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Socioeconomic agricultural research in Papua New Guinea

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Research that works for developing countries and Australia

Socioeconomic agricultural research in Papua New Guinea

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Workshop participants at the National Agricultural Research Institute in Lae, PNG. (Photo: ACIAR)

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Cover: Older women's workshop group, in Kerevat, East New Britain province. The women were asked to write down their activities during a typical day, and what they thought to be a typical day for the opposite gender. This type of activity can draw out different perceptions of daily life. (Photo: Katja Mikhailovich)

Foreword

Papua New Guinea (PNG) continues to be one of the Australian Centre for International Agricultural Research's (ACIAR's) major research partners. PNG is extremely diverse, both geographically and culturally, and the sociocultural environment surrounding its agricultural and livestock systems is complex. Cultural, social and economic factors in any particular area will influence whether and how people adopt new practices and technologies. While many agricultural principles developed in Australia can be applied in developing countries, the specifics of the local context need to be understood for innovations to be successful.

ACIAR has invested strongly in socioeconomic research in PNG to gain a better understanding of how livelihood improvements can be effectively made through innovations. In June 2013, a workshop was held in Lae, Morobe province, to share between Australian and PNG researchers the accumulated knowledge and lessons learned from the current set of ACIAR socioeconomic projects. Since the topic is of broader interest within and beyond PNG, ACIAR has undertaken to publish the papers that were presented at the workshop.

The 'share and learn' theme of the workshop was welcomed by all participants, who spoke openly about the strengths and weaknesses of various research approaches and socioeconomic research philosophies. There was general agreement that new technologies or practices tend not to succeed if they are promoted without sufficient consideration of the sociocultural context. Institutions and individual researchers are beginning to acknowledge the need to take a broad multidisciplinary and multicultural view. Techniques for approaching this issue are discussed in the papers, including methodologies for surveys, trials and training.

Enhancing the recognition of women's role in agriculture has been another key theme of ACIAR's recent research. Various strategies and techniques to help achieve this, and to build women's agricultural and business skills, were outlined in the workshop.

The dichotomy of PNG highlands and lowlands was also discussed. While there are obvious contrasts in PNG's climate regimes and farming practices, it was concluded that approaches required to resolve socioeconomic issues are not fundamentally different. Participants thought socioeconomic issues are more strongly influenced by accessibility factors (such as roads, transport and finances) than by height above sea level.

Sharing experiences within a specific discipline and country made this workshop highly successful, and ACIAR will look for opportunities to hold similar events in the future.

Nick Austin
Chief Executive Officer
ACIAR

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ACIAR would like to thank the participants for coming together and sharing their experiences. Particular thanks go to Nora Omot, Raghunath Ghodake and staff from the PNG National Agricultural Research Institute for hosting the workshop; Emily Flowers (ACIAR, PNG) for logistical support; Barbara Chambers (University of Canberra) for facilitating the workshop; and Ken Menz for reviewing the papers and summing up workshop discussions.

We would also like to thank the numerous partners involved with ACIAR's socioeconomic research projects in PNG. The papers in these proceedings were based on the following ACIAR-funded projects:

- ASEM/2001/037 (*Improving the marketing system for fresh produce of the highlands of PNG*)
- ASEM/2006/035 (*Improving marketing efficiency, postharvest management and value addition of sweetpotato in PNG*)
- ASEM/2006/127 (*Commercial sector/smallholder partnerships for improving incomes in the oil palm and cocoa industries in PNG*)
- ASEM/2008/036 (*Improving livelihoods of smallholder families through increased productivity of coffee-based farming systems in the highlands of PNG*)
- ASEM/2010/052 (*Examining women's business acumen in PNG: working with women smallholders in horticulture*)
- ASEM/2011/048 (*An integrated approach for systemic change and sustained development of the PNG sweetpotato value chain*)
- HORT/2008/011 (*Strategies for using floriculture to improve livelihoods in indigenous Australian and Pacific island communities*)
- SMCN/2008/008 (*Increasing vegetable production in Central Province, PNG to supply Port Moresby markets*).

Abbreviations

ACIAR	Australian Centre for International Agricultural Research
CBO	community-based organisation
CCIL	Cocoa Coconut Institute Limited
CIC	Coffee Industry Corporation
CLUA	Clan Land Usage Agreement
CPB	cocoa pod borer
CPSM	collaborative problem-solving methodology
CRP	customary rights purchase
FPDA	Fresh Produce Development Agency
ha	hectare
K	PNG kina
LSS	Land Settlement Scheme
NARI	National Agricultural Research Institute
NDB	National Development Bank
OPIC	Oil Palm Industry Corporation
PAR	participatory action research
PMV	public motor vehicle
PNG	Papua New Guinea
PNGOPRA	PNG Oil Palm Research Association
POM	Port Moresby
RSPO	Roundtable on Sustainable Palm Oil

Towards socioeconomic change in the fresh-produce supply chains of the Papua New Guinea highlands

John Spriggs[1,*], Barbara Chambers[1] and Norah Omot[2]

Abstract

The Australian Centre for International Agricultural Research (ACIAR) and the PNG Government have had a common interest in improving the highlands marketing system for fresh produce stretching back over 30 years. The early studies focused on the physical/technical challenges and, while they recommended changes to improve the marketing system, they did not actually engage with the change process per se. By 2000, there was a strong desire for change and this led to the commissioning of an ACIAR-funded research project that would engage the change process in a way that responded to the perceived needs of poor rural households in the highlands of PNG. The project involved the University of Canberra, the Fresh Produce Development Agency and the National Agricultural Research Institute as partner institutions. The research strategy selected for this project was participatory action research (PAR), which was relatively new for ACIAR at the time. The project had three objectives, which were to: (1) map the existing marketing system, identifying constraints and capacities for change; (2) facilitate a process of socioeconomic change using collaborative problem solving; and (3) enhance the capacity of relevant people and institutions in PNG. The most important lessons learned from this research were that: (1) our approach to PAR was robust and could work well in the PNG context; (2) the nature and extent of women's participation in the fresh-produce supply chains had not been adequately understood or appreciated and, in their attempts to participate, they faced enormous difficulties; and (3) the physical/technical challenges in the fresh-produce marketing system were only one aspect of the problem, and the human/social challenges were at least as important, if not more so.

Background

The Australian Centre for International Agricultural Research (ACIAR) and the PNG Government have had a common interest in improving the highlands' marketing system for fresh produce that stretches back to 1983, when ACIAR supported a study to examine postharvest problems (Scott and Atkinson 1989). Most of the contributions to the study focused on the physical aspects of storage and handling, but one (Menz 1989) examined the economics of transporting vegetables from the highlands to coastal markets using refrigerated containers. Following this early ACIAR initiative, there were several short-term consultancies and workshops that focused on marketing problems with highland fresh produce. These included Fresh Produce Development Company (1997), Burden (1998) and Epstein (2000). These early studies adopted a research strategy of *positivistic science* that led to recommendations for change, but did not actually engage with the change process per se. Hence, their capacity to make a difference was limited.

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By 2000, there was a strong desire for change. The PNG Government had developed its National Food Security Policy 2000–2010 in which the main priorities were for change to:

- improve production, downstream processing, marketing and utilisation of food
- improve food quality and safety
- improve the efficiency and adaptability in production, processing and marketing systems and meet the changing needs of producers and consumers
- facilitate the creation of markets for subsistence women farmers.

In August 2000, ACIAR and the PNG Government held consultations to consider follow-up work that would assist in improving the marketing system for fresh produce from the PNG highlands. Following these consultations, a new ACIAR project was developed, entitled *Improving the marketing system for fresh produce of the highlands of PNG* (ASEM/2001/037). Its intention was to go beyond the earlier type of studies and workshops that involved analysis and recommendations and to actually seek to engage the change process. To this end, the research strategy selected was one of *participatory action research* (PAR)—a research strategy in which the process to facilitate change is an integral part. At the time, this was a somewhat novel approach for ACIAR and represented a major departure from the mainstream research strategy of the day, which was positivistic science.

The overall aim of the project (January 2003 to June 2007) was to improve the wellbeing of participants of PNG's fresh-produce marketing system, with particular attention being given to the wellbeing of poor rural households in the highlands.

Issues addressed

At the August 2000 consultations, ACIAR and the PNG Government agreed that the major issues facing the highlands' fresh-produce industry were:

- generation of income by smallholders—this was central to their food security and resilience to drought, frost and natural disasters
- identification of optimal industry models for the smallholder/commercial sector interface
- research into marketing constraints, especially with a view to the analysis of transport constraints
- market chain information and postharvest quality systems
- capacity building.

Subsequent discussions with key informants (PNG Government, researchers and those involved in the PNG food business) revealed that marketing, rather than production, was the major concern and that certain aspects needed to be taken into account. These were the:

- geography of the country, with long complex supply chains between the highlands' producing regions and the major coastal consuming regions
- importance of rural poverty in the highlands and the potential for vegetable production to contribute to its alleviation
- extensive involvement of women in vegetable production and the potential for improved marketing to contribute to the empowerment of women and thereby to the wellbeing of their families.

Objectives

The specific objectives of the project were to:

- map the existing marketing system, identify the constraints and capacities for change, and evaluate the potential for improvement
- facilitate a process of socioeconomic change using collaborative problem-solving among the major stakeholders of the marketing system
- enhance the capacity of relevant people and institutions in PNG.

Research strategy and methods

The research strategy used in this project was PAR, which involves a cyclic process known as the action research cycle (Figure 1).

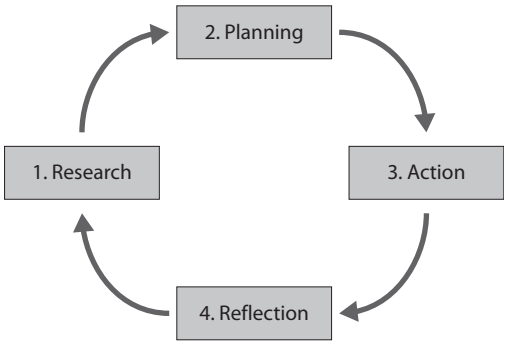

Figure 1. The action research cycle

Phase 1—research

The first phase of an action research cycle is information gathering. In our case, the aim was to develop an understanding of the pre-existing nature of the marketing system, where the marketing system is defined as the relevant value chains plus the surrounding institutional environment. This is what we call *mapping the marketing system*. In such mapping, we consider two distinct aspects: the *physical/technical aspect* and the *human/social aspect*. The physical/technical aspect is concerned with the physical resources of the supply chain (e.g. infrastructure and equipment) as well as the technical skills involved (e.g. handling, storage and transportation). The human/social aspect is concerned with human relationships in the supply chain (e.g. buyer–seller and farmer–farmer relationships, and any gender-related impediments to participation).

According to Spriggs (unpublished presentation, 2004), the physical/technical aspect gives rise to what are known as *tame problems*, while the human/social aspect gives rise to *wicked problems*. Tame problems may be complex, but are relatively straightforward to deal with because stakeholders generally can agree on the nature of the problem and how it should be solved. For example, if the problem is a lack of consolidation of produce in the highlands, then the solution might be to build a consolidation depot in the highlands. On the other hand, wicked problems are not straightforward to deal with because stakeholders generally do not agree on the nature of the problem, let alone how it should be handled. For example, women participants in the supply chain may feel discriminated against, while their male counterparts do not see this. In addition, farmers may feel they are at a disadvantage in buyer–seller relationships, but the (monopoly) wholesaler does not. In general, successfully dealing with wicked problems tends to be much slower and more difficult than dealing with tame problems. In reality, all development problems contain a mixture of 'tameness' and 'wickedness', though some more than others. What is critical for dealing with wickedness in problems is to engage with local stakeholders in a way that encourages consensus and ownership of the problems (and solutions) by those stakeholders.

Initial mapping of the marketing system involved a variety of methods. These included:

- secondary data analysis (e.g. reviewing existing studies and collating already-collected data)
- process mapping of the supply chains (e.g. using data loggers)
- profitability analysis of the supply chains
- semi-structured interviews and focus groups involving the various stakeholders of the marketing system
- random-sample surveying of consumers and interview surveying of major buyers (e.g. supermarket managers and institutional buyers).

One of the key findings from this phase was the fragmented nature of the supply chain. Fresh produce was largely transported by farmers or small-scale middlemen from the highlands down to coastal markets. The produce was often poorly packed and transported in a public motor vehicle (PMV) or on the back of an open truck. It was frequently damaged by rough handling or high temperatures. For example, Figure 2 shows the temperature gradient in tomatoes and beans transported by PMV from near Goroka in Eastern Highlands province to Lae on the coast of Morobe province. Immediately following harvest, the temperature drops below 20 °C as field heat is removed by storing in the shade. However, by the time the produce reaches the market in Lae, its temperature has climbed to around 30 °C, which is sufficient to significantly reduce shelf life.

Phase 2—planning

The information generated by the mapping exercise is then fed into the second (i.e. planning) phase of the action research cycle. The planning phase centres on a stakeholder workshop that is facilitated by the project team. This is the main forum for engagement with stakeholders and is critical to the process of encouraging consensus and ownership of the problems and the change process.

However, before the workshop is the preparatory stage which involves identifying the stakeholders and the workshop participants, preparing a facilitation strategy and organising the workshop. The most time-consuming activity at this stage typically involves working with the identified stakeholders to build trust in the process and to develop the rules of engagement. For the workshop itself, we applied our own methodology to foster consensus and ownership by the stakeholder participants. This process is called collaborative problem-solving methodology (CPSM) and had been used successfully before by University of Canberra members of the project team in a wide range of problem situations within Australia (Chambers et al. 2003; Spriggs and Chambers 2005, 2008). However,

this was the first time we had applied it in a developing-country situation, so it was to be an interesting test of its robustness in different cultural settings. In fact the methodology worked extremely well. Very broadly, CPSM involves careful selection of participants who span all the various types of stakeholders in the marketing system. The workshop participants are provided with information (including that from the

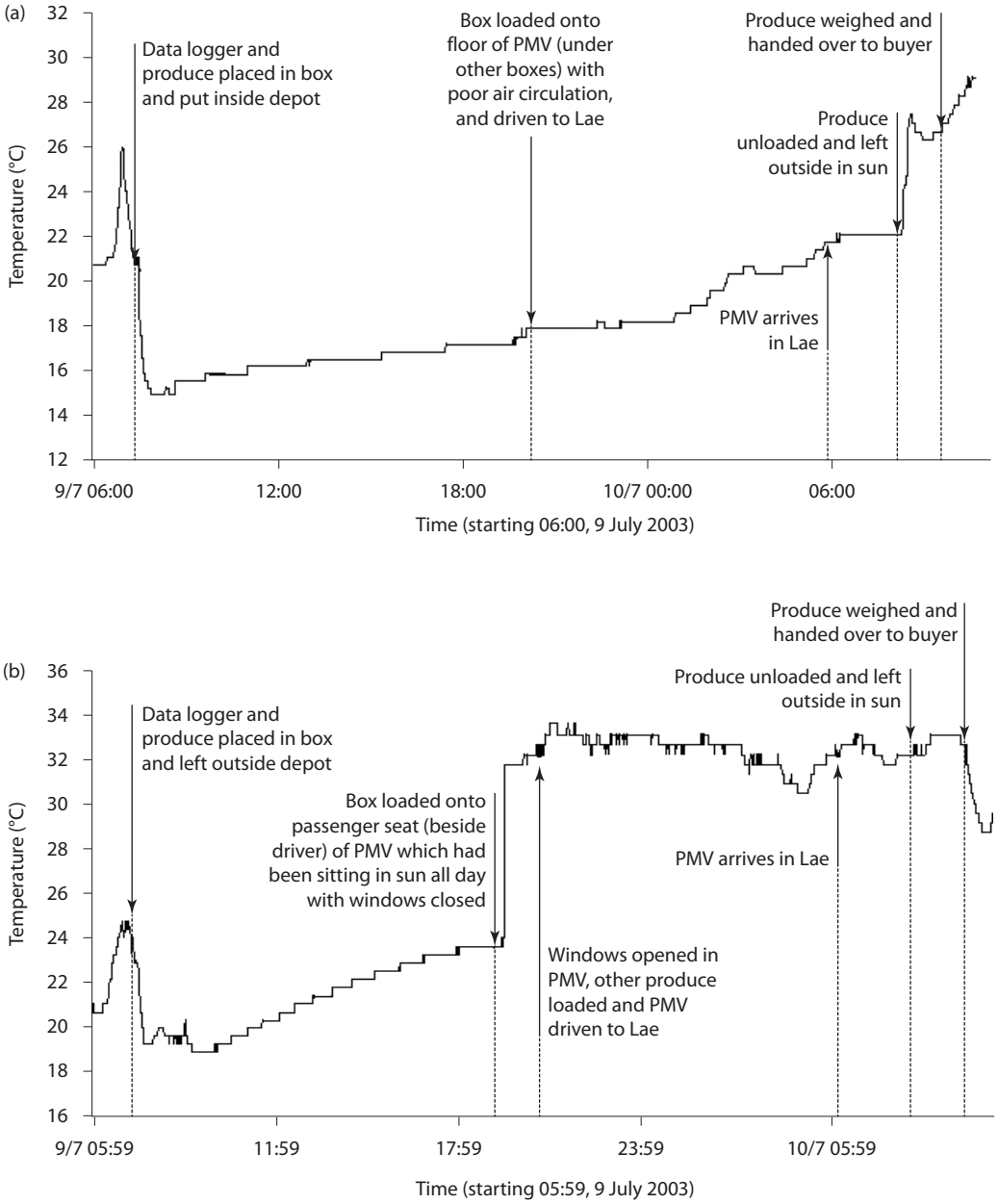

Figure 2. Temperature gradient in tomatoes (a) and beans (b) transported by public motor vehicle (PMV) from the PNG highlands to a coastal market in Lae, Morobe province

marketing system mapping) and the facilitator leads the participants through a divergent (creative) and then a convergent (evaluative) phase to develop an action plan. In our experience, workshop participants tend to have a pretty good idea of the major issues involved, but the action plan may be less well defined. Hence, at the end of the workshop, a steering committee made up of selected workshop participants is formed and that committee, together with the project team, work to clearly define the action plan.

One other comment on the workshop is the stance taken by the facilitator. In conventional action research, the facilitator takes a passive role and just 'directs traffic', but this can lead to problems. For example, what are we to do if the workshop participants agree that the way forward is to start a war with a neighbouring clan or to discriminate against women in some way? In our workshops, the facilitator is an active participant in the process with their own social change perspective based on *critical theory.* Such an approach is labelled *critical action research* to distinguish it from the conventional action research. For this project, the critical perspective was *sustainable socioeconomic development based on principles of social justice*.

Phase 3—action

Since the basic aim of a PAR project is 'to make a difference', phase 3 is an important component. It may, and usually does, involve further work by the project team. However, there is no specific methodology here. It depends on: (a) what emerges in the action plan; and (b) what abilities are possessed by the various members of the project team. Both of these aspects need to be considered before the project team can proceed with a particular initiative in the action phase. Thus, for example, one of the perceived needs in the current project was to improve the postharvest management skills of farmers and the corresponding action idea was to develop a postharvest resource manual. However, this idea was not acted upon until the Fresh Produce Development Agency (FPDA) hired, and assigned to the project, a newly graduated postharvest specialist who could write well. The end result was the ACIAR publication by Haguluha and Natera (2007).

Phase 4—reflection

The final phase of the action research cycle is the reflection phase. Here, the project team and steering committee meet to reflect on the actions taken and plan further research (i.e. a new phase 1) for a new action research cycle. Thus, we have a process that incorporates the idea of *adaptive research*, but also one that adapts to the perceived needs of the participant stakeholders as represented on the steering committee. In this project, the general outcome of the first stakeholder workshop was a focus on the physical/technical aspect of the marketing system. In particular, the main action ideas centred on building postharvest infrastructure (including a consolidation depot) in the highlands. During our reflection on the action taken in the first cycle, it was decided that a follow-up action research cycle should focus more on the human/social aspect. Hence, further studies were undertaken with this focus, including: (a) airfreight trials of shipments of produce from the highlands to Port Moresby, with the main aim of studying buyer–seller relationships; (b) a study on the special difficulties faced by women participants in the marketing system for fresh produce; and (c) a study on the role of youth in the fresh-produce supply chain. The results provided background information for the subsequent action research cycle.

Research activities and outputs

The research outputs are categorised below under the three project objectives.

Mapping the fresh-produce marketing system for highlands' fresh produce (objective 1)

This activity was directly concerned with phase 1 of the action research cycle. Mapping the physical/technical and human/social aspects of the fresh-produce marketing system took most of the first year of the project. The results were synthesised into several background papers (e.g. Spriggs et al. 2004b) and presented to the first workshop by the project team.

Facilitating a process of change using critical action research (objective 2)

This activity was directly concerned with phases 2, 3 and 4 of the action research cycle. One innovation we used was a pre-workshop workshop that involved only women participants. This was deemed necessary as women tended to be silenced in a large mixed group. The women-only workshop was facilitated by Barbara Chambers and Carole Kayrooz. They summarised the findings of this workshop and these were presented to the main workshop by John Spriggs.

Papers discussing the use of our methodology for facilitating change in the project include Spriggs et al. (2004a), Spriggs and Chambers (2005, 2008) and Kayrooz et al. (2006).

The project involved two major action research cycles. The first cycle began with the mapping phase in January 2003. The planning workshop associated with this cycle was held in November 2003 and the cycle ended in June 2004. The second cycle began in July 2004 with the follow-up studies, followed by a planning workshop in November 2004 which, in turn, led to action plans, their implementation and subsequent reflection by a steering committee. In the original project, completion of the second cycle was set for December 2005, but this was extended to December 2007 to accommodate follow-up research and implementation activities.

Action research cycle 1

The first workshop led to a concept paper (J. Spriggs et al., unpublished report 2003). This paper summarised the consensus view of the workshop which was to:

- recognise the important role of women in the fresh-produce industry in the highlands
- encourage a professionally managed marketing system (to improve efficiency and effectiveness)
- ensure that a significant share of the benefits from a professionally managed marketing system accrues to rural households in the highlands
- encourage government policy initiatives that are supportive of these goals.

These led to the following activities and a series of unpublished reports that informed later work:

- *Initiate market infrastructure development for road/sea system*. A paper was developed and submitted to FPDA, which in turn submitted a proposal for infrastructure development to the PNG Incentive Fund in 2004 entitled 'Consolidation of fresh produce in the highlands'.
- *Improve air transport system*. The main initiative here was to undertake a series of airfreight trials to transport produce from highland growers to a Port Moresby supermarket.
- *Improve coordination and communication in supply chain*. This involved exploring the use of two-way radios in the long-distance marketing of horticultural products.
- *Improve farmers' marketing skills*. This activity explored alternatives to the current delivery system for agricultural extension.

The steering committee suggested that much of the work following the first planning workshop had been focused on the physical/technical aspect of the marketing system (especially infrastructure development) and that the second action research cycle should focus more on the human/social aspect.

Action research cycle 2

Following the guidance of the steering committee, a number of reports were prepared for presentation at the second workshop. They included:

- women's participation in the supply chain (T. Brearley, pers. comm.)
- farmer-to-farmer relationships (E. Natera and W. Ehmig, pers. comm.)
- youth in agriculture (B. Wally, pers. comm.)
- buyer–seller relationships (W. Ehmig, pers. comm.)
- understanding the needs of consumers (N. Omot, pers. comm.).

While much of the emphasis of the second workshop centred on the human/social aspects, another area of work considered to be important by the participants was *quality management in the supply chain*.

The second workshop led to the following papers:

- *Improve whole-of-chain quality management*. Four papers were produced: Denano et al. (2007), Haguluha and Natera (2007), Nath et al. (2007) and S. Nath and F. Vidinamo (unpublished report).
- *Improve participation of women and youth in the fresh produce industry*. Several papers were produced, comprising B. Chambers and L. O'Connell (three unpublished ACIAR reports) and Chambers and Wali (2007).
- *Improve our understanding of the needs of the customer*. The results were presented at several conferences and published as Spriggs et al. (2006).

Enhancing capacity of relevant people and institutions in PNG (objective 3)

Capacity building of PNG-based members of the project team

We began the project with a 2-week training course in Canberra, Australia, for PNG-based project team members. This course covered topics in marketing, supply-chain management, critical action research and workshop facilitation. It was also reciprocal training, with PNG-based members teaching Australia-based members about geographical contexts and cultural factors that needed to be taken into account.

During the course of the project, we worked with the PNG-based members to write research papers, concept papers, project proposals, present seminars, undertake surveys and statistical analysis, conduct focus groups and facilitate at workshops.

