melons. Many of them use fertilisers and plastic mulch, but not herbicides or pesticides, as melon disease problems do not often show up at the farm-gate stage. Besides growing and harvesting, farmers may grade, package and transport melons to collection points in the village. Harvesting is done manually by collecting melons in hessian bags. Grading and packaging are mostly based on instructions from collectors or wholesalers. Standards vary between

wholesalers and are not written down. Common indicators are size and blemishes, and judgments are made visually. There are two types of packaging: large netted nylon bags of 20 kg capacity for the Gansu market; and cartons of 10–15 kg capacity for interstate markets.

Collectors

Collectors buy melons from farmers and sell to interstate wholesalers. They are often farmers themselves, who have a bit more capital and have sources of information and contacts with wholesalers. There are generally a few collectors in each village. They build their own simple undercover stands by the roadside near the production areas through which wholesalers and trucks can pass.

Wholesalers

Wholesalers are normally from other provinces and operate as merchants rather than agents. They travel around the country to obtain melon supplies in different seasons. Wholesalers perform a critical function in the chain by linking local production to interstate markets. They have the potential to become supply-chain managers, as they are the only channel partners that know both production (through collectors) and markets. However, this has not occurred for various reasons. Given that individuals are not able to get loans from banks, wholesalers cannot operate on a large scale. Two to three of them work as a team on a small amount of capital. One of them travels to the production area to buy the fruit and the other(s) sells the fruit at the central markets in other provinces. They only do one deal a year, at most twice, for each production area in Gansu, Xinjiang, Mongolia etc. The scale of each deal is one or two truckloads, about 10 or 20 t, but often stretches to the limit of 14 or 28 t. Because wholesalers go to each production area only once a year, it is unlikely that farmers receive any feedback from them about the current season.

Retailers

Retailers are located thousands of kilometres away from Gansu. Wholesalers leave the scene completely once they sell the fruit to the retailers. There is little feedback of information between wholesalers and retailers unless serious problems occur.

The whole supply chain from farmer to retailer is transaction-based and payment is always made in

cash, on the spot. This is not surprising, given few institutional bases for supply-chain coordination — including an absence of consolidation at all levels of the supply chains, an ineffective contract-implementation system, and lack of cultural underpinning for inter-organisational collaboration (Wei 2003).

Logistics, transport and losses

In the current study, losses at the farm level were about 9.1%. Most of the losses were due to blemishes caused by diseases and pests. Farmers normally did not apply sprays to control diseases and most of the time they were able to get away with it. However, there were times where it was too late to save the crop and losses were devastating. Losses during shipping were about 3.75% if everything went well, including weather conditions, maturity level and no serious disease threats. Losses at the retail level were most variable, depending on how long retailers kept the fruit, but losses were regularly about 10%. Total losses in the Gansu-to-Shanghai supply chain were about 23%.

Methodology

Supply-chain partners were interviewed about their costs and profits in producing Huanghemi melons. Because the costs and benefits were based on different lengths of time, their profits have been standardised. Shoucheng Town of Minqin County in Gansu Province is the major Huanghemi melon production area. Three major villages (Xing-Jin, Zhong-Xing and Tien-Cheng) from the town were selected for this study. Thirty farm households were randomly selected for in-depth interviews about their cost structures in growing Huanghemi melons. Collectors, wholesalers and retailers were very sensitive about the cost/profit figures and were often unwilling to divulge information. The research team had to interview a few collectors, wholesalers and retailers that the team members already knew. While these were convenient samples, there is no particular reason to believe the samples were biased. Convenient samples could be an advantage in this study as the respondents were less likely to give false information. Given the high competition at all levels of supply chains in the melon industry, the cost structures of those interviewed were not likely to deviate much from their competitors.

Results

Based on interviews with supply-chain partners, their returns were approximated and analysed at the firm level and their shares in the supply chain analysed from a value-chain perspective. Table 1 shows the costs and returns to farmers in 2002, in which there was no major disease attack and the weather conditions were good. The results were based on the average of 30 farmers surveyed. Average total yield in 2002 was 2750 kg/Mu (or over 41 t/ha), but marketable yield was 2500 kg/Mu. That meant farm-gate losses of 9.1%. Farmers' costs included, in descending order, labour, fertilisers, seeds, taxes, plastic mulch, and irrigation. Expenditure on pesticides was negligible at about CNY1–2/Mu. Returns to farmers were about CNY0.11/kg (AUD1 = CNY4.5 at the time of the survey), or 40% for a 4-month production cycle.

Table 1. Costs and returns to melon farmers in Gansu Province (CNY4.5 = AUD1; 15 Mu = 1 ha).

Factor	CNY/Mu	CNY/kg	Proportion of costs (%)
Labour	240	0.0960	35
Fertiliser	200	0.0800	29
Seeds	100	0.0400	15
Taxes	50	0.0200	7
Plastic mulch	48	0.0192	7
Irrigation	40	0.0160	6
Total variable costs	678	0.2712	100
Farm-gate price		0.3800	
Profit		0.1088	
Return (4 months)		40%	

Collectors' costs and profits details are shown in Table 2. Collectors had no transport costs as farmers took the fruit to the collection points. They had no rent either, as they built simple undercover stands by the roadside. They charge wholesalers (CNY250 per 14 t truckload) without farmers' knowledge of it. The total return for collectors was about 10% for a period of 3–4 days. There were few losses to collectors as they were generally able to clear the goods quickly during the peak season.

As mentioned before, over 80% of the melons from Gansu were sold to interstate markets. Wholesalers in China are merchants rather than agents. Deals were

made in cash, on the spot. In addition to payments to collectors, their costs included packaging materials for farmers, transport costs and losses during transport. In this study, the costs and profits in selling to the Shanghai wholesale market were surveyed. As shown in Table 3, wholesalers' returns were about 9% over a 2-week period.

Table 2. Costs and returns to melon collectors in Gansu Province (AUD1 = CNY4.5).

Factor	CNY/14 t load	CNY/kg
Purchase price		0.380
Selling price, nominal		0.400
Charge to wholesalers	250	0.018
Selling price, effective		0.418
Profit		0.038
Return (3–4 days)		10%

Table 3. Costs and returns to wholesalers in the Gansu-to-Shanghai melon supply chain (CNY4.5 = AUD1).

Factor	CNY/kg
Purchase price	0.418
Transport	0.714
Packaging	0.281
Losses during transport, 3.75%	0.025
Labour	0.025
Total costs	1.463
Selling price	1.600
Profit	0.137
Return (2 weeks)	9%

Costs to retailers included purchasing price, labour costs and an average of 10% losses. Rental costs were minimal as they sold a variety of fruits at a stand. As indicated in Table 4, returns to retailers were about 11% over a 1-week period.

Table 4. Costs and returns to retailers of melons in Shanghai (CNY4.5 = AUD1).

Factor	CNY/kg
Purchasing price	1.6000
Losses, 10%	0.178
Cost of labour for 7 days	0.025
Total costs	1.803
Selling price	2.000
Profit	0.197
Return (1 week)	11%

To compare the returns to supply-chain partners, their returns were standardised over a 1-week period, as indicated in Table 5. This showed that farmers had the lowest return of 2.5% per week during the 4-month production season. Collectors had the highest return of 20% per week during the peak season. Wholesalers had 4.5% per week for a shipment from Gansu to Shanghai. Retailers in Shanghai gained 11% per week for selling Huanghemi melons. It is not surprising that some collectors have quit farming to focus on collecting melons. In the off-season for melons, they collected different products in different seasons or engaged in other lines of business.

Table 5. Comparison of returns for partners in the Gansu-to-Shanghai melon supply chain.

Partners	Returns for the season	One-week standardised returns
Farmers	40% for 4 months	2.5%
Collectors	10% for 3–4 days	20%
Wholesalers	9% for 2 weeks	4.5%
Retailers	11% for 1 week	11%

Looking at returns at firm levels could not answer profit distribution issues in the supply chain. Value-chain analysis was required to see how profits were distributed among farmers, collectors, wholesalers and retailers. As can be seen from Table 6, a total chain value of CNY0.482 was created, indicating lean and thin value for Huanghemi melon from Gansu to the Shanghai markets. Retailers had the largest share of the melon value chain from Gansu to Shanghai with 41%. This is not surprising for a perishable product. Wholesalers, who linked farmers with markets, had the second largest share with 28%. Interestingly, collectors — who had the highest return at the individual level — had the lowest share of 8% in the supply chain. Farmers had a 23% share of the total value.

Discussion

In recent years, melons, including Huanghemi melons, have been under downward price pressure. The main reasons for this are unsatisfactory product quality and the availability of local and imported substitutes, especially in large cities such as Shanghai, Beijing and Guangzhou. Value-chain analysis showed that the total value created in the supply chains for Huanghemi melons were thin and lean.

Off-season melons from Shangdong Province were sold for four times the price of those from Gansu during the peak season. This indicates much scope for improving the Gansu value chain through improving product quality. Farmers get the lowest returns (2.5% per week) among the supply-chain partners. Consequently, they may have little incentive to improve the supply chain. Paradoxically, quality products start at the production and postharvest stages, through the adoption of proper cultural and disease-control practices. Losses at harvest and during the transport and retail stages (23%, Gansu to Shanghai in 2002) could be greatly reduced if proper disease-control practices were implemented. Growers would also benefit from improved disease control if product differentiation was then undertaken, and a premium price paid by consumers.

Table 6. Summary of the Huanghemi melon value chain — from Gansu to the markets in Shanghai.

Item	Cost and price (CNY/kg)	Profit (CNY/kg)	Share of value (%)
Farmers: costs	0.270	0.110	23
Farm-gate price	0.380		
Collectors: costs	0.380	0.038	8
Collectors: price	0.418		
Wholesalers: costs	1.463	0.137	28
Wholesalers: price	1.600		
Retailers: costs	1.803	0.197	41
Retailers: price	2.000		
Total value		0.482	100

Product differentiation

Contrary to the Chinese consumers' traditional perception about melons, the industry now competes on price and has, over time, turned melons into commodity products, which are handled as such at all levels of the supply chains. Improved disease-control practices allow for better quality products with longer shelf life. Such improvements offer an opportunity for product differentiation and a potential branding strategy.

Improved quality for premium prices

There is a temptation to harvest melons prematurely to capture early-season premium prices and to

hide the symptoms of diseases. Farmers reported that this often occurred at the request of wholesalers. Improved disease-control practices allow melons to be harvested at a more mature stage, which results in better taste and sugar levels.

Improved disease control requires implementation of farm and postharvest-level practices by farmers. Value-chain analysis indicated that retailers and wholesalers had the largest shares in the value chain. Innovations that affect the whole chain, such as improved disease-control practices, have the best chance of success if partners with larger shares are involved. Retailers in melon supply chains are located in other provinces and have never had any interactions with farmers. To introduce new disease-control mechanisms at the preharvest and postharvest stages, it is essential that the wholesalers are involved at the outset. It is through the wholesalers that the efforts of farmers can be relayed to retailers. If the retailers, who currently capture the largest share of the value chain, appreciate the value of these efforts in terms of both improved quality and reduced losses, they will be more willing to pay a premium price for the melons.

For farmers to gain an improved 'share' of the value chain with the introduction of new disease control practices, two issues must be considered. Firstly, the practices need to be coordinated at a group level to ensure adequate quantities of improved products. In other words, some horizontal integration at the farmer level needs to occur, albeit not at a wide scale. Secondly, farmers should also be strongly encouraged to perform the postharvest disease-control function, rather than leaving it to collectors or wholesalers.

Horizontal integration at the farm level

The application of disease-control strategies could itself facilitate farmer cooperation as farmers have the opportunity to interact at workshops, demonstrations etc. These activities will also help farmers who sell to the same wholesalers to work together to consolidate larger quantities of melons. The government could make use of the existing farmer network embedded in the 'natural-social constitutes' of the Chinese rural society (Murdoch 2000). The current decentralised and short-term relationships will not achieve the goal of improving the benefits for farmers.

Farmers performing more functions in the supply chain

Unlike farmers in developed countries who clean, grade and pack their fruit, farmers in China only perform the basic production function. Melon farmers only pack and grade melons if instructed to do so by their wholesalers. With the introduction of the improved disease-control strategies, farmers could potentially work together to perform some basic postharvest handling tasks, such as washing, dipping and packaging. The more supply-chain functions that farmers undertake, the more likely they will be to 'catch' a larger share of the value chain.

Conclusion

In summary, this study used a value-chain approach to investigate the returns to supply-chain partners and how the value is apportioned among them. The results indicated that there is much scope to improve the value chain if the quality of Huanghemi melons can be improved, by introducing disease-control practices at the farmer level. This could result in

higher prices being paid by consumers, which would benefit all members of the supply chain. However, to ensure that farmers capture the benefits, they need to be consolidated and perform more functions in their supply chain.

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Improving Indonesian Vegetable Supply Chains

Wendy Morgan,* Syukur Iwantoro† and Ibu Alifah Sri Lestari§

Abstract

An Australia–Indonesia collaborative project used a case-study approach to introduce farmers, packing-house staff and consumers (via retailers) to the concepts of food safety and meeting customers' expectations. Activities undertaken to achieve this have included:

- selection of supply chains and personnel in five locations to participate in case studies, after discussions with senior Ministry of Agriculture (MOA) staff in Jakarta and the provinces
- a training of trainers (TOT) workshop for 10 MOA staff at the Centre for Standardisation and Accreditation, Jakarta, on food safety for packing houses, including packing-house hazard-analysis and critical control point (HACCP), development of a packing-house HACCP manual, and accreditation preparation
- TOT on integrated pest management (IPM) and farmer field school (FFS) methodology for selected MOA staff and experienced farmers at five locations
- FFS for farmers in each supply chain (over 400 farmers have received on-farm training)
- packing-house food-safety awareness for the community at each supply chain's location
- packing-house food-safety training and HACCP methodology for managers, staff and farmers supplying packing houses at five locations
- training in product handling and storage for retail fresh-produce buyers, managers and senior store staff in one supply chain.

It is too early to evaluate the impact of the project, but change has occurred at farmer, packing-house and retail sectors of the case-study supply chains.

In 2002, the Australian Government's Department of Agriculture Forestry and Fisheries (AFFA) funded an Australian-led project team to help the Indonesian vegetable industry to improve the safety and quality of vegetables supplied to consumers in Indonesia.

The Indonesian Vegetable Supply Chains project was a one-year project, undertaken by the Victorian Department of Primary Industries (DPI) and the Indonesian Ministry of Agriculture's Center for Standardisation and Accreditation (CSA). The project used a case-study approach to introduce farmers, packing-house staff and consumers (via retailers) to the concepts of food safety and meeting

customers' expectations by providing reliable supplies of vegetables of consistent, acceptable quality.

Specific objectives were:

- to improve skills and knowledge of Indonesian vegetable farmers and packing-house staff
- to improve production efficiency and safety
- to increase linkages between sectors of the supply chains and government research and development agencies
- to increase the awareness of supply chain players of the importance of safe, quality production.

Project Activities

Following lengthy discussions with senior Ministry of Agriculture (MOA) staff in Jakarta and the provinces, supply chains and personnel in five locations

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— East Java, South Sulawesi, Bali, South Sumatra and West Java — were selected as case studies.

A training of trainers (TOT) workshop was held in Darwin, Australia in February 2003. There were 10 participants from CSA. This food-safety refresher workshop covered food-safety risks for packing houses, including packing-house hazard analysis and critical control point (HACCP) methodology, development of a packing-house HACCP manual, and the steps involved in developing and implementing an accreditation system.

TOT was also provided to selected MOA staff and experienced farmers at the five case-study locations in Indonesia. This covered integrated pest management (IPM) and farmer field school (FFS) training methodology. Over 400 farmers from all five supply chains have received on-farm training in IPM and food safety.

Other activities included:

- raising packing-house food safety awareness for the community at each location
- providing packing-house food safety and HACCP training for managers, staff and farmers supplying packing houses at four locations
- providing training in product handling and storage for retail fresh-produce buyers, managers and senior store staff in a supermarket chain in Bali.

Project Outcomes

HACCP/food safety training for packing-house and DINAS staff and farmers

CSA is running this component of the project at four locations.

HACCP is a method used to identify the food-safety risks associated with the operations of a business, in this case the vegetable packing house. HACCP and food safety are complex concepts and very new in the Indonesian food industries. It was anticipated that it would be difficult to introduce the ideas and procedures involved to packing-house staff and farmers. The program of the refresher course in Darwin thus covered the three food-safety risks (microbiological, chemical and physical) and revised the 12 steps taken for analysis of these risks in the HACCP methodology. Also covered were product identification and traceability, and staff training.

Support was provided to CSA staff to produce a Food Safety Manual for Indonesian packing houses. This was published in the Bahasa Indonesia lan-

guage, and used during training of packing house staff.

It has proven difficult to improve packing house procedures, as there is little demand from purchasers to improve food safety in packing houses or on farms, and even the simplest modifications to packing house operations are expensive. Indonesian consumers are aware of the issue, but supermarkets are generally finding it difficult to source all their produce requirements domestically and are therefore reluctant to specify consistent supply of safe product.

It took some time for participants in the TOT activities to accept that it is impractical, due to cost, to implement at this stage some of the changes required to achieve food safety and quality assurance (QA) accreditation. These include, for example, management of temperature and water quality. Indeed, it might be better in terms of food safety if there were no washing steps at the packing house. This possibility needs to be discussed with the next links in the supply chain and with CSA. Its implementation would need to be accompanied by an education campaign to explain its rationale to the whole community.

Despite the various difficulties, the CSA group's activities are having an impact on the staff of the packing houses they are training. They are seeing changes in staff behaviour (personal hygiene and no smoking), and procedural practices (logistics, cleaning programs and storage) occurring at all locations.

Training for farmers

This component of the project is being run by FIELD Indonesia, a non-government organisation (NGO), at four locations.

The FFS model for delivering on-farm training has as its first step community consultation. Even at this step, each location has different expectations, government structures and personalities, and accommodating these variations requires considerable discussion.

An issue of great interest is that competition to attend FFS is always so intense that farmers are interviewed for selection. They will attend training for 12 hours and still have to be told to go home. They are very hungry for information. Indonesian farmers are compensated for attending training but this cannot be the sole reason they attend.

Retail fresh-produce handling training in a supermarket chain in Bali

A key issue at this level in the supply chain is that the major supermarket chains were not interested in participating. They view staff training as their competitive edge and are therefore secretive about their training programs. Nevertheless, there is a problem in that their in-store produce appeared to be no better than that of the small chain which participated in the training in this project.

This project component included the following activities:

- TOT in Australia for an Indonesian postharvest university lecturer. This training covered the component content, methodology for delivery and selection of modules suitable for the supermarket chain's business. The Indonesian presenter also translated much of the documentation into Bahasa.
- A two-day workshop titled "Fresh produce retailing and profit improving practices" was held in Denpasar on 18–19 March 2003. Seventeen fresh-produce managers (storage and in-store selling) and buyers from the Tiara Dewata supermarkets in Bali participated. Topics covered included: delivery checks, storage, product care and handling, wastage and shrinkage, merchandising, cleaning and sanitation, managing customer feedback. Temperature and refrigeration, humidity, and information on the shelf lives of different types of vegetables were considered by participants as important to maintaining product quality.

Results and Evaluation

The workshop participants rated the workshop highly and have asked for further training modules. The

supermarket contributed financially to the training, which is quite unusual in Indonesia, and made improvements to in-store and storage practices almost immediately.

Conclusions

Although it is too early to evaluate the overall impact of this project, the project team has already observed that some change has occurred at the farmer, packing-house and retail levels of the supply chains concerned. The project team plans to evaluate the longer-term impact of project activities.

Putting an emphasis on the retail component of the supply chain has had an impact already. The supermarkets are looking into developing product specifications and giving farmers more consistent orders, and to meeting farmers' requests for more notice of what and when they want a product. This will allow these farmers a greater opportunity to schedule production, something that Australian farmers take for granted. Farmers and packing houses are using safer farming practices than before the project started. Communication between members of the supply chain has been enhanced, but needs to be continually improved. Indeed, communication is a major constraint to outcomes at all levels of the project — planning, socialisation, delivery, expectations — as well as between the diverse personnel — from two countries and cultures, central and provincial government, government and business, farmers, packers, agents and retailers.

Project follow-up activities should facilitate communication between supply chain members, so as to maximise the benefits of initial activities and enhance overall understanding of the requirements of each member.

Indonesia's Strategic Agricultural Commodities in Meeting the WTO Agreement

Rina Oktaviani*

Abstract

Indonesia is a developing country that is committed to the World Trade Organization (WTO) agreements. The latest WTO agreement, reached in Doha in 2001, allows agricultural products in developing countries to have the special and different treatment in terms of market access, export subsidies and domestic support. The problem is how Indonesia can take advantage of this special treatment in the context of its strategic agricultural products, so as to develop its economy and alleviate poverty, and be ready for the next round of WTO decisions. This paper analyses these problems and suggests the proposed agenda for the next WTO round for Indonesia as an individual country and as a member of various groupings. The paper first considers what Indonesian agricultural trade performance, how the Indonesian government chooses and defines its strategic agricultural products, and how to use supply-chain methods to select these products.