Capacity building of commercial farmers and other PNG stakeholders

To assist commercial farmers and other PNG stakeholders to gain knowledge and develop skills, we:

- produced a postharvest resource manual (Hagulula and Natera 2007)
- delivered a training course for agricultural scientists in PNG on PAR methods, marketing and supply-chain management
- assisted personnel of the New Zealand Aid Programme–funded Institutional Strengthening Project, who had been engaged to assist FPDA towards the end of our project. We worked with them to 'bring them up to speed' on the situation, then incorporated them into a final workshop as table facilitators.

Lessons learned

The most important lesson learned from this research was that our approach to critical action research works in a developing-country context. It is a robust methodology for undertaking socioeconomic research that aims to 'makes a difference'. While traditional positivistic science methods are likely appropriate for dealing with problems of a primarily physical nature (e.g. ascertaining the highest yielding crop variety), they are likely inadequate by themselves when dealing with problems of a primarily socioeconomic nature. This is because socioeconomic problems involve social change, which requires a highly nuanced understanding of local conditions (including cultural and other institutional constraints and opportunities for change) and ownership of the change process by local stakeholders. This requires: (a) engagement with local stakeholders in collaborative problem solving; and (b) adaptive research (i.e. the ability to adapt the research as required by our changing understanding of the local conditions and the perceived needs of stakeholders).

The second most important lesson concerned the nature and extent of participation of women in the fresh-produce supply chains. This was unknown to us (and most of the literature) at the start of the project. Women were very extensively involved in the fresh-produce supply chains, yet they faced significant difficulties in earning income from their involvement. These difficulties included lack of facilities at the local markets, threats of violence if they engaged in long-distance markets and a patriarchal family system (in the highlands) that gave them less access to income and resources and less involvement in decision-making.

The third most important lesson was the important challenges posed by the human/social aspects of the supply chains as opposed to the physical/technical aspects. While there are significant challenges of a physical/technical nature (e.g. lack of consolidation depots in the highlands, poor quality management), these are outweighed, in many cases, by the human/social challenges (e.g. enhancing the participation of women and youth, and enhancing farmer-to-farmer and farmer-to-buyer coordination).

Acknowledgment

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Improving access to credit for smallholder farmers in Papua New Guinea: issues and lessons learned

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Abstract

Credit can help in reducing poverty and improving livelihoods for the poor because it offers the potential for them to engage in income-generating activities to meet household needs. However, the poor have often been kept outside the commercial banking system due to high costs and high risks. This is especially true for smallholder farmers in the PNG highlands who live in remote villages. The locational disadvantage is compounded by social and cultural attitudes of the locals towards savings and loans. The aim of this study was to improve access to credit for farmers in the PNG highlands by linking farmers to rural credit providers.

The results show that improving access to credit has an immediate impact on income and the livelihood of participating farmers. However, the sustainability of the microfinance scheme that provided the loans is in doubt, in part because the program design is not appropriate for the social and cultural context of PNG highlands, and in part because more emphasis is placed on granting loans than on loan repayments. One important lesson learned is that continuous monitoring and evaluation is crucial in ensuring that accurate information and necessary support services are provided to farmers, both before and after a loan has been granted, and that any glitches are picked up and rectified as soon as possible. Another lesson learned is that participatory action research, when applied to international agricultural research projects, has the benefit of helping stakeholders to identify and solve local problems with locally appropriate solutions. However, to achieve real changes, there must be capacity and support services that are locally available.

Background

Sweetpotato is by far the most important staple food crop in PNG, providing 43% of total dietary intake (as measured by weight and food energy). Annual production is estimated to be around 3 million tonnes, with 75% of this crop produced in the highlands. The market potential for sweetpotato in PNG as a cash crop has increased significantly in recent years due to increasing urbanisation, especially in population centres like Lae, Madang and Port Moresby and economic growth due to the development of the PNG LNG project (a US$16 billion liquefied natural gas production and processing development project in Southern Highlands province due to start production in 2014) and several other mining projects. However, marketing opportunities are being constrained by high marketing costs and postharvest losses. Up to 30–50% of product can be unsaleable on arrival in Port Moresby, due to rots and other physical damage.

This paper relates to Australian Centre for International Agricultural Research (ACIAR) Project

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ASEM/2006/035 (*Improving marketing efficiency, postharvest management and value addition of sweetpotato in Papua New Guinea*). The aim of the project was to improve the livelihoods of PNG farmers in the highlands by addressing issues of product losses and high marketing costs in long-distance sweetpotato marketing from the PNG highlands to coastal markets. The project began with a detailed mapping of the socioeconomic and technical components of the PNG sweetpotato supply chains from major producing regions in the highlands (Eastern Highlands province, Jiwaka province[4] and Western Highlands province) to coastal markets in Lae and Port Moresby. The socioeconomic component focused on marketing issues pertaining to women and the institutional/relational/cost aspects of the supply chain. The technical component focused on issues related to postharvest handling, storage, disease assessment and variety evaluation.

The socioeconomic component was undertaken through a series of stakeholder consultations, including with farmers, traders, trucking companies (providing road transport from Lae to Port Moresby), shipping companies (providing sea transport from Lae to Port Moresby), institutional buyers (catering companies, supermarkets, kai bars and hotels) in Lae and women's groups. The results indicated serious issues regarding packaging and postharvest handling (plastic bags too big and unbreathable, rough and multiple handling, and high percentages of skinning, cuts and breakage), transport infrastructure (high costs, poor roads and no specialised transport system for sweetpotato) and supply-chain coordination (no collaboration or communication between smallholder farmers and their buyers or transporters). For women, there were gender-specific issues related to law and order and personal safety, poor market facilities, and inequalities in the division of labour and the distribution of income within the household.

Upon the completion of the supply-chain mapping, results were presented at a stakeholder workshop in Goroka. The objectives were to: seek feedback and clarification from stakeholders on issues identified by the research team; and identify priority issues to be acted upon in the coming year in collaboration with stakeholders. At the end of the workshop, three priority matters were identified for the socioeconomic component. They were:

- lack of credit facilities
- lack of coordination between farmers and transporters
- lack of understanding of consumer/buyer preferences for sweetpotato.

Recommendations were made at the workshop to address each of these problems. This paper reports on actions taken to improve farmers' access to credit. These actions included:

- undertaking an overview of the financial system and microcredit schemes in PNG
- conducting personal interviews of microcredit providers
- profiling and assessing the needs of farmer groups
- providing financial literacy training
- linking farmer groups to microcredit providers
- assessing the impact of the outcomes from linking farmers to credit.

In this paper, we outline the methodology and activities undertaken and summarise the results from the literature review, personal interviews, group profiling, linking farmers to credit providers and impact assessment. They are followed by the lessons learned and concluding remarks.

Key issues and objectives

Credit can help in reducing poverty and improving livelihoods for the poor because it provides the seed money that enables them to engage in income-generating activities to meet household needs. However, the poor have often been kept outside the commercial banking system on grounds of high transaction costs and high non-repayment risks. This is especially true for smallholder farmers in the PNG highlands who live in remote villages. The locational disadvantage is compounded by their social and cultural attitudes towards saving and loans. The majority of the farmers regard money as a communal property and loans as handouts.

To reduce transaction costs and default risks in dealing with smallholder farmers, microcredit is often provided to *groups* rather than individuals. In theory, group loans, which are often accompanied by joint liability and peer monitoring, enable the microfinance institutions to pass on costs of administration and monitoring to the borrowers. However, group loans may not work well in practice because of issues of adverse selection, moral hazard and free-riders, all of

[4] The areas comprising the current Jiwaka province were part of Western Highlands province until May 2012, when Jiwaka province was officially recognised.

which are prevalent in PNG highlands society. The research question was: how would microfinance work in the PNG highlands for smallholder farmers, given the unique social and cultural context? The overall objective of this study was to identify and address socioeconomic constraints to improving smallholder farmers' access to credit. The specific objectives were to:

- provide information on financial products and services to farmers
- improve financial literacy of farmers
- link farmers to credit markets.

Research strategy and methods

In this project, *participatory action research* (PAR, comprising the research–planning–action–reflection cycle) was undertaken to foster stakeholder participation and adoption of research outputs. One key element of PAR is the ownership of the change process, whereby any changes to emerge from the process are 'owned' and directed by the stakeholders, with researchers being the facilitators. This results in local stakeholders identifying and implementing locally appropriate solutions to their own problems. Another key element of action research is 'learning by doing' by local participants, which results in empowerment and capacity building that are crucial for sustainable development. Most importantly, PAR, and the process of change, enable the project team to move beyond simply identifying the constraints in the marketing system to focusing on those particular areas wherein real changes are deemed desirable and necessary by the stakeholders.

In this study, the cycle began with the research team generating an understanding of the sweetpotato marketing system through supply-chain mapping and technical trials (the information-gathering phase). Findings from the research were then presented to the stakeholders in a workshop and were used as a starting point for discussion. Through a consensus decision-making process, workshop participants then identified priority issues and suggested intervention strategies to address those issues (Spriggs and Chambers 2007). Those strategies were developed further by the research team into action plans to be carried out by working groups (comprising researchers, farmers and supply-chain operators in relevant locations). Outcomes from the action plans were again reported back to stakeholders at a workshop for another round of discussion and further action.

The research methods used in this study to improve access to credit included the following:

- *Literature review of microfinance*. Theory and applications of microfinance models were reviewed to determine the extent to which they were applicable in the PNG context and to sweetpotato farmers.
- *Personal interviews of financial institutions and farmers*. In July–August 2009, managers of the National Development Bank (NDB), Nationwide Microbank, Alekano Savings and Loan, and Bank South Pacific were interviewed to find out their views on the issues in dealing with smallholder farmers and possible solutions. Several sweetpotato farmers were also interviewed regarding their experiences and problems in accessing credit. Semi-structured questionnaires, used for interviewing both financial service providers and users, were developed and pre-tested in a training workshop for PNG partners held in June 2009.
- *Group profiling.* The purpose of this activity was to identify and select potential candidates for receiving financial literacy training and linking with microcredit providers. In all, 30 farmer groups in Western Highlands, Jiwaka and Eastern Highlands provinces were surveyed to understand how their organisations have worked for them. Most of the groups were registered under the Companies Act or as cooperatives and few were self-help groups and community-based organisations. Information collected and analysed from the groups included: organisational structure, operations and activities, access to markets and services, issues and problems they faced, and solutions and opportunities to improve their performance.
- *Linking farmers to microcredit*. Altogether, six farmer groups—South Wahgi Organic Food Farmers Association (SWOFFA) (Agnes's Group in Minj), Mitnande Mama (Ellen's Group in Kindeng), Voice for Change (Lilly's Group in Kukpa), Joseph's Group in Banz and Renki's Group in Wahgi Flat, all in Jiwaka province, and Ambo Fresh Produce (Wayne's Group in Kasena village), Eastern Highlands province—were introduced to NDB's microcredit scheme between November 2010 and June 2011. This involved Fresh Produce Development Agency (FPDA) team members in the Goroka and Mt Hagen offices organising farmer groups and inviting loan officers from NDB to go to their villages to discuss how group loans worked and could be accessed. Of

the six groups, four groups subsequently took out group loans from NDB. For those that did, the first loan was PNG kina (K)1,000 per group member.

- *Financial literacy training*. Two financial literacy training sessions were provided by a financial literacy specialist based in Madang to members of Lilly's Group in November 2009 and in October 2010 upon request from Lilly. The 5-day training focused on improving basic knowledge and skills in, and changing attitudes to, money, credit and debt management.

  In 2011, financial literacy training of the other five groups that had previously been linked to NDB was delivered by FPDA, based on a newly developed financial-management training module.[5] The training sessions focused on raising awareness of credit facilities, how to manage household budgets and cash flow, and how to keep records. The training conducted with Wayne's Group at Kasena was featured in the PNG national newspaper *Post Courier*.
- *Impact assessment*. In August 2011, an impact assessment was conducted with the six groups that had been linked to NDB, to learn and verify how financial literacy training and improved access to credit had impacted on the participants. In particular, we were interested in finding out the following:
  - what they had learned
  - whether and how they had put the new knowledge into practice
  - what impact the training or loans from NDB (made through this project) had on them, both positive and negative.

Research outputs

In this section, two sets of outputs are presented. First are the main points from a literature review of the microfinance schemes, specifically those microfinance schemes operated in PNG. This is followed by the results from the experimentation of linking farmers to financial service providers.

[5] After completion of the project, financial literacy training was provided by FPDA to many more farmer groups in the highlands and in Central Province, either as part of FPDA's Village Extension Workers Program, or upon request from community groups and other projects.

Literature review

Microfinance models

Microfinance is the provision of a broad range of financial services, including savings and loans, insurance, leasing and money transfer, to low-income microenterprises and households (Cornford 2002). Microcredit, on the other hand, is more narrowly focused on providing credit services to low-income clients, usually for microenterprises. Microcredit is characterised by short loan durations, small loan sizes, strict supervision and direct or indirect client screening to reduce default risks. In most cases, the provision of savings services in microcredit schemes involves the collection of compulsory deposit amounts that are designed to collateralise those loans.

Microfinance institutions are organisations that provide financial services to the poor. They emerged in the 1970s and 1980s, when the need to provide small loans to the poor to support their microenterprise development was identified. There are various microfinance models being used today, differing in the products and services provided, and the methods by which they are delivered. They include: community-owned village banks, savings and loan associations, credit unions and self-help groups (Cornford 2002). Internationally, some of the most well-known microfinance models include the Grameen Bank solidarity group, the Latin American solidarity group and the rural financial systems approach as facilitated by Bank Rakyat Indonesia's *unit desa* system (Cull et al. 2006). Given the popularity of the Grameen Bank, its operations and reasons behind its success are briefly outlined below.

The Grameen Bank was founded in Bangladesh in 1976 by Muhammad Yunus. It is a microfinance organisation and community development bank that makes small loans to the impoverished without requiring collateral (Yunus and Jolis 1998). It targets the poorest of the poor, especially women, who made up 95% of the bank's loans. Women are targeted because they have less access to traditional credit lines and incomes. In addition, women are often credit constrained and have an inequitable share of power in household decision-making. Lending to women generates considerable secondary effects, including empowerment of a marginalised segment of society (Yunus and Jolis 1998). Since 1995, Grameen Bank has funded 90% of its loans with interest income and deposits collected, hence aligning the interests of its new borrowers and depositor-shareholders. Hence,

Grameen Bank distinguishes itself from other such institutions by converting deposits made in villages into loans for the more needy in the villages.

The Grameen Bank model is characterised by the following features (Grameen Bank 2013):

- *Group formation.* Groups of five self-chosen members from a similar socioeconomic background are formed. Each group elects its own chairperson and secretary, whose responsibilities include ensuring that all members attend the compulsory meetings. Groups are federated into centres. Centre chief and deputy chief are selected from among the group chairpersons. The groups and centres are responsible for the approval, disbursement and recovery of loans under the guidance and supervision of the bank staff.
- *Joint liability*. Groups are collectively responsible for the repayment of loans. Group liability and peer pressure are used as a substitute for collateral against loans.
- *Comprehensive 7-day training*. Before the group is recognised, members must satisfy bank staff of their integrity and commitment, and their understanding of the principles of the Grameen Bank approach and group responsibility by going through the training.
- *Loans are disbursed on a staggered 2–2–1 basis*. Under this approach, the two most disadvantaged group members receive their loans first. To be manageable, loans are repaid in small weekly instalments over a 1-year period. The upper limit of the first loan is relatively small and the loan size progressively increases with each loan cycle. The loan amount is determined by the investment requirements of the borrowers.
- *Savings.* Five per cent of the loan amount is deducted at the beginning and goes into the group's fund. The fund provides access to cash for individual members with the group's approval. In addition, each member makes personal savings each week.
- *Loan interest rate*. The bank charges 20% interest at a flat rate per annum with the objective of attaining financial sustainability.

Studies have shown that the Grameen Bank approach to lending has produced high rates of repayment and viable and sustainable operations and has been adopted by more than 43 countries, including several microcredit schemes operated in PNG. The Grameen Bank approach clearly demonstrates that the poor are 'bankable', provided that the right products are delivered by the right methods. However, Cornford (2002) cautioned that the Grameen Bank and other successful microfinance models developed in Asia or other regions might not be applicable to Pacific island countries such as PNG because of significantly different environmental, economic and sociocultural contexts.

Economics of microcredit schemes

Lending, like insurance, is a risky business because of information asymmetry, where the borrowers have more information about their own ability and intention to repay than the lenders (Varian 1992). Two problems arise from information asymmetry. One is *adverse selection*, where the loan market tends to attract borrowers with less desirable properties (e.g. inability to repay, lazy or irresponsible people, or risk-takers). The other problem is *moral hazard*, where the borrowers change their behaviour after a loan has been made. This is especially true for individual lending. In this case, how to select individuals to lend the money to and how to ensure the loan is repaid with interest are key issues for the lenders.

There are several ways to deal with information asymmetry problems: conducting background checks on potential borrowers (e.g. credit check, employment history, future income streams etc.); requiring collateral (e.g. land, house, equipment etc.); and requiring a minimum level of net worth so that there are sufficient assets to cover liabilities (Spaulding, n.d.). However, these measures cannot be readily applied to the poor and smallholder farmers in developing countries, in part because of their lack of assets or formal employment and in part because the high transaction costs in screening and in assuring repayment of large numbers of small loans in often remote areas.

'Group lending', where borrowing is conditional upon group facilitation, with some form of liability clause, appears to be a compromise solution by which small loans can be offered to the poor. However, there is a problem with joint liability lending programs. That is, when the poor are given access to credit without collateral, they cannot, in the event of default, be punished beyond a mere denial of future access to credit. This form of 'limited liability' can induce borrowers to take actions that are not optimal, such as excessive borrowing, investment in a risky project, misuse of funds, failure to apply enough effort to manage the investment decisions or diversion of funds for repayment of the loan to other purposes, and hence, the so-called moral hazard problems remain (Conning 2000).

To resolve these issues, 'joint liability' group loans rely on self-selection, peer monitoring, peer pressure and social sanctions to ensure repayment from group members (Simtowe et al. 2006). Typically, microcredit groups are formed by self-selection among participants who are familiar with each other and have some social or economic ties. Familiarity among group members implies better information about the participants' character, farming skills, and consumption and investment needs, while social and economic ties provide group members with possibilities of pressuring their peers to perform (Ghatak 1999; Ghatak and Guinnane 1999). Joint liability in group lending, as Conning (2000) put it, has created the 'social collateral' to replace the physical collateral that is required to access the more traditional forms of finance. The way joint liability group lending is designed and implemented, e.g. the Grameen Bank approach, effectively transfers screening costs (through peer selection of group members) and monitoring and enforcement costs (through peer monitoring and social connections) from the bank to borrowers, providing an effective way for banks to overcome adverse selection, moral hazard and enforcement problems (Armendáriz de Aghion and Morduch 2000).

Despite the improvements in design, group lending in practice has a number of shortcomings. One problem is that forming a group, attending group meetings and monitoring group members can be costly and, in some cases, too costly to implement (Besley and Coate 1995). The assumption that the poor have low opportunity cost for their time is not always true. Second, there are social costs associated with members who are least able to repay (most likely women) and, as a result, they suffer from the repayment pressure put on them (Montgomery 1996). Third, borrowers assume higher risks because they are not only liable for themselves but also for their group partners (Stiglitz 1990). Other issues include: members may collude against the lender and undermine the lender's ability to harness social collateral; the demand for credit within a group may change over time, forcing members with small loans to be liable for larger loans of their peers; and the growth of group-lending programs may slow down when new borrowers with looser social ties enter and consequently the group-lending approach loses some of its power (Giné and Karlan 2006).

Microfinance schemes in PNG

PNG has a long history of microfinancing, as far back as the 1960s. Past and existing microcredit schemes in PNG include: Rural Development Bank; Women's Credit Scheme; Small Business Guarantee Facility of the Small Business Development Corporation; PNG Credit Guarantee Scheme, administered by the Department of Finance; savings and loan societies; and non-government organisation (NGO)-supported credit schemes, such as the Liklik Dinau Abitore Trust, Simbu Microcredit Scheme, Putin na Kisim of the Lutheran Development Services, Bougainville Microfinance Scheme, Morata Credit Scheme, other church credit schemes and a number of Rotating Savings and Credit Associations (ROSCAs)[6] (e.g. the Wok Meri groups and the Sandes groups) (Kavanamur and Turare 1999; Kopunye et al. 1999; Kavanamur 2002; Carruthers 2003).

In addition, there are microcredit schemes provided by commodity boards of major cash crops, such as oil palm, coffee and potato. Under these credit schemes, growers are provided with farm inputs, the costs of which are then deducted from their pay cheques when outputs are delivered to the commodity boards at harvest time. For example, coffee growers, through the Coffee Credit Guarantee Scheme, are able to acquire loans from the Coffee Industry Corporation (CIC) to meet the cost of coffee production, which are then repaid with interest upon the sale of coffee to CIC (CIC 2012). These types of credit schemes work well because there are fewer problems with repayments.

[6] Rotating Savings and Credit Associations (ROSCAs) have been very effective in providing microcredit to women in the developing world (Besley et al. 1993, 1994). They come in two forms: random and bidding ROSCAs. In a random ROSCA, members commit to putting a fixed amount of money into a pot for each period of the ROSCA's life. Lots are drawn and the pot of money is allocated randomly to one of the members. In the next period, the process repeats itself, with each previous winner excluded from the draw. The process continues until each of the members receives the pot once. In a bidding ROSCA, the pot is allocated to the member who offers the highest interest payment or pledges the highest future contribution or one-off side payment via a bidding procedure. In a bidding ROSCA, individuals still only receive the pot once, as the bidding process merely establishes priority.

Microcredit schemes vary significantly in program design and business model from those employed by financial institutions, formal or otherwise, which affect their performance. For example, they may differ in: group formation (peer/self-selection versus externally formed by extension officers or credit officers, for example); group composition (co-workers versus kinship); lending strategies (individual versus group lending); liability (individual versus joint liability); and target group (women versus general, farm versus non-farm sector).

Many of these PNG microcredit schemes have failed. Key problems include: lack of appropriate bookkeeping and management records by both credit providers and users; the continued lurking danger of political meddling; high cost of the service-delivery networks; mediocre internal and external monitoring and evaluation mechanisms; highly subsidised interest rates; lack of capacity and experience of financial intermediaries in financial management; near absence of provision of non-financial services, such as management training; neglect of savings facilities; embedded handout mentality where public funds are involved; and rapid expansion without proper planning (Bablis 1999; Kavanamur and Turare 1999; Kavanamur 2002).

Linking PNG farmers to microcredit providers

Personal interviews of credit providers

Four microfinance institutions in the PNG highlands were interviewed: Nationwide Microbank in Mt Hagen (formerly Wau Microbank), PNG Microfinance Limited in Mt Hagen, the National Development Bank (NDB) in Mt Hagen and the Alekano Savings and Loan Society in Goroka. The objectives were to obtain information on their product offerings and to identify issues they face when dealing with smallholder farmers.

The results indicated that the main issues in doing business with smallholder farmers were: *wantok*/kinship system, nepotism and corruption; financial illiteracy of the majority of farmers who don't know how to manage money; lack of a saving culture; irregular income streams due to the influence of a range of biological and environmental factors on agricultural production; farmers' attitudes towards marketing—it is driven mainly by the need for cash, not as a way to build wealth; and the handout mentality, where loans are seen as a grant, rather than something owed that must be repaid.

The details of these financial service providers, including their backgrounds and products and services, are provided in the Appendix.

In this paper, we will focus on NDB's microfinance loans in the discussion that follows because it was identified as the most appropriate industry partner for the broader project.

NDB microfinance loans

NDB's approach to microfinance is similar to that of the Grameen Bank, based mainly on the principles of group lending, joint liability and peer monitoring. Loans amounting to K10,000 and below are categorised as microfinance loans (NDB 2012). These loans target clients who are engaged in commercial microeconomic activities with short-term and frequent cash turnover. Microcredit loans are offered to borrowers who are active members of community-based organisations (CBOs)[7] in communities or villages located close to NDB's branch offices. Payments are usually made frequently (e.g. fortnightly or monthly) over a 1-year repayment period.