Indonesian economic policy has moved from protectionism (during the several years after independence in 1945), to outward orientation (late 1960s up to the 1980s) to deregulation and openness (during the 1990s and 2000s). Numerous trade and investment reform packages have been launched by the government since 1989 in order to face the more open and competitive world economy. Since 1989, the restrictions on trade, including the tariff and non-tariff barriers, have been gradually eliminated. Trade regulations have followed investment regulations to encourage direct foreign investment. The year 1994 saw a significant change in investment: essentially unrestricted direct foreign investment was permitted for the first time in all sectors. It was hoped that the comprehensive economic reforms would improve economic efficiency and lead to an expansion of the

Indonesian economy, which would stimulate further investment and export trade activity.

As an open economy, Indonesia is committed to regional and global free trade. In the East Asian countries, Indonesia is a member of the Asian Free Trade Area (AFTA) agreement and, in the world economy, of the World Trade Organization (WTO). The objective of the agreements is free trade among nations in the region. According to economic theory, free trade would increase the welfare of nations that join the agreement, based on the comparative advantage it brings. The gains from trade liberalisation can be identified as coming from two sources: increasing the efficiency of use of domestic resources, and increasing access to other countries' markets (Stephenson 1994). However, in reality, most countries try to protect themselves with tariff and non-tariff barriers.

Before the last WTO Ministerial meeting in Doha in 2001 and the Uruguay Round agreement in 1994, there were several rounds of multilateral trade negotiations under the General Agreement on Tariffs and Trade (GATT). Before the Uruguay Round, agricul-

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tural trade was largely kept off the agenda by the United States of America (USA) and other developed countries. Consequently, agricultural trade was afflicted with high levels of protection, increasing use of subsidies, worsening fluctuations in world prices and an increasing cost to the national budget to support production. Especially for developing countries, often predominantly agricultural in export orientation, it was hoped that the agreement would reduce restrictions on agricultural trade between countries. The Uruguay Round Agreement on agriculture has three main components: markets access, export competition, and domestic support outlays.

The Doha Ministerial Conference in November 2001 delivered new declarations, especially in agriculture. The declarations emphasised the importance of international trade in promoting economic growth and alleviating poverty (Roberts et al. 2002). Growth on world trade will enhance the economic wellbeing of developing countries. Indonesia supports the Doha declaration, which will reduce barriers to market access, and reduce export subsidies and domestic support for agricultural product. As a developing country, Indonesia receives 'Special and Differential' (S&D) Treatment in agriculture (Roberts et al. 2002). The treatment allows Indonesia to reduce its barriers against imports and its market-distorting forms of domestic support to a lesser extent than developed countries. Indonesia must capitalise on the this special treatment to promote its agricultural and economic development.

Despite a declining share in output and exports, agriculture has maintained its dominant role in the Indonesian economy. In 2000, agriculture accounted for 16.9% of the gross domestic product (GDP) and provided work for around 40% of the active population (World Bank 2001). Devaluation of the rupiah helped boost agricultural exports (in value terms), particularly during the post-crisis period. However, Indonesia could not depend on the weakness of the rupiah in order to increase its trade balance. Indonesia must also meet its WTO commitment. For the WTO Ministerial Conference held in September 2003, Indonesia, together with other developing countries, had to be ready to meet additions and/or revisions to the special treatment on agriculture. The question was what and how the Indonesian Government should choose and define strategic agricultural products?

The high dependence on the agricultural sector in the Indonesian economy means that Indonesia needed to be well prepared for any pushes at the WTO Minis-

terial conference. This paper analyses the Indonesian agreement on agriculture and Indonesia's strategy for market access, export subsidies and domestic support and the proposal for S&D treatment at the next WTO Ministerial Conference. The paper also seeks to identify Indonesian agricultural trade performance and how the Indonesian Government defines and chooses strategic agricultural commodities.

Indonesian Agricultural Trade and Strategic Agricultural Products

Indonesia is the world's largest producer of coconuts, the second-largest producer of copra, palm kernels, palm oil and natural rubber, and the third-largest producer of rice (WTO 2003). However, most farms are small and only 13% of cultivated land is worked by large state-owned and private estates. The small scale of farms contributes to the low productivity of land. For example, the profitability of rice production fell from 5.3% in the 1980s to 1.5% in the 1990s (FAO 2002). It was followed by a fall in the harvested area and productivity growth. The fluctuation in harvested area was caused by the depredations of pests and diseases and the sensitivity of the rice to climate change. The stagnation of productivity could be the result of stagnation in new technology development following the green revolution in the 1980s. Before Indonesia gained the rice self-sufficiency in 1984, rice productivity in Indonesia was the highest one in the world. However, after 1985, the productivity growth in Indonesia was the lowest in Asia. Rice productivity growth in Indonesia was negative in the period of 1996–2001, while productivity in China and Vietnam continued to increase (Oktaviani 2002).

Besides facing a low productivity rate, Indonesian agricultural exports have declined in recent years. Table 1 shows that the export value increased during the huge devaluation of the rupiah. Agricultural export commodities become more competitive during the Asian economic crisis. The Indonesian Government hopes that this will lead to an export-led recovery from the economic crisis. Recently, however, the agriculture sector has shown poor export performance, the worst case being rubber. It can be seen from Table 1 that the prices of imported goods have fallen, except for fruits and vegetables.

The weak export performance should increase the efforts of Indonesian negotiator in the next WTO round to put a case that will help to recover export

performance, even though trade policy is not the only influence on export value. The business environment, such as a perceived increase of Indonesia's country risk, also contribute to export performance.

Indonesia also imports agricultural products. Table 2 shows that the annual value of food and agricultural imports increased dramatically in the 10 years between 1984–86 and 1994–96. This caused a decline in the agricultural trade surplus. Annual agricultural import value grew slowly and annual food import value fell slowly between 1994–96 and 1998–2000. The large devaluation of the rupiah contributed to this import performance between 1994–96 and 1998–2000.

The value and quantity of rice and sugar imports rose rapidly between 1994–96 and 1998–2000. Besides the effect of the stagnancy in rice production between 1996 and 2002 (Tabor et al. 2002), the increase of rice imports was caused by a change in rice policy, in line with the trend to globalisation in the world market. The National Logistics Agency (BULOG) does not monopolise the rice market any more, since Indonesia signed an International Monetary

Fund (IMF) agreement in 1998. Private importer can now bring rice into the country through normal market channels. At the same time, the rice import price has tended to fall, because of dumping from other countries such as the USA, Thailand and Vietnam (Tabor et al. 2002). Increasing rice imports caused the domestic price of rice to fall. On 19 December 1999, the government applied a rice import tariff of Indonesian rupiah (IDR) 340, equivalent to 30%.

The sugar industry faces a structural problem — the state-owned mills are inefficient and it is more profitable to grow other crops (Magiera 2002). Even though the government has made an effort to move the cane production to extensive areas off Java, the sugar imports continue increase. As with other food commodities, the world market in sugar commodities is thin. Production growth is less than the export and import growth in the world market (Oktaviani 2002). This means that if sugar production in one country falls, an increase of the import demand might increase the world market price. Indonesia is one

Table 1. Indonesian agricultural exports, 1984–2000.

Commodity	Period average			Annual percentage change	
	1984–1986 (A)	1994–1996 (B)	1998–2000 (C)	B/A	C/B
Animal/vegetable oil					
Value (USD million)	249	1413	1705	19.0	4.8
Quantity ('000 t)	696	2693	4461	14.5	13.4
Unit value (USD/t)	357	525	382	3.9	-7.6
Rubber					
Value (USD million)	753	1676	936	8.3	-13.6
Quantity ('000 t)	951	1306	1490	3.2	3.4
Unit value (USD/t)	792	1283	628	4.9	-16.4
Coffee, tea, spices					
Value (USD million)	1017	1274	1305	2.3	0.6
Quantity ('000 t)	469	763	957	5.0	5.8
Unit value (USD/t)	2170	1670	1364	-2.6	-4.0
Fruits/vegetables					
Value (USD million)	70	327	294	16.6	-2.6
Quantity ('000 t)	540	1054	728	6.9	-8.8
Unit value (USD/t)	130	310	403	9.1	6.8
Food exports (USD million)	1244	1987	2038	4.8	0.6
Agricultural exports (USD million)	2488	5414	5045	8.1	-1.7

Source: FAOSTAT, cited in Magiera (2002).

such example; we have a decrease of production growth but an increase in import growth.

The information in Tables 1 and 2 makes it clear that Indonesia both exports and imports large quantities of agricultural commodities. Because of the high proportion of the population who are engaged with the agricultural sector, the trade policy will strongly affect economic welfare. A careful and strategic agenda should be made for the next WTO round to minimise the detrimental impacts of trade liberalisation.

As mentioned in Doha Mandate, strategic products relate to the Non-Trade Concerns of food security, rural development and poverty alleviation. The Indonesian Government has identified four commodities as strategic products — rice, maize, soybean and sugar. The basis for the government's choice of these

products is not clear. The argument of food security is relevant for rice, but not for sugar. As mentioned above, the main problem for the sugar industry is inefficient, state-owned mills. Protection of the industry does not deliver a direct benefit to sugar farmers. The poverty alleviation argument may be relevant to these industries as a whole, since Sawit (2003) argues that rice, maize, soybean and sugar involve 23 million, 9 million, 2.5 million and 1 million households, respectively, or 68% of total households in 1999. However, because of IMF pressure, the dependence on imports of those products has increased dramatically (Table 2).

Although the product is related with food crops, Indonesia can actually choose other products as strategic, such as exported goods. Through supply-chain

Table 2. Indonesian agricultural imports, 1984–2000

	Period average			Annual percentage change	
	1984–1986 (A)	1994–1996 (B)	1998–2000 (C)	B/A	C/B
Rice					
Value (USD million)	49	603	836	28.5	8.5
Quantity ('000 t)	159	1976	2999	28.7	10.9
Unit Value (\$/ton)	309	305	279	-0.1	-2.2
Other cereals					
Value (USD million)	297	1014	688	13.1	-9.2
Quantity ('000 t)	1581	4871	4327	11.9	-2.9
Unit Value (\$/ton)	188	208	159	1.0	-6.5
Textile fibres					
Value (USD million)	200	875	726	15.9	-4.6
Quantity ('000 t)	174	475	497	10.6	1.1
Unit Value (\$/ton)	1149	1840	1459	4.8	-5.6
Sugar/sweeteners					
Value (USD million)	10	285	417	39.3	10.0
Quantity ('000 t)	25	694	1735	39.7	25.8
Unit Value (\$/ton)	422	411	240	-0.3	-12.5
Animal feeds					
Value (USD million)	85	402	309	16.8	-6.4
Quantity ('000 t)	376	1405	1348	14.1	-1.0
Unit Value (\$/ton)	226	286	229	2.4	-5.4
Oilseeds					
Value (USD million)	118	337	265	11.0	-5.8
Quantity ('000 t)	402	882	1084	8.2	5.3
Unit Value (\$/ton)	295	382	245	2.6	-10.5
Food imports (USD million)	589	2963	2901	17.5	-0.5
Agricultural imports (USD million)	985	4545	4145	16.5	2.3

Source: FAOSTAT, cited in Magiera (2002).

analysis, Indonesia can identify weaknesses in the supply chain for exported goods. The approach can be used to choose strategic products for the global market (Kaplinsky and Morris 2000). The approach can identify levels of competitiveness and help understanding of the advantages and disadvantages of firms and countries specialising in individual products. Production efficiency is just one of the prerequisites for entering the global marketplace. We need also to understand how the ways in which producers are connected to final market influence the ability to win in the global market and determine the distribution of benefits to participants.

Indonesia could argue to the developed countries to open their markets to Indonesian exports if market access is a barrier in the supply chain. In practice, Indonesia promotes its exports less than do other developing countries. Instead of supporting agricultural exports, the Indonesian Government has applied export taxes to goods such as for palm oil (Sawit 2003).

The WTO Agreement on Agriculture and Indonesia's Trade Policy

The agricultural negotiations in the WTO began in the early 2000, under Article 20 of the WTO agreement. The Doha Ministerial Conference in November 2001 reconfirmed the present WTO agreement to establish a fair and market-oriented trading system through a program of fundamental reforms. The program encompasses strengthened rules, and specific commitments on government support and protection for agriculture. The purpose is to correct and prevent restrictions and distortions in world agricultural markets (WTO 2003, paragraphs 13 and 14). The member governments, including Indonesia, commit themselves to reducing the barriers to market access, export subsidies and domestic support. The declaration makes special and differential treatment for developing countries integral throughout the negotiations such that they should be able to meet their needs, in particular in food security and rural development. The explanation below about the agreement on agriculture is based on WTO (2002).

Market access

Reducing barriers to market access means that the WTO members should reduce tariff and non-tariff barriers to agricultural products as a result of the Uruguay Round. The Uruguay Round has focused

broadly on two issues: the high levels of tariffs outside the quotas (with some countries pressing for larger cuts on the higher tariffs), and the quotas themselves — their size, the way they have been administered, and the tariffs charged on imports within the quotas. Another market access agreement is a special agricultural safeguard.

The tariffs cover both tariffs on quantities within quotas and those outside. Traditionally, the tariff reductions that resulted from trade negotiations came from bilateral product-by-product bargaining, or they were based on formulas that applied over a broad range of products, or a combination of the two. How the reductions will be handled in the present negotiations is still undecided. The developing countries argue that tariffs and other import barriers are necessary in order to protect domestic production and maintain food security. For this reason, some countries are linking lower import barriers with disciplines on other countries' export restraints and export taxes — if producing countries do not restrict their exports, then importing countries can feel more secure about being able to obtain food from them. Some developing countries say they need flexibility in deciding the level of import duties they charge to protect their farmers against competition from imports whose prices are low because of export subsidies.

The tariff quotas are the regulation covering whether a product exported from one country can gain access to the market of another country at the lower, within-quota tariff. The method for giving exporters access to quotas include first-come, first-served allocations, import licensing according to historical shares and other criteria, administered through state trading enterprise, bilateral agreements, and auctioning. The terms can also specify time periods for using the quotas — for example, periods of time for applying for licences, or for delivering the products to the importing countries. Exporters are sometimes concerned that their ability to take advantage of tariff quotas can be handicapped because of the way the quotas are administered. Sometimes they also complain that the licensing timetables put them at a disadvantage when production is seasonal and the products have to be transported over long distances.

Each method has advantages and disadvantages, and many WTO members acknowledge that it can be difficult to say conclusively whether one method is better than another. Several countries want the negotiations to deal with tariff quotas: to replace them with low tariffs, to increase their size, to sort out what

they consider to be restricting and non-transparent allocation methods, or to clarify which methods are legal or illegal under WTO rules in order to provide legal certainty.

Safeguards are contingency restrictions on imports taken temporarily to deal with special circumstances such as a sudden surge in imports. The special safeguard provisions for agriculture differ from normal safeguards. In agriculture, unlike with normal safeguards:

- higher safeguards duties can be triggered automatically when import volumes rise above a certain level, or if prices fall below a certain level
- it is not necessary to demonstrate that serious injury is being caused to the domestic industry.

The special agricultural safeguard can only be used on products to which tariffs applied — which amount to less than 20% of all agricultural products (as defined by ‘tariff lines’). But they cannot be used on imports within the tariff quotas, and they can be used only if the government reserved the right to do so in its schedule of commitments on agriculture. In practice, the special agricultural safeguard has been used in relatively few cases.

Proposals range from continuing with the provision in its current form, to its abolition, or its revision to prevent its use on products from developing countries. Some developing countries have proposed that only they should be allowed to use special safeguards — developed countries should not be allowed to do so.

Export subsidies

Proposals to reduce export subsidies differ between countries. Some countries are proposing the total elimination of all forms of export subsidies. Others are prepared to negotiate further progressive reductions without going so far complete elimination, and without any ‘down payment’.

Many developing countries argue that their domestic producers are handicapped if they have to face imports whose prices are depressed because of export subsidies, or if they face greater competition in their export markets for the same reason. This group includes countries that are net food importers and also want help to adjust if world prices rise as a result of the negotiations. In addition, many countries would like to extend and improve the rules for preventing governments circumventing their commitments on export subsidies — including the use of

state trading enterprises, food aid and subsidised export credits.

Domestic support: amber, blue and green boxes

In WTO terminology, subsidies are in general identified by ‘boxes’ which are given the colours of traffic lights: green (permitted), amber (slow down — i.e. be reduced), red (forbidden). In agriculture, things are, as usual, more complicated. The Agriculture Agreement has no red box, although domestic support exceeding the reduction commitment levels in the amber box is prohibited; and there is a ‘blue box’ for subsidies that are tied to programs that limit production. There are also exemptions for developing countries (sometimes called the ‘S&D box’).

(a) *The ‘amber box’*

For agriculture, all domestic support measures considered to distort production and trade (with some exceptions) fall into the ‘amber box’. The total value of these measures must be reduced. Various proposals deal with how much further these subsidies should be reduced, and whether limits should be set for specific products rather than having overall ‘aggregate’ limits.

(b) *The ‘green box’*

In order to qualify for the ‘green box’, a subsidy must not distort trade, or at most cause minimal distortion. These subsidies have to be government-funded (not by charging consumers higher prices) and must not involve price support. They tend to be programs that are not directed at particular products, and include direct income support for farmers that is not related to (is ‘decoupled’ from) current production levels or prices. ‘Green box’ subsidies are therefore allowed without limits, provided they comply with relevant criteria. They also include environmental protection and regional development programs (for details, see Article 6 and Annex 2 of the Agriculture Agreement, available at <<http://www.wto.org>>).

(c) *The ‘blue box’*

The ‘blue box’ is an exemption from the general rule that all subsidies linked to production must be reduced or kept within defined minimal levels. It covers payments directly linked to acreage or animal numbers, but under schemes which also limit production by imposing production quotas or requiring farmers to set aside part of their land. Countries using

these subsidies — and there are only a handful — say they distort trade less than alternative ‘amber box’ subsidies.

Before WTO agreements are applied to developing countries, Indonesia already has investment and trade regulations, which is in line with WTO agreement and affect the agricultural sector. For the first 25-year Indonesian development program, government policy for the agricultural sector has focused on food self-sufficiency, and primarily on rice. On the other hand, assistance received by the major agricultural exporting industries was below average, often negative. Export commodities such as cassava, rubber, coconut oil, palm oil, coffee, pepper, nutmeg and tea were, in effect, taxed by the trade policies of Indonesia (GATT 1991). However, some changes have been made in trade policy on export commodities since the mid-1980s. Quantitative trade restrictions (Qts) were, on paper at least, eliminated in October 1989 for cassia-vera (cinnamon), for nutmeg and mace in the policy package of May 1990 (*PakMei* 1990), and for crude palm oil, other palm oil, palm kernel oil, copra and coconut oil in the policy package of 3 June 1991 (*PakJun* 1991) (Tomich 1992). Regulations on agricultural export commodities meant the assistance that was offered to those commodities was lower than the assistance provided to the other crop sectors, and even to the manufacturing sector. Even though there is limited assistance for estate crops, these commodities, especially coffee, oil palm, cocoa and rubber, have a lower cost than those in other exporting countries. In rubber production, for which Indonesia is not so prominent in the world market, the smallholder costs of production are lower than the cost for estates in Malaysia and Thailand (Tomich 1992). Palm oil production in Indonesia also has the lowest cost in the world. Based on Sucofindo data, Larson (1996) showed that the production costs for crude palm oil, ex-factory, was USD127/t in 1993. Compared with the 1995 average international price of USD600/t and the historically low price in 1990 of USD290/t, the Indonesian palm-oil sector still profitable.

Besides the regulation in these commodities, there was re-regulation in some estate crops in 1992. The BPPC (*Badan Penyangga dan Pemasaran Cengkeh*) was established as a Clove Marketing Board and given monopoly rights for clove marketing. The BPPC was not successful in terms of increasing farmer incomes because, according to field reports, the purchase price was well below the floor price in the harvesting period (Tomich 1992). The West Kali-

mantan citrus industry was also regulated, restricting inter-island trade and pushing down the local farmers’ incomes.

The financial crisis that began in the middle of 1997 has induced the government to deregulate in several areas, including trade policy. The following steps in relation to trade regulation to be implemented as part of an agreement reached with the IMF for receiving international aid to help with the crisis (Soesastro and Basri 1998):

- gradual reduction of import tariffs to 5–10% by the year 2003, including those on chemical products, iron and steel, and fisheries products
- trade deregulation for various commodities
- wheat and wheat flour, soybeans, and garlic would be able to be imported freely under a general importer licence from 1 January 1998
- with imports of soybeans and garlic subject to a 20% tariff, and imports of wheat flour to a 10% tariff, those tariffs to be reduced to 5% by 2003, the government would provide a temporary subsidy for wheat flour to protect consumers.
- the administrative retail price of cement would be eliminated in the near future
- gradual reduction of barriers to exports, including export taxes
- elimination of the special tariff for automobile producers by 2000
- government review of investment and expenditure by the public sector.