NDB prefers a credit group to be between 20 and 30 members who meet the following eligibility criteria (NDB 2012):

- must be engaging in an ongoing income-generating activity or have a current source of regular income
- must be a permanent resident in the area for at least 5 years and have no intention of moving in the next 12 months
- must be willing to consistently attend the credit group meetings
- must not be a previously delinquent borrower of NDB or have outstanding loans with other lenders or financial institutions
- must show capacity to be a financial member of the credit group

[7] CBOs refer to existing self-help informal groups, registered groups or people's associations. However, since not all members of a CBO are qualified for, or interested in, a group loan, in most cases new groups within an existing CBO must be formed. NDB also refers these newly formed credit groups as 'CBOs' in its documents (see the details in the Appendix). In this paper, we will call them credit groups.

- must have attended the Personal Viability (PV) course[8] conducted by the Entrepreneurial Development Training Centre or any related course conducted by the Small Business Development Corporation or other recognised organisations that are targeted at enhancing business skills and financial literacy
- only one member of a household or family can become a member of a credit group.

The formation and organisation of the credit group is facilitated by NDB's loan officers through a microfinance training workshop and, in most cases, for the sole purpose of accessing NDB's microfinance loans. Once a credit group is formed, the group is then divided into small units, each with their own unit treasurer. The unit treasurer's role is to represent the unit members, visit their project sites and report back to the group leader on the progress of the unit.

Once approved, the loan is given to the group (i.e. group lending) and it is up to the group members to decide how the loan is to be divided among themselves. In the case of loan default, all members of the credit group are liable to repay (i.e. joint liability). For loan security, NDB requires a 30% deposit on the total amount of the group loan, which is used as collateral and can be used to repay any bad debt. This means the savings:loan ratio is 30:100, or 1:3.33.

In order to prevent bad debt, the members of credit groups must have a similar socioeconomic background when formed and meet regularly (e.g. fortnightly) to keep track of each other's progress (i.e. peer monitoring). In such a set-up, members are expected to encourage each other to work diligently towards repaying their loans. During the Credit-group meetings, sometimes the bank staff will be present to get a feel for the group's performance and to make sure the group is on track for loan repayment.

Group profiling in PNG highlands

Collective action plays an important role in rural development programs. In the 1970s, local groups were organised to address rural development issues in watershed management, integrated pest management, participatory breeding programs, extension, farmer-managed irrigation systems and microfinance. The assumption was that communities would fully engage collectively over a large range of activities. But this is not necessarily true. Seabright (1997) argued that some types of activities were best managed at the community level, while others were not, and more attention should be given to a better understanding of how collective action arises to deal with different issues and how it is sustained. Without attention to this critical question, the current policies to devolve natural resources to communities, empower women through self-help groups or deliver a range of services through community-based organisation risk failure (Meinzen-Dick et al. 2004).

There are pre-conditions for successful collective action outcomes. Agrawal (2001) identifies a common list of enabling conditions for collective action, including:

- interdependence among group members
- clearly defined boundaries
- shared norms
- past successful experiences
- appropriate leadership
- heterogeneity of endowments
- homogeneity of identities and interests
- small group size
- low levels of poverty.

Many farmer groups, CBOs and self-help groups exist in PNG rural communities. However, not all of these groups have been active or successful in achieving their stated objectives. The purpose of profiling groups in this study was to identify groups that met these criteria and were deemed sufficiently organised and motivated to be potential recipients of credit and technical training programs of FPDA, a key partner in this ACIAR project. The list provided by Agrawal (2001) formed the basis for the study to select the potential recipients of NDB microfinance loans.

The profiling covered information about the purpose of forming the group, the success, or otherwise, of the

[8] The Personal Viability (PV) program was devised in the late 1990s by Sam Tam. The program has been in operation in PNG under the Entrepreneurial Development Training Centre since 1997. A basic 2-week PV course currently costs K250 per person and is open to anyone. The course teaches participants how to manage their finances effectively and how to balance the demands of social obligations, such as the traditional customary activities. They are encouraged to discipline themselves when it comes to these demands. Participants are also told that time is of the essence and the course teaches it is the most valuable asset. Hence, it should not be wasted doing anything other than productive work, such as working in the growing/marketing of garden produce. Participants are also taught not to entertain people who want to borrow money from them for various reasons, as these are the type of people who will run their businesses down, and facilitating such borrowing encourages the borrower to be lazy and fall into debt (EDTC 2010).

group, its organisational structure and governance, and its current operations, problems encountered and training needs. The profiling also assessed the groups' need for credit and their knowledge of products and services provided by various financial institutions in their areas. In all, 30 farmer groups in Mt Hagen (20) and Goroka (10) were profiled. Because of the similarity of the findings from the Mt Hagen and Goroka cohorts, the results are summarised together below.

Organisational structure. Of the total groups interviewed, 24 were registered under the Investment Promotion Authority as cooperative societies, while the remaining 6 were self-help groups and not registered. Generally, all groups had a farming background and were engaging in vegetable production.

Purpose. There were various reasons given for group formation, including: to improve living standards through income-generating activities (55% of the 30 groups interviewed); to seek financial assistance from outside to implement their group projects (30%); to mobilise resources and assist each other in production and in accessing markets (10%); and for religious purposes or for addressing social concerns over gender equity and women's issues (5%).

Group activities. Eighty per cent of the groups focused mainly on agricultural production of fruits and vegetables, livestock (chickens and pigs), fish and flowers. However, most of these activities were done independently rather than collectively.

Management and organisational capacity. Groups' activities and performance depend primarily on the organisational and management capability of the group leaders. About 16% indicated that their group had very strong leadership and administration, with good working relationships within the group, while 32% indicated good leadership and 52% were not satisfied with their group administration.

Problems. Although half of the groups indicated good leadership and satisfaction with the performance of the group, there were various problems that prevented them from achieving their objectives. The main problems indicated were: lack of financial assistance and access to credit, poor infrastructure and transport system, lack of marketing facilities, lack of cooperation between group leaders and members, and unstable price of fresh produce. Eighty per cent of the groups stated that they needed financial assistance to implement their projects. Access to credit was therefore considered as the biggest hindrance to successful implementation of group projects. Out of the 30 groups profiled, only 2 had accessed credit from NDB.

The lack of marketing facilities (especially cool storage and chiller containers) for fresh produce, livestock and fish products meant that they were restricted to local markets and within a tight schedule. Likewise, poor road and transport infrastructure, and the resulting high transport costs, also reduced their incomes and contributed to the groups' inability to realise their full potential. Although most groups wanted to implement projects to improve market access, without credit they had not been able to move forward.

Training needs. To better manage and run the affairs of the groups' activities, 50% of the groups interviewed indicated they needed training in financial management, while 30% needed training in general administration and management. Another 10% needed some leadership training, while the remaining 10% needed technical training in cut-flower, citrus and vegetable production. Of the 30 groups interviewed, about 80% indicated having received technical training, especially from FPDA (vegetable production), the National Agricultural Research Institute (livestock) and the Coffee Industry Corporation (coffee management). However, as indicated, there is need for more training in the management and administration of the groups.

From the group profiling, three groups were identified as suitable candidates for trialling group loans with NDB. They were South Wahgi Organic Food Farmers Association (SWOFFA) (Agnes's Group), Mitnande Mama (Ellen's Group) and Voice for Change (Lilly's Group).

Partnership with NDB

After the interviews with the microcredit providers and farmer groups, arrangements were made for the project team to meet with the microfinance loan officer at NDB to learn more about the process involved. The group leaders then met with the microfinance loan officer to discuss the training program, how to prepare and select participants, and to set the training dates. The 4-day 'financial training' run by NDB for the three women's groups took place between November 2010 and January 2011. During the first 3 days, participants who were interested in accessing credit were formed into credit groups of 20–30 people and they were informed of their responsibility for being a group member and the loan conditions. On the last day, the bank manager met with the newly formed credit groups to confirm their eligibility to apply for a NDB microfinance loan. Two of the first three selected groups (Agnes's Group and

Ellen's Group) subsequently submitted their loan applications and each member of these two groups received their first loan of K1,000. Lilly's Group did not need the loan because it had its own savings group. By June 2011, another three groups who were part of FPDA's Village Extension Workers (VEW) Program were also linked to NDB and two had taken out loans. Wayne's Group did not take out a group loan, but Wayne did take out an individual loan.

Financial literacy training

Soon after the first few financial training courses were given by NDB, we realised that the so-called 'financial training' run by NDB was all about group formation and their duty to repay the loans, with nothing on financial literacy. Unsatisfied with the situation, FPDA immediately took action to develop a financial literacy training manual and new groups were provided with such training before they were introduced to NDB. FPDA also provided training to five of the six groups who had been linked to NDB previously, but did not receive proper financial literacy training from NDB.

FPDA's financial literacy training component comprises four modules: budgeting, cash flow management, debt management and credit management. In future, financial literacy training will not only be included in the FPDA's farmer-training program but it will be done before any technical training on production or marketing. The rationale for this is that because there is no saving culture in PNG, if farmers do not know how to budget and manage money, the money they make would simply be spent unproductively. In the impact assessment that follows, that was exactly what we found when comparing the groups that had received the financial literacy training with those that had not. In essence, many farmers said that they either would not have participated in the group loan or would not have borrowed as much as K1,000 (or for some, rushed into taking a second loan of K3,000) if they had received more information and fully understood the direct and indirect costs of borrowing and the need for budgeting, saving and cash flow management.

In funding previous microfinance pilot and expansion projects in PNG, great emphasis was given to capacity building and financial literacy training of both the clients and microfinance institutions (ADB 2010). However, this has not happened. Instead, potential borrowers were required only to have attended the Personal Viability (PV) program of the Entrepreneur Development Training Centre or an equivalent. Other credit schemes (e.g. the Fisheries Microcredit Scheme) also use the PV program as a prerequisite for qualifying for a loan. Given that PV is a 2-week training course, focused primarily on building entrepreneurial skills and costing K250, it does not suit smallholder farmers' needs and circumstances. Clearly, this requirement is too stringent and unlikely to be met by the majority of smallholder farmers. On the other hand, it is irresponsible and short-sighted to ignore or play down the importance of financial literacy in ensuring the long-term viability of a microcredit scheme.

In March 2011, we brought the issue of financial literacy training to the attention of NDB. The reply was that NDB simply does not have the capacity or resources to conduct proper training in financial literacy of their potential borrowers. Their job is to grant loans. A few months later, both the Goroka and Mt Hagen Branches of NDB ceased to provide microfinance loans to new groups because of serious 'repayment problems'. In March 2013, overdue repayments for one of the branches amounted to 62% of total repayments due—way over the tolerance level of 10%. On the other hand, the interest rate has been reduced from 20% to 6.5% per annum to broaden outreach. When a microcredit scheme collapses due to poor management, it means a large number of smallholder farmers will miss out on the opportunity to access credit.

Impact assessment

The purpose of the impact assessment was to learn what effect improved access to credit had on smallholder farmers and what problems had arisen and had to be solved. To achieve that, in August 2011 we went back to those groups that had borrowed from NDB and those groups that had received financial literacy training from FPDA and other agencies.

During the interviews, we were told that, until now, vegetable farmers in PNG had not had access to credit as had farmers of other cash crops (e.g. coffee, oil palm) or agricultural businesses. However, through this study, the opportunity to access credit had finally opened up for vegetable farmers. We also found that the improved access to credit had a significant impact on farmers' income, and the returns from vegetable marketing were quite high. The first K1,000[9] loans were used mainly for purchasing farm

[9] In December 2010, 1 PNG kina was worth A$0.48.

inputs for vegetable production, and day-old chicks and feed concentrate for poultry raising. Some also used them as working capital to buy and sell coffee beans, to increase land holding and to buy equipment (e.g. coffee pulpers and generators), as well as for building permanent houses, buying household goods and paying school fees. Those business ventures had generated significant income, with a 100–200% return on investment, and all the participating farmers were able to repay their first loans in 3–4 months.

However, during the impact assessment, a few problems were identified. First, we found that the group that received the first loan in December 2010 was submitting a new loan application for K3,000 per person. This was worrying because, from our assessment, most of them needed only K500 from the first loan to do what they wanted to do, not the K1,000 that they had borrowed. Second, given the high income generated from the first loan, there was no need for a second loan, let alone a greater amount of K3,000. Third, while the loan term was 12 months at an interest rate of 20% per annum, most loans were repaid within 3–4 months. This means that if they had delayed the repayment, there might not be a need for the second loan or only for a smaller loan. We also found that most of the participating farmers did not understand the interest payments and how costly they were compared to their small earnings. All of these reflect the lack of financial literacy on the part of the borrowers.

At the time of interviews, one group leader was pressured by the loan officer to submit the second and bigger group loan application 'by tomorrow'. It was clear that some group members were reluctant to borrow such a huge amount in such a short time as there was no real need for it. However, they were pressured to participate because the group loan could not proceed without the participation of all members. We also found that some farmers joined the group simply because they wanted to build their credit worthiness so that they could borrow the maximum amount of K10,000 in future. Because of different credit needs among the group members, it seems that there would be conflict sooner or later about when and how much to borrow, with the possibility of breaking up an initially cooperative, harmonious group. The other potential issue was that the greater the amount borrowed, the higher the probability of default by some members because of the potential adverse selection and moral hazard problems discussed earlier.

We also assessed the impact of credit on women, since women farmers often encountered problems unique to them (Chang and Be'Soer 2011). We found that, in most cases, women were satisfied with the outcomes because men and women were working together on the income-generating activities afforded by the credit, and the whole family benefited. However, some women had to work extra hard on their own as a result of expanded farming activities and because of the pressure to repay the loan. There were cases where husbands demanded a large share of the profits from the women's hard work while contributing little or nothing to women's income-generating activities. In this case, the additional incomes women made caused conflict within the household and often meant the women were potentially subject to domestic violence.

The worst case we heard was a husband who had bought a new wife with the coffee money he made and was expecting the first wife to support him and his new wife with the extra income she was making. Fortunately, this type of negative outcome was rare and happened only in some communities where traditionally women have been seriously marginalised. Indeed, in most cases, we found that husband and wife were working more closely together to improve their livelihood now that the biggest constraint to generating income (i.e. the lack of credit) had been removed. Another good outcome was that the credit was made available at a time when there was an increasing demand from the PNG LNG project for fresh produce, and hence farmers were able to increase supply without depressing the prices for their vegetables.

Impacts

The provision of financial literacy training to women's and farmer groups, and linking them to credit providers had had an immediate impact on the communities. Many of them were able to increase their vegetable production to take advantage of increased demand, and high prices, from the PNG LNG project for good-quality vegetables. They made significant profits and repaid their loans in 3–4 months. This was a significant outcome (it is a 'breakthrough', as one team member put it) because vegetable farmers did not have the opportunities until now to borrow from financial institutions. It is well documented in development literature that access to credit is one major constraint for resource-poor smallholders to improving farm productivity and access to markets. With credit, they can purchase high-quality inputs (seeds, fertilisers, packaging

materials), hire extra labour and invest in labour-saving technology. This was exactly what had happened.

FPDA's active support for this study played a significant role in generating the positive outcomes it had. FPDA has committed itself to continue the financial literacy training beyond the life of this project and has done so. More importantly, financial literacy training has been incorporated into FPDA's work programs to be implemented in coming years. FPDA extension staff have undergone training to provide this additional service to smallholder farmers. The inclusion of financial management in its training program will ensure farmers not only have the know-how to make money, but also have the skills to manage their hard-earned income appropriately.

Farmers also claimed that the exercises on budgeting and cash flow have made them think more about costs, prices, incomes and expenses in dealing with their personal finances, and in contemplating a business venture. FPDA has tried for years to encourage farmers to keep records, mainly as part of the technical training on production, but to no avail. The financial literacy training conducted through this study may have provided the necessary motivation for record-keeping because it relates more directly to their bottom line. It is clear that the financial literacy training, when conducted properly, can be very effective in changing attitudes towards both farming (seeing it as a business) and borrowing (seeing it as a debt which needs repaying, not a grant).

As the demand for high-quality fresh produce will continue to increase substantially in the foreseeable future as a result of the PNG LNG project and the mining boom, the timing of this project activity could not have been better in terms of providing the impetus and ammunition for farmers to respond to demand increases. Significant economic and social benefits are expected in years to come, especially if suggested changes to postharvest management (cooling, curing and packaging) can be implemented.

Lessons learned

Methodology

The PAR approach, and the stakeholder workshops, worked very well for this project. It brought all stakeholders together to interact and to build relationships that would help foster future supply-chain collaboration. The support the project received from the stakeholders was exceptional. The stakeholder workshops, facilitated by Professor Barbara Chambers and based on the consensus decision-making process, were extremely effective in narrowing down a long list of issues to a small set of priorities. We highly recommend a similar approach be adopted by other agricultural research and development projects, especially in countries where the culture and social structure are diverse and complex.

However, we found that year-long research–planning–action–reflection cycles, separated by stakeholder workshops, were too long and too broad in scope, both of which affect group coherence and performance. In hindsight, some subprojects would benefit from having their own smaller planning cycles (e.g. less than 90 days) involving small groups. We also found that to make real changes there must be local facilitators to monitor progress and deal with problems as soon as they arise.

In addition, we learned that although it is important to focus on issues that are considered important or necessary to stakeholders (e.g. access to credit, transport costs and understanding market requirements), one cannot lose sight of the broader and more strategic issues that will have longer term impact on the competitiveness of the sector as a whole. Such issues include institutional innovations in grading schemes, the pricing mechanism and the market information system.

In terms of overall research project management, there needs to be some flexibility in terms of budget, milestones, outputs and deliverables. This is so because the outcomes from the stakeholder workshops do not always coincide with what was envisaged at the time of preparing the project document. For example, the project had budgeted for two stakeholder workshops but, in the end, there were five because the circumstances required them. Another example is that access to credit was not part of the proposed activities, but was identified through the stakeholder workshop. It turned out that improved farmers' access to credit has had the greatest and most direct impact on farmers' income and their livelihoods—the overall objective of the project.

Linking farmers to credit providers

It is clear that farmers have benefited from the NDB microfinance loan program. However, the sustainability of the program is now in jeopardy, after only a few years of operation in the PNG highlands. Both farmers and NDB and its loan officers are to blame. First, the NDB's microfinance scheme had some design

flaws, even though it was based on the Grameen Bank approach. Second, it had not been implemented according to prescribed rules. In particular, it ignored or played down the importance of financial literacy as one of the key criteria for eligibility and everyone who had an interest was allowed in. It also appears that more emphasis was placed on granting loans than ensuring loans would be repaid, allowing some farmers to borrow large amounts without either the ability or the intention to repay.

One important lesson learned from this exercise is that continuous monitoring and evaluation are crucial to ensuring that accurate information and necessary support services are provided to farmers, both before and after a loan has been granted, and that any glitches are picked up and rectified as soon as possible.

Many microcredit schemes have failed in the past because of inadequate internal and external monitoring and evaluation methods, lack of capacity and experience of financial intermediaries in financial intermediation, near absence of provision of management training, neglect of savings facilities, an embedded handouts mentality and rapid expansion without proper planning. It seems that few lessons have been learned. To ensure the sustainability of a loan program, microfinance institutions and loan officers must be better educated on past successes and failures of various microfinance schemes in PNG and elsewhere and adhere to rules and procedures to minimise problems of adverse selection and moral hazard. Loan officers may also benefit from training in financial and project management, as well as agricultural production, so they can monitor and evaluate the lending and loan repayment processes properly, as well as provide useful advice to farmers where required.

Women's issues

Women faced additional credit issues that were gender-specific as a result of their social status in PNG society. We found that some women did not benefit fully from their improved access to credit because they did not have full control of the income generated. And in some cases they became worse off because of the extra workload and expectations put on them. This means gender training is also needed to ensure that women's work is supported by their husbands and families and income is distributed more equitably within the household.

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Appendix

Products and services of microfinance institutions in PNG

The operations and products and services provided by Nationwide Microbank, National Development Bank, Alekano Savings and Loan Society and PNG Microfinance Limited are described below.

Nationwide Microbank

Nationwide Microbank (previously Wau Microbank Ltd) was registered under the Company Act in 2005 and licensed by the Bank of Papua New Guinea. The bank was funded jointly by the PNG Government and the Asian Development Bank. Nationwide Microbank focuses on providing financial services to small enterprises throughout the country. It has 20 branches nationwide. The bank's focus is on individual lending, not group lending, due to past experiences of lending to groups. However, group loans are still available, provided the groups are registered under the Investment Promotion Authority or cooperative societies of PNG.

The bank offers passbook savings accounts to all clients. The five different types of accounts currently offered by the bank are Micro Enterprise, Silver, Gold, Small Enterprise and Diamond. The minimum requirements for savings accounts are described in Table A.1.

Nationwide Microbank also provides loans of various types, including small loans to farmers and operators in the informal sector. Other types of loan offered by Nationwide are described in Table A.2.

There are two loan options for clients. Option 1 is a fully secured loan, where the savings:loan ratio is 1:1, i.e. the loan amount is up to the same amount of savings. For example, if a farmer has K500 savings in his passbook, they are eligible to get a loan with a maximum limit of K500 at an interest rate of 3% per month for All Purpose, Salary and Microfinance Loans or at 2% per month for a Business Loan.

Table A.1. Savings accounts and minimum deposits of Nationwide Microbank

Account type	Target group/client	Minimum amount to start an account (PNG kina)
Micro Enterprise	Self-help groups	20, processing fee and 20, opening balance
Gold	Individuals, groups, associations trust accounts, joint accounts etc.	20, processing fee and 50, opening balance
	Registered businesses	20, processing fee and 500, opening balance
Silver	Wage or salary earners	20, processing fee and 20, opening balance
Small Enterprise	Registered companies	20, processing fee and 1,000, opening balance
Diamond	Interest-bearing deposit All clients	20, processing fee and 1,000, opening balance

Table A.2. Loans types and interest rates of Nationwide Microbank

Account type	Purpose/target client	Loan amount (PNG kina)
All Purpose	Any purpose/all clients At 3%/month	200 and up
Salary Loan	Any purpose/only for wage/salary earners At 3%/month	200–5,000
Microfinance Loan	To purchase electrical items, machinery or other household items/ all clients At 3%/month	200–15,000
Business Loan	For any type of business/all clients At 2%/month	15,000 and up

For option 2, potential borrowers are required to meet the following criteria:

- the farmer or the client must have had savings with the bank for at least 3 months
- 30% of the loan amount is required as security (put away in an interest-bearing deposit account)
- other forms of security or collateral are nominated, such as basic household items, electrical goods and other household valuables
- two persons are prepared to act as witnesses and guarantors for the loan. The guarantors are expected to put pressure on the client to repay the loan, and are liable to repay the loan should the client default or be unable to fully meet the repayments.

If a repayment is late, the management writes a default notice letter to the client and the loan officer makes follow-up calls/visits to the client. A grace period can be given of up to 3 months. If the client does not repay within that period, then other measures are taken to recoup the money, including confiscating the client's assets which were nominated as collateral and/or the guarantors are asked to meet the liability. The main causes for defaults by farmers are:

- intentional—some people purposely avoid repaying their loan
- seasonal—some crops, such as coffee, experience seasonality in production. During the peak season, there is more income and repayment is not a problem. However, during the off season, there is less or no income, causing delay in repayment
- Natural disasters—these also contribute to delays in loan repayment where crops are destroyed or access to markets is prevented by poor road conditions or landslides.

National Development Bank

NDB is the development finance institution of PNG and wholly owned by the Independent Public Business Corporation (NDB 2012). Its primary function is to provide accessible development credit to citizens to engage in income-generating activities to improve their livelihood, especially for the 80% who live in the rural areas of PNG. The head office is in Port Moresby, with 18 branch offices nationwide.

NDB, previously Rural Development Bank, has been very active in providing credit to the agricultural sector since its establishment in 1967, with up to 50% of loans going to that sector. NDB's products include long-term agricultural and commercial loans, and credit scheme loans, including

the Fisheries Credit Facility and the Small Business Development Corporation (SBDC) Credit Guarantee Scheme. Rural Development Bank was designed to promote programs of the PNG Government that were favourable to small enterprise sector development. These include: hire and purchase equipment finance schemes, small rural loans, mini loan schemes for women and youths, smallholder coffee rehabilitation loan schemes and commercial industrial loans. It also helped implement some government programs, such as cash crop price support schemes, government grants and interest subsidy schemes to enterprises in disadvantaged areas.

Although NDB was created to provide small agricultural loans, it has had a long history of serving larger farm units and non-farm operations orientated towards the urban sector (Kavanamur and Turare 1999). In addition, loans are provided mostly to clients who are easily accessible by roads for easy administrative and monitoring purposes. This is due to bad experiences when lending to clients in remote villages, which has proven risky because of non-availability of security/collateral, lack of access to markets, commodity price fluctuations, non-existence of extension services and deteriorating road conditions.

NDB piloted its microfinance scheme in Kimbe, West New Britain province, in 2005. It was then rolled out to seven other locations in 2007. The main aim of the NDB microfinance scheme is to provide small loans to people in rural areas to improve their livelihood. Loan amounts under K10,000 are categorised as microfinance loans.

The microfinance scheme has three mandates:

- *Outreach*—this is about reaching as many communities as possible, including people in very remote areas who are hard to reach, and rural communities that are shut out by other financial service providers such as commercial banks.
- *Sustainability*—this aims to provide demand-driven services that can be sustained over a period of time so that clients will continue to have access to the credit and savings services provided.
- *Impact*—the microcredit scheme aims to have impact on the lives of the people who seek their services, through such means as generating income and improving living standards.

Microfinance loans (except for fully secured loans) are offered only to borrowers who are active members of community-based organisations (CBOs) in the communities or villages operating close to the branch offices. Most microfinance loans are given a 1-year repayment period and repayments are usually made frequently (e.g. every fortnight or monthly). These loans are to be invested by clients who are engaged in commercial microeconomic activities with regular income (NDB 2012).

A CBO can be a self-help informal organisation, registered group or people's association. The CBO assists the bank's field staff in selecting and training borrowers and collecting repayments. A CBO comprises a maximum of 30 members, which is subdivided into subgroups of 5–7 members. Each of the subgroups elects a treasurer who does the collection of repayments from the members. The CBO is headed by executive members who lead and facilitate fortnightly members' meetings. The executive members are given the authority to recommend and approve the loan amount that is acceptable to each member on the condition that each member is accountable for their own conduct and the conduct of the CBO. The fortnightly members' meetings serve as a monitoring device to follow-up the repayment status of the members and to discuss issues affecting the CBO. Microfinance loan officers attend each CBO meeting in their designated geographical areas of jurisdiction and provide guidance to the executive members in running the affairs of the group. Under the CBO arrangement, if a CBO member defaults, all the other members are liable to pay for the outstanding amount.

The eligibility test for becoming a recipient of a microfinance loan includes the following:

- member of a recognised CBO
- must be engaging in an ongoing income-generating activity or have a current source of regular income
- must have attended the Personal Viability (PV) course or other course conducted by SBDC or other financial institutions that are contracted to provide business skills and financial literacy training
- be a permanent resident of the area for at least 5 years and have no intention of moving in the next 12 months
- must be willing to consistently attend the CBO meetings
- must not be a previously delinquent borrower with NDB or other lenders.

The bank's microfinance officer initially conducts a demographic survey of the area and, if proven satisfactory, then the participants were taken through a

series of steps in the formation of the credit group (i.e. CBO) leading up to the members receiving training on financial management and loan procedures. The training workshop covers the following topics:

- detailed explanation of a CBO
- CBO formation and organisation process
- duties and responsibilities of CBO members and executives
- duties and responsibilities of a Loan Screening Committee
- duties and responsibilities of a Discipline Master
- group operating account, security deposit, loan processing fee
- types of loans
- incentives and penalties
- withdrawal and expulsion from the group
- lending process
- recording of payments and reconciliation
- repeated loan (next loan after the first one has been completed)
- CBO meetings
- means and priority of collection in case of a loan default.

Once the CBO meets all the requirements, it is eligible for a loan application.

The loan products of NDB are summarised in Table A.3.

Alekano Savings and Loan Society Most of the members of Alekano Savings and Loan Society are from the informal sector—those outside the employment zone—unlike other savings and loan societies which are available to only employed or salaried individuals. The Alekano Savings and Loan Society was originally formed as a grassroots-based cooperative association by the Gehamo–Gahuku tribes to offer credit to its members. It later grew and expanded into a Savings and Loan Society under the Savings and Loans Act. Currently, it has a branch in Lufa, Eastern Highlands province, and an agent in Port Moresby. With rapid growth, it plans to establish branches in all districts of the Eastern Highlands province.

The society offers savings accounts for day-to-day transactions as well as savings for future use Table A.4).

With Alekano, clients are eligible for a loan if they:

- contributed continuously to their savings account for 6 months
- have a minimum of K120 or more in their savings account
- are considered trustworthy
- are industrious
- have a good credit rating with repayment of their previous loans with the society
- have the capacity to repay the loan.

The loan amount clients qualify for is determined by:

- their savings balance and pattern
- a savings:loan ratio of 1:1 or 1:2 (depending on the purpose of the loan
- their ability to repay
- additional securities they pledge over their personal and business assets.

Clients are allowed up to eight loans a year and the loan interest rate is a flat rate of 12% per annum. The 12% flat rate is the maximum interest rate that can be charged by all savings and loan societies to their members. There are no account-keeping fees and no loan establishment fees. With the 1:1 ratio loans, clients can borrow up to the value of their savings, while for the 1:2 ratio loans, clients can borrow twice the amount of their savings. The loans range from K100 to K80,000.

Loan repayment is flexible according to the types of projects in which clients are engaged. Clients who are involved in freighting and marketing can obtain short-term loans, and loans for the purchase of assets and trucks can be repaid within 24–36 months.

Clients who default on loans are penalised with a K20 fee together with interest. To date, there has been no loan default, which is a result of effective dissemination of information, especially at the counter. Since most of the clients are illiterate, Alekano is planning to provide financial literacy training to help its members understand how the microcredit system works and their responsibility towards repaying their loans.

PNG Microfinance Limited

PNG Microfinance was established in 2004 by PNG Sustainable Development Program Ltd to provide financial services to people who have been considered as 'unbankable' by commercial banks and other financial service providers.. The bank was licenced by the Bank of Papua New Guinea in December 2004. It is owned by the PNG Sustainable Development Ltd (49%), Bank of South Pacific Ltd (32%) and International Finance Corporation (19%) (Kamit 2008). Its main funding sources come from the shareholder capital as well as savings from the depositors.

The bank lends to both groups and individuals. Table A.5 provides a list of account types with the minimum account opening balances.

Table A.3. Loan products of the National Development Bank (NDB)

Type of loan	Purpose and target client	Loan amount (PNG kina)
Agriculture	Small Rural Loans—generally these loans are to assist in establishing village-based farming with a view to diversifying rural-based industries.	<10,000
	Large Agricultural Loans—these loans are for redevelopment or rehabilitation of plantations, or for an extension as part of an overall agricultural development program.	>10,000
Commercial	A Commercial Loan is any loan for the following non-agricultural purposes: large equipment finance, purchase of commercial property, hotels and guesthouses, hire car services or working capital.	2–4 million
Corporate	Similar to the Commercial Loans	>4 million
NDB Microfinance	Microfinance loans are delivered using the community-based organisation (CBO) model. Borrowers must be a member of a CBO recognised by NDB. Loans are secured with a CBO group guarantee and 30% of the loan amount must be deposited in cash up-front. There are two types of microfinance loans:	
	Kisim-na-Bekim Bisnis Loan—individual members can get a loan from K300 to K5,000 with a loan term of 3, 6, or 12 months, which is to be repaid fortnightly or monthly.	300–5,000
	Tutu Bisnis Loan—individual members can get a loan from K300 to K2,500 with a loan term of 4, 8, or 12 months, which is to be repaid bimonthly.	300–2,500
Credit Schemes	NDB manages a number of credit schemes. These include the Village Oil Palm Credit Scheme, Fisheries Credit Facility (see details below), District Credit Schemes funded by the Joint District Planning & Budget Priorities Committees and Agriculture Credit Schemes sponsored by the National Department of Agriculture and Livestock under the National Agricultural Development Plan. Under these schemes, NDB and the project sponsors enter into a Memorandum of Agreement that stipulates the parties' responsibilities as well as the operational aspects of the scheme.	
Fisheries Credit Facility	Micro Credit line—offers small lines of credit to individual village-based fishers or enterprises that may not necessarily have access to credit from mainstream financial institutions.	1,000–5,000
	Small Enterprise Creditline—targets small fishing enterprises that wish to strengthen and commercialise their operations. Under this credit line, some form of tangible collateral may be required to secure a loan.	20,000–100,000
	Business Credit line—targets established, private fishing companies and individual members of fisheries cooperatives or associations that have been successful and are expanding their operations or seeking to improve internal management.	10,000–1,000,000
Women in Business Loan	In March 2012, NDB launched two new Women In Business Loan products called the Start Up Package and the Grower Package. These products have been specifically designed to meet the needs of PNG women-only owned and managed businesses and small–medium enterprises (SMEs). They are targeted at women aged 18–55.	
	Start Up Package—offers loans ranging from K5,000 to K100,000 at a 10%/year interest rate, which is to be repaid between 2 and 15 years. There is an equity requirement of 20% with security or 30% without security.	5,000–100,000
	Grower Package—offers loans ranging from K100,000 and more at market rates, which is to be repaid between 2 and 20 years. There is an equity requirement of 40% (including cash).	100,000+

Table A.4. Alekano Savings and Loan Society's account types

Account type	Minimum opening balance (PNG kina)	Purpose
Savings	120 (plus 7 membership)	All-purpose account and can be used as security for loan
Transaction Savings	120	Day-to-day transactions
Special Purpose Savings	120	Special purposes (e.g. Christmas, school fees etc.)
Term Deposit	Minimum 300 and maximum10,000	Long-term savings

Table A.5. PNG Microfinance loan types and minimum account opening balances

Account type	Minimum deposit (PNG kina)	Target group or client/Purpose
Personal Savings	20	General public/Normal current savings purposes
School Savings	20	Children aged 8–18 years/Aimed at developing good savings habits
School Fee Savings	20	General public/For school fees only. Withdrawals allowed only in January and February
Equity Savings	20	Loan clients only/Used as savings for loan customers for future business needs and security for loans
X-Mas Club Savings	20	General public/Withdrawal only in December.
Term Deposit	300	General public/Savings invested for a certain period with its corresponding interest rate. Cannot be withdrawn until maturity.

Infrastructure is limited and mainstream financial services are mainly restricted to larger urban centres.

Even though PNG Microfinance falls under the category of microfinance institutions and it has great importance in providing microcredit, its geographical coverage (mainly in Port Moresby) hampers its services to the target farmers of this project.

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The use of activity diaries for understanding the daily lives of farmers and their livelihood choices

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Abstract

This paper reviews the use of activity diaries in two Australian Centre for International Agricultural Research (ACIAR) projects in PNG: a smallholder cocoa project in the East New Britain province (ASEM/2006/127) and a smallholder coffee project in Eastern Highlands province (ASEM/2008/036). Both projects were similarly concerned with identifying the production constraints on cocoa- and coffee-farming households and to better understand the range of socioeconomic and cultural factors influencing farmer decision-making and the allocation of household labour among various livelihood activities. In PNG, the household is the principal production unit underpinning livelihood activities such as commodity production. It is at the household level that decisions and negotiations are made regarding the organisation, mobilisation and management of family and extended family labour. Thus, examining in detail the daily economic and social livelihood activities of household members, through time-allocation studies, helps researchers to understand more comprehensively the factors influencing smallholder decision-making regarding livelihood choices, agricultural practices and the adoption of agricultural innovations. This paper outlines two different techniques using activity diaries employed in the projects, and discusses the methodological advantages and challenges of these techniques in smallholder studies in PNG.

Introduction

Activity diary surveys (sometimes referred to as time allocation surveys) can be employed to measure how people allocate their time and labour. Crosbie (2006, p. 2) notes 'descriptions of how people use time can tell us much about quality of life, social and economic well-being and patterns of leisure, work, travel, and communications'. Activity diaries have been used extensively by health scientists, anthropologists and geographers and, to a lesser extent, by agricultural economists to gather information on the gender division of household labour, the allocation of time to productive and leisure activities, seasonal variations

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in workloads, links between workload and nutrition, agricultural practices and household commodity crop production (Acharya and Bennett 1981; Grossman 1984; Suda 1994; Whitehead 1999; Koczberski et al. 2001; Blackden and Wodon 2006; Erdil et al. 2006). The detailed data gathered from activity diaries on the daily activities of rural households in developing countries have been valuable in identifying the extent, range and complexity of livelihood activities in which household members engage and the overall work burden of poor households and, particularly, of women. Thus, data from activity diaries can be useful for informing rural agricultural policies and smallholder extension initiatives. There were several reasons why we used activity diaries in the two Australian Centre for International Agricultural Research (ACIAR) projects under discussion: a smallholder cocoa project (*Commercial sector/smallholder partnerships for improving incomes in the oil palm and cocoa industries in Papua New Guinea*, ACIAR Project ASEM/2006/127) in East New Britain province and a smallholder coffee project (*Improving livelihoods of smallholder families through increased productivity of coffee-based farming systems in the highlands of Papua New Guinea*, ACIAR Project ASEM/2008/036) in Eastern Highlands province.

First, one aim of the cocoa project was to monitor the impact on cocoa farmers' productivity of NGIP-Agmark's[6] grower support and agricultural extension programs to combat the devastating cocoa pest, cocoa pod borer (CPB). The pest was first detected in East New Britain province in 2006 and it rapidly became established. By 2010, cocoa production in East New Britain province fell by 80% to around 5,000 tonnes (Curry et al. 2012). Because CPB requires high-input management strategies for its control, it was important to ascertain the extent to which NGIP-Agmark–supported farmers were able to make the transition to high-input farming and to determine the impacts on their broader livelihood activities. To do this, activity diaries were designed to capture the capacity of households to respond to the CPB threat through their ability to achieve sustainable changes in their livelihood strategies. By recording where members of cocoa-farming households allocated their time and labour in daily farm and non-farm activities, the diaries assisted in quantifying how farmers were responding to CPB and their uptake of NGIP-Agmark's CPB training, which required them to adopt intensive farm-management practices to control the pest. The information gathered also helped to identify the time spent on cocoa harvesting, block management and in the pursuit of alternative income sources.

One of the overall aims of the coffee project was to develop farmer-driven extension models involving partnerships between the public and commercial sectors. The research sought to improve nutrient management, extension delivery and the mobilisation of labour for coffee production. Labour mobilisation required identifying how different socioeconomic factors, household characteristics, gender and 'position in the household' influenced smallholder production strategies, particularly labour inputs. The purpose of the activity diaries was to gain a better understanding of the range of livelihood activities in which households were involved in order to pinpoint the constraints on the supply of household labour for coffee production.

In both the cocoa and coffee projects, the activity diaries were part of a broader research framework that relied on qualitative and quantitative techniques. For example, in the cocoa project, in order to monitor and evaluate the effectiveness of NGIP-Agmark's CPB training and the company's partnership with farmers, a monitoring and evaluation framework was developed at the start of the project to guide the research process. The activity diaries were one component of this framework, which drew on a combination of methodologies involving smallholder questionnaire surveys and interviews, farm inspections, attending and recording community and farmer group meetings, collection of cocoa production data and other industry data, and in-depth qualitative interviews with smallholder families and NGIP-Agmark personnel. The multi-method approach enabled a comprehensive understanding to emerge of the changing livelihood strategies in response to CPB, and how NGIP-Agmark working with farmers facilitated the transition towards sustainable smallholder strategies for controlling CPB.

Similarly, in the coffee project, the activity diaries were part of a larger two-phase methodological approach. The first phase was data collection (completed) and analysis (in process); and a second stage (commencing mid 2013) is using the findings to inform interventions to be trialled with farmers through the Coffee Industry Corporation (CIC), the private sector and non-government organisations (NGOs). In the first phase of the project, the activity

[6] NGIP-Agmark is a diversified agribusiness company based in PNG.

diaries were complemented with other qualitative and quantitative data collected through household socioeconomic surveys, an assessment of farmers' technical knowledge and technical needs, coffee garden inspections and focus group discussions to evaluate CIC extension services. Socioeconomic data collected at the household level provided the sociodemographic and cultural context for the natural resource management (NRM) components of the fieldwork. The NRM work involved an assessment of soil fertility status of smallholder coffee and food gardens and documentation of the pathways of nutrient movement into, through and out of coffee and food gardens to identify points of vulnerability to nutrient loss and points of intervention to maximise nutrient retention or accumulation. Throughout, the research relied on participatory action research approaches with farmers and other stakeholders.

Conducting activity diaries among coffee and cocoa farmers

The research team employed activity diaries over a 14-day period among coffee- and cocoa-farming households in addition to other village-based fieldwork. The coffee activity diaries were conducted in 2011–2012 with 30 households in the coffee flush and non-flush periods in each of 4 villages in Eastern Highlands province: Baira, Marawaka, Bena and Asaro. Activity diaries among cocoa-growing households were undertaken among 135 farmers in 4 villages on the Gazelle Peninsula, East New Britain province: Tokiala, Tinganagalip, Bitagalip and Tabaule.

The two projects used different approaches to conduct the activity diaries: (1) researcher-administered activity diary (coffee); and (2) farmer-administered activity diary (cocoa).

Coffee project: researcher-administered diaries

In the coffee project, a researcher visited a household late in the afternoon and collected information from the household by asking about activities undertaken that day and the preceding day by individual household members and recording the information on prepared data sheets. During the 14-day fieldwork periods, the team resided in the houses of respected community members. A small rental was paid of PNG kina (K)10 per head per night for each team member. The research team brought food with it and also purchased food locally and contracted women or a church group to prepare and cook food for the team. This helped to maximise the amount of time team members spent collecting data and also fostered good relations with the host community (see below).

Collecting information for the activity diaries was logistically not possible in the early morning or during the day because household members would leave their houses early for most work activities. Therefore, activity diaries surveys were carried out in the late afternoon when most family members had returned home. Each team member was allocated four to six households, half of which were interviewed each afternoon every second day (two to three households per day). The number of households interviewed per interviewer depended on how far from base a particular household was located. An effort was made to allocate a spatial cluster of households to one interviewer to minimise time spent moving between household locations and also to afford an opportunity to return to a household the same evening if family members had not yet returned from their gardens when initially visited.

During interviews, each adult family member was asked to recall the main work and leisure activities undertaken that day and on the preceding day, with answers recorded in quarter-day units on prepared data sheets. To avoid double counting, the previous data sheet was referred to during the interview and when double reporting appeared to be possible, it was checked with informants. Initially, male household heads dominated interviews, but as other family members became accustomed to the interviewer and the content of the interview, they tended to answer for themselves. Labour recruited from or given to other households was also noted, together with arrangements governing labour transactions. Because the study also sought to capture nutrient-management strategies associated with coffee, food gardening and livestock, any mention of these activities triggered further prepared questions on nutrient management. The survey also asked about cash income earned and food intake during the 2-day period.

In the early evening, when team members had returned to the house where they were residing, an hour or two was spent checking survey forms to ensure they were completed properly. Each team member was allocated a set of forms to check (not their own). Any questions or ambiguities were resolved that evening while the surveys were fresh in everyone's memory.

Cocoa project: farmer-administered diaries

The farmer-administered activity diaries for cocoa farmers on the Gazelle Peninsula were completed by the farmers themselves. Households were asked to record, each day, the morning and afternoon activities of each household member. Records were also made of tasks performed by family members for other households, such as those for relatives, community groups, farmer groups, or for the school or church. Tasks performed for the household by non-household members were also recorded and the relationship to the head of the household noted. At the time the diaries were conducted, some farmers had received CPB training by NGIP-Agmark (e.g. those at Tokiala village), while other farmers nearby had not (e.g. Tinganagalip).

Two research staff resided full-time at each village while the activity diaries were being completed by farmers. Before the start of the study, a letter was given to each household head that informed the family about the project work in general and what to expect from the project team temporarily staying in their village to supervise the farmer diaries. At the beginning of the survey period, an information sheet was circulated to farmers (and their children) with an example of a partly completed farmer diary as a guide. Prior experience indicated that farmers would report only those activities they thought researchers would be interested in (e.g. cocoa activities) and they would under-report activities that they considered mundane or thought were of little interest to researchers. The example of the partly completed diary given to farmers emphasised the importance of reporting 'mundane' activities like socialising, food preparation, other domestic chores, pig husbandry and so on.

At the start of the survey period, two team members visited each household every day, in the afternoon or evening, to monitor how farmers were progressing with completing their diaries and to assist where needed. Some households took to the diary very quickly and after receiving initial assistance were able to complete the rest of the diary entries on their own. Other households, where the literacy levels among family members were relatively low, required more assistance and some had to be assisted to complete the diaries for the entire survey period. When a household was managing diary entries competently, a member of the team would visit that household every second day to assess progress and to ensure that diary entries were completed for each family member and were legible. This sometimes required a clarification of particular diary entries. These corrections or clarifications were added to the diary while activities of household members were still fresh in their memories.

Research benefits of the activity diaries

Activity diaries were a very valuable component of the research framework of both projects because of the insights they afforded into the economic and social lives of smallholder families and household decision-making, and provided some of the key findings of the two projects.

Cocoa project

The farmer-administered activity diaries provided a way to gauge differences in the livelihood strategies between cocoa households making the transition to high-input farming and those which had not received training or were unable to make the transition. As stated above, the main purpose of the diaries was to quantify how farmers were responding to CPB and their uptake of NGIP-Agmark's CPB training, which required them to adopt intensive farm-management practices to control the pest. It was clear from the activity diaries that Tokiala farmers, who had received training from NGIP-Agmark, were putting much more effort into cocoa than the nearby village of Tinganagalip, where farmers had not received training (Figure 1). Tokiala farmers had successfully made the transition to high-input farming. Their increased inputs of labour and chemicals, and their adoption of rotational replanting, were associated with greatly improved block maintenance and significantly reduced incidence of diseased and CPB-affected pods (Figures 2 and 3). Farmers reported getting double or treble the yields they got in pre-CPB days.

The fact that the farmer diary results showed that farmers who adopted high-input farming had significantly increased their incomes compared with the pre-CPB period was a critical finding. It demonstrated to farmers that their additional labour inputs were rewarded with considerably increased production and income. This made it much easier for NGIP-Agmark to promote their model of addressing CPB.

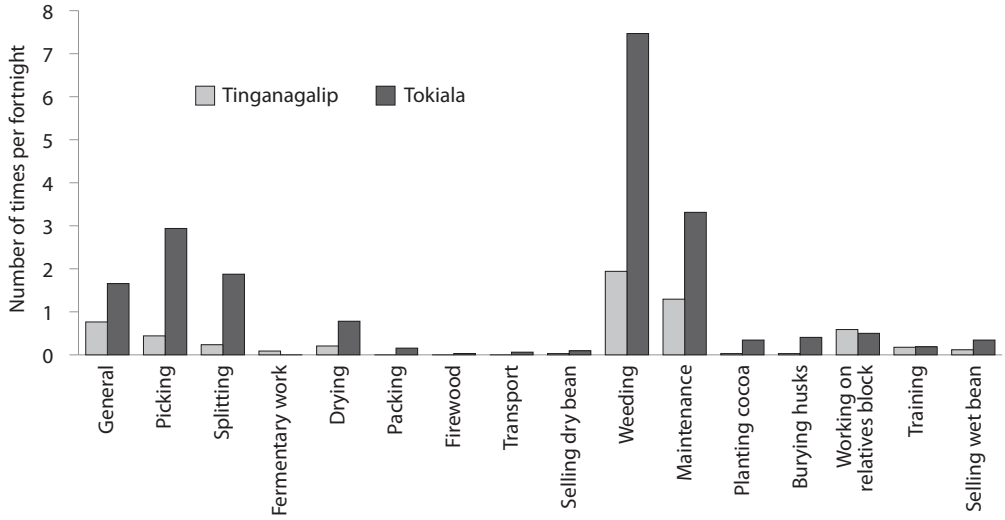

Figure 1. Average number of times each cocoa activity was conducted per household per fortnight, Tinganagalip and Tokiala, 2009

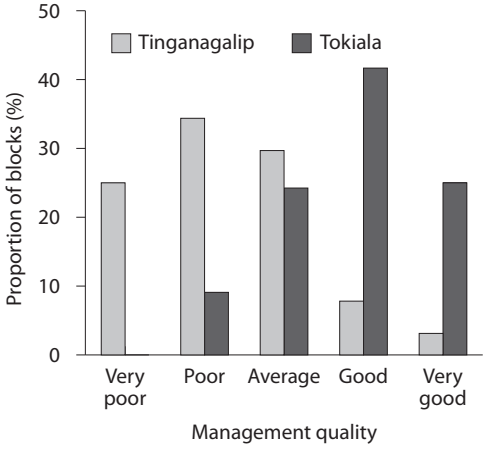

Figure 2. Average levels of block management (weeding, pruning, shade control and sanitation), Tinganagalip and Tokiala, 2009

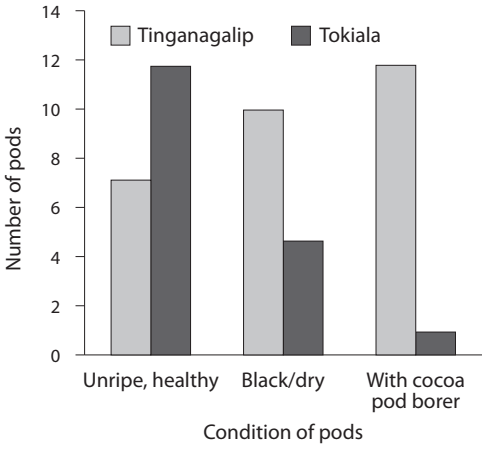

Figure 3. Average numbers of pods per tree and their condition, Tinganagalip and Tokiala, June 2009

Coffee project

Similarly in coffee, although the data are still under analysis, the activity diaries provided a detailed picture of labour strategies and the constraints on labour supply. The diaries were valuable for identifying household needs, priorities, labour demands and the constraints they contend with daily. Research team members also reported much deeper appreciation of the differences in opportunities within the community—between genders, age groups, educated and poorly educated people, and people with greater or lesser access to social and economic resources like land, labour, savings and remittances (such understandings were also facilitated greatly by residing in the community during data collection—see below). The information generated from

the activity diaries showed that unlike surveys using longer recall periods, say over a week, month or year, repeat surveys over short intervals (daily or every 2 days) tend to generate more accurate data because activities are still fresh in the memories of individual family members. The repetitive surveying over short intervals also improves accuracy as respondents come to realise that they will have to recall their activities since the preceding survey.