The failure of the IMF Agreement led the IMF to reinforce the economic program. On 15 January 1998, the President signed a second agreement, the IMF II Agreement. The microeconomic reforms under IMF II included the following (Soesastro and Basri 1998):

- elimination of BULOG’s monopoly over the importation and distribution of sugar and over the distribution of wheat flours. In contrast to the November IMF reform package, in which wheat was to be distributed through BULOG for a 3–5 year transition period, the Letter of Intent deregulated the distribution of wheat, allowing flour millers to market it from 1 February 1998
- complete deregulation of domestic trade in all agricultural products; elimination of the Clove Marketing Board by June 1998
- abolition of all other restrictive marketing arrangements by February 1998; specifically the dissolving of the cement, paper and plywood cartels

- elimination of internal and external trade restrictions on cement; permission for traders to buy and distribute all cement brands in all provinces and to export under the general exporter license
- with respect to foreign investment, removal of formal and informal barriers to investment in palm oil plantations from 1 February 1998, and lifting all restrictions on investment in wholesale and retail trade in March 1998
- discontinuation of special taxes, customs and credit privileges to the National Car Project, as well as any budgetary and extra-budgetary support and credit privileges to IPTN (the state-owned aircraft industry) projects
- reduction in tariffs on all food items to a maximum of 5% in order to secure food supplies for lower income groups
- abolition of local content rules on dairy products
- abolition of import restriction on all new and used ships
- abolition of export taxes on a wide range of products such as leather, cork, ores and waste aluminium from 1 February 1998
- reduction in export taxes on sawn timber, rattan and minerals to a maximum of 10%; elimination of quotas by the end of the year 2001
- exemption of export restrictions on palm oil, to ensure adequate domestic supplies; this exception, however, was to be eliminated by March 1998.

The IMF agreement represents radical changes, even before the WTO implementation for developing countries. The IMF agreement serves to further encourage trade liberalisation in Indonesia. It can be seen from the IMF agreement that Indonesia has already implemented aspects of the Uruguay Round, such as:

1. To maintain actual tariff rates at or below bound rates, and reduce bound rates by an average of 33% by 2004. In this case, Indonesia has already fulfilled this commitment because the tariffs for agricultural commodities were mostly below bound rate.
2. To eliminate all non-tariff imports. In this case, Indonesia has eliminated BULOG's sole import rights, even though it is legal under the WTO. However, Indonesia has introduced new license which restrict imports to sugar producers that would be illegal under WTO agreement. Indonesia also already eliminated the local

content rules for soybean meal and dairy products.

Indonesia's Proposed Agenda

As a developing country, Indonesia can propose special and differential treatment at the WTO Ministerial meeting. Indonesia can make a proposal as an individual country or as a members of a group of countries such as the Association of South-East Asian Nations (ASEAN) and the Cairns Group, the latter consisting of Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Guatemala, Indonesia, Malaysia, New Zealand, Paraguay, Philippines, South Africa, Thailand, and Uruguay. This group favours much greater liberalisation in agricultural trade and is an alliance that cuts across the developed-developing country boundaries. Because 14 of its 17 members are developing countries, the Cairns Group would also like to see developing countries given some kind of 'special and differential' treatment to take account of their needs. However, some developed countries that protect their agricultural sector with subsidies, including the European Union, Switzerland, Norway, Japan, and South Korea, have been resisting such a move. Indonesia could seek special and differential treatment as an individual or jointly with other developing countries in the Cairns Group.

ASEAN could take a position similar to that of the Cairns Group. The Group urges negotiations on all aspects of market access including all tariffs, tariff peaks, tariff escalation, tariff quota volumes, and tariff quota administration and other rules applying to market access commitments. Further, ASEAN could push for a better market access for all agricultural and food products, including value-added products in processed forms.

Avila (2001) argues that developing countries seek greater acknowledgment of their difficulties and a broader application of S&D Treatment provisions of the GATT and other WTO agreements, particularly through: a lower level of obligations; more flexible implementation schedule; best endeavour commitments by developed countries; more favourable treatment for least-developed countries; and technical assistance and training. Indonesia also seeks this greater acknowledgment. As an individual country, Indonesia can also propose more flexible WTO arrangements so that it can support and protect its agricultural and rural development and protect the

livelihoods of its large agrarian populations whose farming is quite different from the scale and methods in developed countries. Indonesia can argue subsidies and protection are needed to ensure food security, to support small-scale farming, to make up for a lack of capital, or to prevent the rural poor from migrating into already over-congested cities.

In the market-access agenda, a possible Indonesian proposal is in the areas of access to developed-country markets, food security, tariff binding, special safeguards and anti-dumping, and minimum access. Indonesia could complain that its exports still face high tariffs and other barriers in developed countries' markets, and that its attempts to develop processing industries are hampered by tariff escalation (higher import duties on processed products compared with raw materials). Indonesia should propose to developed countries, especially its trading partners, such as Japan, the USA and the European Union, to provide quota-free and tariff-free access for products from Indonesia. This would expand the market access of Indonesian agricultural products. Careful analysis using supply-chain methods can identify the critical points maintenance of the competitiveness of the products.

Indonesia also can propose to raise tariffs, based on food security argument to reduce the market access to Indonesia. The Food and Agricultural Organization of the United Nations defines food security in three dimensions — availability, stability and accessibility (FAO 1997). Adequate food availability access to food supplies that are sufficient to meet the consumption needs. Formally, food security can be defined as a situation in which all households have both physical and economic access to adequate food for all members, and where households are not at risk of losing such access. Actually the food is not only rice; however, as the main staple food, the Indonesian government has always focused on rice.

The choice of trade regime will influence food security in Indonesia. Trade liberalisation for food commodities, which was fulfilling the IMF II agreement in 1998, increased food imports, especially of rice and soybean (Oktaviani 2002). In the short run, food security can be achieved through an increase in import volume and the availability of food at lower prices. However, this will discourage farmers from increasing production and productivity, reduce the farmers' incomes and disadvantage the rural-based milling and marketing sector (Tabor et al. 2002). In the long run, greater reliance on importing countries

will accelerate high dependency not only in the economic area but also in the political and social arenas. To reduce the high rice imports, the government applies an import tariff. However, the import tariff policy is not applied very effectively. There is an indication of smuggling and under-invoicing of rice imports (Oktaviani 2002). An increase in the import tariff gives an even greater incentive for smuggling and under-invoicing.

In order to minimise an ineffective import tariff, Tabor et al. (2002) suggest a tariff quota. They also suggest BULOG could use the government portion of the rice import quota and establish a rice policy council. However, it seems that BULOG's monopoly in the rice market could re-emerge. Controlling and deciding of who is the importer, how many quotas per year, how many quotas for each importer is also difficult. Moreover, tariff quota policy is more difficult to apply than the import tariff in terms of the management system. Tariff management is needed in order to make the simple rice tariff policy effective. Indonesia can propose to increase the tariff, to even higher than that tariff binding in the harvest season and otherwise in the dry season. Indonesia needs flexibility in the tariff rates for food crops, especially rice.

In the domestic support agenda, Indonesia can make proposals the area of S&D Treatment and 'green box'. For the S&D Treatment, Indonesia could propose that subsidised credit and other capacity-building measures should be permitted as exemptions when provided to low-income or resource-poor farmers. Indonesia could argue to have greater flexibility because of an 'unequal playing field' with developed countries, such as the level of economic development, technology, infrastructure and human resources. The greater flexibility to increase the domestic support could be proposed within the 'green box' framework.

As a country that exports agricultural products, Indonesia has a strong interest in seeing developed countries export subsidies further reduced. This would improve Indonesia's competitiveness in international trade.

Because there are differences in transaction costs between developed and developing countries, the domestic strategic policy should be aligned with the international trade policy. The Indonesian Government should increase the investment on infrastructure, better apply competition policy, provide greater access to international services and transportation, increase the efficiency and effectiveness of law and

order, and disseminate information about and promote the agreement reached.

Conclusion

This presentation has outlined the numerous trade and investment reform packages that have been launched by the Indonesian Government since 1989 in order to face the more open and competitive world economy. Indonesia signed the commitment of regional free-trade agreement various region which are AFTA, APEC and WTO. The Doha Ministerial Conference in November 2001 delivered new declarations, especially on agriculture. The declarations emphasise the importance of international trade in promoting economic growth and alleviating poverty. Indonesia agrees on the declaration, which will reduce barriers to market access, export subsidies and domestic support for agricultural product. The 'Special and Differential' (S&D) Treatment allows Indonesia as a developing country to reduce its barriers against imports and its market-distorting forms of domestic support by less than developed countries.

In the market-access agenda, a possible Indonesian proposal is in the areas of access to developed-country markets, food security, tariff binding, special safeguards and anti-dumping, and minimum access. Indonesia could complain that its exports still face high tariffs and other barriers in developed countries' markets, and that its attempts to develop processing industries are hampered by tariff escalation (higher import duties on processed products compared with raw materials). Indonesia should propose to developed countries, especially its trading partners, such as Japan, the USA and the European Union, to provide quota-free and tariff-free access for products from Indonesia. This would expand the market access of Indonesian agricultural products. Careful analysis by supply-chain methods and management can be applied to find the critical points affecting the competitiveness of agricultural products.

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Market Access and Job Creation: a Supply Chain Action Agenda (the Case of the Philippine Fruit Export Winners)

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Abstract

Philippines' bananas, pineapples and mangoes have a niche in the international market and are among the country's export winners. With a combined export value of US\$236.5m, they account for approximately 38% of the value of the country's top 10 exports. The country has much to gain by tapping the potential of these export winners, not only to gain foreign earnings, but also for job creation among its primarily agriculture-dependent rural population.

To position Philippine fruits in the global market, will necessitate a review of the market, the product and product flow, to ensure that they come together. This involves issues of market access as well as the functioning of the supply chain.

The paper examines the supply chain for the Philippine fruit export winners (bananas, pineapples and mangoes) and identifies three areas needing attention: product flow (internal), trade impediments (market), and policy support. The focus is to enhance market access, as it is a means to expand trade, stimulate growth and development, and create job opportunities in the agricultural sector. A framework for market promotion and development within the context of the supply chain is outlined.

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Public Policy Issues in Supply-Chain Management

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Abstract

In this paper, the organisation of agricultural markets is explained from the perspective of economic interdependence between agents in the supply chain. The high transactions' costs associated with conveying information about quality, monitoring and testing quality of inputs in the supply chain, and the high degree of financial risk associated with investing in specialised agri-food enterprises, has led to a move away from spot markets to integrated supply chains. Various forms of vertical organisation, including contracting and vertical ownership, have evolved as solutions to information and incentive problems associated with this economic interdependence.

The experience of contract farming as a means of providing opportunities to smallholders to participate in agri-food supply chains of developing countries is presented in this context. While the private sector has an increased role in the development of agricultural marketing services that were traditionally provided by the public sector, there is still an important facilitative and regulatory role for government. The public policy issues surrounding the vertical organisation of supply chains, particularly contract farming, are discussed.

The traditional form of agricultural marketing involves the physical exchange of goods after harvest, where the prevailing market price is determined by the interaction of demand and supply. Spot-market transactions occur along the supply chain at different stages of exchange, between farmers and traders; traders and processors; and on to the retail sector. Where goods are homogeneous or where quality is easy to measure against industry standards, prices determined through these spot-market transactions contain the necessary incentives to direct farm output and marketing decisions.

In contrast, in satisfying today's food consumer, the emphasis is on product differentiation and the supply of quality attributes that are difficult to measure. This has led to a revolution in the organisation of modern agri-food systems. Two main elements of change that stem from this consumer-

focused revolution are increased technical innovation in agri-food production, and the high cost of monitoring and assuring quality along the supply chain.

Technical innovations in the food chain, which have generally led to more capital- and knowledge-intensive production, have led to economies of scale at the food-processing level, and there is increased dependency between players in the marketing chain. Investors bear the risk of stranded assets if they do not have a ready source of raw material input (farm produce). The farmer may also face asset specificity risk if there are sunk start-up costs with entering into a new type of production. The increased concentration of industry that results from economies of scale in the food processing and marketing end of the supply chain raises the potential for abuse of market power.

The high transactions' costs associated with conveying information about quality, monitoring and testing quality of inputs in the supply chain also contribute to the trend towards vertical reorganisation of markets. If it is impossible or too costly to measure

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the quality of a product at the time of sale, the scope for using premiums to reflect quality differences, and thus provide market incentives for quality production, is diminished.

Management of the supply chain has become an essential element of modern food-production systems. In this paper, the policy issues associated with modern agri-food systems are discussed. The issues are presented by first examining the main factors influencing the vertical organisation of supply chains. Economic interdependence has led to the emergence of alliances between the downstream private sector and the agricultural producer, which implies a much greater role for the private sector in agricultural sector development. The main type of vertical organisation is contract farming, and after outlining the main forms of contracts, the literature on developing-country experience with contract farming is reviewed. The discussion then turns to the question of private and public sector roles in agri-food supply chains in developing countries, and public-policy issues are presented.

Characteristics of Agri-food Marketing Problems that Promote Vertical Coordination

There are two main explanations for the rise in vertical coordination in agri-food industries. These are:

- asset-specific investments required by parties to a transaction create dependencies that can be protected better through contracting *vis-a-vis* open markets (*financial interdependence*)
- the transactions' costs of producing and monitoring quality throughout the interdependent production and marketing decisions associated with modern food chains (*information interdependence*).

Financial interdependence (asset specificity)

The asset specificity problem refers to relationship-specific investments that are made in setting up a supply chain. As long as the asset has a lower value outside the supply-chain relationship, there is a risk that parties to the transaction will act opportunistically. For example, a farmer may invest in a particular type of machinery in order to supply a particular product to a processor. The farmer may make his investment decision based on a negotiated price, but

once he has made the investment he bears the risk that the processor will renege on the agreement. The processor will have the incentive to renegotiate prices if the farmer has incurred a sunk cost and the asset has little resale value. Having made the sunk investment, the farmer will be forced to accept a lower return to the invested capital because it has low opportunity cost elsewhere. This problem is also referred to as a 'hold up' problem, because fear of opportunism associated with asset specificity can prevent investments from going ahead.

Asset specificity problems can arise at any point in the supply chain. At the farm level, examples of asset-specific investments include tree crops and investments specific to livestock handling or postharvest handling. Production of highly perishable crops also represents an asset specificity problem. Once the product is ready for harvest, the producer has little bargaining power because the value of the product rapidly diminishes, and thus the buyer has the incentive to threaten to delay purchase and offer a lower price. Forward-contracting of supply schedules and delivery prices can assist in removing the risk of opportunism associated with selling perishable produce.

In the downstream end of the marketing chain, asset specificity problems also arise. For example, the investor in a processing plant makes a highly location-specific investment and is dependent on acquiring raw-material input from the farms in the vicinity of the plant. High economies of throughput imply that a steady source of material is required, and there is potential for opportunistic behaviour by the farm sector. The severity of this threat will depend on the nature of the farm product — if long-distance transport of alternative raw-input supplies is unfeasible, such as in the case of eggs, then the farm suppliers have stronger bargaining power in the post-investment situation.

In many cases, the entire supply chain has relationship-specific investments that imply that there is potential for opportunistic behaviour by all parties. While this co-dependency may lead to a mutually beneficial outcome being struck even in the absence of formal arrangements between the agents, there is a tendency for relationships to be formalised through contractual arrangements. These contracts attempt to spell out various contingencies and reduce the scope for opportunistic behaviour in a post-investment situation, thus providing greater incentives for mutually beneficial supply-chain investments.

Information interdependence

Increased dependency between decision-makers in supply chains is a characteristic of modern agri-food production systems. This interdependency gives rise to information and incentive issues in the design of supply chains. Problems arise where a decision-maker, whose actions affect the wealth of another agent in the supply chain, can hide information about their actions. In this situation, it is necessary to design monitoring and enforcement mechanisms to overcome incentive-incompatibility problems. Contractual arrangements between agents in the supply chain provide a lower-cost means of dealing with information-asymmetry problems than in open market transactions.

The source of many of these information-asymmetry problems stems from the value placed on quality attributes in the consumer product, where these quality attributes are difficult or costly to measure. Agents in the supply chain have little incentive to supply quality if it is not possible to trace low quality back to the individual supplier. Other sources of information asymmetry include opportunities for cheating on agreed supply-chain arrangements — this problem arises because one individual has an information advantage over the other and because it is costly (or impossible) to monitor his performance.

There are two distinct classes of information-asymmetry problems, hidden information and hidden action (Sexton 1994).

Hidden information (adverse selection)

One of the important adverse-selection problems in agri-food supply chains stems from the fact that food consumers have strong preferences for embodied attributes that are difficult to measure from visual inspection of the consumer good. For example, consumers have preferences for food safety and production technique (e.g. free-range eggs) and are willing to pay premiums for these attributes. They are unable to assess whether these attributes are in the product they are consuming and rely on information provided to them by suppliers. There is an incentive for suppliers to lie about these attributes and claim the premium. The adverse-selection problem, if not dealt with, results in a sub-optimal supply of quality because, in the absence of screening information, consumers base their willingness to pay on a probability-weighted expected value — which only low-quality suppliers have the incentive to supply (Ackrelot 1970).

There are various ways in which product differentiation (markets for quality) can be established, even where it is difficult for the consumer to judge quality from appearance of the good. Branding or labelling provides one mechanism for signalling the quality of a good. For example, companies using branding rely on an established reputation to signal quality, and consumers can obtain information about the quality of the good through advertising or repeated purchases and can be assured that quality will be maintained because of the cost to the supplier of lost reputation. Mandatory labelling of food attributes is an example of how public regulation can assist in promoting markets for quality (Antle 1996). However, in many cases, there is considerable uncertainty about food safety and the cost of measuring quality is prohibitively costly, so alternative means of quality assurance, such as monitoring of production processes (e.g. hazard analysis and critical control point — HACCP), are necessary.

Information-asymmetry problems regarding the quality of agri-food products pervade the entire marketing chain. For example, the provision of product guarantees at the consumer end also requires that hidden-information problems be dealt with along the length of the supply chain. Vertical coordination in the supply chain is one means of overcoming these information-asymmetry problems — for example, through contracts that specify measurable quality. However, other means include advertising and branding by input suppliers; or by government intervention in licensing or quality standards in upstream processes.

While contracting helps to overcome adverse-selection problems related to the provision of food quality, it can give rise to other types of information-asymmetry (moral-hazard) problems, which are discussed below. Moreover, contracting does not necessarily overcome all adverse-selection problems. For example, participants in the contracting process face adverse-selection problems in selecting with whom to contract.

Hidden action (moral hazard)

Hidden-action problems arise in a post-contracting situation, where there is an incentive for the agent to cheat on the deal that has been struck. Such cheating could be undertaken by the farmer, such as using inferior (cheaper) inputs to production or not following specified production protocols aimed at providing the processor with desired quality of raw materials. Successful development of contract

farming requires that attention be paid to the design of incentives and monitoring procedures to overcome moral-hazard problems. The nature of these problems is specific to the good being produced, and some examples of contract design to overcome such problems are provided in the next section.

Vertical Organisation in Agri-food Marketing Chains

Contractual arrangements between agents in the supply chain can take a range of forms, and the nature of the arrangements can be categorised by the degree of control offered to the contractor. The choice of control will be determined largely by the nature of the industry, such as the degree of asset specificity and the extent of information asymmetry at points along the supply chain. The degree of control ranges along the spectrum from the spot market, where market prices provide the only information guiding production and marketing decisions, to vertical integration, where the downstream and upstream operations are owned and managed by a single decision-maker. This continuum is represented in Figure 1.

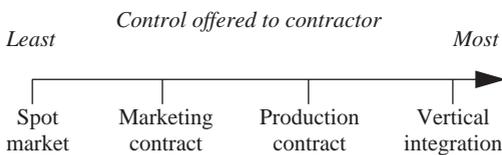


Figure 1. Methods of vertical organisation along the spectrum of control. Source: Martinez (2002).

In practice, there is no clear distinction between different types of contracts along the continuum, but the **marketing contract** generally refers to a contract regarding delivery schedules, pricing methods and quality requirements. There is little direct input into production decisions, and the contract helps to assure both the farmer and the buyer of a market, whilst managing the timing of marketing and conveying information about quality premiums. This type of contract is commonly used by small-scale contracting operators (classified by Eaton and Shepherd 2001 as the ‘informal sector’). Characteristics of these systems are products that have minimal processing and few scale economies. Technical advice is usually limited to grading and quality control, with little advice on production techniques. The

success of these systems is to some extent dependent on the availability of public extension services (by Eaton and Shepherd 2001), and also on the competitiveness of the market, which affects the opportunities for buying or selling outside the contract.

Production contracts generally confer more control to the contractor, and can include provision of raw material inputs such as seed and fertiliser, technical directions regarding production technique, as well as specifications regarding price schedules. The specification of production contracts can help to overcome monitoring problems by specifying inputs (Martinez 2002). Where managing throughput in a downstream processing plant is important, contracts may include a delivery quota that helps assure a regular delivery schedule.

Vertical integration is associated with a higher degree of uncertainty, where it is difficult to specify all contingencies via a contract (Hobbs 1996). However, the management costs of full vertical integration can preclude its use in some industries. It is more likely to occur in industrialised production systems where there is less reliance on decentralised decision-making skills (like local farmer decision-making).

Use of Contract Farming in Developed Countries

Contract farming is becoming an important form of agricultural production in developed countries, particularly for crops that have a high degree of asset specificity at the processing level; where quality control and timing of delivery are important. Such industries include pig and chicken meat production, egg production, and the canning and frozen food industries. For example, more than 80% of broiler production and 70% of pig production is under contract in the United States of America (USA) (e.g. Martinez 2002). Overall, about one-third of the value of agricultural production in the USA is now produced under contract (Young and Hobbs 2002).

That contracts are widely adopted in some industries indicates that they have cost advantages in overcoming quality control and investment issues associated with spot markets, while avoiding the large investment and difficult management costs associated with vertical integration. Contract design varies from industry to industry, as contracts are designed to deal with transactions’ problems that are specific to that industry. However, problems are still

encountered in contract farming for a number of reasons. Firstly, it is difficult to specify all contingencies in a contract, so there is always some scope for renegotiation in an *ex post* setting, and this can lead to fear of opportunism. Secondly, recourse to litigation is often expensive or non-existent. Thirdly, even if it were possible to specify fully the terms of the contract, it is not possible to determine without cost whether the terms of a contract are being fulfilled. High costs of monitoring mean that the information and incentive problems in agri-food production systems continue to be an issue. Other problems with contract farming are associated with the high degree of concentration at the downstream end of the industry. The potential for exercise of market power by these firms in developed-country agri-food systems is an issue of ongoing debate (e.g. Griffiths 2000; Young and Hobbs 2002).

Contract Farming in Developing Countries

In the past few decades, the use of contract farming has expanded rapidly in developing countries. Contracts are used to source raw-material supply for processing industries, such as canned and frozen fruits and vegetables in Mexico (Key and Runsten 1999) and fresh horticultural exports from African countries. In Indonesia, smallholder contracts include production of seed corn, mangosteens, ginger and fresh vegetables for the tourist trade (Simmons 2000). Firms entering into contract farming have had mixed success (Key and Runsten 1999), and there is much debate about who in the farming sector benefits from successful contracts (e.g. Warning and Soo Hoo 2000; Echanove-Huacuja 2001).

Contract farming is used in developing countries to overcome asset specificity and quality-control problems in agri-food marketing, just as it is in developed countries. However, there are other dimensions to contract-farming practices in developing countries that affect the attractiveness of contracts to downstream firms. They also affect the scale at which contracts will be offered and the distributional impact on the farming sector. These extra dimensions to contract farming relate to problems of imperfect or missing markets in developing countries. Much of the literature on contract farming in developing countries focuses on production or resource providing contracts which have the advantage of overcoming

constraints associated with access to farm inputs (factors of production, extension) commonly encountered in these countries. In some cases, these missing markets are associated with removal of parastatal marketing agencies; and agribusiness has stepped in to fill the void by providing input supply services in their contractual dealings with farmers (Eaton and Shepherd 2001).

The question of whether contract farming can benefit smallholders by giving them access to global agri-food opportunities really comes down to three issues. These are the attractiveness of market development in the developing country, and hence the number of contracting opportunities available; the ability of smallholders to access these contract opportunities; and the extent to which farmers benefit, which depends on the terms of the contract. Second-round impacts of contract farming also affect poverty. These matters are discussed below and their policy implications highlighted.

Smallholder access to contracting opportunities

There is concern that smallholders do not get access to opportunities for contracting, and there are a number of reasons why this may be so. One of the most commonly cited reasons is the high transactions' costs of dealing with smallholders (e.g. Sartorius et al. 2003). These include costs of search and negotiation; administration costs; higher costs of providing extension advice because farmers have a greater need for it, and there are more of them; costly communication because there is no access to telephones; and higher monitoring due to pesticide violations (Key and Runsten 1999). In addition, there is a need to provide more resources to these growers, and while this invested capital can be recouped at harvest/payment, there is a greater loss incurred when there is a default on the contract.

Other reasons promoting contracts with larger growers versus smallholders are that technology used in farm production usually comes from developed countries and consequently is capital-intensive and has economies of scale. Larger farmers are usually better educated and are better at adapting to new technologies. Larger farmers can also deal better with yield risk, as they can self-insure through crop diversification. It is difficult for downstream contractors to assist in providing insurance against yield risk because of the difficulty in monitoring whether crop

failure is due to bad luck or bad management. Thus, smallholders cannot be readily involved in production of highly risky crops (Key and Runsten 1999).

However, there are some reasons why smallholders might be advantaged over larger farmers in the choice of contracting partners. These relate to missing or imperfect markets. For example, they are likely to be credit constrained, which can work to the contractor's advantage if there is a premium to be earned from filling missing credit markets. One of the problems with supplying credit to farmers is that the cash can be diverted into other activities, but Key and Runsten (1999) argue that the risk of default can be reduced by supplying credit in-kind. Since production contracts are normally more lucrative than traditional crops, the desire to maintain the contract over the longer term can provide a further incentive for compliance. Group dynamics and peer pressure can provide an effective self-monitoring role where a smallholder group faces the prospect of losing a contract if one of the members defaults.

Where price (as opposed to yield) risk is the key problem in a new crop, there may be an incentive to contract with smallholders because of the returns to providing 'price insurance'. That is, smallholders are likely to be more risk averse and hence will be willing to accept a lower (fixed) price in the contract, which essentially reflects a market risk premium afforded to the contractor.

Another feature of smallholders is that they normally have an abundance of labour and are thus willing to take on labour-intensive activities at a return less than what would be achieved if the contractor had to hire labour. Some examples of case studies that have demonstrated a smallholder advantage in contract farming are illustrated in Table 1.

The requirements of large and small farmers differ in that the latter require a much higher level of service (e.g. resources and information) and are also much more costly to deal with. In theory, both types of farmers could be accommodated in contracts as long as the agribusiness firm can discriminate between them, offering a range of contracts that provide a different level of service and a different price, to account for the extra cost of service. However, experience from Mexico reveals that this can be politically unacceptable — for example, Campbells offered seven types of contracts designed to cover large and smallholder requirements but were eventually pressured to remove their 'price discrimination' practices; and were thus no longer able to offer contracts that recov-

ered the transactions' costs to smallholders (Key and Runsten 1999).

Since the main cost disadvantage of contracting with smallholders is the cost of transactions, policies aimed at reducing this cost will assist in levelling the playing field for smallholders. For example, governments can play a development role by introducing sponsors to farmer groups (and helping in selection of suitable regions). They can also act as intermediaries and protect farmers by scrutinising the sponsors' plans and intentions on behalf of the farmer before contract development. Such a developmental role reduces the search costs associated with finding and negotiating with potential contractors. This facilitating role could also be played by non-governmental organisations (NGOs), and there is some evidence to suggest that the involvement of NGOs does contribute to contract success (Simmons 2000).

One of the reasons for failure of contracts is a lack of understanding on the part of agribusiness firms as to the social and cultural constraints to production. For example, lack of awareness of the religious or social calendar could result in contracts that have inappropriate demands on labour that conflict with social or religious obligations. Government (or NGO) mediators could play a role in scrutinising the terms and conditions of the contract to ensure that they do not pose such conflicts.

Developing the capacity of the smallholder to participate in contract farming, through provision of public extension advice concerning production, will also reduce the private cost of contracting with smallholders. The public sector might also provide public extension services to advise farmers on the implications of various contracting decisions. One of the problems with contracting is the lack of transparency in market transactions, which makes it difficult for farmers to assess the merits of contracting. The government may play a role in advising farmers on assessing contract terms and in dealing with contract disputes (Young and Hobbs 2002). Similarly, provision of public market-information services will assist the farmer in choosing between agribusiness marketing alternatives.

Land policies that restrict foreign ownership may be conducive to improving opportunities for smallholders because they preclude plantation farming and vertical integration. Warning and Soo Hoo (2000) present the case of a particular region in Mexico where local constraints on land markets meant that smallholders had a cost advantage (low rent) and

were thus chosen as contractors. However, it should be noted that there are other factors that go against plantation farming, such as a high cost of investment, and the production risk. The high cost of supervising labour in less industrialised agricultural systems, such as tree crops, is cited as the reason why many crops formerly grown as plantation industries are now being farmed under contract (Key and Runsten 1999; Eaton and Shepherd 2001).

Most of the studies of smallholder experience with contracts have focused on resource-providing production contracts associated with processed or fresh export marketing. The nature of the contract is that a high degree of quality control is important and smallholders are generally disadvantaged because of the high transactions' costs of monitoring performance. However, other opportunities for contract farming

are possible in domestic urban markets. For example, contract farming of vegetables and milk for the domestic market is common in Asia. In the case of fresh vegetable markets, there are lower investment costs (and less distinct scale economies) in the downstream sector; and there are likely to be less stringent quality standards than in export marketing. These two factors imply that the degree of control required by the contractor will be less, and vertical organisation of markets is more likely to have a spot-market or marketing-contract orientation. Policies specific to the promotion of marketing contracts will improve smallholder access to these opportunities. One important factor impinging on the success of marketing (as opposed to production) contracts is that problems of missing markets must be overcome. For example, if contractors only supply marketing serv-

Table 1. Some case studies on smallholder experience with contract farming.

Commodity	Country	Smallholder disadvantage/advantage	Reference
Frozen vegetables	Mexico	Disadvantaged. They did not have access to reliable irrigation water (as timing of delivery was unreliable due to common-property nature of wells).	Echanove-Huacuja (2001)
Frozen vegetables	Mexico (one region)	Advantaged. Farm family members worked in processing factory and this ensured compliance of farmers, for fear of relatives' job loss. Smallholders had lower land rental costs to local land policy.	Warning and Soo Hoo (2002)
Processing tomatoes	Mexico	Advantaged. Large holders were defaulting on contracts due to lucrative fresh market. Smallholders couldn't access this market so were more reliable. They were also credit dependent, which promoted compliance due to longer-term demand for credit.	Warning and Soo Hoo (2002)
Peanuts	Senegal	Neutral. Simple technology did not disadvantage smallholders. Firm used local intermediaries to screen and monitor potential growers, keeping transactions' costs low.	Warning and Soo Hoo (2002)
Seed corn	Indonesia	Potentially neutral. Firm used traditional grower groups to keep transactions' costs low. Contracted with 40 groups involving 10,000 individual growers. However, comparison of contracted and non-contracted farmers revealed contracted farmers generally larger scale.	Simmons (2002)
Pickling cucumbers	Mexico	Advantaged due to low labour cost.	Warning and Soo Hoo (2000)
Frozen vegetables	Mexico (one case)	Used as last resort because larger growers were attracted to grain production due to pro-grain agricultural policy.	Warning and Soo Hoo (2000)

ices, smallholders will need to be able to access extension services, credit and obtain access to factors of production through alternative means. Rural development policy aimed at overcoming these missing-market problems will assist in promoting the use of marketing contracts, and may improve the access of smallholders to marketing opportunities associated with rapidly growing domestic urban markets. Under such improved conditions, marketing contracts may offer a better alternative to spot-market transactions because of the value added by giving growers signals on the quality and type of product demanded in urban markets, and in managing the timing of delivery.

There are, however, other problems associated with marketing contracts that need consideration. These are that volatile markets provide one of the contracting parties an incentive to renege on the agreement, and source/sell outside of the contract. For example, the contracting party, after agreeing to buy a certain crop at a particular price may 'disappear' if there is a glut in the market. Similarly, growers may sell elsewhere if prices are better. Buyer/seller default is a commonly cited problem in fresh-produce markets (e.g. Poole 1998). Government intervention to facilitate a bonding or down-payment scheme could assist in providing greater security to contracting parties (Key and Runsten 1999).

Terms of contract — market power issues

The extent of market power that can be achieved in an agri-food market is affected by the relative bargaining power between the contracting firm and the farmer. The bargaining power of the contractor is stronger where they have a monopoly on input or output markets. For example, production of non-traditional crops that have no market demand domestically, such as cauliflowers in Mexico, require special inputs (seed) and access to an export market — this offers significant market power to the contracting firm. Farmers have some bargaining power where they are able to form groups; and where they have access to other factors of production, other markets for their products, and to other production opportunities.

In situations where the contracting firm has significant market power, there may be a role for government in regulating their pricing behaviour. Antitrust legislation provides a framework for protection in

developed countries although it has not been successfully used in appeal against pricing behaviour of agribusiness firms (Simmons 2000). One factor that makes regulation of pricing behaviour in agri-food chains difficult is the associated decline of spot markets (Young and Hobbs 2002). Thin spot markets do not provide a reliable measure of market conditions and therefore make it difficult to compare contract returns with a market benchmark.

Difficulties in applying antitrust regulation in developed countries would imply that prospects for its use in developing countries, where the legal system is poorly developed, are dim. Jones (1995) points out that attempts to regulate behaviour can be counterproductive, as enforcement relies on the local administration, which is likely to be influenced by local political pressures. Measures designed to control exploitation, such as licensing and the restriction of trade to certain locations, can actually be used to reduce competition. Some authors raise concerns that the threat of overzealous regulation could reduce the attractiveness of investment. For example, Key and Runsten (1999) argue that investors need to be guaranteed of some profits to justify the risks and, in particular, the start-up costs associated with industry development, and that excess profits will be removed by the threat of entry anyway.

Echanove-Huacuja (2001) reports that exploitation of growers usually occurs through 'quality' downgrades when there is an excess supply. Growers say that there is much more argument over quality assessment than price. This implies that the public sector may play a role in ensuring consistency in the application of quality standards, either by creating industry standards, if appropriate, or by providing mediation over quality disputes between growers and contracting firms.

One of the developmental roles that the government can play is in supporting and assisting producer organisations. These associations are particularly important for dealing with transactions between smallholders and large firms, because of the associated transactions' costs (Key and Runsten 1999). In the USA, several states have recently passed legislation to strengthen the rights of producers to form bargaining groups, in response to concern over market power associated with increased concentration in the downstream market (Young and Hobbs 2002).

Scrutiny of contract terms and conditions at the start of a contract may not be sufficient to guarantee smallholder welfare. There is a perception that con-

tract terms and conditions gradually deteriorate over time, although there is little hard evidence on whether or not this is true. Some conjecture that initially better terms are provided to cover grower set-up costs; an alternative explanation is that firms can tighten pricing as they identify the cheaper operators and sack high-cost farmers from their contracts (Simmons 2000). Further research on the experience of smallholders with contracts over time is warranted to assist in the public debate over the long-term benefits of contract farming for smallholders. Meanwhile, one method of scrutinising the merits of contracts during the set-up phase is to examine the likely 'exit' costs imposed on farmers. If there are sunk costs associated with moving into contract farming, or if contract farming results in loss of traditional markets, then smallholders are less able to move back to traditional practices. These higher exit costs mean that farmers have lower bargaining power and are likely to be subject to deterioration of contract terms after they have been induced to switch into contracted farming.

Encouraging market development

Opportunities for smallholder access to supply chains are ultimately limited by the development of these supply chains by investors. There are a number of areas where the public sector can play a role in facilitating such development.

Much of the promotion of contract marketing in developing countries can be attributed to foreign firms that have brought their experience with contracting from developed countries. They have access to appropriate technology, output markets and distribution networks in the exporting country and are therefore in a good position to develop supply chains in developing countries. They also provide spillover benefits through the technology they introduce (Gow and Swinnen 1998). Consequently, policy towards foreign direct investment (FDI) will have an important bearing on opportunities for agribusiness development. Echanove-Huacuja (2001) reports on the experience of frozen food sector in Mexico, which was initiated by two large multinationals, but now domestically owned agribusiness firms have the largest market share.

Suitable laws of contract and an efficient legal system are prerequisites for a strong agribusiness sector. The state has a role in providing a regulatory framework that defines what constitutes legitimate

contracts, and a system of authority to enforce contracts (Jones 1996). The government sector can assist in assuring food quality either directly by providing laws relating to food quality and public health; as well as indirectly by assisting with voluntary certification schemes. For example, it could play a role in the verification of industry quality-assurance schemes, industry standards and accreditation. It may also invest in research to reduce monitoring costs, thus reducing transactions' costs.

Whilst agribusiness firms are active in research and often bring technology to bear in a contract, there are many cases where public research and extension can assist the development of agri-food chains. In many cases, private-sector developers find it easier to move on than to invest research funds in local issues such as pest management. A stronger research and development system, centred on local agro-ecological issues where spillover benefits to the country are possible, is likely to promote development of agribusiness ventures.

Agricultural policies may impact on the attractiveness of contract farming. For example, if there are agricultural subsidies used in promoting traditional crop production for food security, the relative attractiveness of contract farming will be distorted and it will cost more to entice farmers to enter contracts. Agricultural policies can affect the participation of larger farmers in contract farming and thus affect opportunities for smallholders. For example, Warning and Soo Hoo (2000) note that opportunities for smallholder participation in contract farming in Mexico arose because large producers were attracted to grain production as a result of pro-grain agricultural policy. A subsequent policy shift reduced the profitability of grain production and, as a result, the pool of available large growers increased and smallholders were shut out of contract opportunities.

Customs and quarantine arrangements will affect the transactions' costs associated with exporting the agri-food product. High taxes, cumbersome procedures, and corruption can all affect the cost of setting up export markets and therefore impact upon incentives to invest in a particular country. Inadequate quarantine arrangements and poor capacity in pest management can affect the export attractiveness of certain crops, through the exercise of sanitary and phytosanitary (SPS) measures in importing countries. The government has a role to play in promoting good quarantine and conducting research in quarantine issues of national importance.

Public investment in infrastructure will improve the access of smallholders to markets and reduce the costs associated with transacting with them. One of the successful smallholder contracting experiences in Mexico was attributed to the selection of farmers adjacent to the national highway (Warning and Soo Hoo 2000). A strong transport infrastructure also stimulates development of other market opportunities, including spot markets, and creates opportunities for market development by smaller domestic agribusiness firms.

Governments also have a role in setting an effective general environment for agribusiness development. Sound macro-economic policy is essential for industry development. For export-oriented supply chains, a stable exchange rate is necessary to ensure the viability of the operation, which earns receipts in one currency and incurs costs in another. A stable political environment is also essential for assuring access to markets and services. For example, Eaton and Shepherd (2001) give the example of the disruption caused to tourism, and hence access to air-freight services, that can result from military coups.

Broader issues

There are broader issues associated with contract farming that can impact on the welfare of smallholders. These are the second-round effects associated with adoption of contract farming in a particular region. Widespread adoption of contract farming in a particular area could cause thinning of traditional markets, which can impact on those producers still producing for that market. For example, if market size is significantly diminished, it may not be viable for traders to source any product from that region. Where a region's traditional markets are lost, opportunities to moving out of contract farming are diminished and this can reduce the bargaining power of contracted farmers. Other potential negative effects of contract farming may be an increase in factor prices as production of high-input crops increases factor scarcity. Food prices will also go up if contract farming is associated with a reduction in food production and markets are fragmented. Where contracts are only awarded to larger-scale farmers, the net effect on smallholders may be negative. Positive second-round impacts of contract farming are those associated with increased income in the region, which can increase demand for goods and services. The potential importance of all of these factors

should be accounted for in the process of selecting regions for promotion of contract farming, and policies for alleviating any adverse distributional impacts should be considered.

Promotion of alternative institutions for local agribusiness growth

The importance of transactions' costs in the vertical organisation of agricultural markets implies that governments may have a role to play by providing institutional arrangements that reduce these costs, in order to influence the structure of the industry. Hubbard (1997) notes that weak institutions in developing countries lead to a bi-modal industry structure where the only firms able to enter the high-value export market are those with large enough capital, their own institutional arrangements for overcoming missing markets etc. The implication for the agri-food sector is that market concentration could reduce the benefits to the farming community, and to the domestic economy. The potential for growth of smaller-scale regional firms into the agri-food industry could be improved by improving public institutions relevant to the agri-food trade. For example, the need for brand-based quality assurance at a large scale may be due to the lack of standards/legislation in food handling that would otherwise guarantee compliance to safe food practices by the small-medium enterprise sector. An improved food-standards code may promote opportunities for domestic agribusiness firms to enter the domestic food market in competition with multinationals. This will reduce the market power of large agribusiness firms providing a better outcome for both domestic consumers and farmers.

Similarly, a publicly coordinated strategy for improving national reputation in the export sector may assist the smaller-scale sector from establishing export markets, by reducing establishment costs associated with individual firm reputation development. This will provide a more competitive industry structure that will reduce the potential problems associated with current vertical arrangements in the food industry.

Conclusion

The agri-food sector has moved from a production-driven to a customer-driven focus, and this has resulted in a restructuring of vertical arrangements in the industry. Contract farming has emerged as a means of managing supply-chain interdependencies

in both developed and developing countries. There is considerable debate about whether such arrangements actually benefit smallholders, and evidence on this matter is mixed. In general, the high transactions' costs associated with dealing with this sector places them at a competitive disadvantage, although in some circumstances other factors may contribute to their attractiveness as contractees.

Public policies that promote the role of the smallholder in contract farming will ensure that smallholders can capitalise on the opportunities in today's global agri-food market. Efforts to reduce the transactions' costs of dealing with smallholders, through promotion and facilitation of smallholder links to agribusiness, and provision of research and extension services, will improve smallholders access to contracts. Governments may need to play a role in overseeing the terms of contracts to ensure that agribusiness does not abuse market power associated with the high degree of concentration in the downstream sector. Promotion of growers' organisations and monitoring of contract terms and conditions are means of achieving this. Finally, attention needs to be given to policies that affect the attractiveness of investment in the country's agri-food sector, and these include foreign direct investment (FDI) policies, general macro-economic stability, as well as agricultural and trade policies that affect the comparative advantage of establishing supply chains in that country.

Over the longer term, policies aimed at improving the competitive structure of the industry should be investigated. These would be focused on removing the technology bias towards large-scale firms by providing public institutions for quality assurance, and other public services such as extension, that will reduce the large (private) set-up costs associated with agri-food market development.