Very importantly, especially in the coffee project, the activity diaries gave the teams a greater appreciation of the different opportunities between communities with relatively good access to markets and those in remote areas (e.g. in accessible sites, there are much greater livelihood opportunities, far better returns on labour and much easier access to services, including extension). This had a notable influence on the way the research team thought about potential strategies to increase productivity through new extension initiatives. For example, in the accessible coffee sites within half an hour of a serviceable road, farmers had a diverse range of lucrative livelihood opportunities, including the large-scale production of pineapples, cabbages, sweetpotato and carrots for the markets of Goroka, Lae and Madang; opportunities that were not available to growers in remote sites. Thus, the high opportunity cost of labour in accessible sites meant that growers were less likely to commit additional labour to coffee garden maintenance than growers in remote sites where alternative income sources were highly constrained.

Other benefits

The activity diaries were particularly useful for new researchers and those who had been desk-bound for a long time. Participation in the activity diaries engendered a better sense of the diverse livelihood activities of farmers and helped overcome the common notion among many researchers that smallholders are solely cocoa growers, coffee growers or oil palm growers. The reality is that often these export cash crops represent only a small proportion of their total activities, and researchers' participation in time-allocation studies quickly dispels such ideas. Also, for senior research officers who have little recent fieldwork experience, participation in data collection provides an opportunity to develop a sense of the changes occurring in rural communities because of changing social values (e.g. market engagement and market incentives) and the uptake and impact of new technologies (e.g. the effect of mobile phone technology on marketing).

In terms of the two approaches, the farmer-administered diaries were an efficient method of conducting time-allocation research because only two members were required to be present in the village to supervise diary entries. In contrast, at least five team members were required to conduct the researcher-administered activity diaries, which were carried out with each family every 2 days. However, the use of farmer-administered diaries is appropriate only in villages with reasonable literacy levels among participating farmers. This was the case with cocoa farmers in East New Britain province, where levels of education are higher than the national average of 4.3 years (UNDP 2011). Indeed, most farmers enjoyed completing the diaries and were keen to finish the task each day: it was the first time for them to have kept a log of their daily activities. Most were able to see which activities they spent most of their time on, which was a surprise to many. Farmers could see how much effort they were putting into cash and food crop production, and how much time they allocated to non-income-generating activities. For some, they could see where they could make adjustments in their use of time to improve their economic situation. While it may have been possible to use farmer diaries in the accessible sites in the coffee project, this would not have been possible in the remote sites, which are characterised by very low literacy levels. Therefore, to standardise the methodological approaches across all coffee sites, the researcher-administered activity diaries with farmers was the method chosen.

Apart from eliciting information on labour activities, the farmer diaries also provided insights into farm-management decision-making, household relations and access to household and non-household labour. Significantly, the diaries also provided a window into other dimensions of people's lives that affected their capacity to pursue particular livelihood options. For example, illness management consumed a great deal of a household's time, and not only that of the person who was ill. When a family member was seriously ill, typically the whole family was involved in illness diagnosis and seeking both traditional and Western medical care for the sick family member. The activity diaries revealed the vulnerability of households to events that could significantly reduce a household's capacity to sustain a high-input production system.

Research benefits of sustained and close interaction with village communities

Village-based fieldwork for research team members residing in the village was quite different from the standard fieldwork practices of the Cocoa Coconut Institute Limited (CCIL), CIC and the National Agricultural Research Institute (NARI). Previously, if researchers from these institutions were spending time overnight in the field, it was during field trips in which they were moving from village to village delivering extension or carrying out large-scale, one-off surveys. The lengthy village-based fieldwork conducted in this project allowed the team to become immersed in a single community for an extended period.

Trust and ownership

The most significant research benefit from prolonged village residence arose from the increased level of trust that developed between researchers and the village community, which contributed to higher participation rates in the study and improved data reliability. The level of trust required for good data collection should not be underestimated. For example, with the private-sector partner in cocoa research, NGIP-Agmark, some smallholders were initially suspicious of the intent of the company in offering extension services to growers. By living with villagers, the team, as an independent party, was able to explain the company's partnership goals and how such partnerships had the potential to overcome the CPB problem.

The situation in the coffee project was different, and it was even more difficult to build up trust with the community. Initially, when the team began fieldwork, many farmers were reluctant to participate in the research because of a deep suspicion of anything concerning government and government services (mainly because of a widespread perception of the failure of the government to deliver services). Many villagers held resentment from earlier experiences with government representatives. It is likely that in such situations, a one-off cross-sectional survey on a short visit to a community would result in a significant proportion of the population not participating in the survey, leaving only those with a more positive attitude to government or the more educated or progressive farmers to represent the views of the community. Thus, spending time in the village engaging with farmers over an extended period provided more opportunities for the community to get to know the researchers and understand the nature and purpose of the research.

Michelle Bafeo (Coffee Industry Corporation) interviews a farmer from Baira, Eastern Highlands province, about his daily activities. Farmers must walk for over 4 hours to reach the nearest highway to transport their coffee to the market. (Photo: Susan May Inu)

Understanding objectives

Moreover, farmers enjoyed the close working relationship that developed with the research team, and appreciated the opportunities for informal discussions with the team during the day and in the evenings. Farmers came to feel that the researchers were interested in their lives and livelihoods and that the research was being carried out for their benefit. The sustained engagement of researchers with farmers over 2 weeks did much to improve farmers' understanding of the research process, the purpose of the research, and the role of the research institutes (the team spent many evenings discussing the research in relation to farmer problems). Indeed, it was a case of genuine participatory research in which farmers felt they had a stake in the research and its outcomes.

Moreover, there is no doubt that the reputation of the research institutes was enhanced by an extended and sustained period of engagement with the community focused on their needs and concerns. As noted above, initially some of these communities were very suspicious of the motives of NARI and CIC, especially in remote areas. In the case of CCIL, farmers were sometimes unfamiliar with the role of the institute, but participating farmers came to see themselves as active partners in CCIL's research programs. As farmers developed an understanding of the research, its purpose and its potential benefits, their attitudes to the institutions shifted in a very positive way.

Reinforcement by community leaders

In both projects, the central involvement of community leaders such as councillors, elders and church figures was paramount to building trust, thereby encouraging a high level of farmer participation. Community leaders had a good understanding of project objectives and the process by which data were being collected. Farmers often consulted their leaders about aspects of the project if team members were unavailable or if they had difficulty understanding Melanesian Pidgin. Community leaders often provided information in the local language, which was particularly important in the coffee project where none of the team spoke the local language at any of the sites. In East New Britain province, one member of the cocoa team was from the local community, and farmers, especially women, appreciated communicating with him in Kuanua, the local language. While communicating with farmers in Kuanua assisted with developing trust and rapport between the team and the community, farmers still consulted their community leaders about aspects of the project they were unsure about.

Data quality

In addition to high levels of trust contributing to a more representative sample of the community, it also highly likely that greater trust increased the validity of the data collected. In coffee, for example, as families became used to the interviewer (they saw the same interviewer regularly), and as they learned more about each other, interviewees tended to relax and feel more able to discuss matters that they may have felt uncomfortable with or embarrassed to discuss initially. This was equally true in the cocoa project. Thus, for example, family disputes which led to the withholding of family labour, such as that of sons and daughters, could be discussed more openly. This provided insights into how labour remuneration interacts with family labour supply to influence productivity. Conversations about family disputes and other sensitive issues are unlikely to be raised in one-off interviews on short visits using cross-sectional survey methods.

Moreover, village residence offers opportunities to complete work and plug gaps in data collection that are not possible on short visits. Often on short-term field visits, delays caused by access problems or people being unavailable for interviews can lead to major gaps in the data record. The problem is not eliminated entirely by extended field visits, but it is reduced considerably. Also, having opportunities to check completed survey forms each evening helped reduce error rates and ensured that all interviewers were recording the data in a standardised format. Potential recording errors or missing data could be followed up the next day while still fresh in the memory of respondents. Also, interesting points to emerge while checking survey sheets, such as particular food gardening practices, could be followed up and investigated while still in the field. Often this is not possible during short-term field surveys.

Research insight

In addition to improving participation rates, representativeness of the sample and improving the validity of the data, there were several other benefits that team members reported from immersion in study sites. For example, cultural immersion of both teams led to a better understanding of local lifestyles and

sociocultural and economic values and how these interact with agricultural practices and other livelihood strategies to affect smallholder productivity. An improved understanding of the project sociocultural environment provided a context for interpreting results. For example, understanding the cultural factors determining land access for coffee was very important for interpreting differences in the size of coffee holdings among farmers. Similarly, cultural values affect gender and generational work roles which influence management practices.

Training opportunities

An extended period of village residence enabled the team to pinpoint the training needs of the community, and to conduct training during fieldwork. Talking to growers and visiting them in their coffee and food gardens enabled the team to see exactly which coffee husbandry and coffee processing skills were deficient. An extended fieldwork period also provided opportunities to overcome these skills deficiencies. For example, many farmers were not aware of the symptoms of particular nutrient deficiencies. The extension members of the coffee team also took the opportunity of funded fieldwork to deliver extension and tools under CIC's District by District Village Coffee Rehabilitation Program (often extension delivery is constrained by a lack of funding).

Institutional relationships

Finally, long-term cross-institutional relationships established among staff of the major service organisations (e.g. NARI, CCIL, Monpi Sustainable Services and NGIP-Agmark) have led to new collaborative partnerships in research and extension among staff of these organisations. Knowledge sharing across institutions has been very positive, with team members learning from their colleagues in partner institutions. In addition, involvement with staff from the private sector has been very positive and helped overcome some of the long-standing divisions between the private and public sectors in PNG. This has facilitated a greater understanding of the commercial imperatives of the private sector and the need for research recommendations to be financially sustainable. Also, such partnerships have been mutually beneficial through the sharing of costs and resources. For instance, when the cocoa team's car was in the workshop for repair, NGIP-Agmark assisted with transport to take staff to and from the field.

Challenges of conducting activity diaries

Despite the value of activity diaries and the research advantages of spending an extended period residing in the community, there are also several challenges to be overcome. These included incomplete data because respondents were not always available for interviewing, logistical problems arising from prolonged fieldwork, the effect of the team's presence on respondents' behaviour, the risk of being perceived to take sides in village conflicts and the problem of excessive and unreasonable demands being placed on the research team. Each of these is discussed briefly below.

In both the coffee and cocoa projects, farmers sometimes arrived home late in the day and were not able to complete their diary entries or were unavailable for interview. This problem is common with other approaches too, but being resident in the village did provide an opportunity the following day to gather the missing information. However, when respondents left the village for 2 or more days, it was difficult to obtain accurate data on their activities while they were away. Such absences were often to attend a funeral, spend time with a sick relative in hospital or help a relative with their subsistence garden or export cash crop.

Logistical problems are greater during prolonged village-based fieldwork, especially in poorly serviced remote sites. On several occasions, the coffee team ran out of store foods and petrol (for drying samples) in remote highland sites. We underestimated the amount of food sharing with the community, which drew down our food supplies more quickly than we anticipated. Local stores are irregularly provisioned and supplies of biscuits, tea and sugar were quickly depleted.

While it is possible that the presence of the team in the village may have affected the behaviour of the farmers, this problem is likely to be common to any method involving outside researchers visiting a community. However, previous research has shown the effect is not enduring and may last a day or two until the novelty wears off. The extended period of fieldwork therefore makes this less of a problem than would occur during a single one-off visit to a village for data collection.

A significant problem that can emerge is when team members are perceived to be partisan in their

relationships with different groups in the community. Outsiders often assume that communities are harmonious when often they are riven with conflict between clans and subclans and even within families. Therefore, it is very important to ensure that the project does not engage with only one social grouping or one side in a conflict. This can happen when local contacts attempt to influence the selection of households by steering the team in the direction of their own clan or subclan, thereby excluding other groups from the study. Care must be taken to ensure that a cross-section of all the main social groupings is included in the study, so that jealousies do not arise that can lead to disputes with project team members. This requires considerable pre-fieldwork planning, with at least one trip to the site before fieldwork commences, and working closely with respected community leaders.

Finally, community members sometimes have very high and unrealistic expectations of what a project will deliver. This can contain elements of 'cargo cult' thinking, whereby the project is expected to deliver wealth without work. Expectations can arise from the survey questions themselves. A farmer may conclude that he is going to be given new tools after being asked about the number of the tools he owns and their condition. Great care must be taken to reduce such expectations before the project goes ahead and contain them during the research period. In some highland communities, farmers will demand to be paid for their time and involvement in the research. In one case, we changed a field site because of such demands. These expectations must be managed very carefully, if the communities are not to become frustrated or disappointed with the research.

Lessons learned

Based on the experience of conducting village-based fieldwork, this section provides a brief discussion on what is considered important in facilitating high participation rates among farming households, the collection of reliable data and the community's receptiveness to the research team residing in their village.

Importance of community leaders

First, it is important that community leaders understand and support the research because it is they who will explain to the community the purpose and methods of the research, often in the local language. This groundwork of informing the community about the research through local leadership structures is critical and must be done well before the commencement of the research and should be part of formal project planning. Also, when the field trip begins, the team should spend the first couple of days getting to know the community leaders (e.g. councillors, village development officers and church leaders) and as many farmers as possible to explain the purpose of the project and what would be required from the community in terms of participation. Community leaders will have a major role throughout the project, explaining to the community what the team is doing. Do not underestimate the number of times that the project must be explained to different sections of the community, as community members come back for additional clarification of aspects of the project. Community leaders can do much to allay concerns and inform the community of what the project is about. If community leaders are cooperative and trust the team, then it is likely that other community members will follow suit.

The role of community leaders in informing the community about the research can be facilitated by providing them with information sheets of about one page maximum explaining the project in Melanesian Pidgin. Leaders find these very useful to refer to when clarifying questions from the community. Information sheets help ensure community leaders stay on track and do not misinterpret the project objectives and methods, which can lead to later problems, such as raising unrealistic expectations about what the project will achieve. For example, much of the coffee research was carried out during a World Bank project that most villagers had heard about. Cargo cult expectations were emerging in relation to the World Bank project and we had to inform villagers repeatedly that we were not part of that project.

Researcher involvement in village life

Second, it is imperative to show respect to people and their cultural practices. Sometimes, for researchers not familiar with the intricacies of village social life, it might not always be clear how to do so, especially during major events that disrupt normal social routines. For example, deaths in the community can cause major disruptions to the work routines of community members. Often it is not only the immediate

family of the deceased whose routines change during the mourning period, and inadvertently attempting to interview members of a household one did not perceive to be part of the group in mourning can be interpreted as being disrespectful to that family. Therefore, it is important to heed the advice of community leaders about which families will be available to interview. Furthermore, although the team are temporary members of the community, they should show respect for the deceased's family by contributing food and cash to the *haus krai* to feed mourners. Although they are largely token contributions, such actions strengthen relationships with the community.

Respect for the community can also be shown through team members participating in community activities and events during fieldwork. Sports and church services are excellent ways to engage socially with the community, and villagers respond very well to such initiatives. They help build trust between the team and the community and demonstrate an interest in the community beyond a work relationship, which is very important culturally in PNG.

Two-way gift giving

Third, small token gifts to participants are culturally appropriate and assist with establishing a good rapport between the research team and the community. The coffee team brought posters on coffee management on field trips and CIC team members skilled in extension ran training programs for villagers and distributed coffee rehabilitation tools under the District by District program. The training was eagerly received and greatly appreciated by project participants, and ideally training should accompany all village-based research, especially in remote areas where people have virtually no access to training. Members of the coffee team from NARI also brought gifts of new planting material, such as maize, rice and yam, and distributed them among the community. In the cocoa project, research staff gave pre-paid K10 (around A$5) mobile phone top-ups to community leaders to enable them to keep in touch with team members when arranging interviews. Again, these are token gestures but do much to facilitate positive relations with the community.

Gifts are not unidirectional. Gifts of food are frequently given to the team and it is disrespectful to refuse such gifts, even though the team's food supply appears to far outweigh their need. Often, surplus food can be shared with the host family looking after the team, who will also provide cooked meals to community members assisting the team with the research. Often in the initial interview with a family, a meal will have been prepared in which the interviewer is expected to partake. Sharing food establishes and strengthens the relationship between the team member and the family who prepared the meal. So, it's best to start with one or two interviews and slowly increase the number of households visited each evening as the pressure to consume full meals declines. A slow start to interviews allows interviewees or farmers completing the diaries more time to get used to them.

Finally, towards the end of the fieldwork period, it is appropriate to host a feast for people participating in the research, including community leaders. Typically, the community will contribute food for the feast, usually garden foods. It is appropriate for the research team to purchase some pig meat for the feast or contribute store foods like rice and tinned fish. By hosting a feast, the fieldwork period can finish on a very positive note, which will make subsequent visits easier.

Conclusion

The inclusion of activity diaries in the mix of data-collection techniques employed in the projects proved very successful in capturing how farmers and individual family members allocate their time among different livelihood activities. In the case of cocoa, the farmer diaries revealed the level of inputs required for farmers to respond to and control CPB. Importantly, immersion in the community for an extended period was highly effective in developing positive relationships between the researchers and farmers and for dispelling some of the long-held negative/suspicious views farmers held towards CIC, CCIL, NARI and private-sector partners. Gaining community trust and improving farmers' understanding of research (and their role in research) was an important step to increasing the probability that new smallholder initiatives would be suitable to the needs and lives of farmers. The insights gained from the two approaches to conducting activity diaries discussed here are relevant to other socioeconomic studies where the goal is to understand the factors operating at the household and village levels that affect farm-management decision-making.

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Identifying socioeconomic constraints to improving sweetpotato quality and postharvest management in Papua New Guinea: preliminary results from a farm survey and marketability trials

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Abstract

Sweetpotato is the most important staple food crop in the PNG highlands. The market potential for sweetpotato in PNG (as a cash crop) has increased significantly in recent years due to urbanisation and the mining boom, especially in Port Moresby. However, postharvest losses are known to be high for sweetpotato produced in the highlands and transported to the distant coastal city markets of Port Moresby. Previous studies have identified factors contributing to postharvest losses to be: poor postharvest handling and packaging, poor marketing infrastructure (especially storage and transportation), fragmented supply-chain relationships, and a lack of understanding of market requirements and consumer preferences. To improve the situation, a better understanding of consumer preferences and how current postharvest practices affect quality is required. The main objective of this ongoing study is to identify specifically where changes are needed and to effect those changes. In particular, this paper contains a report of:

- a farm household survey to understand quality perceptions and current postharvest practices
- a postharvest training workshop to educate farmers on quality issues and how to effect change
- marketability and grading trials to define quality to indicate where improvement can be made.

The results suggest that most farmers are aware of the issues of postharvest losses. However, they are either unable to effect change because of lack of resources, or are unwilling to try because it is perceived to be someone else's responsibility. The main methodological lesson learned is that it takes time and requires significant resources on the ground to change attitudes and behaviour.

Background

If PNG highland farmers are to take advantage of the opportunities to improve their incomes by selling sweetpotato (*Ipomoea batatas*) to higher valued city supermarkets or mining camps, they should improve quality and reduce postharvest losses. More cooperation with marketing agents is also required. They must overcome one major criticism of the involvement of smallholder farmers in high-value

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markets—that they are unable to meet the requirements of the markets for high quality and consistency in supply (Chang 2011; Chang and Griffith 2011; Chang et al. 2013).

Quality specifications usually start with size and appearance. Shape is important for ease of packing and peeling. Freedom from pests and diseases, cracking, skinning and breaks is also important for the higher value markets, but is better tolerated in the less-discerning markets. Variety can be another element of consumer preference linked to quality, and variety, especially a range of colours, may help raise sweetpotato above the image of a 'poor man's food' (Thiele et al. 2009). Grade standards, and grading, result in more uniform product in packages on the shelf, and higher prices.

There are several markets at Port Moresby (e.g. open markets, supermarkets, kai bars and institutions) and mining camps (mostly through catering companies) and each may have a different requirement. Mining camps, where food is prepared in bulk, may demand large sweetpotato, whereas supermarkets may demand smaller sizes, as customers must carry the sweetpotato along with other shopping to their mode of transport. So, it is important to determine the quality requirements of the respective target markets in PNG.

Issues and objectives

Opportunities exist for farmers to meet quality requirements of high-value markets and to receive higher prices and improve their income. However, lack of awareness of quality issues for some farmers, and lack of interest and motivation for others to change their current practices, have hampered the effort to link farmers to high-value markets. These farmers must be better educated and convinced of the value of improved postharvest practices to their bottom line in the short term and to the competitiveness of *kaukau* (sweetpotato) in the longer term. The new Australian Centre for International Agricultural Research (ACIAR) Project ASEM/2011/048 (*An integrated approach for systemic change and sustained development of the Papua New Guinea sweetpotato value chain*) of which this study is a part, will examine these factors. The objectives of this study are to:

- identify the socioeconomic constraints to improving postharvest-management practices for sweetpotato in the PNG highlands
- improve sweetpotato marketability and quality attributes for high-value markets
- understand perceptions of sweetpotato quality and curing by PNG highland farmers.

Research strategy and methods

The methods used so far to achieve these objectives include conducting:

- a farm household survey to understand quality perceptions and current postharvest practices and to establish a baseline for impact assessment
- a postharvest training workshop to educate farmers on quality issues
- marketability and grading trials to define quality.

Farm household survey

The survey was conducted in selected districts and villages of Jiwaka province[4] (see Figure 1). Overall, 186 respondents from 5 groups/locations were interviewed (Table 1 and Figure 1).

The sample has been divided into farmers taking part in the project and those who aren't, which will allow an impact assessment to be conducted at the end of the project to determine whether the project has achieved its goals in changing the postharvest and marketing practices by comparing participating and non-participating farmers.

The semi-structured survey questionnaire covered the following topics:

- sociodemographics of the farm households—age, gender, education and role in sweetpotato production and marketing of household members
- production activities and decision-making—landholdings and tenure, garden size, share of sweetpotato production compared with other crops, and varieties of sweetpotato grown and their characteristics
- postharvest activities—practices regarding curing, packaging and storage of sweetpotato
- product utilisation and marketing—share of sweetpotato grown/used for home consumption, animal feed and markets, market outlets, and pros and cons of different selling methods
- finance—income sources, assets, expenditure and access to credit

[4] The areas comprising the current Jiwaka province were part of Western Highlands province until May 2012, when Jiwaka province was officially recognised.

- access to training and extension—group membership, training received and training needs
- self-assessment of wellbeing—degree and source of happiness, and areas of dissatisfaction and/or for future improvement.

Postharvest training workshop

A 2-day postharvest training workshop was held in Mt Hagen, Western Highlands province, in March 2013. The main purposes of the workshop were to educate farmers on quality issues and the concept of impact pathways for problem-solving, and to present the preliminary results of the farm household survey. There were 30 attendees, including PNG project staff, lead farmers who conducted the farm household survey and farmers who participated in the farm household survey. The topics covered included:

- what the market wants—quality
- postharvest biology—understanding the vegetable
- handling and packaging—protecting the vegetable
- postharvest diseases—reducing the waste
- presentation of survey results on quality perceptions and postharvest practices
- impact pathways—problem identification and problem-solving.