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Supply-chain Management and Agro-Enterprise Development: CIAT's Approach in Southeast Asia

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Abstract

The Rural Agroenterprise Development Project of the International Centre for Tropical Agriculture (CIAT) has taken a territorial approach to equitable, market-oriented, agriculturally based development in the rural tropics, with the objectives of poverty reduction (through income generation) and environmental sustainability. A four-stage methodology has evolved based on experiences in South America, Africa and, more recently, Southeast Asia. These stages are:

- formation of working groups at the level of rural communities, comprising stakeholders interested in equitable, market-oriented agro-enterprise development, and building consensus on a vision for the future
- prioritisation of agri-food subsectors for further development, based on integration of market demand, production and environmental criteria, and economic profitability, and in line with overall working-group objectives
- strengthening of the supply (value) chains associated with each prioritised subsector, with active involvement of local community groups, support organisations and supply-chain actors from outside the rural area
- development of sustainable services (business development services) to support and further enhance the competitiveness of the supply chains into the future.

Examples of this approach from South America and Vietnam — the root-crop starch subsector — are presented, along with details of a new project in Vietnam and Laos, funded by the Swiss Agency for Development and Cooperation (SDC) — *Small-scale Agroenterprise Development in the Uplands* (SADU) — which aims to adapt the process to the situation of these two Southeast Asian countries.

Globalisation, trade and public-sector reforms, urbanisation and technological advances are all contributing to an agricultural sector in rapid change across the developing world. Rural smallholders, who must be reached if the millennium goal of reducing poverty

rates by 50% by 2015 is to be met, face declining real prices for their basic commodities. Competitive pressures, often from imported foodstuffs, are driving a process of intensification in the use of natural resources. This has potentially serious consequences for sustainability in the longer term.

Markets are penetrating deep into what were formerly rural subsistence economies. To survive, producers now need to operate successfully in a different, market-oriented environment where new skills and knowledge are needed to make different types of decisions. At the same time, the agri-food industry is itself changing, with a rapidly increasing role for managed, coordinated supply chains that are

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dominated by a few large — often multinational — supermarket retailers.

This trend of increasing concentration and vertical coordination in agri-food supply chains tends to marginalise smaller-scale producers. In turn, rural producers are seeking options that will provide opportunities for them to improve their livelihoods and incomes. These can include production of higher-value crops (rather than basic commodity staples), differentiation and added value through production practices (e.g. organics), product quality, packaging and marketing strategies (e.g. fair trade). Options also include leaving agriculture to seek off-farm income, either in the local rural area or via migration to urban centres.

To achieve success with the demand-side options, smallholder producers need to participate in supply chains for added-value products with growing markets. This means finding ways to participate in the type of managed supply chains that are now developing, in a manner that is both efficient (i.e. competitive), but that is also compatible with environmental and social sustainability. This implies a need to combine a supply-chain approach with local development processes in specific communities (a territorial approach). This paper presents an approach by the International Centre for Tropical Agriculture (CIAT; Centro Internacional de Agricultura Tropical) Rural Agroenterprise Development Project to meet this challenge.

The Rural Agroenterprise Development Project at CIAT¹

Based in Cali, Colombia, the project started in 1996 as an outgrowth of previous work on postharvest technology, marketing and enterprise development of cassava. The purpose of the project is to link smallholders with growth markets and motivate the adoption of natural resource conservation practices through the development of techniques and information for the establishment and strengthening of rural agro-enterprises and their complementary support services. In particular, the project focuses on strengthening local capacities for rural business development through information, methods and

institutional schemes, all in collaboration with local partners.

Basic values of the project include: (a) an entrepreneurial, market-oriented focus, (b) participatory decision-making with partners, (c) a focus on strengthening existing local skills and building new ones, (d) a search for consensus among actors, (e) equal access to opportunities for participating groups, and (f) social, economic and environmental sustainability.

The territorial focus has been developed in three specific field sites in Latin America: Pucallpa, Peru; Cauca, Colombia; and Yorito, Honduras. In each of these sites, CIAT has worked with a variety of local partners including producer groups, non-governmental organisations (NGOs), governmental organisations, the private sector and others. It is out of this field work and dialogue with partners that the approach has evolved.

Before explaining the approach in detail, it is important to explain why CIAT has chosen to combine a territorial approach with the development of supply chains for specific, prioritised commodities or products. By focusing on a given geographical area or territory, it is hoped that a local skills base may be built that not only generates positive returns for a specific subsector or supply chain, but also produces spillover effects which contribute to a diverse and dynamic local economy. Market systems will change, so by not limiting work to a specific product, a territorial approach allows flexibility and adaptive learning which the working groups can continue to apply as the market opportunities change. For agricultural products, a focus on the land where they are produced also helps the development of more sustainable and diverse production systems, whereas a single supply-chain focus could tend to do the opposite. In addition, the selection of a number of options for a given territory makes it possible to target different socioeconomic groups or agro-ecological niches, providing for more balanced social and agricultural development. Finally, the creation of human capital and the improvement of both bonding and bridging social capital among organisations are embedded in this approach. This last point is important for achieving sustainable gains against poverty in a region.

The territorial approach consists of four major areas of work:

- (a) identification of a specific working group composed of diverse local organisations with interest in rural business development

¹ This section draws on the paper prepared by the CIAT project staff in Latin America (Lundy et al. 2002).

- (b) identification of supply-chain priorities based on the market opportunities available to the region
- (c) participatory supply-chain analysis and development, through consensus-building with chain actors
- (d) provision of appropriate and sustainable business-development services for the region.

The entry point for this approach is the identification and consolidation of a local working group in a particular community or territory. The other areas of work are subsequently developed in collaboration with that group.

Local working-group formation

The formation of a working group around the theme of rural business development is an iterative process that varies depending on the organisations present in the area, previous experiences and the necessities of the local population. In our experience, these groups usually include strong representation from producer organisations and NGOs, with somewhat lesser participation by public- and private-sector actors. Membership in the interest group and the organisational form are decided by the participants, as is the demarcation of the territory in which the interest group seeks to work. To facilitate these decisions, two specific activities are carried out with the interest group at the beginning of the process. First, a profile of the territory, including biophysical, social, organisational, institutional, economic and political concerns, is developed with secondary data and the use of rapid rural-appraisal tools. This information provides a common basis for decision-making among group members. Based on this information, a consensus for action is developed that builds on agreements around a common vision, mission and values, and the organisational structure and rules for working-group operation. An initial action plan is then developed. At this stage, topics like market orientation, entrepreneurship, participation and alliances are debated. This process is key, since it allows group members to discuss and analyse past experiences and decide on what actions are appropriate in the future.

Identification and management of market opportunities

Once the working group exists, one of the first questions is which products and/or areas are most likely to generate positive impact for the region. To

avoid past mistakes where increased production of a single or restricted range of crops/products led to saturated markets, low prices and continuance of the poverty cycle, a market orientation is fostered by involving the local actors directly in the identification of market opportunities. This process consists of two types of work: specific market studies and the on-going management of market intelligence. In the first area, CIAT has developed a market-opportunities identification manual (Ostertag 1999) which seeks to respond to three main questions:

- (a) what products show strong market demand in terms of increasing volumes and prices
- (b) which of these products can be produced in the region, given the biophysical characteristics, infrastructure and access to productive resources
- (c) of those products identified in (a) and (b), which are of interest to smallholders?

This opportunity-identification process involves the collection of information from different market outlets, including produce markets, local shops and supermarkets, food processors and traders in order to assess the prospects and potential for developing produce and product supply options. These market outlets can be local to the territory or beyond, in urban centres, or in some cases in neighbouring countries. Opportunities for export can also be considered.

The end result is a portfolio of options. The size and diversity of this portfolio depends on market conditions, biophysical characteristics and potential of the territory to produce any given alternative, profitability and on farmer interest, but normally includes from 10–30 possibilities. Sustainable-production criteria — soil conservation, biodiversity etc. — can be included in the evaluation and prioritisation process.

In the area of market intelligence, we seek to build local capacity to generate, manage and disseminate key market information on a permanent basis. This capacity involves not only direct market visits by working-group members and/or interested groups of farmers, but also strategic alliances with national market information system programs and the development of information dissemination tools appropriate to the rural context and local culture.

The end result of a market-opportunity identification study is a basket of possible options for development in the selected region. At this stage, the working group prioritises these options based on local criteria in a participatory fashion. Local criteria used have included strength of market demand, product profit-

ability, environmental impact, perceived *ex ante* development impact, and interest in the product by organisations, among others. These criteria vary by region and culture. Using local criteria, the market options are ranked and a decision made on which option(s) to pursue first.

Integrated supply-chain projects

At this stage, the local working group moves into the participatory analysis of the selected product supply chain. CIAT has developed a method that seeks to facilitate the analysis of the market chain by the actors directly involved and, through this process, to generate collectively owned information and a consensus for action. The scope of this analysis is somewhat broader than a typical subsector approach in that it includes not only the supply chain as such (production, postharvest/processing and marketing), but also two important cross-cutting areas: business organisation and the provision of business development services (see Figure 1).

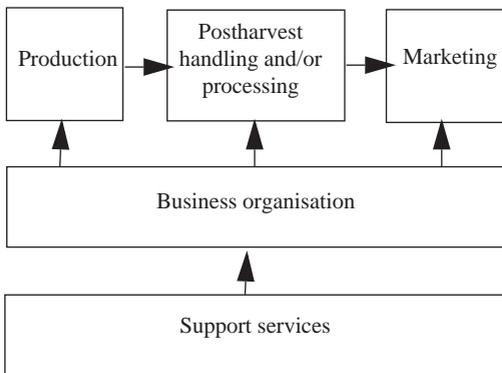


Figure 1. The scope of supply-chain analysis.

Business (enterprise) organisation and support services present in a supply chain are key to understanding the prospects for improving chain performance through the effective use of existing skills and services, as well as identifying important bottlenecks that constrain such improvements.

Once priority supply chains have been agreed, specific market contacts are identified. This is complemented by a broader identification of relevant actors (those involved in production, postharvest and marketing operations) who can participate in the analysis of the chain. Participatory tools, focus groups and direct interviews with the different actors are used to

collect supply-chain information (chain mapping). This helps to group actors so that the perceptions of traders, producers etc. can emerge independently, for later comparison and analysis in a wider group setting. All actors then review this information to identify and analyse bottlenecks and propose solutions. At the end of the process, facilitated consensus-building workshops are held where all the information is shared and discussed with the various actors with the goal of identifying positive synergies among actors, common interests and critical points where strategic investments can achieve high returns. Figure 2 shows the steps used in this analysis.

After the process of negotiation with actors occurs, an action plan, or integrated agro-enterprise project (IAP), is drafted, which includes research and development (R&D) activities in the short, medium and long term. The goal of this project is to improve the competitiveness and sustainability of the chain through the development of a common business-development vision among various actors. Once a common vision has been established, specific development or research activities may be disaggregated into discrete projects, depending on funding opportunities and donor interest, while conserving a clear idea of where everything fits together.

The implementation of activities is coordinated by the working group, which sources appropriate funds and technical services based on the demands identified during this process. By learning how to design and implement an IAP — diagnose, analyse, design, source funds and coordinate implementation activities — the local working group builds important capacities, which are needed for other future projects.

Provision of appropriate and sustainable business development services

A final component in the CIAT approach is the provision of appropriate and sustainable business development services (BDS) that support the participation of rural communities in these more efficient supply chains. A methodology is now under development at CIAT for assessing the supply and demand for services in local communities, and for ensuring that gaps in the market for services are filled in a sustainable manner. This covers financial, non-financial, formal and informal services and seeks to build functional markets for BDS that link specific demands with suppliers either at the local, regional or national level. This is currently under development in

a project in Honduras and Colombia supported by the New Zealand Agency for International Development (NZAID).

These methods have been developed through participation in local and supply-chain development projects in Latin America — see Lundy et al. (2002) for more information on the results obtained in Peru, Colombia and Central America to date.

CIAT Project Activities in Asia

Between 1998 and 2002, CIAT’s Agroenterprise Project has had two areas of activity in Asia, one focused on the root-crop starch subsector in Vietnam — especially the small-scale processing enterprises around Hanoi — and the other concerned with developing a strategic alliance with the SEAMEO (South-east Asian Ministers of Education Organization) Regional Center for Graduate Study and Research in Agriculture’s Agroindustry Development Programme (SEARCA-AIDP) and the network Users’ Perspectives With Agricultural Research and Development (UPWARD) for capacity-building in the agro-enterprise development area. During 2003, a major agro-enterprise development project for Lao

People’s Democratic Republic (PDR) and Vietnam has been initiated, funded by the Swiss Agency for Development and Cooperation (SDC), representing an opportunity to adapt the methodologies developed in Latin America (and now also being trialled in Africa) to the Asian regional situation.

Rural agro-enterprise development training courses with SEARCA and UPWARD

Two regional courses have been conducted, one at SEARCA, Los Baños, Philippines, in 2001, and a second at the Post-Harvest Technology Institute, Ho Chi Minh City (PHTI-HCMC), Vietnam, in April 2003. The courses stressed markets and supply-chain development in the context of territorial (micro-regional) processes and priorities. Each course comprised modules on:

- Asian context — macro policies and trends in rural development and the agri-food sector
- local participation
- methods for designing and implementing rural agro-enterprise projects
- learning from experiences
- project design, including field work.

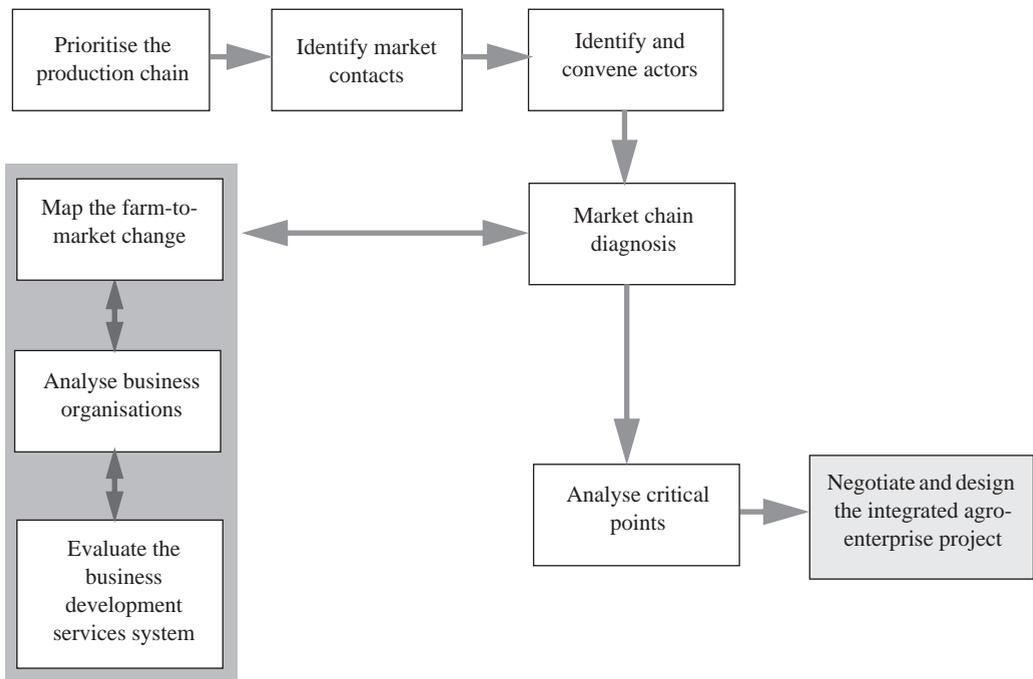


Figure 2. Steps in the supply-chain analysis method.

Participants in the first course (13 from 3 countries) were mainly from academic or research institutions, while those in the second course (25 from 4 countries) were principally from rural development agencies in both the NGO and public sectors (provincial level). Course evaluations have proved very positive, and a further Southeast Asian regional course is planned for 2004, perhaps in Indonesia. PHTI-Vietnam is planning to adapt course materials for a Vietnamese national course, also in 2004. A loose network of course participants exists, and the new CIAT project in Vietnam will serve to strengthen this further, especially in Vietnam and Laos.

Vietnam starch cluster project

A national study of the small-scale root-crop starch industry in 1998 (Goletti et al. 2001) identified the potential of rural industrialisation to generate income and reduce poverty. Since then, an more detailed study has been undertaken of the cluster of root-crop processing enterprises in Dong Lieu commune, some 20 km from Hanoi. This has since developed into a more development-oriented project to improve the performance of the supply chain (or system of enterprises), supported by Urban Harvest (formerly SIUPA; the Strategic Initiative on Peri-Urban and Urban Agriculture of the Consultative Group for International Agricultural Research — CGIAR).

The area is traditionally agricultural but has, since the late 1960s, specialised in household-level root-crop (cassava and canna) processing, due to its proximity to Hanoi and access to its growing markets. Since then, processing capacity has increased 3–10 times, an average of 600% increase over 15–25 years. The average amount of cassava processed increased from 0.05 t/household (hh)/day in 1978 to 3 t/hh/day in 2001, while the average amount of canna processed has increased from 0.04 t/hh/day in the 1960s to 9 t/hh/day. Thus, the volume of roots handled by each trader has increased by 200–300% over recent times. Of the 2193 households in the commune, 1410 households (64%) are directly involved in root-crop processing, while others supply raw materials, trade end products, use processing by-products, or provide a wide range of support services. On average, pig raising using the residue from cassava processing as a major feed ingredient is a common supplemental livelihood activity in root-crop processing households (1409, or 64% of households raise pigs). Only 4% of households obtain a livelihood mainly from

crop production. In the 2000–2001 processing season (approximately September to April), the commune processed 680 t of cassava roots and 314 t of canna roots daily.

As the starch processing developed, a starch-based cluster of enterprises emerged in support or in association with starch processing (Table 1). The ever-increasing enterprises are packed in the small village area with little space to operate and no space to expand. The major constraints facing the starch processors are not the technologies, as they are developed appropriately, but the limited space and the associated constraints to production.

Table 1. Frequency of different household enterprises in Dong Lieu, Vietnam (total number of households surveyed = 2193).

Household activity	No. of households
Cassava starch processing	630
Canna starch processing	141
Cassava starch filtering	311
Cassava root grating (service)	59
Canna waste drying for sale	209
Canna waste filtering	32
Maltose production	146
Canna noodle production	65
Sugar processing	2
Rice noodle production	86
Candy production	32
Tofu production	8
Processing solid waste trade	11
Cassava/canna root trade	33
Rice production for maltose	3
Agricultural labour for hire	201
Industrial labour for hire	91
Green bean processing	15
Mushroom production	12
Pig raising	1409
Alcohol production	21
Tile cutting	2
Drying cassava waste (fuel)	432
Other (including services)	847
Total number of activities	4798

Consequently, the women often queue for hours (some claim 3–4 hours) to obtain roots before pushing/pulling the heavy cartload back home, which, for some, can be a fairly long journey, depending on location. Thus, much time and labour is wasted on root procurement. Moreover, due to limited space for drying, many processors push cartloads of starch products to the fields and spread them

out to dry in the morning and collect them in the afternoon. Again, depending on the location of the house in relation to the field, this can also be a time-consuming activity. The limited space also contributes to low starch quality, as there is not enough space to set up various settling tanks to produce high-quality starch. The starch quality is further adversely affected by drying on the very dusty or muddy roadside. Thus, the limited space has resulted in serious wasted labour and low starch quality.

In addition to the adverse effects it has on production, the confined space has caused another serious environmental pollution as starch processing generates a large amount of wastewater and solid matter. Dong Lieu generated almost 1.45 million m³ of wastewater during the processing season of 1999–2000, and estimated 51,750 t of solid wastes.

During a stakeholders' meeting with the commune leaders and processors, limited space, wasted labour, and environmental pollution were clearly recognised by the participants as the major constraints to their enterprise development. During the meeting, no proposals emerged for viable solutions. The constraints were evident, but solutions were elusive.

Subsequently, a trip to Dong Nai Province in southern Vietnam to visit some medium-size processors was organised for Dong Lieu to help generate relevant ideas for overcoming the constraints. The visiting team (comprising processors, an equipment maker and a local government representative) was most impressed with the continuous filtering tank system, which accounted for the high quality of the starch, and the way in which the wastes were processed or disposed. Based on this observation, the commune brainstormed the idea of designing a processing zone in Dong Lieu that creates a space to accommodate the continuous filtering tank system and a better organised processing layout. The solution came from the commune itself when they observed another production system and compared it with the constraints they face. Concrete steps to implementing the solution may be learned in another visit to a processing zone of the similar nature, planned for late 2003.

Small-scale agro-enterprise development in the uplands of Lao PDR and Vietnam

There are continuing high levels of poverty (40–50%) in the upland areas of both Lao PDR and Vietnam. While poverty alleviation is a major aim of

rural development programs, market limitations remain a major impediment to success in development. Agro-enterprise development can contribute to poverty alleviation through creating more diverse income sources by providing improved access to markets, improving product quality, adding value to raw products through intermediate processing, and in providing service industries. The *Small-scale Agroenterprise Development in the Uplands* project proposes to develop approaches to agro-enterprise development at the district and community levels that are appropriate to the economic, cultural and political setting in Lao PDR and Vietnam. The goal is “to develop sustainable agroenterprise initiatives with upland rural communities that generate income and employment opportunities through diversifying and adding value to local natural resources”.

Lao PDR

In Lao PDR, the project is initiating work in the poorest districts of the relatively isolated Xieng Khouang Province. Contacts with the local provincial government have confirmed that community development should be a major concern of the project, in addition to the development of specific supply chains based on identified market opportunities.

The province is changing rapidly — new roads to both Vientiane and to the Vietnamese frontier are now open, electricity in urban centres is now much more reliable (power cuts were common) and flights have been increased to bring greater numbers of international tourists to the area.

Although the project is still in the initial phase of working-group formation, some market opportunities are already appearing, based on the improved market access that recent infrastructure developments have brought. These include potential in local and national markets to obtain higher prices for new varieties of fruit (plums, nectarines) and prospects for higher prices for local asparagus, if selection and packaging can be improved. In international markets, the region is already exporting a specialty rice (glutinous rice) to Vietnam, and a local mushroom is being air freighted via Taiwan to Japanese supermarkets. These and other options will be used as a basis for participatory market-opportunity identification as the project progresses.

Vietnam

Understanding the potential role of private enterprises in the economic development of the country,

the Vietnamese government has recently introduced many policies with regard to small-enterprise establishment, operations, and tax burdens to favour the development of small and medium enterprises, in both agricultural and non-agricultural sectors. Thus, the current environment is very favourable for the project to introduce, test, and adapt CIAT's experience and approach in agro-enterprise development to Vietnam.

The CIAT approach will eventually be tested in the upland districts of three provinces in Vietnam — Tuyen Quang, Thue Thien Hue, and Dak Lak. As in Laos, the project is still in its initial stages. Previous experiences of working in these areas have helped identify some opportunities among the current products and potential projects. In Yen Son District of Tuyen Quang, there are opportunities to improve production of tea, coffee, various fruit trees, and livestock, such as pig, fish, and meat cattle. The potential markets for Tuyen Quang include non-timber forest products (NTFPs), which are yet to be identified, private nurseries, or perhaps organic tea and gourmet coffee. Nam Dong District of Thue Thien Hue currently produces NTFPs (rattan, bamboo), fruit trees, pepper, fish, and rubber, but pigs, chickens, and vegetables also have potential to contribute income if properly developed. Coffee, NTFPs (rattan, bamboo, medicinal plants), timber, maize, rice, pepper in Dak R'Lap District of Dak Lak can be improved to increase their market opportunity, while fruit trees and livestock also should not be overlooked as potential enterprises.

The complete supply chain of current enterprises will be evaluated from production to market to examine breakdowns or bottlenecks in the chain that cause low profitability of the enterprises. Once a bottleneck has been identified, strategies can be developed to modify or eliminate it, or to enhance performance so that obstacles can be removed. For example, if product quality is identified as a major constraint, further investigation into all areas of the crop — variety, agronomic practice, field management, harvesting and handling, and storage — will be necessary to understand the root of the problem. Once that is understood, uncomplicated and short-term on-farm or farmer participatory trials can be conducted to seek solutions. If transportation or volume of produce to meet purchaser requirements are identified as a major constraint, investigation into group marketing, various transportation pros and cons, alternative means of transport, and negotiation

with buyers on sharing the burden will need to be considered. Each step of the supply chain will have several aspects that can be considered for improving the function of the whole chain. Through this process, the working groups will learn to analyse the weaknesses of the supply chain and ways to find solutions to overcome them. This skill, once learned, can be applied to analyse the supply chain of each of the income-generating activities.

Going beyond the current products to explore uncharted markets involves risk, time, and possible cash investment. For cash-strapped and risk-averse farmers, such an endeavour must proceed with caution and comprehensive understanding of market demand and requirements. Both the supply and demand sides must be considered. For example, in order to consider gourmet coffee or organic tea as potential enterprises for Yen Son District of Tuyen Quang Province, the working group must have the knowledge of markets — where the market is and how to connect to it directly or indirectly, quality requirements, quantity required, frequency of delivery, and price stability, as well as production knowledge in order to meet the quality, quantity, and seasonal demand with a profit, while withstanding the occasional risk caused by market fluctuation. Such endeavours take time to develop, but the potential benefits of developing new agro-enterprises to meet new market challenges could be enormous and should not be overlooked.

The strategy of the project is to focus on the improvement of the supply chain of current enterprises that show strong demand growth for the short run, while beginning to assess new market opportunities and assist the working groups in developing the supply chain to meet the market demand in the long run. An important output of the project is that the working group will learn to assess the weaknesses and find solutions for the current supply chains, and assess the potential and find entry-ways into the potential supply chains. The principles of assessing the supply chains are the same, but the different starting points require different methods in these assessments.

Conclusions

The agri-food sector is changing fast in Asia. Managed supply chains are expanding, and will soon take a major share of processed-food and fresh-produce markets in many countries in the region. Can

smallholder producers bridge the gap that currently exists between the traditional and the more coordinated, efficient supply chains? Can they participate equitably in such chains?

CIAT believes that opportunities for this do exist, but that success requires a pro-active R&D effort that links supply-chain and local-development processes, combined with conducive local and national policies that support entrepreneurial endeavours in rural areas. CIAT's Rural Agroenterprise Development Project, with its national and regional partners, is a contribution to this end.

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The Supply Chains of Melons in Western China

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Abstract

Melons are regarded as a delicacy among the Chinese consumers. They are well known for their good flavour, sweetness and crispness. Melons are grown in the arid, remote areas of China, including Xinjiang, Gansu and Mongolia. The major markets for melons, however, are located hundreds of kilometres away, or even over 1000 km away. This study illustrates the supply of melons in western China at each of the supply levels: production, harvest, grading, purchasing, wholesale and retail, and the transport logistics. It highlights some of the issues that are obstacles to the effective supply of melons to other regions. This includes small-scale production, postharvest losses, large distances between growing areas and end markets, transaction-based relationships between growers and traders, and little information flow from end markets to farmers and collectors.

To address these issues in the Chinese context, this study proposes to focus on the following to improve the supply chain: formalising the existing relationships among farmers with a view to sharing experiences and exchanging information; carrying out projects to identify and involve appropriate extension officers; and improving technological knowledge through the participation of in research and development (R&D) projects.

Melons have traditionally been regarded as a delicacy among the Chinese consumers. They are well known for their good flavour and sweetness. They are grown in the irrigated arid remote areas of Xinjiang and Gansu provinces in western China and, more recently, have been introduced to Mongolia, Shandong (where they are grown in greenhouses) and some dry areas in southern provinces, to capture off-season premium prices. Among all the melons, Hami melons have been the best known for centuries — ever since the Hami king brought them from thousands of kilometres away as a special offering to a Chinese emperor.

Most Hami melons are grown in Xinjiang Province, but more recently are also grown in Mongolia and some southern provinces. Gansu Province is rather well known for honeydew melons, including Huanghemi melons (literally Yellow River melons) — a variety developed two decades ago by a research team in Gansu. Over 85% of the melons from western China are transported over thousands of kilometres to interstate markets. While melons were once regarded as fruits exclusive to the imperial family, they now suffer from downward price pressures. Industry-level problems include technical issues of pests and diseases, lack of cold-chain storage, packaging and supply-chain relationships. The issues are recognised by all stakeholders in the industry and the government. However, there have been few systematic actions to address these problems.

This study looked at each level of the melon supply chains in western China, including supply-chain functions, transport logistics and relationships. Some issues that are obstacles to effective supply chains are discussed, such as small-scale production, long-dis-

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tance transport, and transaction-based relationships between chain partners. The discussion is based on interviews with farmers, collectors, wholesalers and extension officers in Gansu and Xinjiang provinces.

Melon Supply Chains in Western China

The partners in the melon supply chains include farm-input suppliers, farmers, collectors, wholesalers and retailers. The bulk of the melons sold at interstate markets pass through all levels in the chain. For the local market, melons may go straight to wholesaler, retailers or directly to consumers.

Suppliers of farm inputs and services

These suppliers include seed companies, chemical suppliers and county-level extension service stations. Many of the suppliers, especially seed companies, are state owned or with state shares. There are increasingly more private businesses selling seeds. However, farmers have had bad experiences with them in regard to quality standards and authenticity of the claimed varieties. Under the recent 'one dragon' policy of agro-industrialisation, some farm-input corporations now work closely with farmers or farmer groups to integrate production and distribution functions (Wei and Zhang, these proceedings). This has not yet occurred in the melon industry, but the potential exists for input suppliers to work more closely with farmers.

Farmers

Farmers in Gansu and Xinjiang have very different scales of production. In Xinjiang, many melon farmers rent large blocks of land from the government's 'military settlement farms': normally 50–100 Mu, up to a few hundred Mu (15 Mu = 1 ha or 1 Mu = 67 m²). Military farms were unique in Xinjiang. They were established by massive migration of soldiers to the areas soon after the liberation in 1949. The soldiers played the dual roles of maintaining stability and farming the vast tracts of undeveloped land in Xinjiang. Now that the soldiers are passing away, the land is rented to younger members of the soldiers' families. In the past, military settlement farms gave orders to the tenants as to what to plant and bought back the produce for distribution. They had their own

technical teams to assist farmers in preharvest practices. Recently, the government quit its distribution role and farmers are now responsible for their own losses and profits. Farmers have much autonomy in making planting decisions. In addition to military farms, some melons are produced by small farm households. In Gansu, farm size is much smaller — about 10 Mu (0.67 ha) for an average household, and farmers are used to making their own planting decisions.

Melon farmers in both Gansu and Xinjiang have modest infrastructure for growing melons. Many of them use fertilisers and plastic mulch but not herbicides or pesticides, as their disease problems do not often show up at the farm-gate stage. Disease problems are most serious for Hami melons. To address the problems, some Xinjiang farmers are now only renting land that has not been planted with melon in the past few years. Some also use sheep manure rather than fertilisers as they see its benefits in reducing disease problems and improving quality and shelf life.

Besides growing and harvesting, farmers may grade, package and transport melons to collection points in the village. Harvesting is done manually by collecting melons in hessian bags. Grading and packaging are mostly based on instructions from collectors or wholesalers. Standards vary between wholesalers, and are not written. Common indicators are size and blemishes and judgments are made by visual observations. There are two types of packaging: large, netted nylon bags of 20 kg capacity for the local market; and cartons of 10–15 kg capacity for interstate markets.

Collectors

In Xinjiang, collectors (known as Ma Zai) merely play the role of go-between. They bring wholesalers from interstate to farms to inspect the fruit and collect fees. They are not involved in the actual business. In Gansu, collectors buy melons from farmers and sell to interstate wholesalers. They are often farmers themselves, who have a bit more capital and have sources of information and contacts with wholesalers. There are generally a few collectors in each village. They build their own simple, undercover stands by the roadside near the production areas through which wholesalers and trucks can pass.

Wholesalers

Wholesalers are normally from other provinces and operate as merchants rather than agents. They travel around the country to obtain melon supply in different seasons. Wholesalers perform a critical function in the chain by linking local production to interstate markets. They have the potential to become supply-chain managers, as they are the only channel partners that know both production (through collectors) and markets. However, this has not occurred for various reasons. Given that individuals are not able to get loans from banks, wholesalers cannot operate on a large scale. Two to three of them work as a team on a small amount of capital. One of them travels to the production area to buy the fruit and the other(s) sells the fruit at the central markets in other provinces. They only do one deal a year, at most twice, for each of the production areas in Gansu, Xinjiang, Mongolia etc. The scale of each deal is one or two truckloads, about 10 or 20 t, but often stretches to a limit of 14 or 28 t. Because wholesalers go to each production area only once a year, it is unlikely that farmers get any feedback from them about the current season.

Wholesalers are the link in the supply chain who that have the whole picture of melon production, transport and marketing. They have years of experience in the marketing of melons in their region. However, they may not purchase melons in any particular year if they do not expect it to be profitable. Before travelling to Gansu, wholesalers first contact collectors by phone on supply and price.

Local business people from the production area are hesitant to enter the wholesale business due to lack of an interstate network, and lack of understanding of the end markets. In addition, melons are shipped with no refrigeration and these people would be under pressure to find an outlet in cities in which they have no contacts.

Retailers

Retailers are located thousands of kilometres away from the production areas. Wholesalers leave the scene completely once they sell the fruit to the retailers. There is little feedback of information between wholesalers and retailers unless serious problems occur.

The whole supply chain from farmers to retailers is transaction-based and payment is always made in cash, on the spot. This is not surprising, given few institutional bases for supply-chain coordination,

including an absence of consolidation at all levels of the supply chains, an ineffective contract-implementation system and lack of cultural underpinning for inter-organisational collaboration (Wei 2003).

It was estimated that in the Gansu melon value chain, retailers have the largest share (41%), followed by wholesalers (28%), farmers (23%) and, lastly, collectors (8%) (Zhang and Wei, these proceedings). One complaint from farmers was that they paid over 7% of their cost of production in various taxes.

Characteristics of Melon Supply Chains in Western China

The melon supply chains as described above have several characteristics that make supply-chain management difficult to implement, as discussed below.

Undifferentiated product

The industry competes on price and has turned an exclusive product into a commodity product. Given that interstate, urban consumers are able to pay a premium price for quality, there is an opportunity for product differentiation and a branding strategy. While Hami melons have been introduced to other provinces, consumers still perceive Hami melons from Xinjiang as the best. Hami melons from other provinces are often sold with the false claim of 'Product of Xinjiang' on the box.

A vast market

China has a vast production area and a vast market with many segments. Both top and poor quality products find their way to consumers. While China is opening up its doors to overseas commodities, local produce still has a large share of the market. Some of the reasons why the domestic market has not become more integrated include the huge distances between production and consumption areas, poor road infrastructure, and imperfect information flow.

No horizontal integration at each level of the supply chain

Consolidation of supply-chain levels has been one driver for supply-chain management in the food and fibre industries in developed countries. In China, businesses are not consolidated at any level of the melon supply chains. There are myriads of unorgan-

ised producers, collectors, wholesalers and retailers. Wholesalers operate on low capital costs and can enter and exit the industry easily. The prosperity or downturn of the melon industry will thus not affect the wholesalers in a significant way.

Transaction-based supply chains

Competition has forced business operators with limited capital to enter into short-term businesses for immediate benefits. Melon supply chains are characteristically loose, fragmented and unstable over time. They involve a series of decentralised, dyadic interactions, with no purposeful intention to deliver the best products to the end consumers. As no channel manager exists, the chain partners do not see the possibility of coordinating the marketing functions among all chain actors.

Low bargaining power by farmers

For several reasons, melon farmers do not have equal bargaining power over collectors or wholesalers. One of the main limitations is the absence of cool-chain storage, which forces farmers to sell their perishable products at the earliest opportunity after harvest. During the one-month peak season, there is much competition for price within the same melon-growing village, rather than the farmers cooperating to achieve any collective power in determining the price paid for their melons.

Farmers performing only the basic function of production

Unlike farmers in developed countries who clean, grade and pack their own fruit, farmers in China only perform the production function. They grade and pack only when this is requested by wholesalers. Farmers can sell only in their own neighbourhood or to organisations with which they have contacts.

Declining quality

There is a temptation to harvest melons prematurely to capture early-season premium prices. This often occurs at the request of wholesalers, as the best prices may be obtained by being first on the market. Declining fruit quality has resulted in poor returns for the industry. The concept of a consumer focus remains only a concept and has not been translated into action. At this stage, the whole chains are not

capable of being coordinated to best serve the market. Declining fruit quality needs to be addressed as melons face competition from a range of other summer fruits, such as stone fruits, mangoes etc.

Improving the Melon Supply Chains in China

Improved disease control practices and product differentiation

Diseases are a serious threat to Hami melons in Xinjiang. To reduce losses from disease, wholesalers often instruct farmers to harvest melons prematurely. Consequently, poor-quality melons in the market have affected the industry as a whole. Improved disease control technologies, such as enhancing the self-defence mechanisms of plants, are available through research organisations. The challenge is to speed up the adoption process through an effective extension system. Product differentiation can follow if the quality of fruit is improved. The success of the strategy also relies on state power to prosecute those who use misleading branding. As this is not going to occur quickly, one way to identify quality product is through reputation from defined supply chains.

Consolidation at the farmer level

At all levels of the melon supply chains in China, there is no horizontal integration. One strategy to improve this is to start at the farmer level. Farmers in the same village know each other quite well. Such 'natural-social constituents' (Murdoch 2000) can be harnessed to get farmers to work together — firstly on production and postharvest areas, and later on group marketing. This concept is consistent with the government policy of getting farmers into groups. However, the approach needs to emphasise self-managed groups, not government-directed groups. It is a critical success factor to identify and involve motivated extension officers. Consolidation at the farmer level will allow better collaboration between farmers and wholesalers and an opportunity for farmer groups to link with supermarkets directly.

Farmers to perform more functions in the supply chain

For farmers to improve their share of the value chain, they need to perform more functions, both

technical and business ones, in the supply of products to consumers. Potential technical functions at the farm level include washing, dipping and packaging. In terms of business functions, once farmer groups are developed, they may take over the function currently fulfilled by collectors. Whether farmers can perform these potential functions in the supply chain depends to a large extent on whether self-managed groups can be developed.

China is a large recipient of international aid programs. A postharvest and economic program for the melon industry is currently funded for by the Australian Centre for International Agricultural Research. Technologies for disease control are being developed to suit local agronomic conditions. The long-term effort to improve the 'soft infrastructure' will include training on extension techniques, information provision, credit system and other business services (Morgan 1997).

The government will need to play a facilitative role in the whole process. There have been complaints that various farm taxes add to the burden of production costs. With the increasing tax base from the

urban population, the government needs to consider an alternative way of obtaining revenue. At the 'play of the game' level (Williamson 2000), the government needs to improve the effectiveness of implementing contract laws and accreditation systems (Wei and Zhang, these proceedings). This will assist industries to restore business order and improve supply-chain management.

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Development in Agribusiness Chains and Challenges for Postharvest Technology: Experiences from The Netherlands

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Abstract

The definition of quality in fresh produce has gone well beyond classical physiological concepts, and the food system is now confronted with the situation that the consumer is defining quality. Product quality will be determined by a broad set of attributes. Not only are there more parameters, but also the values of these parameters will vary for different consumers, purposes, times and places. Led by this new consumer-driven paradigm, this contribution identifies some implications for the treatment of fresh produce.

Society is 'individualising'; people are more and more following their own lines of life. There are many attributes that can differentiate products; some of them are appreciated by only a (small) part of the consumer market. The food system is challenged to look for opportunities to make money out of this urge for differentiation; product differentiation is a strategy for many companies. So product differentiation will lead to differentiation in postharvest treatment.

Another aspect is the dynamics of the scope of the firms involved in food chains. Companies have developed around so-called asset specificity; equipment, knowledge and capabilities to do things they are good enough to make money with. If products and product requirements are changing, it might happen that the capabilities of the businesses in the supply chain change more drastically. Many examples can be observed of new (sometimes unusual) companies entering the supply chain. An issue in this that it might be interesting to look at from a postharvest technology point of view, is that the flow of fresh produce has to be integrated in a system with substantial differences from other product flows. Also, new types of companies, so called 'trusted third parties', emerge and take responsibility for food safety and other quality attributes.

There are many opportunities for reducing quality loss in the last stage of the chain — the consumers. 'Consumer equipment', in the kitchen or during transportation, is evolving rapidly. More dedicated equipment and ICT-driven opportunities will create new challenges for the postharvest community.

Shifting from supply to consumer-driven food production, some interesting contributions from postharvest technology are expected. These can be considered to be challenges to exploit the postharvest knowledge and expertise in the context of the consumer-driven paradigm.

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Linking Farmers with Markets: the Case of Cocoa

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Abstract

'Supply-chain management' means very little to most smallholders — they are concerned with managing their farms, saving sufficient for their own needs and selling any surplus for the best price they can get. Their contact with 'markets' is often limited to dealing with a produce collector, or to sales at the local 'fresh market'. Limited contact with markets probably means that growers have little awareness of product suitability, quality or choice of crop. While crop choice is often dictated by what other local growers find profitable, crops in demand can quickly become 'surplus to requirements'. In the case of cocoa, however, global demand is strong at present, and growers in Asia can earn good incomes from the crop. Cocoa is a crop of the developing world, while chocolate is largely consumed in the developed world. In Indonesia, a large smallholder cocoa industry has developed in Sulawesi over the past 20 years, while in Papua New Guinea (PNG) there has also been a major shift from plantation to smallholder production. Cocoa has been a good source of income to smallholder farmers for meeting financial commitments such as school fees in these countries, but this may not be assured in the longer term. As communities continue to develop, greater focus on 'linking farmers with markets' might be the key to sustainable income generation from cocoa. This paper describes some characteristics of the cocoa industries in Indonesia and PNG, discusses the key issues for sustainability of their industries, and describes research and development initiatives that aim to improve smallholder incomes.

Cocoa fortunes Indonesia is currently the third-largest producer of cocoa with about 20% of global production (Table 1), mainly of bulk cocoa based on

Forastero hybrids. Papua New Guinea (PNG) produces only 2% of the world crop, but supplies a niche market of 'fine' cocoa based on Trinitario × Amazonian hybrids. Global demand for cocoa is strong, and supply projections suggest potential shortfalls in supply. As a consequence, interest in overcoming deficiencies in supply has become stronger amongst chocolate manufacturers and government agencies in developed countries (such as USA), where local farms produce milk and sugar, which are also used in chocolate manufacture. While global demand for cocoa is strong, threats such as the potential for market oversupply by emerging future producers such as Vietnam, and a decline in demand due to the use of non-cocoa fats in chocolate manufacture, heighten the need for producing countries to have greater market focus in planning research and development (R&D).