Other activities included: showing participating farmers the video on sweetpotato postharvest handling that was produced by a previous ACIAR project (ASEM/2006/035, *Improving marketing efficiency, postharvest management and value addition of sweetpotato in Papua New Guinea*), an exercise to define marketability and quality, and an exercise on problem-solving.

On the day after the workshop, the research team delivered a simplified version of the postharvest presentations and the exercise on marketability and quality in Kudjip village to test the method of 'training the trainers' at the grassroots level.

Table 1. Respondent groups—farm household survey

	Group number				
	1	2	3	4	5
Name of group	Voice for Change	South Wahgi Organic Farmers Association	Konza Organic Farmers Association	Village Extension Worker (VEW) group	Kundafina Flood Farmers Association
Location	Kukpa and Kudjip	Minj	Banz	Kindeng	Wahgi Flat
Number of respondents	77	49	24	17	19

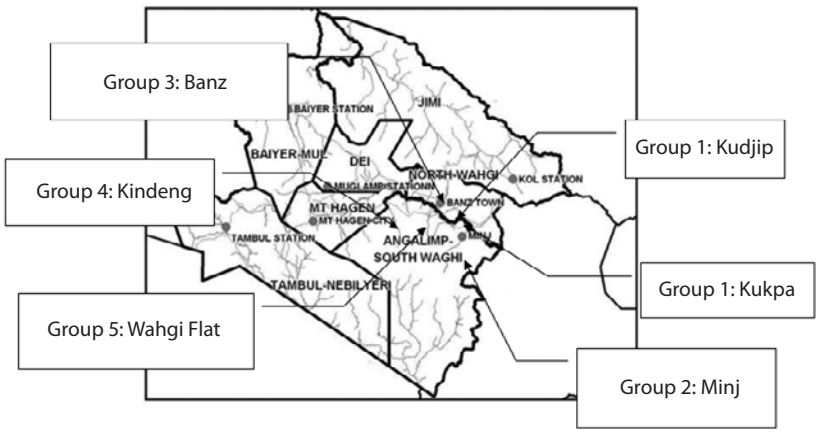

Figure 1. Location of survey groups and respondents within Jiwaka province

Marketability and grading trials to define quality

Determining what is marketable, and where, and what quality standards are required, are considered essential for farmers to contemplate new markets for their produce. One of the key requirements of a locally appropriate quality system is that the language is suitable for the people who will use it.

The method we used at the workshops, detailed in Box 1, has been trialled on 3–4 occasions using small numbers of people, or at a village. In the example below, we utilised lead farmers and Fresh Produce Development Agency (FPDA) and National Agricultural Research Institute (NARI) personnel at a training session in Mt Hagen in 2013. Four bags of sweetpotato (each about 70 kg) were purchased from the Mt Hagen market and spread in heaps around the lawn, one heap of approximately half a bag per group. A protocol sheet with instructions (Box 1) and sheets for data capture (Appendix) were provided to each group. On the supply-chain sheet, we offered the opportunity for locals to describe the way in which they determine quality. Apart from the instruction sheet, no guidance or directions were offered to influence the participants' decisions.

Box 1. Instructions for exercises on marketability and quality standards—formal markets

1. Form a group of 3–4 people maximum
2. Get a 'normal' bag of kaukau[a]
3. As a group, fill in the header portion of the attached SUPPLY CHAIN SHEET and DIMENSIONS SHEET. Collect an individual MY PREFERENCES SHEET and fill in the header[b]
4. Open the kaukau bag and spread out the roots on a canvas
5. Separate the kaukau into two heaps, one for marketable and one for unmarketable
6. Describe the unmarketable heap (e.g. rots, odd shapes, too large, too small, rat damage, breaks, splits, surface roots, cuts, weevil damage). Record descriptors on the SUPPLY CHAIN SHEET. These kaukau are unmarketable, unsaleable and unsuitable for human consumption
7. Count and weigh all unmarketable roots together and record number and weight on the SUPPLY CHAIN SHEET
8. Put unmarketable kaukau back into the bag
9. For the marketable kaukau, separate into three heaps of choice decided by the group
10. For each marketable heap (called grade 1, 2, 3 on the SUPPLY CHAIN SHEET), count the roots and weigh the roots together. Record weights and numbers for each marketable heap on the SUPPLY CHAIN SHEET
11. Describe each marketable heap (i.e. the reasons kaukau were put into each group). Record the reasons used in the descriptors column on the SUPPLY CHAIN SHEET
12. Each member should then separately record their preference for each grade by ranking each heap as 1 (like best), 2 (like second), to 3 (like least) on the MY PREFERENCES SHEET
13. Take 10 roots at random from each marketable heap and measure and record individual lengths, maximum widths and weights. Please keep these as separate heaps. Record the values on the DIMENSIONS SHEET
14. Make a traditional heap of mixed sizes and of similar size to the heaps of step 13 (similar volume or weight) using kaukau from each graded heap in step 10
15. Each individual member of the group should indicate the price they would be willing to pay for each of the four heaps. Record these prices on the MY PREFERENCES SHEET
16. If 'Korowest' is the standard variety, each individual should indicate which varieties of kaukau you would pay below or above that for 'Korowest'? Record on the MY PREFERENCES SHEET
17. The assessment is now complete. Thank you.

[a] Kaukau is the PNG word for sweetpotato

[b] See Appendix for activity sheets

Research outputs/impact

Farm household survey

The survey covered a number of topics, such as family background, dwelling characteristics, asset ownership, income-earning activities, household decision-making, and sweetpotato production, marketing and postharvest practices. In the discussion that follows, we will focus on farmers' understanding and perceptions of quality, and their postharvest practices (curing and packaging).

Of the 186 respondents, those in groups 1 and 2 (78 and 49 respondents, respectively) form the target groups, while groups 3, 4 and 5 (24, 17 and 19 respondents, respectively) form the 'control' groups. The number of respondents differs between groups because of the varying degrees of importance of sweetpotato marketing to their income activities and the difficulty in reaching farmers in more remote areas. Overall, 64% of the respondents are female, with groups 1, 2 and 4 having over 70% female respondents (Table 2). This is intentional, as the project is interested in empowering women in our target groups (groups 1 and 2), with Group 4 serving as a control group.

Overall, 37% of respondents are illiterate, with between-group differences varying from 18% in Group 4 to 47% in Group 2 (Table 2). In all, 20% of the respondents attended high school and 2% attended college/university. In general terms, Group 4 is the most educated while Group 2 is the least educated. The level of education is important for the selection of trainers/facilitators at the village level and the design of extension and training methods and materials. Our previous experience has shown that farmers with Grade 9 and above are easier to work with because there is no language barrier between them and the research team and hence communication can be direct. For farmers who are less educated, there is a need for translation, which tends to result in loss of information and, at times, misinformation and distortion. Therefore, the effectiveness of the training and extension programs depends crucially on the selection and capacity building of the right people to be the trainers/facilitators on the ground.

Overall, 55% and 28% of the male household members are engaged in sweetpotato production and marketing, respectively (Table 2). By contrast, 68% and 62% of the female household members are engaged in sweetpotato production and marketing, respectively. These figures are consistent across groups and highlight the importance and role of women in the sweetpotato supply chain in the PNG highlands and the need to focus research and training activities for postharvest and marketing on women.

Table 2. Demographic characteristics of respondents and households

Item	Group number					Total respondents
	1	2	3	4	5	
Number of respondents	77	49	24	17	19	186
Gender (%)						
Male	25	24	71	29	74	36
Female	75	76	29	71	26	64
Education (%)						
Nil	36	47	38	18	26	37
Grade 1–4	10	8	21	18	21	13
Grade 5–8	35	24	17	24	32	28
Grade 9–12	18	18	25	35	16	20
College/university	0	2	0	6	5	2
Engagement in production/marketing (%)						
Male engaged in production	58	47	51	61	51	55
Male engaged in marketing	20	36	34	36	28	28
Female engaged in production	70	66	71	66	60	68
Female engaged in marketing	63	61	67	61	55	62

Landholding and land-use patterns

In all, half the respondents own their cultivated land, while 39% are cultivating customary land (Table 3), but there are differences across groups. While 67% and 76% of respondents in groups 2 and 5, respectively, claim to own the land they cultivate, this is only the case for 34% of respondents in Group 1. The overall high level of private land ownership, if true, is a good development, as customary land tenure was said to have hampered commercial activities and economic development in PNG. Later in this study, we will try to verify those claims and try to determine whether land ownership has had any impact on entrepreneurship, postharvest and marketing practices, or behavioural change.

As it was difficult to obtain an accurate measure of farm size, we recorded the size of gardens based on farmers' estimates. Farms are relatively small: 54% of respondents have land area under 1 hectare (ha), 23% have land area of 1–2 ha and 24% have over 2 ha (Table 3). About two-thirds of respondents are growing crops other than sweetpotato (data not shown), such as maize, banana, peanut and vegetables, for both home consumption and cash income. The main cash crop is coffee.

Sweetpotato production is the most important crop for the respondents, grown both for home consumption and marketing. Overall, 46% of total area cultivated is planted to sweetpotato. The highest proportions were in groups 1 and 2, with at least 50% of the land planted to sweetpotato (Table 3). The average number of sweetpotato gardens is 2.6 per farmer (Table 3).

Varietal choice and preferences

In the majority of villages, approximately 30% of respondents grow four varieties of sweetpotato, with a range of one to six varieties per household (Table 4). About 36 varieties were named distinctly by farmers, with the most preferred being Wahgi Besta (preferred by 74% of farmers), Sugar (14%) and Rachael (8%) (Table 4). The most preferred variety for groups 1, 2 and 3 is Wahgi Besta, whereas Sugar is most preferred by Group 4 and, for Group 5, Wahgi Besta and Sugar are equally preferred.

The decision to grow these varieties is influenced by several factors, including the growing duration, purpose and farmers' quality perceptions of each variety. The growing duration of these varieties ranges from 3 to 6 months. Among the most commonly grown varieties, Wahgi Besta is grown specifically for the market by 18% of respondents, whereas 13% indicated that they grow the Sugar variety for home consumption. These results show that most farmers do not grow sweetpotato specifically for the market, instead they sell what they are growing—an indication of production/supply orientation, as opposed to customer/market orientation.

Table 3. Landholding and land-use characteristics of respondents

Item	Group number					Average of all groups
	1	2	3	4	5	
Size of landholding (%)						
Up to 0.1 ha	14	2	0	12	0	8
>0.1–0.5 ha	30	12	17	18	16	21
>0.5–1.0 ha	26	22	17	29	32	25
>1.0–2.0 ha	13	31	38	6	42	23
>2.0 ha	17	33	29	35	11	24
Total[a]	100	100	100	100	100	100
Land tenure status (%)						
Owned	34	67	43	59	76	50
Customary land	61	27	39	6	6	39
Relatives	3	4	13	0	0	2
Rented/other	2	2	4	35	18	9
Total[a]	100	100	100	100	100	100
Proportion of area (%) under sweetpotato	50	52	40	31	35	46
Average no. of sweetpotato gardens per farmer	2.5	2.8	2.4	3.1	2.1	2.6

[a] Total may not equal the sum of the column due to rounding.

Perceived varietal attributes

Respondents' perceptions of desirable and undesirable traits of the varieties they grow are given in Table 5. Good eating quality, yield performance, market price, early maturing, and resistance to pests and diseases are some of the most common reasons for selecting those varieties. Some morphological attributes were also mentioned, including colour of the skin and the flesh. Only 39% and 32% of respondents indicated that these varieties are easy to handle and travel well to long-distance markets, respectively—again, this is an indication of production/supply orientation, as opposed to customer/market orientation.

Curing

Curing extends the storage life of sweetpotato and is a physiological process that requires defined conditions (28–30 °C and 85–95% relative humidity for 5–7 days) in order to inhibit disease and repair damaged skin. Respondents were asked about their knowledge, perceptions and practices of sweetpotato harvesting and postharvest activities. Of the total sample interviewed, 41% indicated they knew what sweetpotato curing is, 34% knew what curing does for sweetpotato and 37% said that they practised curing (Figure 2).

In discussing actual practices with the farmers, it seems what they think of as 'curing' is not actually resulting in curing. These practices include:

- leaving sweetpotato to mature in the field longer (84% of respondents; Figure 3), which produces stronger and sweeter roots with thicker skin, but this is a consequence of delayed harvest and lower dry matter, possibly after vine deterioration
- letting the sweetpotato dry on the ground after harvest for 4–5 hours (18% of respondents)
- removing the tops (vines) about 7 days before harvest (18% of respondents), which may result in some in-ground curing producing a tougher skin, but whether curing has occurred has not been determined objectively.

Table 4. Varietal use in sweetpotato production by respondents

Item	Group number					Average of all groups
	1	2	3	4	5	
Number of varieties grown	1–6	1–6	2–5	2–6	2–6	1–6
Most preferred varieties (percentage of farmers preferring)						
Wahgi Besta	83	98	63	12	42	74
Rachael	7	–	17	24	5	8
Sugar	4	–	17	59	42	14
Other	7	2	4	6	11	5

Table 5. Perceptions on attributes of sweetpotato varieties (percentage of respondents)

Attribute	Sweetpotato variety				All varieties (average %)
	Wahgi Besta	Rachael	Sugar	Other	
Good eating quality	99	100	100	78	99
Yield performance	91	86	76	56	88
Price on the market	85	79	68	67	83
Colour of the skin	83	57	72	67	80
Colour of the flesh	80	50	72	78	77
Early maturing	55	57	20	11	48
Easy to harvest and store	50	14	8	0	39
Resistant to pests and diseases	39	21	36	11	35
Travel well	37	21	16	11	32
Other	17	7	20	11	16

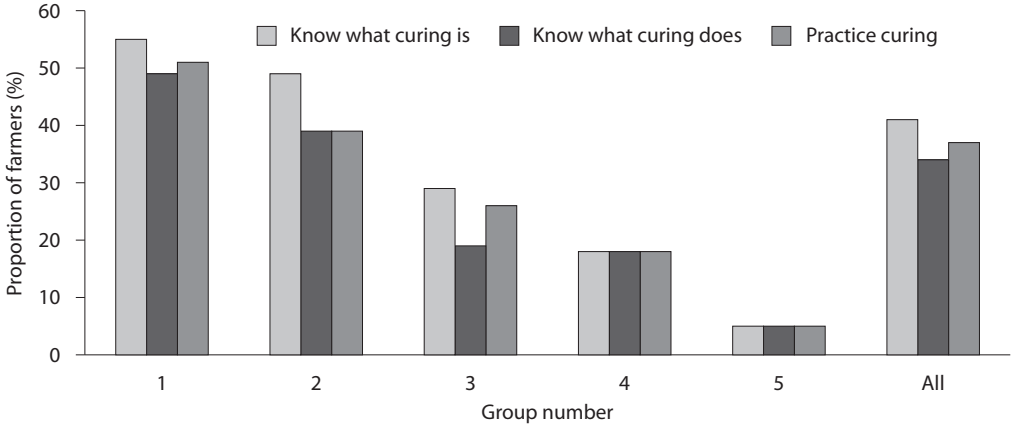

Figure 2. Knowledge and practice of sweetpotato curing by respondents

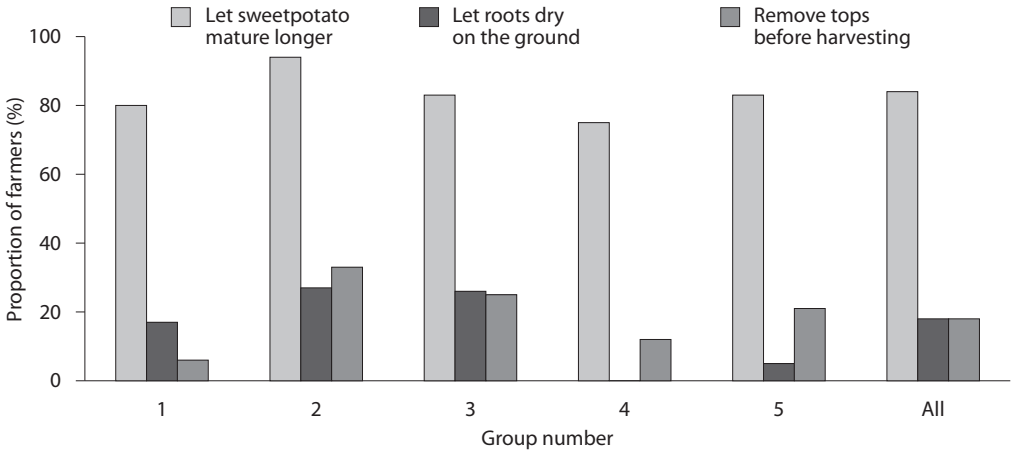

Figure 3. Practices undertaken by farmers to 'cure' sweetpotato

There is a simple stain test that should be developed and utilised to determine the presence of curing (e.g. van Oirschot et al. 2006). From periodic observations of highlands sweetpotato at Port Moresby, there is no indication that curing has occurred.

Despite the lack of curing, we have observed very low disease incidence in sweetpotato at Port Moresby, despite prolonged storage in hot, damp conditions during transit. However, disease risk could be further reduced by taking more care at or before harvest (where digging-stick/shovel damage may introduce disease) and by removing diseased roots before packing. We need to further test hypotheses as to the sources of disease. We will also provide training on curing, if needed, when locally appropriate (i.e. low cost and low input) methods are found during proposed trials.

Packaging

The majority of farmers use polypropylene bags to pack their produce and have expressed satisfaction with their current packing materials because they are readily available and convenient. However, overpacked polypropylene bags are known to result in rots, skin damage and breakage of roots because they reduce evaporation of free water, and can become too heavy to handle. A small percentage (around 20%)

of farmers expressed discontent with the use of polypropylene bags and indicated their willingness to change under different circumstances, especially with the availability of other packaging materials that are as strong as polypropylene bags, allow good airflow to reduce free water accumulation, are of reasonable size, and are easy to carry (Table 6).

Quality and quality attributes

Respondents demonstrated an appreciation of the importance of selling good-quality sweetpotato. Approximately 62% (Table 7) of respondents are grading and sorting sweetpotato before packing or/and at the market. Sweetpotato is sorted according to colour, size and shape. Most farmers rely on their own experience and knowledge to sort/grade sweetpotato. While grading and sorting are the most common practices undertaken to ensure that farmers are meeting the quality requirements of consumers, around 33% of respondents nominated proper postharvest handling (washing and packing) and 24% indicated choosing the appropriate variety to be

Table 6. Conditions under which farmers would be willing to change their packaging materials (percentage of respondents)

Condition	Group number					Average of all groups
	1	2	3	4	5	
If selling to long-distance markets	12	2	16	19	15	9
If there is more produce (increase in production)	27	6	0	0	0	13
Availability of other packaging materials[a]	7	32	52	19	15	20
If there is access to own transport	1	9	0	19	10	6
If made aware of new packaging materials	9	6	28	38	40	18

[a] Packaging materials that are strong enough, permit airflow to reduce free water accumulation, are a reasonable size, and are easy to carry.

Table 7. Perceptions on quality of sweetpotato (percentage of respondents)

Item	Group number					Average of all groups
	1	2	3	4	5	
Basis for sorting						
Colour	73	83	48	47	47	67
Size	99	100	100	100	100	100
Shape	85	92	83	77	89	86
Other	3	2	17	29	37	11
Source of information about grading						
Own experience	97	95	100	94	89	96
FPDA[a] workers	3	13	0	0	5	5
Traders and buyers	2	6	0	0	5	3
Other	2	2	4	12	11	4
Perceptions as for whom quality of sweetpotato is important						
Consumer only	41	6	0	0	0	16
Consumer and producer	48	94	96	82	100	78
Actions taken to ensure good-quality sweetpotato						
Choosing the variety	21	33	25	12	21	24
Grading and sorting	52	57	83	71	79	62
Handling[b]	38	43	21	24	16	33
Presentation[c]	7	2	0	6	5	4
Harvesting on time	3	4	4	0	0	3

[a] FPDA = Fresh Produce Development Agency
[b] Proper postharvest handling (washing and packing)
[c] Presentation when selling (big heaps, clean)

important in this respect. While 78% of respondents believed that the quality of sweetpotato is important for both consumers and farmers (producers), 16% indicated that quality is important only to consumers.

The results given in Table 7 are most surprising because, while most respondents claim to sort and grade sweetpotato to ensure good quality, it is not what we have observed at the market. The discrepancy could be a result of a lack of commonly accepted quality standards. Therefore, the standards used by the farmers could be much lower than what are considered to be acceptable by the research team. The development of locally appropriate quality standards, through the marketability and grading trials to define quality (as discussed below), is a key objective of this project.

Product losses

Product losses are an ongoing problem in the marketing of sweetpotato. The most common causes of product losses for respondents selling at long-distance markets include skin damage, broken roots, water loss and rots (Table 8). By comparison, the most common causes of product losses at local markets are skin damage, broken roots, oversupply, rots, wrong skin/flesh colour, too small and mixed sizes (Table 8). These results indicate that the local market is more discriminating and products are more easily rejected by the customers for a variety of reasons, leading to quality/product losses. Oversupply, in particular, is a serious problem for those selling at the local market. This supports the finding that 34% of farmers wish to have more training and skills on how to access and sell produce to long-distance markets, which are easy to sell to and offer higher prices.

Table 8. Perceptions of causes of product loss (percentage of respondents)

Cause	Farmers who sell at:	
	long-distance markets	local markets
Wrong cultivar	19	12
Too big	19	18
Too small	19	35
Mixed sizes	22	32
Rots	33	45
Insect/rat damage	22	30
Wrong skin/flesh colour	15	45
Broken roots	41	51
Skin damage	44	59
Water loss	33	18
Sprouting	11	20
Oversupply	19	49

Gender roles

The roles of husbands and wives in various activities and decision-making processes are summarised in Table 9. Women played greater roles in many decisions, especially those regarding varietal selection and marketing of sweetpotato, with overall gender role scores of 4.0 and 3.8, respectively (Table 9). A number close to 4.0 means that the decision is made mainly by the wife. By comparison, numbers close to 2.0, such as borrowing/credit and training and extension for Group 3, mean that those decisions are made mainly by the husband.

Overall, an average gender role score of 3.6 was obtained, with groups 1, 2 and 4 attaining 4.0, 3.7 and 3.5, respectively (Table 9). By contrast, groups 3 and 5 scored 2.8 and 2.9, respectively. This means that, for the former groups, household decisions are made mainly by women, while for the latter groups, they are made jointly by husband and wife. At this point, it is too early to draw a conclusion on whether a higher average score is necessarily better (or worse), since an ideal situation will be for all the household decisions to be made jointly by husband and wife. However, the results indicate that a gender-sensitive extension and training strategy is needed, as women are major contributors of labour for sweetpotato production and important decision-makers in agricultural production and marketing. To the extent that some activities are gendered, targeting extension advice by gender would be a rational strategy.

Training needs

The majority of respondents depend on their own experience and knowledge, as far as cultivation, new varieties, pest control, growing other crops and the marketing of sweetpotato are concerned. Extension workers and farmer organisations also play an important role in the dissemination of information and skills training on various farming operations. About 52% of farmers indicated they need to know more about sweetpotato production in general, and 28% needed information specific to marketing and postharvest activities. In all, 47% of farmers had attended farmer training on various skills, including farming in general, marketing and postharvest skills, and financial literacy. About 34% of farmers wish to have more training and skills on how to access and sell produce to long-distance markets.

Table 9. Gender roles on various activities within the household[a]

Decision-making on:	Group number					Average of all groups
	1	2	3	4	5	
Farming activities	3.9	3.8	2.8	3.7	2.7	3.6
Varietal selection	4.4	4.0	3.3	4.2	3.4	4.0
Marketing	4.2	3.9	3.5	3.5	3.2	3.8
Income	3.8	3.8	2.8	2.9	2.8	3.5
Savings	3.9	3.6	2.9	3.2	2.9	3.5
Expenditure	3.7	3.7	3.1	3.5	3.2	3.5
Borrowing/credit	4.1	3.6	1.9	3.3	2.7	3.5
Training and extension	4.3	3.7	2.1	3.5	2.4	3.6
Future farming activities	3.4	3.6				
Average	4.0	3.7	2.8	3.5	2.9	3.6

[a] Where a value of 1 indicates husband only is making the decision; 2 = mainly husband; 3 = both husband and wife; 4 = mainly wife; 5 = wife only

Summary and conclusions of survey results (before any project intervention)

- There are significant variations between the five groups in terms of education, land tenure, knowledge and practices of curing, variety preferences and gender roles in household decision-making. These results indicate the broad social and cultural diversity in Jiwaka province.
- A gender-sensitive extension strategy is needed, as women are major contributors of labour as well as major decision-makers in various sweetpotato production and marketing activities. To the extent that some activities are gendered, targeting extension advice by gender would be a rational strategy.
- Farmers reported own experience, friends, family members and neighbours as the major sources of information and advice regarding marketing of sweetpotato. Farmer-to-farmer extension of new technology seems to be the major mechanism of diffusion utilised in the past. There is a need to examine how a formal extension system can use these mechanisms to leverage its resources.
- While the farm household survey has indicated that farmers are conscious of the importance of production, harvest and postharvest activities that will improve the quality of sweetpotato for the market, there is a lot more to be done in terms of enriching their knowledge, changing their way of thinking and adopting new and proposed interventions.
- The key recommendations from the household survey are: targeting of extension systems based on socioeconomic conditions of farmers will facilitate adoption of improved marketing practices; and the development and provision of marketing and quality information to farmers that will speed up technology uptake.

Postharvest training workshop

On the first day of the workshop, participants were exposed to the major principles of postharvest biology and practice, which also included a marketability and quality exercise (discussed below). On the second day, participants were divided into four groups to map out the causes and effects associated with postharvest losses from their own experiences, with each group using a different coloured note pad. The groups presented their ideas, which were assembled into a 'problem tree' (Figure 4).

As indicated in the problem tree, the main factors (the main branches) contributing to postharvest losses identified by the participants were: harvest, packaging, handling, transport and supply chain. Each of these main factors also has its own contributing factors (the side branches). This branching out process continues until the root causes to postharvest losses are identified. This is an excellent result because it indicates that the participants acknowledge the problems associated with postharvest losses. The important next step is: what can be done to reduce postharvest losses? And who should do it?

To demonstrate how a problem tree can be used to effect change and achieve goals, the participants were asked about what they could and would do to

Figure 4. Problem tree for postharvest losses produced at the training workshop

effect change in order to reduce postharvest losses. Unfortunately, we did not get very far. It seemed that despite every attempt we made in encouraging them to think about what they themselves could do to effect change (e.g. reducing cuts to sweetpotato during harvest, packing small bags etc., based on what had been covered in the workshop the day before), they replied with other problems on transport, value chain, pathogen-tested (PT) planting materials and so on. The problem-tree exercise was supposed to help them think more logically and consistently, distinguishing more clearly between cause and effect, and taking responsibility to effect change. But it did not work as expected, as farmers seem to expect someone else to fix the problem for them.

After the workshop, the research team went to Kudjip to deliver a simplified version of the postharvest training to grassroots farmers in the village. The idea behind it was to see how the 'train-the-trainer' method can be applied to our project and in a PNG context. In the past, Australian project staff would provide the training to PNG partner staff and some lead farmers (these are the trainers), who were then expected to pass on the new technology/information to grassroots farmers. However, this approach did not work well because there was usually no follow-up, and hence the second stage (trainers training the farmers) was often not carried out as expected. The reasons are several: (1) the trainers may not be fully trained or confident enough to conduct their own training soon after a one-off (normally half-day) training session; (2) the training material used for training the trainers may not be appropriate for training the farmers; (3) there were no work plans specific to training the farmers; and (4) no budget was set aside for extension or training the farmers in the project document. Without training the farmers, there are unlikely to be changes on the ground.

Because of these lessons learned, we want to see whether and how we could take it a step further. That is, not only will we provide training to the trainers, but also we will oversee the training process from trainers to farmers. This means for this exercise, after the training workshop, FPDA staff will provide the training to (lead) farmers in Kudjip which will be overseen by Australian project staff. The next stage would involve lead farmers training grassroots farmers, overseen by FPDA staff. The important thing to note in this process is that both trainers and trainees would be exposed to the same ideas and process more than once and from different individuals. With repetition, the information we want to disseminate will be reinforced and better absorbed.

In addition, necessary adjustments can be made both to the training materials and the delivery method to better suit their own clients' needs, and hence, make

them locally and culturally more appropriate. One example of this is that when the training was given by Australian project staff, training materials were delivered in English through PowerPoint presentations in a conference room and with a set program. This is most likely not how extension to farmers is delivered in PNG. In Kudjip, the 'workshop' was conducted in a local church, with participating farmers sitting on the floor, and some women had babies with them. There is no electricity, let alone PowerPoint presentations or video or slide shows. This means, to improve training effectiveness, pictorial depictions and posters in local language will need to be developed and used for the training of farmers in future.

One key issue identified during this trip was the deeply entrenched production orientation of the majority of farmers. Although they all wanted to improve access to market, in the end, they appeared to be more (if not only) interested in production, rather than improving postharvest handling and quality to meet market requirements. At the Kudjip workshop, one question that was asked of us at the end of the talk was, 'Can you show us how to grow *kaukau*?' Our immediate reaction was, 'Before, you told us you knew how to produce, what you need was market access. Now when we are trying to show you how to improve access to market, what you want to know about is composting, getting PT planting material, subsidies for transport etc.' We encountered the same problem with another group before the March workshop.

Marketability and quality

In this exercise, participants at the Mt Hagen workshop were asked to separate a half bag of sweetpotato into four heaps and describe the differences between them, as described earlier. The results are shown in Table 10.

The descriptions are qualitative and use general terms such as 'small', 'medium', 'less sprouting', 'good size', 'good shape' and 'good looking'. However, some groups recommended grades that were suited for high-quality (e.g. supermarkets) and lesser quality (e.g. roadside) markets. Some quantifying was expected, but this didn't appear in the descriptions received. To receive more precise descriptions, there is a need to investigate Pidgin translations for some groups that are illiterate in English, although translation can introduce a number of problems in interpretation. In addition, descriptions may be hampered by a lack of exposure to markets, especially higher quality markets, such as those found in Port Moresby or Lae.

Our target personnel in the training session were farmer-marketers who have exposure to high-quality markets, so it may be more appropriate in future that we target solely those people rather than having a mixture of subsistence farmers and supply-chain leaders as we did in the training session. FPDA and the supply-chain leaders would be in a better position to train the subsistence farmers on the requirements of the higher quality markets. From a

Table 10. Descriptions of sweetpotato grades and quality standards put forward by workshop participants

Grade	Descriptions
Unmarketable	small, some broken due to harvest, disease, not sold, used for pig feed
	small, some broken, rots
	small, some broken, rots
	small size, damage made by digging sticks, rots, growth cracks, twisted, rat bites, large breaks on ends
	damaged and broken during harvest, broken during packing, bruised, rots
Grade 1	good shape, good size, no disease, no scratches, excellent condition, suited to supermarket
	good shape, good colour, good size, large
	no rots, no damage, no cuts, medium size
	elongated shape, skin colour deep pink, suitable for distant market
	about the same size and shape, same colour of skin, no bruises, good looking
Grade 2	different shapes, minor scratches from digging sticks, suited to local market
	medium size, some of good size with different shapes, some broken
	less sprouting, medium and large
	smaller size than grade 1, different shapes, suited to roadside market
	round shapes
Grade 3	small, scratches, good appearance, suited to home consumption or roadside market
	small, broken roots from digging sticks, skinning, not good shape

farmer perspective, a marketable sweetpotato is one that can be sold, even if a rotten sweetpotato must be hidden within a bag or heap in order for it to be sold. This is an issue that we must continue to raise with farmers, as it undermines any quality system. When participants sorted the supplied sweetpotato to determine marketability, the participants were able to decide that about 41%, on average, of the sweetpotato in a sample were unmarketable (Table 11). This is interesting, because the bags would have been sent to the market by people similar to themselves, reinforcing the view that the farmers recognise poor quality (unmarketable or unsuitable for humans), but are comfortable packing such unmarketable product.

Even in open markets at Port Moresby, poor quality (very small, broken, split or diseased) roots will be collected into distinct heaps, or distributed among otherwise heaps of 'good' sweetpotato, and sold. Consumers are accustomed to throwing out a portion of what they buy to domestic pigs or compost, and PNG and Australian consumers have a different attitude to this practice of hiding 'bad' among the 'good'.

One group decided that there were no sweetpotato that fitted into a grade 3. The above data refer to numbers of sweetpotato rather than weight, as we did not have sufficient balances available for each group and weighing would have taken extra time. The sweetpotato were of very uneven size, with a preponderance of medium-to-small sweetpotato, which may relate to the amount paid per bag at the market. It is noticeable that purchase from the market for research has been of budget-priced bags, and we may inadvertently undertake research on low-quality sweetpotato if we are not vigilant during product purchase.

We attempted to quantify the grades by getting groups to randomly select 10 sweetpotato from each grade and measure the length and maximum width of each, plus weigh the 10 sweetpotato combined. The results appear in Table 12.

Table 11. Proportions (%) of sweetpotato arranged into grades by workshop participants

Grade	Mean	Standard deviation	Range
Grade 1	18.9	12.5	12–41
Grade 2	13.7	3.9	8–18
Grade 3	26.7	28.1	0–67
Unmarketable	40.7	27.3	2–75

Smallholder farmers learn how to grade sweetpotato for high-quality markets at an ACIAR postharvest workshop in Mt Hagen, PNG. (Photo: Andrew Watson)

As shown in Table 12, the grades could not be separated by length or width. The grades were separated on the basis of weight (t-test, $P < 0.05$), so participants must have integrated length and width to determine the grade for each sweetpotato. This is interesting too, as the earlier discussed definitions of 'good size' or 'medium size' seem not to relate very well to linear dimensions. This could be due, in part, to the 10 selected sweetpotato not being characteristic of the heap, but it is consistent with one other observation on an earlier trip when farmers made up grades that, to the eye, looked identical. It is not clear yet how theory and practice are reconciled over sorting and grading at this point. We may need to determine the linear relationships between the variables of length, maximum width and weight for a number of varieties, and possibly farms, so we can work out empirically how the grades are determined. Alternatively, we may need to discuss the construction of a physical model or scale for farmers to measure lengths and ensure some uniformity within grades.

When personal preferences were examined, out of 19 responses received (not all participants fully completed the survey form), 79% of them scored grade 1 as their first preference, 63% scored grade 2 as their second preference, and 73% grade 3 as their third preference. Surprisingly, 5 of the 19 (26%) scored their second preference to be grade 3, possibly suggesting they prefer lighter sweetpotato over the medium weight sweetpotato. The prices that participants were prepared to pay for each grade are presented in Table 13.

Although it was clear that grade 1 was of a higher quality and worth more to most respondents, the range was very high, covering prices paid for 'lower grade' roots. Also of interest is that the mixed heaps (using sweetpotato from all grades that would be typical of a roadside market) commanded a similar price to that of straight grade 2 roots. Thus the differential in price between grade 1 and a traditional mixed size heap that participants were prepared to pay was about PNG kina (K)4.0, between grade 2 and the traditional was K0.3, and between grade 3 and the traditional was K0.1 lower. This is a small sample, and although they are individual preferences, not group preferences, it may reflect collusion among less literate farmers, and a lack of understanding of sweetpotato worth in higher quality markets.

Finally, individuals were asked about the varieties for which they would pay more (using Korowest as the standard) and for which they would pay less. Of the participants who responded, 94% (15/16) stated they would pay more for Wahgi Besta, and 2 of those respondents included Wanmun. Kerot was not liked as much as Korowest by 60% of responding participants (9/15), Trimun by 33% (5/15), and Rachael by 20% (3/15). The universal appreciation for Wahgi Besta could have been emphasised by the preponderance of attendees from Jiwaka province, where Wahgi Besta is most widely grown.

Table 12. Measurement of 10 sweetpotato taken from each grade established by workshop participants

Grade	Mean length (cm)	Length SD[a] (cm)	Mean width (cm)	Width SD[a] (cm)	Mean weight (g)	Weight SD[a] (g)
1	13.7	3.9	5.3	1.5	256	71
2	13.5	1.6	4.8	1.1	180	63
3	12.3	0.7	4.3	0.9	148	44

[a] SD = standard deviation

Table 13. Prices (PNG kina/heap) that workshop participants were prepared to pay for different grades

Grade	Mean	Standard deviation	Range
Grade 1	6.4	3.6	2–14
Grade 2	2.7	1.7	1–6
Grade 3	2.3	1.7	0.5–5
Mixed	2.4	2.2	0.5–9.5

Lessons learned

- It is imperative to discuss and trial potential interventions with stakeholders rather than attempting to implement interventions based on researchers' technical knowledge. When the cultural and political factors are considered within a participatory framework, it can considerably slow progress. This may be what it takes to introduce a sustained change for the better.
- The training workshop on proper postharvest practices and handling was well received by participants, especially women farmers. As most production, harvest and postharvest activities are done by women, it is imperative to include women in future training workshops and the dissemination of extension material.
- Both the marketability and quality, and impact pathway, exercises are useful in terms of detecting the level of understanding and interest in improving quality and reducing postharvest losses, relative to issues of production. In addition, it is quite clear that the participants have the entrenched idea that whatever the problem is, it is always someone else, not themselves, who must do something about it.
- It will take more than one workshop to change attitudes or impart knowledge or a new way of thinking. More time and more resources are also required on the ground for real change to occur, and for scaling up. This means we may need to identify and work with more local partners, in addition to FPDA and Voice for Change, who can work closely with farmers to facilitate change. The unresolved issue remains: where do you draw a line between action research and development?

Acknowledgments

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Appendix Marketability and grading trial activity sheets

MY PREFERENCES SHEET

Date:	Team member 1 of 4
Supply Chain Leader:	

Protocol step(s)	Grade	Grade you prefer (circle choice where 1=best, 3=least)	Price willing to pay per heap (K)	Price differential (K)
12+15	grade 1	1 2 3		
12+15	grade 2	1 2 3		
12+15	grade 3	1 2 3		
15	Traditional mixed	1 2 3		
16	pay more (circle choices or add your own)	| Wunmun | Trimun | Wahgi Besta | Kerot | Rachael | Korowest		
	pay less	| Wunmun | Trimun | Wahgi Besta | Kerot | Rachael |		

SUPPLY CHAIN SHEET

Date:	Location of this assessment:	Location of producing farm:
Supply Chain Leader:	Step in supply chain (circle appropriate step):	| farmer supplier | supply chain leader | transporter | hotel buyer | kai bar buyer | school buyer | | supermarket buyer | LNG buyer | mining buyer |

Protocol step(s)	**Grade**	**Number of roots**	**Total weight (kg)**	**Descriptors used (i.e. what made you decide to put kaukau in each grade?)**
6+7	unmarketable			
9+10+11	grade 1			
9+10+11	grade 2			
9+10+11	grade 3			

DIMENSIONS SHEET

Date:	Harvest date:
Supply Chain Leader:	Variety:

Grade	Root number	Length (cm)	Max width (cm)	Weight (g)
1	1			
1	2			
1	3			
1	4			
1	5			
1	6			
1	7			
1	8			
1	9			
1	10			
Mean				
2	1			
2	2			
2	3			
2	4			
2	5			
2	6			
2	7			
2	8			
2	9			
2	10			
Mean				
3	1			
3	2			
3	3			
3	4			
3	5			
3	6			
3	7			
3	8			
3	9			
3	10			
Mean				

Comparing training preferences by gender in Central Province, Papua New Guinea

Gomathy Palaniappan[1], Barbara Chambers[2,*], Laurie Bonney[3] and Colin Birch[1]

Abstract

This paper presents the similarities and differences in the training needs of men and women farmers involved in horticulture, from case study villages in PNG's Central Province. It seemed there could be differences in training needs and priorities among men and women, given the observed gendered differences in horticultural tasks traditionally undertaken in this province. Typically, men are involved with soil preparation and planting, while both men and women are involved with irrigation and crop management. Women are substantially involved in production, and many are also engaged in the marketing of fresh produce, particularly in the local informal markets.

From interviews conducted in early 2011, we hypothesised there could be differences in training priorities among younger and older people as well as between women and men. To test this, we conducted separate mother/daughter and father/son workshops, using collaborative problem solving to identify and prioritise training needs. The results demonstrated that the training priorities of older women from Rigo-Koiari village are of a higher order than those from Bautama village, where basic horticultural and crop-management training was paramount. Older and younger women from Rigo-Koiari had different training priorities, as did older and younger men from Bautama. However, there was no difference in training priorities among the older men from Bautama, Rigo-Koiari and Sogeri villages. A companion paper in these proceedings (Seta-Waken et al. 2013) examines the subsequent training conducted for women smallholders, which was informed by the needs identified in this paper.

Introduction

Papua New Guinean society is not yet industrialised, with 82% of citizens engaging in agriculture for their livelihood. Most of these people obtain a large proportion of their domestic food requirements from the use of customary land, which is held by the community or village rather than individuals—the notion of land as a tradeable commodity is largely absent from PNG society. As the society of PNG is generally patrilineal, women are placed in an inferior position in decision-making, particularly with regard to money, effectively promoting male dominance.

Customary land tenure is concerned with networks of kin and the obligations of clan and community. As long as society is constructed within the framework of kinship, external interventions must maintain the balance of men's and women's roles in the household and in resource management (Gustafsson 2004). In addition, it is estimated that, in PNG, women contribute 75–80% of their income to the family compared with 25–30% by men (Mason and King 2001; Garap 2004). Women are substantially involved in food production, and many are also engaged in the marketing of fresh produce, particularly in the local

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informal markets. They face considerable operational and social constraints, with a lack of appropriate transport and other facilities, as well as harassment and bullying in the marketplace, and have difficulty in retaining sufficient income for family purposes (Spriggs and Chambers 2007).

Australian Centre for International Agricultural Research (ACIAR) Project SMCN/2008/008 (*Increasing vegetable production in Central Province, Papua New Guinea, to supply Port Moresby markets*) commenced in 2009. The project aimed to improve vegetable production through conducting field experiments with selected vegetables and by jointly establishing value chains to meet consumer needs. One aspect was to improve vegetable production in Central Province by actively engaging all actors of the society—men, women and youth. In order to do this and to ascertain their respective training needs, separate mother/daughter and father/son workshops were organised, as discussed here. A companion paper in these proceedings (Seta-Waken et al. 2013) describes the nature and impact of the subsequent training on vegetable production for women smallholder farmers conducted on the basis of the needs identified by this research.

Methodology

Background

Collaborative problem-solving methodology (CPSM) draws on understandings of groups of individuals to resolve an issue where an obvious solution does not exist. CPSM as a workshop method was first developed by Chambers, Spriggs and Kayrooz from the Australian Institute for Sustainable Communities at the University of Canberra, derived from the processes of value management, used extensively by engineers for determining stakeholder responses to proposed structural and institutional change (Spriggs and Chambers 2004; Kayrooz et al. 2006). The major elements of CPSM are a shared conception of the problem and a shared understanding of the solution. Workshops using CPSM are typically designed in two parts: the first provides relevant information, checks for assumptions, states what is given about the situation and facilitates divergent thinking, i.e. brainstorming issues and coming up with creative ideas; the second encourages convergent thinking, where judgments are made about possible ideas and solutions proposed, often as part of an action plan. This methodology was chosen as the framework for conducting smallholder women's and men's 2-day workshops, wherein we sought to ascertain separately their needs for training to support improvement in vegetable production, as an obvious solution (i.e. a package of training relevant to both) did not exist.

CPSM allowed for a shared conception of the problem among men and women smallholder farmers in their respective workshops, together with staff from research and advisory stakeholders, namely the Fresh Produce Development Agency, the National Agricultural Research Institute, the Pacific Advent University and an Australian research team from the Tasmanian Institute of Agriculture and the University of Canberra. The challenge of CPSM is that it demands effective communication skills. This is often done in developing countries by working in cross-sectoral groups along the value chain, thereby sharing issues in common and solutions that might work for the various actors; e.g. in a typical value chain, farmers, wholesalers, transport workers, supermarket managers and so forth would be represented. However, in the context of this project, although the focus was on the horticultural value chain, only smallholders were selected because it was about their training needs. Additionally, small-group work was based on place (i.e. in this case, on a village or clan) because that is very relevant to PNG culture and society and therefore context was essential (OECD 2010), as were appropriate media for eliciting training needs and priorities.

Process

Workshop participants were selected using the following criteria:

- had previously undertaken training of some kind
- was actively involved in horticulture and/or keen to develop their production
- was a member of a women's or men's agricultural organisation or association
- had a commitment to sharing their learning with others
- contained a mix of ages, i.e. mothers and daughters/daughters-in-law and fathers and sons/sons-in-law.

The women's (mother/daughter) training needs and analysis workshop was conducted in September 2011 with 29 participants from two Central Province villages—Rigo-Koiari and Bautama. A year later, in September 2012, the men's (father/son) workshop was conducted with 21 participants from three

Central Province villages—Rigo-Koiari, Bautama and Sogeri. Both workshops were conducted at the same venue (Pacific Adventist University) and a similar methodology of collaborative problem solving was used to identify training needs.

The low level of literacy meant that the smallholders were not necessarily able to communicate effectively in writing among themselves or with staff of the research and advisory stakeholders. This challenge was overcome by using a pictorial method of assessment to gain information in low-literacy and cross-cultural settings (Catalani and Minkler 2010; Keremane and McKay 2011). Posters were used to identify training needs for categories of horticultural production activities (soil preparation, planting, irrigation and crop management), marketing activities (harvesting, packaging and marketing) and business activities (banking, bookkeeping and transport) during the divergent phase, which was held on the first day of the workshop.

Women and men were initially asked to sit in small groups, with others from the same village. In the women's workshop, the 29 participants were seated in 4 small groups (3 groups representing Rigo-Koiari and 1 group representing Bautama). In the men's workshop, the 21 participants were seated in 4 small groups (2 groups representing Rigo-Koiari, 1 group representing Sogeri and 1 group representing Bautama).

The convergence activity was undertaken on the second day so that the participants representing different villages were more comfortable to exchange views and communicate freely and willing to sit as groups, irrespective of whether or not they belonged to the same village. After identifying 'very difficult', 'quite difficult' and 'easy' tasks on the first day, on the second day, participants were asked to form subgroups based on their age as 'older' and 'younger' women/men and to prioritise their training needs, with stars indicating first, second and third priorities.

Results and discussion

Training needs were identified through small-group discussions based on the pictorial representation of different stages of the value chain, including categories of horticultural production, marketing and business. Activities in each picture were clarified and gender roles and responsibilities identified. Table 1 presents the similarities and differences in training needs identified by women and men.

Overall, similarities and differences in training needs between men and women for all categories of activities were attributable to the respective established roles of men and women in undertaking the various tasks involved.

Training needs for horticultural production activities

Soil preparation

All men's groups agreed that soil preparation was a 'very difficult' task, which contrasted with the women's response that it was 'easy'. The difference in ranking is attributable to the respective established roles of men and women in agricultural tasks. As discussed in small groups during the rating of training needs, women said that soil preparation was the role of men, so women did not classify the task as difficult. The majority of the men also mentioned that they are in need of good ploughing equipment to prepare the land.

Planting

Planting was considered an 'easy' task by women for the same reasons as for soil preparation, but men considered it 'quite difficult'. They related their experience before, during and after the physical activity of placing seeds in the soil. For instance, some had bought eggplant seeds that were labelled as pink eggplant, but only some plants yielded pink fruit while many others yielded white fruit, which were unmarketable. Some also asserted that seeds were very expensive and decided to save the seeds after harvest and tried planting these for their next crop. The saved seeds did not do well, as the parent plants were hybrids, meaning the next generation of seeds was either non-viable or produced very uneven stands with poor yield. Consequently, the group emphasised that they preferred crop varieties that can be regenerated by retaining seed from their fields.

Irrigation

Both women and men agreed that irrigation was a 'very difficult' task. The main difficulty was that they had to carry water in cans to their gardens. The level of difficulty reported related to the distance from the river to their garden, as well as the size of the area they had to water. Men stated that they had to carry 20-litre water cans and found this a significant burden.