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Table 1. Cocoa bean production (Mt) in the Americas, Africa, Indonesia, Malaysia and Papua New Guinea, 1996–2003. Source: FAO STAT (2004).

Country/region	Year							
	1996	1997	1998	1999	2000	2001	2002	2003
Africa	2,144,525	1,940,505	2,169,731	2,136,463	2,344,348	2,048,042	1,891,396	1,892,396
Americas	571,117	575,282	540,750	474,320	435,270	456,566	561,659	471,726
Indonesia	350,800	329,700	430,800	442,700	465,700	380,900	450,000	450,000
Malaysia	120,071	106,027	90,183	83,700	70,200	58,000	47,661	47,661
Papua New Guinea	36,000	40,000	29,800	35,600	46,800	38,800	45,000	42,000

Cocoa in Indonesia

In Sulawesi, an industry involving more than 300,000 smallholders has developed since the 1980s. Key drivers in the development of the industry have been the improvement of land access, the settling of transmigrants and the experience of returnees from Malaysian cocoa plantations bringing farming knowledge and seed. The Sulawesi industry supplies ‘bulk cocoa’ used for cocoa butter. Annual production is over 300,000 tonnes, 90% of this by smallholders. Smallholder yields average 800–1000 kg/ha, as compared with 1800 kg/ha on plantations, but smallholder input costs are lower (Bedford et al. 2002).

The main factors affecting productivity include:

- weather extremes
- pest (particularly the cocoa pod-borer moth (CPB), *Conopomorpha cramerella*) and disease losses
- labour shortages
- restricted access to finance and high interest rates (Bedford et al. 2002).

Industry characteristics

- Labour requirements in Indonesia are higher than those of the West African producers. Labour is needed throughout the year during establishment, but the requirement falls to 80–90 days/per year/ha in established but non-bearing plantings, and to 30 days/ha when trees are bearing (although the last-mentioned input may not be sufficient for optimal maintenance). As a consequence, a family of 2–4 can care for a 2–4 ha farm.
- Rainfall patterns allow harvesting throughout the year, so labour requirements for harvesting are higher than in the West African industry.

- Producers can be owner–farmers, sharecroppers or farm managers.
- There are few co-operatives or farmer groups.
- Most producers sell semi-dry beans of 15–20% moisture to village collectors.
- The industry has a fairly efficient marketing system, fostered by the marketing policies of the Indonesian Government, but there are few incentives to improve quality. Industry middlemen have limited knowledge of handling, quality and storage.
- Indonesian cocoa sells for a lower average price than cocoa from Ghana and Côte d’Ivoire (which produce ‘fine’ cocoa), but Sulawesi cocoa farmers earn a higher percentage (70%+) of ‘free-on-board’ (FOB) prices.
- Recent trends in the industry include the growth of primary processing in producing countries, e.g. the PT Effem (Masterfoods) processing factory in Macassar, Sulawesi, and multinationals now dominate the trade (declining from 60 national traders in 1998 to 2 in 2000, with 11 international trading companies).
- As a ‘bulk’ cocoa supplier, the provenance of cocoa at grower level is less important, and processors can address the quality issue of low or no fermentation, but the real quality problem is the physical quality of cocoa, specially the percentage waste (placenta and flat beans, small beans and clumps due to CPB infestation, and contaminant residues may also become a problem) (Bedford et al 2002).
Although processors can address minor quality defects through blending and processing technology, there is the risk that the mean quality can become too low, for example when CPB damage becomes excessive.

In summary, there is little traceability of product (cf. horticultural produce), grower–trader relations are often short-term, quality and reliability of volume have not been high enough to favour long term links, and chain members may be tempted to add foreign matter to boost weight. While the quality of bulk cocoa is important, managing it is complex and the Indonesian value chain for cocoa is less suited to the introduction of ‘quality improvements’ than are those for the horticultural industries (Bedford et al. 2002).

Critical issues for industry improvement in Indonesia

- Product supply needs to be more reliable (in quality and quantity).
 - Losses due to pests and disease need to be reduced.
 - Cocoa butter levels in cocoa beans need to be improved.
- Any new inputs for crop improvement must not be too labour intensive, as labour is already in short supply.
- Strategies for improving grower returns through improved production and quality are needed. Sulawesi farmers already have the highest percentage of world cocoa price and the cocoa pipeline is very efficient with very low margins for the intermediary collectors/traders.
- In dealing with these issues, chocolate manufacturers are important drivers.

Some 85% of the cocoa from Sulawesi, worth US\$140 million in 2000, goes to the USA, but the CPD has destroyed 40% of recent crops and reduces quality in the remainder.

Research and development

The Indonesian Government has placed high priority on extension and implementation of R&D in the last few years, while devolving more responsibility to the provincial level. The Balai Pengkajian Teknologi Pertanian (BPTP) centres have the charter of extending and developing all forms of agricultural technology in regional areas. Cocoa, after rice and other subsistence food crops, is the most important crop in Sulawesi and has underpinned a large part of the recent economic development. In tandem with BPTP, the Dinas Perkebunan provide the provincial extension service for small-scale plantations. While cocoa R&D is centred at the Indonesian Cocoa and

Coffee Research Institute (ICCRI) in Jember, Indonesia, investment in infrastructure and resources in Sulawesi has been strengthened (for example, the BPTP facility in Kendari). This investment is complemented by the following suite of international development initiatives which seek to overcome major industry constraints.

ACDI/VOCA SUCCESS Alliance project.¹ (USAID funded)

This initiative focuses on integrated farmer training, information exchange and applied research on pest control (regular harvests etc.) in the Sulawesi cocoa industry. Between 2000 and 2002, more than 10% of Sulawesi cocoa farmers were trained, crop losses for trained farmers dropped by 30%, and farmer incomes rose by more than US\$500 p.a.

In a second stage of the SUCCESS Alliance there is a new focus on quality, farmer organisation and leadership. Under the Alliance, PT Effem (Masterfoods) Sulawesi started to buy small quantities of cocoa directly from smallholders, and private sector partners have agreed to buy cocoa worth more than US\$10 million p.a.

The project has a spillover activity in the Philippines and is also planning work in Vietnam. In Indonesia, challenges for the Alliance include:

- accessing locally proven germplasm and technologies
 - there are good opportunities for synergy with ACIAR initiatives (see below)
- assuring some carryover of experience when the Alliance ends. Options include:
 - maintenance of links with processors
 - continuing to build local extension and information dissemination capacity
 - fostering farmer organisations.

¹ ACDI/VOCA was formed in 1997 by the merger of Agricultural Cooperative Development International (ACDI) and Volunteers in Overseas Cooperative Assistance (VOCA). The merger blended ACDI’s systemic, long-term approach to development and VOCA’s people-to-people volunteer activities. ACDI (first known as the International Cooperative Development Association) was formed in 1963 by major US cooperatives and farm credit banks to assist cooperatives in developing countries. ACDI eventually grew into an international technical and management assistance organisation with rural finance, natural resource management and agribusiness capabilities <<http://www.acdivoca.org/acdivoca/acdiweb2.nsf/whoware/history?opendocument>>.

Pest Reduction Integrated Management (PRIMA)

The main aim of the PRIMA project (under Netherlands Government funding) is to assist a group of 900 Sulawesi farmers on a 1000 ha area to improve their production and quality of cocoa by using an integrated management approach. Development of a quality cocoa pipeline, with training of farmers and traders on grading and cocoa quality, is also a very important part of this project. The most efficient methods for biological control of CPB are also being tested. One component of this approach is the rehabilitation of plantations by side grafting with CPB-resistant cocoa clones, aiming at improved production and quality. The project is not undertaking primary collection of putative resistant material — this is being undertaken in a parallel ACIAR project, and some of the most promising locally selected clones from the ACIAR trial will be re-tested in the field trial in PRIMA project area in Noling, near Palopo, Sulawesi. In this way, the superior agronomic characteristics and pest and disease resistance of clones will be confirmed and budwood multiplied. Budwood from the ACIAR selected clonal materials will then be made available for the farmers trained on integrated management in the PRIMA project.

ACIAR support

ACIAR project PHT/2000/102, 'Selection for improved quality and resistance to *Phytophthora* pod rot, cocoa pod borer and vascular-streak dieback in cocoa in Indonesia', in Sulawesi began 2000, after the start of ACDI-VOCA SUCCESS Alliance project and before the start of the PRIMA project. The project focuses on evaluation of germplasm with putative pest or disease resistance or improved quality, collected from across Indonesia by Dinas Perkebunan personnel (Isyanto et al. 2003). The project has stronger links with Indonesian agencies than do the ACDI-VOCA and PRIMA initiatives and emphasises:

- evaluation of local selections with resistance to pod borer, disease (*Phytophthora* pod rot and canker caused by *Phytophthora palmivora* and vascular streak dieback (VSD) caused by *Oncobasidium theobromae*), and higher cocoa butter and bean size
- farmer participatory side-grafting of bearing trees with grower/adviser selected superior material
- improvement of *Phytophthora* pod rot and VSD control.

The project is linked to and complements the other initiatives.

Potential impacts of the ACIAR project include:

- risk reduction if lines with resistance to one or more pests are identified
- lines may give more cocoa butter, less shell
- growers will be able to move to improved cultivars through side grafting
- there is likely to be an interest from manufacturers to source cocoa from improved clones.

Summary and conclusions

The Sulawesi cocoa supply chain is very efficient, with farmers receiving probably a larger share of the selling price than any other cocoa farmers around the world. There are few intermediary collectors and trader intermediaries, and they make relatively low profits. Nevertheless, quality (as percentage waste, flat and small beans, and the lower fat percentage in such beans, which are a result of the CPB infestation) is critical. Manufacturers can play a key role in overcoming these problems. Probably the best solution would be to introduce differential pricing. Differential pricing would encourage farmers to produce better-quality cocoa. This way, farmers could increase their incomes and manufacturers would obtain more cocoa of the preferred quality standard.

The other element of quality improvement and income generation is to reduce losses through improved, pest-and-disease-resistant planting materials (as is being investigated in the ACIAR project), and training of farmers in integrated pest management (as in the SUCCESS Alliance and PRIMA projects).

The Indonesian cocoa industry and the R&D programs that support it have many of the elements critical to sustainability: a crop with a well-identified market, and strategies to reduce losses and improve productivity. The challenges will be to foster wide adoption of improved cultivars, and to encourage adherence to control measures recommended for pod borer and diseases. Given the labour shortages, and the costs and extension challenges associated with encouraging farmers to use other control methods, resistance is a good option for sustainable crop improvement, with the larger market for 'bulk' cocoa remaining as a better option than 'fine' cocoa. For industry improvements to be sustainable, links between farmers and manufacturers that enable adequate income improvements to cover increased costs

of management, will be critical. The strong commitment by some manufacturers to participatory R&D offers hope that this will happen.

Cocoa in Papua New Guinea

Papua New Guinea (PNG) supplies just 2% of the world market, a tenth of that of Indonesian production. However, the 35,000 tonnes produced each year (mostly from East New Britain) is acidic, 'fine' cocoa, with most (80%) now coming from smallholder production. In contrast to Sulawesi, where under-fermented beans are sold for processing as bulk cocoa, PNG cocoa is fermented and dried locally. Papua New Guinea cocoa beans are recognised worldwide for the quality attributes that reflect their Trinitario origin.² However, they also have a reputation for some undesirable characteristics, such as excessive acidity, high shell content and smoky flavour (especially in smallholder produce), the latter a result of smoke contamination during drying or storage. In addition, the introduction of hybrids of inferior flavour led, in recent years, to a decline in the premium paid for PNG cocoa, with PNG's 75% 'Fine or Flavour' rating being reduced to 25%. Other dimensions of the industry include the following:

- yield averages are increasing (in East New Britain) from 300 kg/ha in 1989 to 620 kg/ha in 1999
- industry growth has been hampered by
 - the decline in the value of local currency
 - the civil unrest in Bougainville, one of the main production areas,
 - problems with weather, pests and diseases
 - volcanic eruptions
- Productivity has also been affected by the inefficiency of smallholder production and low levels of inputs.

PNG contrasts with Indonesia

- 'Fine' versus 'bulk' cocoa
- Diseases are the more serious problem in PNG versus the pod borer in Indonesia (CPB is not yet a problem in PNG)

² The original material, from early last century was Trinitario. Since the early 1980s and now, material distributed by CCRI has been Trinitario × Amazonian hybrids. There have been claims that this has diluted the Trinitario attributes. However, PNG cocoa is still sought by manufacturers for its flavour attributes.

- as a subsistence crop, cocoa will provide some income even when neglected
- traditional land rights in PNG affect access
- lower literacy levels affect information access, extension and financial management
- high transport costs cut into profits
- civil unrest and natural disasters have had more adverse impacts
- less experience in repayment of microfinance affects credit availability to smallholders.

Nevertheless, PNG receives prices above world averages for its cocoa and, as in Indonesia, manufacturers have a strong interest in fostering improvement of the PNG industry: improvement of cocoa quality and ensuring that smallholder production is sustainable are key focuses of R&D.

Research and development

The PNG Government also places high priority on fostering improvement and expansion of the cocoa industry. Research and development is undertaken by the PNG Cocoa and Coconut Institute, formed in 2003 by the amalgamation of Cocoa and Coconut Research Institute and the Cocoa and Coconut Extension Agency (CCEA). Cocoa and Coconut Institute cocoa research is centred on East New Britain.

AusAID Cocoa Improvement Project 1992–1996

To re-establish and improve the quality characteristics of PNG cocoa beans, the PNG Cocoa and Coconut Research Institute (CCRI) started a R&D project in 1992, supported by the Australian Agency for International Development (AusAID) (the Cocoa Quality Improvement Project). The project investigated several aspects of fermentation and quality improvement:

- screening of germplasm for cocoa quality traits to improve the genetic base for quality cocoa production in PNG
- development of fermentation and drying methods to enable smallholders to increase their income through the sale of fermented, dried beans rather than wet beans.
- a review of the regulations for fermentaries and drying facilities in order to provide advice to the Cocoa Board of PNG on changes needed to enable smallholders to undertake these processes.

More recently, AusAID, in partnership with the United Nations Development Program (UNDP), has provided further support for the PNG cocoa industry

under initiatives for the rehabilitation of cocoa on Bougainville.

ACIAR Project PHT/1995/136 'Cocoa fermentation, drying and genotype × product quality assessment'

The ACIAR project³ was initiated in 1998 as a follow-on to the AusAID-funded activities at the Cocoa and Coconut Research Institute (CCRI). In collaboration with the Queensland Department of Primary Industries and the University of New South Wales, its objective was to complete assessment of an integrated approach to quality improvement involving changes to fermentation, drying and selection of cocoa varieties with superior flavour.

ACIAR later extended the project to (a) finalise evaluation of fermentaries and dryers, and to develop and implement technology transfer strategies, particularly in relation to the re-establishment of the industry on Bougainville, and (b) finalise participation in the International Cocoa Confectioners' Organisation (ICCO) collaborative project to establish the benchmark physical, chemical and organoleptic parameters that differentiate between fine and bulk cocoa. Papua New Guinea cocoa was compared with the industry bulk standard (West African) and with cocoa produced by other partners (Trinidad and Tobago, Ecuador and Venezuela).

The project has investigated the following key elements of quality improvement and industry development:

- fermentation process and time (smaller volumes of beans, shorter times) (Hollywood 1998)
- cocoa drying (A-framed solar collectors) (Hollywood et al. 1997)
- varieties with better 'PNG fine' flavour
- revision of cocoa industry regulations
- industry extension and uptake
- support for the Bougainville industry through testing of methodologies, particularly related to drying
- 'PNG' chocolate options
- benchmarking of PNG cocoa in an ICCO collaboration
- income generation for smallholders.

³ Funded under the ACIAR-AusAID Record of Understanding for PNG.

Table 1 summarises achievements to date and the factors that remain to be dealt with in order to realise the benefits of the current investment.

What are the key messages from the PNG research?

Smallholder issues

- *Fermentation.* Fermentation methods for small quantities of cocoa (down to 25 kg) have been developed. This means that virtually any size producer could ferment their harvest and produce a good quality cocoa.
- *Solar drying.* The original dryers distributed during the AusAID program had limited success due to severe maintenance problems. Most of the maintenance problems have now been solved and there is a need to ensure recommendations regarding construction are adhered to. Farmers also need to be encouraged to take greater ownership for acquisition and maintenance of drying units.
- In provinces or districts with similar rainfall to East New Britain Province, stand-alone solar dryers are an option, provided the maintenance recommendations are adhered to.
- For wetter provinces, combination solar/kiln dryers have been developed and test units distributed on Buka Island and Bougainville. These have proven a popular development with the local population. However, their long-term value will depend upon maintenance by users.

Quality issues

- The Cocoa Quality Laboratory of CCRI has developed good capabilities for quality assessment and sample throughput.
- Recommendations regarding fermentation procedures to improve quality attributes have been developed; e.g. by reducing fermentation times from 7 to 5 days, shell content is reduced by 2%, acidity of the cocoa is lower and flavour attributes improved (enabling distinctive 'PNG chocolate' to be made).
- With PNG export cocoa, successful participation in the ICCO project could enhance PNG's reputation as a producer of fine-flavour cocoas. Provided support from CCRI is ongoing, further improvements in fermentation and drying technologies and selection for flavour attributes in plant breeding could be expected.

Table 1. Cocoa quality improvement in PNG: issues, achievements and future needs.

Element of quality improvement	Key achievements	What needs to be done now?
Fermentation process and time	Smallholder technologies developed: for shorter fermentation times and smaller volumes of beans	Procedures for small-scale fermentation and the amended regulations need to be approved by the PNG Cocoa Board, and follow-up extension activities undertaken.
Cocoa drying	Small-scale, solar-drying technologies have proven useful for East New Britain	Recommendations regarding their construction, use and maintenance, and amendments to regulations need to be approved by the Cocoa Board and follow-up extension activities undertaken. Options for wetter areas require more work.
Varieties with better 'PNG fine' flavour	Large range of germplasm screened, and testing for quality incorporated into routine breeding. New release lines shown to have good 'PNG fine' flavour. Training of CCRI cocoa quality laboratory staff in cocoa quality assessment. Training for chemist in taste panel procedures.	CCRI should continue screening of breeding lines for quality traits. Resources and experience in taste panel evaluation should be established and maintained. This will reduce need for taste evaluation by manufacturers.
Cocoa industry regulations	Revisions to industry regulations drafted and presented to the Cocoa Board.	Board needs to formally consider and approve the revised regulations before cocoa produced with smallholder fermentation and drying technologies can be sold.
Industry extension and uptake	Training manual drafted. Extension personnel trained.	Manual needs to be updated to include recommendations for smaller fermentations, down to 25 kg, and the latest developments in solar-dryer construction. Need to increase commitment to extension and involve other groups (training institutions, NGOs) in training and implementation of the technology.
Bougainville industry rehabilitation	Support for United Nations Development program/AusAID installations	The PNG Cocoa Board needs to approve modified specifications on dryer size in cocoa regulations. Consideration should be given to distributing combination solar/kiln dryers (as a method of saving of firewood) and/or purely solar alternatives for drying in suitable weather conditions. PNG and donor agencies need to review future needs/sustainability of industry on Bougainville.
'PNG' chocolate	Distinctive flavour of 'PNG' chocolate demonstrated through collaboration with Masterfoods Australia.	An economic analysis should be undertaken of opportunities which could include: local marketing of products made from cocoa nibs, and links with a specialist manufacturer who might want to market 'PNG fine' chocolate to international markets.

Table 1. (Cont'd) Cocoa quality improvement in PNG: issues, achievements and future needs.

Element of quality improvement	Key achievements	What needs to be done now?
ICCO 'Fine/Flavour Project'. Partner countries and commercial users of PNG cocoa are involved in 'benchmarking' fine/flavour criterion. ^b	Some progress has been made in 'bench-marking' PNG standard fine cocoa against other producers.	Ongoing support is needed for CCI participation in the current project. Future directions/needs will depend on progress made in current ICCO project.
Income generation for smallholders	This project has developed affordable options for smallholders to produce higher quality cocoa and potentially earn more income. In 2003–2005, a new ACIAR project will provide additional resources and effort in this area.	The Cocoa Board has to approve revised regulations before farmers can use project-developed technologies to produce and market cocoa.
International collaboration	Partnership initiated in ICCO project ^a International cocoa conference presentations made CCCRI staff participated in an ACIAR–Indonesia cocoa workshop in 2001, and discussions were held between CCRI and the Indonesian Cocoa and Coffee Research Institute (ICCRI) about fostering collaboration.	Collaboration in the current ICCO project could foster future links and funds. The profile of CCI in international cocoa R&D should be maintained. Links with Indonesia and other ASEAN cocoa producers (including Vietnam) should be fostered both for research gains (e.g in developing strategies for exotic pests such as cocoa pod-borer) and to enable the PNG industry to have a better understanding of future competition. CCRI should continue to foster good links with manufacturers.

Extension liaison

- This is the most critical and challenging issue to handle at the present time (resources, farmer linkages and security). There is a major need for a concerted effort for the recently merged CCRI and Cocoa and Coconut Extension Agency (CCEA), and the Cocoa Board, to deliver research outcomes to the field and foster adoption by farmers. Adoption of recommended procedures country-wide would automatically deliver an improvement in quality attributes of PNG cocoa (and thus reputation and income). The challenge will be in getting this message across.

Future ACIAR support

In parallel with the ACIAR support for research on cocoa fermentation, drying and genotype evaluation, another ACIAR project in PNG has promoted

options for income generation in the smallholder oil palm sector of PNG, including the increased participation of women in the industry through the 'Mama Lus Frut' card scheme. In recognition of the oil palm project achievements and of the opportunities for cocoa industry improvement described here, a new project funded by ACIAR (ASEM/2002/014) will focus on improving productivity and the participation of young people and women in the Papua New Guinea cocoa, coconut and oil palm industries. Partners in the project are Curtin University, CCRI/CCEA and the PNG Oil Palm Research Association.

The new project will capitalise on the oil-palm project interventions that led to significant increases in smallholder productivity. The new project aims to replicate such achievements in the PNG smallholder cocoa and coconut sectors. Researchers will also conduct an in-depth evaluation of a promising new

payment system (also arising from the earlier ACIAR project) for oil-palm smallholders at Hoskins, West New Britain, and seek to further adapt it for other smallholder oil-palm regions and for the smallholder cocoa sector in PNG. The project will promote the sharing of knowledge and expertise between the key smallholder extension agencies and research organisations in the three industries.

For the farmers of PNG to be better linked to markets, the most important issue is to enable them to ferment small quantities of beans harvested from hybrids that produce cocoa of superior flavour. There must also be a continuing effort to refine postharvest procedures suitable for farmer use and which would enable them to match manufacturers needs more closely and deliver superior product to traders, with a price premium paid for beans of superior quality. In this way, smallholders in remote locations would have the chance to improve their incomes while enhancing the quality and reliability of PNG cocoa. One option to consider is that proposed by local industry leaders in Bougainville — the concept of ‘cocoa traders’ as middlemen between growers and export companies. Traders would have their own transport and travel to villages both close to and distant from export outlets. This would, in theory, do away with problems farmers have in transport of crop to buying points, and the traders would also act as quality assessors, as they would wish to establish a good reputation for the product they handle, with the exporters. Under such a system, traders could also provide advice at the village/smallholder level, about such matters as what needs to be done to correct quality problems encountered (i.e. they would act as

extension people). Such an approach might also be suitable for other provinces and ensure that the PNG Cocoa Board developed policies that were in tune with industry needs.

In PNG cocoa, smoke contamination of cocoa is another problem that farmers should seek to solve through better dryer management. The ACIAR/AusAID collaborations have demonstrated a suitable option for regions such as East New Britain, but other options (such as combination dryers) are needed for areas that experience annual rainfalls above 2500 mm. Critically, Cocoa Board approval is also needed for the smallholder dryers. In managing smoke contamination, it also needs to be determined if dried beans are being further contaminated by cook-fires during household storage.

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The Benefits of Supply-Chain Practice in Developing Countries – Conclusions from an International Workshop

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Abstract

Interest in supply-chain management (SCM) in developed countries has grown as consumers demand product quality and integrity that can be achieved only by integrated management from farm to retail shelf. Effective relationships between members of a supply chain have been shown to contribute to improving its efficiency and innovativeness, and enhance its competitiveness. As food security is achieved in developing countries, farmers are seeking to generate income by sale of a more diverse range of products. This trend, combined with increasing urbanisation, population growth, rising standards of living and gradual changes to traditional markets for foodstuffs, has created interest in application of the concept of SCM to market situations in developing countries.

An international workshop (Bali, August 2003) attended by personnel from Asia–Pacific countries associated with projects that had a supply chain dimension reviewed the theory of SCM as it relates to developing countries, and the approaches that are being used to work with local supply-chain members on improving their products and service to meet the demands of markets. A key question considered by workshop participants was the distribution of the benefits which arise from SCM approaches, and the extent to which small farmers and traders share in these benefits. This paper reports on the key conclusions of the international workshop.

Supply-chain management (SCM) is ‘the management of the entire set of production, distribution, and marketing processes by which a consumer is supplied with a desired product’ (E. Woods <www.lfwm.net>; see also Woods (2004)). Interest in better management of supply chains in developed countries has expanded in line with increased consumer demand for quality,

convenience, novelty and other non-food attributes in the food products they buy, together with an increased concern over food-product integrity and safety. Satisfying these consumer demands can be achieved only by integrated management of the supply chain from farm to retail shelf. Many food-industry experiences demonstrate that effective, cooperative relationships between members of a supply chain can contribute to improving the efficiency of the chain, enhancing both innovation and competitiveness.

An international workshop on this topic was sponsored by ACIAR and the ATSE Crawford Fund (19–22 August 2003, Bali, Indonesia). The workshop reviewed the theory of SCM as it relates to developing countries, and the approaches that are being used to work with local supply-chain members on improving their products and service to

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meet markets demands. The 39 workshop participants included staff from current supply-chain projects in Australia, China, Ghana, Indonesia, Laos, Papua New Guinea, the Philippines, Thailand and Vietnam.

Supply chains in developing countries are typically long and fragmented, involving multiple small-holder producers delivering produce to collectors. Product then moves to traders and wholesalers and possibly several layers of retail distribution. Primary and secondary food processing may also occur, often at a small to medium enterprise scale. These chains are characterised by multiple product handling steps, poor information flows and a predominance of spot transactions over longer-term buyer–seller relationships.

As basic agricultural commodity prices continue their worldwide decline, and food security is largely achieved in most developing countries, farmers in Southeast Asia are increasingly concerned to improve their livelihoods through income derived from the sale of a more diverse range of high or added-value produce and products. This has produced a strong trend towards a more market-oriented agriculture, even at smallholder level in remote areas. Alongside this, population and incomes are rising, the region is becoming more urbanised, and food habits and markets are changing accordingly. The result of this is an increasing dualism in the agri-food sector. Shorter, more efficient, coordinated supply chains are growing, especially those associated with higher-value commodities and large-scale retail outlets (supermarkets and hypermarkets). Meanwhile, traditional supply chains continue to handle bulk commodities and basic food products for most of the population.

Given the current trend towards more managed supply chains in Southeast Asia, the workshop was organised to undertake a review of theory and current practice, to provide participants with a greater understanding of the potential benefits of the SCM approach, to enhance the capability of supply chains in the Southeast Asian region to supply produce to higher-value markets (e.g. supermarkets and the hospitality trade), to identify constraints to improving supply chains in the region (for better targeted research and development (R&D) activities), and to understand the implications of the rapid growth of the SCM approach for governments, the agri-food industry and rural communities.

Learnings from the Workshop

The potential benefits and implications of supply-chain management for smallholders

Experience with the development of more efficient and managed supply chains in Southeast Asia and elsewhere is that the number of suppliers tends to fall over time, as the nature of the relationship between producers and retailers deepens. Working with multiple smallholder producers entails additional transaction costs for SCM at retail level. Opportunities for smallholders to participate (and benefit) from such high-value chains are therefore uncertain. Mechanisms that reduce the transaction costs associated with small-scale production are needed, and this may well require significant R&D assistance.

One option to improve prospects for small farmers to participate and benefit from these chains is to form producer groups or associations. These may enable smallholders to work together to obtain the product volumes and economies of scale needed, continuity of supply over time, and increased market power. Producers need assistance to make the transition from a production to a market-orientation, to obtain and use information on consumer demand, to access and adopt better production and postharvest technology, and to incorporate quality and safety management systems.

Experience in the projects represented at the workshop indicates that existing supply-chain actors provide many services in addition to their principal marketing function (e.g. traders may provide informal market information, credit and technical assistance services). These services are also provided in a manner that is compatible with local cultures and values, something that may not be the case for externally driven SCM approaches. Another option for the development of efficient supply chains that include the small-farm sector is to build on existing supply chains, specifically incorporating a role for some actors (e.g. traders) to provide these and other services (e.g. organisation of produce supply volumes over time) in a culturally appropriate manner, so that transaction costs are reduced without the need for the creation of formal farmer organisations.

Enhanced capability for supplying produce to the higher priced supermarket and hospitality trades, by increasing product quality and supply efficiency

Timely, reliable information about consumer requirements is required if farmers are to become

more market-oriented, and to 'produce what they can sell', rather than trying to 'sell what they produce'. Workshop participants identified two types of market information:

- information on long-term consumer trends, influencing decisions on what to produce
- information on current market prices, important for decisions on when to sell.

Producers currently have poor access to both types of information, and may have basic misconceptions about consumer preferences. Examples of this were clear from the workshop cases presented (e.g. for potatoes in northern Vietnam and vegetables in Mindanao). Often this is to the result of poor communication between producers and traders.

Potential does exist to build on existing supply chains, e.g. for high-quality, local variety bananas to supermarkets in Indonesia, where adoption of SCM practices could be beneficial. This would require implementation, through the chain, of quality-assurance practices and standards, with culturally appropriate incentives in place for producers, and communication strategies to reach them. It also requires organisation to obtain required volumes over time from many small producers, and increased professionalism at producer and trader levels to get the product right; capacity building is therefore an essential component of any SCM program.

An additional barrier remains in many areas; the existing transport, storage and communications infrastructure is inadequate to ensure efficient access to the market. This has implications for national and local governments.

The development of enhanced and efficient supply chains for high-quality produce in domestic markets will help chain actors prepare for their eventual participation in export markets.

Better identification of the real constraints preventing improvement in the targeted industries, so that research and development activities can be implemented more effectively

There are few documented experiences of the SCM approach in the developing world, and especially for national markets in Southeast Asia. Participants felt that, based on these experiences, we still have only a preliminary understanding of the SCM approach in these situations. There is a real need to investigate, document and systematise cases, in order

to be able to demonstrate actual and potential benefits to rural producers.

There is plenty of relevant technology on production and postharvest handling available, but it is not 'organised' or readily available to supply-chain actors, resulting in missed opportunities and in wasted R&D effort that duplicates existing knowledge. Better organisation of, and access to, information on existing postharvest technologies would permit much greater efficiency through identification of knowledge gaps and better prioritisation of future R&D activities.

Workshop participants also acknowledged that we still lack a good understanding of the constraints (infrastructure, capital and policy) to adopting market-oriented approaches that farmers face in specific contexts. These range from illegal taxes to lack of tools to monitor quality at the farmer level.

Understanding the implications for governments, the agri-food industry and rural communities

Rural communities will benefit from adopting a market orientation only if smallholder producers in that community are able to gain from participating in higher-value chains. In this context, proactive facilitation is required to ensure that smallholders do indeed benefit from improved SCM. Some of the projects represented at the workshop were able to demonstrate effective facilitation of the supply chain improvement process by local and national government. Other actors (e.g. non-government organisations (NGOs)) can also undertake this role. Ensuring that smallholders can access higher-value markets will often require different levels of government working together with NGOs, the private sector, and academics to deliver training and facilitate integrated efforts.

It is important that the process of improving supply chains is carried out in a manner that is compatible with, and takes advantage of, the existing local culture and social structures. Opportunities should be sought to build on existing social capital (e.g. through engaging women and village leaders) and trying to work with the high levels of trust that already existing in some chains. This will facilitate the development of sustainable and efficient supply chains (by using social capital to minimise the transaction costs inherent in incorporating smallholder producers) and reduce any social impact of market-induced changes in these communities.

Priorities for Future Action: What Next?

During the workshop, group discussions took place to identify major issues where future R&D activity should be concentrated. These were subsequently synthesised and organised around three levels of intervention:

- macro level – policies and regulations
- meso/institutional level – R&D and capacity building
- micro level – local chain development and infrastructure provision.

This synthesis was presented to the 21st ASEAN/3rd APEC Post-Harvest Technology Seminar, which immediately followed the SCM workshop in Bali. This section of the paper summarises the synthesis of the SCM workshop outcomes at these three levels.

Policies and regulations

While the group discussions identified several specific policy areas where government action is needed, they also highlighted some deficiencies in the current policy-making process itself. The potential benefits that flow from including smallholder producers in high-quality supply chains, and the negative implications for equitable economic and social development if they are not included, are often poorly communicated to governments and policy makers. This may mean that the concerns and needs of rural communities and smallholder farmers are not adequately taken into account in the formulation of policies that affect these rural people, with implications for the success of poverty-alleviation initiatives in the medium to long term. It is vital that governments recognise the importance of creating an environment where smallholders can also benefit, in an equitable manner, from their active participation in higher-value supply chains. The institutions involved in SCM projects and initiatives in Southeast Asia have a responsibility to provide information and advice to national governments (and appropriate regional bodies) in fulfilling this policy-development function.

Specific areas where government policy interventions are needed if smallholders are to maximise their potential to be involved in, and to benefit from, higher value supply chains, are as follows:

- Suitable legal systems must be established and enforced. This will include creating a legal framework for contracts agreed between parties in

supply chains, and ensuring that the capacity and ability to enforce these contracts exists.

- Improving the availability of capital for business infrastructure investments (e.g. storage and distribution facilities) and access to credit for all actors in supply chains.
- Providing the public infrastructure that is a precondition for rural communities to gain access to markets and for business to prosper. This includes roads, harbours, law and order, and political stability.
- Provision of market information and support for training in business management and marketing for small and medium enterprises.
- Ensuring smooth operation of the markets within which supply chains function, through appropriate competition policies, regulatory frameworks for businesses and markets, and regulations and standards for food quality and safety.

Research and development

Workshop participants identified R&D activities in four distinct areas: markets, supply-chain development, postharvest technology and food quality/safety. In all cases, this is action-oriented (i.e. involves working with chain participants, government agencies and other stakeholders in a range of situations) and is thus highly collaborative. Many of the topics are framed as ‘how’ questions, the answers often involving the development of methods to help chain actors, and especially smallholders, to make better decisions as they enter supply chains and then participate in their subsequent development.

Markets – Key questions in this area include the following:

- How can timely market information be made available to farmers so they can decide who to sell to in ‘spot transactions—, and reduce the information imbalances often present in farmer–trader negotiations? Many projects attempt to provide market information to rural communities, but transforming these into sustainable services that continue after projects finish is more complex. This implies creation of sufficient demand for the service to support the cost of its provision, unless long-term public sector subsidies are available.
- Understanding the long-term trends in consumer markets can help farmers and other chain members decide what to produce. How can this type of

longer-term demand forecasting be made accessible to chain actors, including farmers?

- Once a chain is operating, how can the chain members explore new options and identify market segments?

Supply-chain development – The key issue here is how to ensure that smallholder farmers can be included in the development of higher-value and more-coordinated supply chains. As mentioned earlier, mechanisms are needed to reduce the additional transaction costs that are involved in working with many smallholders, rather than one or few major suppliers.

One option is to encourage the formation of farmer groups, so that from the perspective of a major retail chain, for example, the farmer group acts as a single supplier. In Southeast Asia, this approach has had mixed success to date, with such farmer groups often requiring extensive support for their formation (reducing prospects for replication), and lacking sustainability once such support is removed. Practical methods for forming and strengthening such farmer groups need to be developed. Group formation should be focused on a commercial opportunity (rather than being an goal in itself) and on following the process through to delivering business success. The process must be replicable and not too expensive.

Another option is to include traders in supply chains, specifically for their ability to organise smallholder farmers in a sustainable, low-cost and culturally appropriate manner. This implies building on existing arrangements to include technical assistance to producers in critical areas, such a quality assurance and related production practices. There has been very little documented experience of working with traders and smallholders in this way, and methods for accomplishing this— across the range of cultural situations found in Southeast Asia—are urgently needed.

For both these options, it is essential to communicate the incentives and rewards of participation in these new supply chains to farmers and rural communities in a culturally appropriate way, and to improve the business skills of these rural actors. Methods to achieve this are needed; they could involve training, facilitation and working with existing traders as providers of these services.

Once these supply chains are operating, their future development and competitiveness is related to several other key issues that were identified at the workshop, and which require further research. These

include how to Trust and credibility must be built between the different stakeholders in the chain. This type of social capital can reduce transaction costs (e.g. the need for formal contracts) between actors in the chain. Mechanisms that chain actors and facilitators can use to build trust in these situations may be culturally driven.

Benefit distribution along the chain is a key issue. Experience from the developed world suggests that benefits may accrue disproportionately to actors with most power in the chain (usually retailers). Mechanisms to ensure that smallholders receive an equitable return from their participation in these high-value chains are needed. These could include farmer organisation, to increase market power, and/or the adoption of ethical trading standards through the chain.

Small farmers are often at a disadvantage to other chain actors, for example as regards access to credit (where they may lack collateral) and to legal services (e.g. for contract enforcement). How to resolve these imbalances, through, for example, novel credit arrangements, needs investigation.

Finally, a supply chain is necessarily focused on one commodity, product and market. Enhancing the performance of one chain may have implications for others, and for the wider society and natural environment. For example, increasing production of one commodity as demand within a supply chain expands, could greatly affect land-use patterns and livelihood strategies in a rural community, affecting (positively and/or negatively) both environmental and social sustainability. It is important that these wider implications of supply-chain development are captured in the decision-making processes of the different actors involved in the chain. Mechanisms to facilitate this need to be developed.

Postharvest technology – Workshop participants were more concerned with accessing existing post-harvest technologies than with the development of new technology. This requires better organisation of existing information, and enhanced access to this information at the level of rural communities and the agencies that provide technological support services. Short-term technological priorities for small farmers were identified as:

- cold-chain development
- shelf-life improvement
- quality assurance.

Food quality and safety – Existing knowledge about food quality and safety issues is not extending down the chain to farmers, or to consumers. Mechanisms to ensure that farmers are aware of the issues, and the steps they need to take to overcome any problems, are needed. Direct involvement of other chain actors — traders and retailers — in communicating and addressing these issues (and implementing appropriate assurance systems) is probably essential.

Capacity building

Training topics that the workshop identified included:

- increasing the market orientation of chain members
- building the business skills of chain members
- enhancing chain members' awareness of food safety issues and measures to deal with them.

If smallholder producers across Southeast Asia are to benefit from their involvement in supply chains, this implies a massive effort. Strategies at national (and perhaps regional) level for developing and delivering this training need to be defined, including who should be responsible for delivery, and who exactly should be trained. As agriculture becomes increasingly market-oriented, it is clear that training smallholder farmers (and their organisations) in these areas is essential, but how this should be accomplished when support services are weak, especially in more remote areas, is not clear. The strategy should meet the need to strengthen rural support service institutions capable of providing this type of training.

Building supply chains at the local level

In order to maximise the prospects for small farmers to benefit from their involvement in higher-value supply chains, it is important that lessons are learned from supply chains that are now being developed. The key process at local level will be action learning; that is, learning by doing. It is likely to involve processes such as benchmarking, best practice, and case-study analysis across a range of supply chains in different countries (in order to provide culturally acceptable solutions), types of products and market situations, aiming to improve the efficiency of individual chains, and the benefits they provide to all actors. The results of such a cross-case analysis should translate into improved performance and a greater scale of benefits to all participants from these chains.

The question of entry points for small farmers and how to build on existing products and chains to access higher quality and new markets is also likely to be informed by case analysis.

Practical, local-level pilot activities will also help to identify appropriate and high priority roles for government, NGOs, producer organisations, and the private sector, in supporting chains. One positive feature of the current environment is that decentralisation policies in many countries have created an opportunity for local (provincial or district level) initiatives. This creates scope for piloting a range of innovative solutions, including local policies.

Infrastructure provision

Infrastructure constitutes a major barrier to small farmers participating in high-value chains. Ensuring adequate storage, handling and transport facilities will be critical to chain competitiveness, as will ensuring that the chains have access to that infrastructure. Decentralisation can also be important, so that the provision of basic infrastructure investment can be addressed through appropriate local policies, as well as at a national level.

Conclusions

Workshop participants concluded that SCM is becoming increasingly important in developing countries because:

- the supermarket sector is already well established (in major urban centres) and shows high levels of capital investment and market share growth
- traditional food products in domestic markets will face increasing competition from imports
- consumers across the region, and international retailers, share a desire to ensure that all products (in both traditional and more-managed supply chains) move towards global standards of food safety and health.

The growth of managed, high-value supply chains has profound implications for smallholder producers across the developing world. One key issue identified and considered by workshop participants was that of the distribution of benefits that arise from enhanced SCM, and the extent to which rural communities, smallholder farmers and traders across Southeast Asia can share in these benefits. Several key areas were identified where action is required in order to

maximise the potential of small farmers to participate in, and benefit from, such supply chains.

It is important that action, based on these ideas and issues, is indeed taken. Governments need to be informed of the implications of these changes for the small-farm sector of their economies. Agencies working in the rural development and agricultural sectors need to incorporate these major agri-food sector developments into their strategies. Retail chains need to become more aware of the wider social and environmental consequences of a SCM approach that tends to place most emphasis on economic efficiency. The people, communities, enterprises and other actors involved in producing, processing, and marketing food products need to learn to take a more market-oriented approach, something that (for many) requires a new set of skills, including how to work together in different ways.

There is much we still need to learn about this process. Supply-chain management in developing

countries crosses many disciplinary boundaries. Research institutions and donor agencies will need to adjust to these realities and ensure that they are addressed in a coherent and holistic manner. It is also essential that research be action oriented, involving the various supply-chain actors themselves. This will help to ensure that efficient, competitive supply chains can make a significant and positive contribution to the development of prosperous and sustainable rural communities in Southeast Asia.

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