Table 1. Similarities and differences in training needs among women and men smallholders, where shaded cells represent marked differences in perception by gender

Task	Ease of task		Gender difference in training needs?	Task allocation
	Women	Men		
Horticultural production activities				
Soil preparation	Easy	Very difficult	Yes	Men
Planting	Easy	Quite difficult	Yes	Men
Irrigation	Very difficult	Very difficult	No	Men and women
Crop management	Quite difficult to very difficult	Very difficult	Slight	Men and women
Marketing activities				
Harvesting	Easy to quite difficult	Easy	Slight	Women
Packaging	Easy to quite difficult	Easy to quite difficult	No	Men and women
Marketing	Quite difficult to very difficult	Quite difficult	Slight	Men and women
Business activities				
Banking	Easy	Easy	No	Men and women
Bookkeeping	Easy	Quite difficult to very difficult	Yes	Men and women
Transport	Very difficult	Quite difficult to very difficult	Slight	Men and women

Crop management

All men's village-based groups agreed that crop management was a 'very difficult' task, which is similar to the women's response, although some women rated it as only 'quite difficult'. Although women mentioned that men had attended training on crop-management practices, such as how to apply chemicals, the majority of the men still considered it very problematic.

Outcome for potential training activities

Training on soil preparation and planting may be more important for men than women, as these are tasks allocated to them which they find difficult. Tasks that were perceived as very difficult and were the responsibility of both men and women, such as irrigation and crop-management techniques, were topics of interest to both genders that could be considered for joint training.

Training needs for marketing activities

Traditionally, men in Central Province undertake marketing involving transportation, but in the case of a cooperative like Rigo-Koiari, women are involved in local markets and are keen to become involved in marketing to supermarkets and hotels in Port Moresby.

Harvesting

Harvesting was considered as an 'easy' task by the majority of the men's village-based groups. In the women's groups, two groups considered it 'easy' (agreeing with the men's group) and two groups considered it 'quite difficult'. The groups that considered the task quite difficult lacked experience in growing some crops and did not know when to harvest to meet consumer preference.

Packaging

Packaging was considered to be a 'quite difficult' to 'easy' task by both men and women. Some women considered it difficult to choose appropriate packaging for vegetables with very different requirements, like capsicum and bok choy. They also found it hard to maintain quality of produce in cases where it is a long distance from the field to the transport site. For the men who considered the task easy, reasons included that they had some resources to deal with their difficulties, such as their own vehicles for transport or weaving cane baskets to improve packaging.

Marketing

Marketing was considered a 'quite difficult' task by both men and women, but some women found it 'very difficult'. The opportunistic behaviour of men and women whereby they take a small volume of produce to the open market does not guarantee them a good price. The men's groups supplying to supermarkets stated that they are working to meet the supermarket demand in spite of the horticultural production limitations mentioned above. The women's groups stated that the reason for marketing being very difficult was that it was hard to find a space to sell their produce as the market is dominated by highlanders. One of the women's groups also mentioned that they had no say on the price of their produce as it was graded by the middlemen at the market and the price was fixed.

Outcome for potential training activities

In relation to marketing activities, harvesting is attributable to women while packaging and marketing are attributable to both men and women. Thus, both genders need to be considered in value-chain building and packaging techniques.

Training needs for business activities

Banking

All men's and women's groups considered banking an 'easy' task. This was interesting as, when individual needs were prioritised, older and younger women and younger men of Bautama voted banking as their second priority for training. During small village-based group discussions, it was understood that women from Rigo-Koiari had attended training and were actively involved in the PNG Women in Agriculture Development Foundation.

Bookkeeping

Three women's groups reported they'd had prior training in bookkeeping, while the fourth group had not. Through CPSM, a solution was derived through communication and consensus. The women's groups that had received training agreed to deliver training to those women who did not have the opportunity to attend training on bookkeeping and so the task was categorised as an 'easy' task. The men's groups reported that bookkeeping was 'quite difficult' to 'very difficult' as they did not have the knowledge on bookkeeping and also referred to a lack of time to maintain records.

Transport

All men's groups agreed that transport was a difficult task (two groups considered it as 'very difficult' and two groups as 'quite difficult'), which was similar to the women's response where all groups agreed that transport was a 'very difficult' task. Men agreed that they did not have reliable transport and had to depend on public motor vehicles (PMVs). If the PMVs arrived late, then they got to the market very late and they had to pay PNG kina (K)5–10 to keep their produce secured in the market—this additional cost being a drain on the value of their crops.

Outcome for potential training activities

Concerns about business activities like banking, bookkeeping and transport were held by both women and men. This confirms that both genders need to be considered in delivering business-management training, though some specific tailoring of training to needs of men and women may be needed in each village.

Training needs priorities by age and gender

Convergent thinking is where judgments are made about possible ideas and solutions proposed, often as part of an action plan. After identifying 'very difficult', 'quite difficult' and 'easy' tasks on the first day of the workshops, on the second day, women and men participants in their respective workshops were asked to form subgroups based on their age as 'older' and 'younger' to prioritise training needs, with stars indicating first, second and third priorities for each individual, which were then tallied to give the final group priorities. Table 2 presents the results of those exercises.

The older women of Bautama village ranked crop management as their highest training need, followed by banking, irrigation and planting. The younger women of Bautama showed similar preferences and ranking of training needs, but included marketing rather than irrigation in their top four.

The older women of Rigo-Koiari village identified their highest ranking as bookkeeping, followed by harvesting, soil preparation and crop management (ranked equal third), irrigation, marketing and packaging. Younger women put their highest emphasis on soil preparation, crop management and irrigation and were therefore quite different from their older mothers in prioritising compared with Bautama women. It transpired that some older women had received training in soil preparation, packaging, irrigation and

marketing, but the younger women were not aware of this, and vice-versa for banking, harvesting and marketing training for youth. The point was made about the importance of sharing the knowledge in the community between older and younger women.

In the men's workshop, both the older and younger groups nominated bookkeeping, transport, soil preparation and crop management in their top-ranked training priorities. However, the young men identified banking as their first priority, as well as including planting in their list, neither of which were identified by the older men.

In terms of improving transport, it was pointed out to the men's groups that our project could not improve roads or transport per se and, after further discussion, it transpired that the groups were asking for skills enabling them to lobby local, provincial and national authorities. Skills identified for the Rigo-Koiari/Sogeri group were submission writing, negotiation skills and cooperative management.

The villages were quite different in terms of their priority training needs for both older and younger women. It appears that the training needs at Rigo-Koiari are at a more advanced level than those at Bautama, where basic horticultural and crop management needs are of priority. However, there was no difference among the older men from Bautama and Rigo-Koiari /Sogeri in their training priorities.

Table 2. Training priorities of workshop participants separated by age into 'younger' and 'older' groups, by village

Workshop group	Training priorities (where '1' is highest ranking)	
Older women from:	Bautama	Rigo-Koiari
	Crop management (1) Banking (2) Irrigation (3) Planting (4)	Bookkeeping (1) Harvesting (2) Soil preparation, crop management (= 3) Irrigation (4) Marketing (5) Packaging (6)
Younger women from:	Bautama	Rigo-Koiari
	Crop management (1) Banking (2) Planting, marketing (= 3)	Soil preparation, crop management, irrigation (= 1) Bookkeeping (2) Harvesting (3) Packaging (4) Banking (5) Marketing (6)
Older men from:	Bautama	Rigo-Koiari & Sogeri
	Soil preparation (1) Bookkeeping (2) Transport (3) Crop management (4)	Soil preparation (1) Bookkeeping (2) Transport (3) Crop management (4)
Younger men:	Majority of participants were from Bautama	
	Banking (1) Crop management (2) Bookkeeping (3) Transport (4) Soil preparation (5) Planting (6)	

Conclusion

This paper highlights the similarities and differences in horticultural practices undertaken by men and women farmers in Central Province, PNG. While horticultural roles in the value chain are often traditionally based on gender and women or men may therefore have rated a task as easy or difficult because they didn't have to do it, this should not imply that training should reflect only such gendered practices. Our results demonstrate that horticultural production activities like soil preparation and planting are undertaken by men, and irrigation and crop management are undertaken by both men and women. This suggests that irrigation and crop-management techniques that might suit both genders need to be considered during gender-inclusive training. In regards to marketing activities, it was evident that harvesting is done mostly by women, whereas packaging and marketing are the responsibility of both men and women. Business activities, such as banking, bookkeeping and transport, are also undertaken by both women and men. While there are differences, especially between villages, the results confirm that both genders need to be considered in value-chain building, packaging techniques and business-management training.

The priorities for training show significant differences between older women and men compared with younger people. Youth priorities also need to be catered for in training. Our results demonstrate that the training priorities at Rigo-Koiari are more advanced than those at Bautama, where basic horticultural and crop management was the priority in the women's workshop, but there were no differences amongst the older men from Bautama and Rigo-Koiari/Sogeri in their training priorities.

Further workshops of the type described here will be conducted for smallholders at Tapini—another Central Province village. Results from Tapini will be compared with training needs and priorities of Rigo-Koiari and Bautama smallholders, and whether or not there is any apparent difference between older and younger people and between men and women will be assessed. It will be argued in a subsequent paper that place-based training needs, determined and prioritised by the people themselves, will benefit adoption of improved horticultural practices more than generic horticultural training which does not appear to target the differing needs and priorities of men, women and young people.

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Impact of training on horticultural practice adoption by women smallholders in Central Province, Papua New Guinea

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Abstract

Subsistence food production is the most important part of PNG agriculture, providing most of the food consumed in the country, with an estimated 83% of food energy and 76% of protein. Women play a crucial role in agricultural development, including main crop production, livestock production, horticulture, postharvest operations and fishing. Women in the horticulture industry in Central Province are no exception. Hence, in an attempt to increase the supply of vegetables into the Port Moresby markets to meet the increasing demands for these crops, women in the horticulture industry should be equipped with the knowledge and skills required to contribute to the increased production required. In line with this, the objectives of this research were to: (1) identify the training needs of women farmers in the horticulture industry at the village level in Central Province through a needs-analysis workshop; (2) determine the adoption and implementation of techniques presented during training; and (3) obtain feedback from women farmers in regards to the suitability of the training delivered. The main training needs were identified as farm production (crop management and irrigation), marketing (product readiness and price negotiation) and business skills (banking and bookkeeping). Post-training evaluation using survey questionnaires, interviews and focus-group discussions showed that the training was effective in improving their basic business skills, farm production skills and knowledge, as well as increasing marketing opportunities. A companion paper in these proceedings (Palaniappan et al. 2013) describes how these training needs were earlier identified in separate mother/daughter and father/son training needs–analysis workshops.

Introduction

The National Agricultural Research Institute (NARI) has been collaborating with the Tasmanian Institute of Agriculture, University of Tasmania, and the Australian Institute for Sustainable Communities, University of Canberra, on Australian Centre for International Agricultural Research (ACIAR) Project SMCN/2008/008 (*Increasing vegetable production in Central Province, Papua New Guinea, to supply Port Moresby markets*). Local partners include the Fresh Produce Development Agency, Pacific Adventist University, Green Fresh and the Central Provincial Government of PNG. One of the project's objectives is to establish more efficient, effective and sustainable vegetable value chains in order to provide improved economic returns expressed as profitability and household income security for chain participants.

Apart from scientific and capacity impact, social impact is also a major focus of this project. In order to enhance urban/regional equity and mitigate some of

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the gender inequities in the production and marketing of vegetables, the project has provided knowledge, skills and opportunities for smallholder families and an enhanced role for women in vegetable production and marketing. In addition, the development of more-sustainable farm businesses with improved educational and occupational opportunities should improve the retention of young people in productive and profitable rural communities. With respect to horticultural training, it is posited that extension methods are often based on post-industrial methods deriving from the expert–novice model. Often, new technologies are introduced in large meetings based on talk rather than even 'show and tell'. There is little or no follow-up in the field by village extension workers to assist implementation and adoption of new knowledge, skills and attitudes (Kayrooz et al. 2006; Palaniappan et al. 2011) nor is there an appreciation of gendered traditional roles affecting how smallholder farming is conducted (Kretzmann and McKnight 1993; Leach et al. 2008).

In February 2011, group interviews were carried out with men and women in the villages of Rigo-Koiari and Bautama in Central Province, PNG, to determine what crops they produced. Villagers spoke about their crops, what they were proud of, and what they hoped to do in the future. One of the implications of the group interviews was a realisation that separate horticultural, business and market training for women and girls, and men and boys, was needed to achieve expressed dreams. Before this training could occur, it was decided that a mother/daughter workshop first be held in September 2011, trialling pictorial training-needs assessment. The reasoning behind the development of a pictorial format was the low level of literacy, especially among women, and that, if a traditional pen-and-paper test was used, it would be time-consuming and labour-intensive because of the need to use *TokPisin* or *Motu* translators in the field. A workshop framework called collaborative problem-solving methodology (CPSM) was applied that had been used previously in the highlands of PNG, Cambodia and Vietnam and shown to be particularly robust across cultural groups and in multicultural groups. Criteria were developed to guide the selection of women, including a range of ages and willingness to share training with other women (and men). The outcome was 29 women from the villages of Rigo-Koiari and Bautama attending a 2-day consultative workshop. Following that workshop, an action committee, comprising project partners in consultation with a steering committee comprising women leaders of the Rigo-Koiari and Bautama women's groups, got together to plan the training and logistics. The horticultural training was conducted in May 2012 according to the women's horticultural training priorities as identified in the workshop. Participants of the training were women vegetable smallholder farmers from Rigo-Koiari and Bautama.

Materials and methods

Needs-analysis workshop

Women's training needs were identified as part of a broader needs analysis for villages in the area at the mother/daughter workshop (see Palaniappan et al. 2013) using CPSM. This methodology is based on a 2-day workshop using *divergent* and *convergent* thinking activities (Spriggs and Chambers 2005, 2008). On the first day, participants were asked to say why they came to the workshop and what their expectations were. They were then presented with cards showing pictures of major horticultural tasks along the value chain, which were identified during previous visits to the women's villages, as well as pictures of activities related to business that may have been mentioned but were not portrayed, e.g. applying for microcredit, opening a bank account and drawing up a seasonal calendar and/or business plan. Participants sat together in a circle of up to five members from the same village with a facilitator and with photo-cards scattered in the middle. The facilitator explained to the participants that the cards were meant to depict women performing different tasks. The participants discussed the cards, explaining to each other and to the facilitator what the different tasks were showing.

The facilitator then asked the participants to divide the cards into three groups: (1) tasks that were very difficult to perform; (2) tasks that were easy to perform; and (3) tasks that were in between difficult and easy (categorised as 'quite difficult'). The facilitator kept track of the discussion, noting when consensus was reached, or not easily reached, and also the minority opinions. Participants then turned their focus to the problematic tasks, discussing the obstacles and resources available to them for

overcoming impediments. After that, the facilitator asked if training was needed for the most difficult tasks, then posted pictures of the 'very difficult' and 'quite difficult' tasks onto butcher's paper so that other groups could see them and compare each other's results. The workshop facilitator recorded and compiled what the participants' training needs were. This ended the first day.

On the second day, participants had to make decisions or judgments about training priorities, which meant reflecting on the displayed pictures of 'very difficult' and 'quite difficult' tasks. Overwhelmingly, their training needs were identified as farm production (crop management and irrigation), marketing (product readiness and price negotiation) and business skills (banking and bookkeeping). A steering or communication group representing workshop participants was set up to monitor the action plan on training priorities. Only the horticultural production aspects of the training are analysed in this study.

Pre-tests, post-tests and post-post-tests

Based on the training priorities identified in the workshop, training was conducted in May 2012. Information about horticultural practices was collected before and after the training session from the 28 female farmers who attended from two different areas of Central Province: Rigo-Koiari and Bautama villages. Survey data were supplemented by observations, focus-group discussions and interviews.

In March 2013, a longitudinal 'post-post-test' was carried out to determine participants' perceptions of the adoption of training knowledge, skills and attitudes. At the same time, staff from NARI observed horticultural practices in each village to see if training had been implemented. Evaluation of training effects over time has not been evident in the literature on the training of women smallholders in PNG, especially a period as long as 10 months after training. Yet, such an evaluation is essential to improving and reframing ways to enhance the smallholder business acumen of both women and men (Pamphilon and Hardy 2006).

Data analysis

Data from the 28 participants were entered and tabulated into Excel spreadsheets, then analysed by tallying.

Results

Influence of training on soil-management practices

Before any training on soil management was given to the farmers, we wanted to find out what knowledge they had about soil management and the methods they currently used to manage soil. The responses (Table 1) indicated that mulching with dry banana stems and maize leaf was the most common practice among the farmers, followed by other techniques that included slash and burn, and fallowing. Applying organic composts such as food peelings was identified as the third most used soil management practice among the farmers. Most of these methods of soil management were learnt from the farmers' parents and formal training from agricultural extension officers. When further asked if they were able to follow these methods taught to them by their parents, all farmers responded positively.

After the training, the post-test was conducted to find out if the participants had learnt anything new. All participants agreed to having learnt new methods of soil management (Table 2). These new methods included mulching, crop rotation, drainage, green manuring and crop cover. Fallowing and using fertilisers were the least mentioned, as these were practices already familiar to the farmers. All the farmers stated that the new methods were learnt by attending the training, while two also learnt them from their parents. When asked if they were able to follow the new methods, all but one responded positively, but the majority (71%) admitted to seeing challenges in following the methods. The biggest challenges identified were finance/funding for implements needed to try out the new methods (95%) and lack of support from family, relatives or friends (45%).

Influence of training on irrigation practices

Before training, common methods reported for irrigating gardens (Table 3) were carrying buckets, containers or drums of water (57%); other farmers said they used water pumps as a source of water for their crops. In contrast, there were also farmers who did not irrigate their food gardens at all, but rather depended on rain. Most of the farmers stated that the knowledge and methods of irrigation currently used were learnt from their parents (71%). Others were

taught by agricultural extension officers (21%) and/or by relatives and friends (14%). When farmers were asked if they knew of other methods, 57% responded positively, with 50% of them knowing about using other irrigations systems.

After the topic of irrigation was taught to the women farmers, they were asked if they had learnt any new methods of irrigation.They all responded positively and said this new knowledge was learnt through attending the training (Table 4). In all, 68% stated that they were able to follow new methods, while 32% said they couldn't. The majority (86%) said there were challenges in following the new methods. The challenges were identified as finance/funding for the purchase of irrigation materials and equipment (71%), the negative attitude of the community in trying out new irrigation methods (25%) and bad road infrastructure (25%).

Influence of training on weed-, pest- and disease-management practices

Most farmers (89%) stated that the main plants that compete in the crop gardens are weeds, such as nut grass, kunai grass and others (Table 5). All farmers use hand weeding to manage them. Insect pests that damage crops in the gardens, as observed by the farmers, were mainly a combination of lady-bugs, caterpillars (green/brown /black), grasshoppers and beetles.To manage insect pests, 25% of the farmers tended to scout and manually pick off the insects, while 57% used that technique together with applying pesticides. Diseases in the gardens were: white spots, rotting before ripening, stunted plants and black spots (observed by 79% of participants). Plants changing colour (46%) was next, followed by plants dying from wilting (39%). Practices used to

Table 1. Soil-management knowledge before training

Pre-test survey responses	Number of responses	Proportion of total respondents (%)
1. Methods used to manage soil in the gardens are:		(*n* = 28)
a) Mulching with dry banana stems, maize leaf etc.	18	64
b) Applying organic composts	7	25
c) Weeding	0	0
d) Applying fertilisers	1	4
e) Other: slash and burn/fallowing	16	57
2. The methods of soil management were learnt through:		(*n* = 28)
a) Parents	23	82
b) Relatives/friends	4	14
c) Formal training from agricultural extension officers	8	29
d) Other: read posters	1	4
3. Are you able to follow these methods?		(*n* = 28)
a) Yes	28	100
b) No	0	0
4. Are there any other methods you know about soil management?		(*n* = 28)
a) Yes	24	86
b) No	4	14
4.1. If yes, the other methods of soil management known are:		(*n* = 20)
a) Slash and burn	3	15
b) Soil erosion-reduction techniques	1	5
c) Fallow/crop rotation	3	15
d) Other: drainage/applying food peelings	13	65

manage diseased crops in the gardens varied. Some women did nothing out of lack of knowledge (36%), some treated diseased crops by spraying fungicides/bactericides (25%), while 21% sterilised the soil and applied wood ash on infected crop areas. Finally, 18% of the farmers culled and destroyed disease-affected crops.

After the training on weed, pest and disease management, most farmers (75%) stated that apart from what they had observed in the gardens before training, they now know that there are also other weeds, pests and diseases that affect crops, comprising a combination of beneficial and harmful weeds, disease caused by bacteria and fungi, and sucking, chewing and cutting insects (Table 6). This knowledge was gained through the training (100%) and has since been observed by 61% of the farmers. All participants felt they were able to follow the methods taught in the training—including hand weeding, spraying appropriate chemicals for pests/diseases, culling diseased crops and using plant-derived pesticides.However, 96% of them said there would be challenges in following these methods, including: finance/funding for equipment, materials and consumables needed to try out the new methods; lack of support from family, relatives or friends in trying out new methods; and the negative attitude of the community in accepting new methods.

Table 2. Soil-management knowledge after training

Post-test survey responses	Number of responses	Proportion of total respondents (%)
1. Are there any new methods you know about soil management?		(*n* = 28)
a) Yes	28	100
b) No	0	0
2. New soil management methods learnt were:		(*n* = 28)
a) Fallowing	3	11
b) Green manuring/crop cover	12	43
c) Drainage	13	46
d) Crop rotation	13	46
e) Mulching	20	71
f) Applying fertiliser	2	7
3. These new soil management methods were learnt through:		(*n* = 28)
a) Parents	2	7
b) Relatives/friends	0	0
c) Attending this training	28	100
d) Other	0	0
4. Are you able to follow these methods?		(*n* = 28)
a) Yes	27	96
b) No	1	4
5. Are there any challenges in following these methods?		(*n* = 28)
a) Yes	20	71
b) No	8	29
5.1. If yes, the challenges are:		(*n* = 20)
a) Finance/funding for implements needed to try out the new method	19	95
b) Convincing family, relatives or friends in trying out new methods	3	15
c) Lack of support from family, relatives or friends	9	45
d) Other	0	0

Longer term impact of training

In the follow-up survey in March 2013 (Table 7), the majority of women had been able to apply their horticultural production and management training. However, in irrigation, 69% of women had not been able to apply new techniques. When asked why, most women said that newer techniques (such as drip irrigation) were too expensive and furrow irrigation could work only if you had ready access to water. However, one woman had borrowed money for a tank and pumps that she was starting to use for irrigation. In terms of impact on yield, quality and price, the majority of women (around 75%) said that their changed practices through training had improved these things, except that they had spent more money on their gardens where chemicals were used to control pests and diseases or improved irrigation technology was purchased.

Discussion

Adoption and implementation

The horticulture industry in Central Province is in its infancy. Farmers from that province who supply vegetables to the Port Moresby markets are smallholders. Women, in particular, play an important role in the production of these vegetables. Sobha (2001) emphasised that training and technology information had to be provided to farm women to improve their skills, level of decision-making and effective participation. All pre-test results on soil management, irrigation, and weed, pest and disease management clearly illustrated these women farmers had little knowledge of improved husbandry practices and they did not understand the importance and reasons behind their traditional vegetable husbandry practices. In contrast, the post-test results revealed that they had broadened

Table 3. Irrigation knowledge before training

Pre-test survey responses	Number of responses	Proportion of total respondents (%)
1. Methods used to irrigate the gardens are:		(*n* = 28)
a) Irrigation system	1	4
b) Carrying buckets, containers, drums etc.	16	57
c) Using water pump to pump water	7	25
d) Do not irrigate food crop garden	6	21
e) Other	0	0
2. The methods of irrigation were learnt through:		(*n* = 28)
a) Parents	20	71
b) Relatives/friends	4	14
c) Formal training from agricultural extension officers	6	21
d) Others	0	0
3. Are you able to follow these methods?		(*n* = 28)
a) Yes	28	100
b) No	0	0
4. Are there any other methods you know about irrigation?		(*n* = 28)
a) Yes	16	57
b) No	12	43
4.1. If yes, the other irrigation methods known are:		(*n* = 16)
a) Other irrigation systems	8	50
b) Water pump	5	31
c) All of the above	2	13
d) Other	1	6

their knowledge of new and improved practices. The follow-up post-post-test showed a considerable impact as these women farmers were able to adopt and implement these new skills and knowledge gained from the training. The horticultural training topics—soil management, irrigation, and weed, pest and disease management—were entirely based on what these women farmers identified as their training needs and priorities. All participants agreed that the training met their expectations. The women of the Rigo-Koiari area are now engaged in a contract with a supermarket chain in Port Moresby to which they supply vegetables weekly. Women from Bautama decided that their best way forward was to cooperate by pooling their gardens and rotating one of them for improved soil management and production. This strengthens Majhi and Patra's (1996) suggestion that a 'special training programme should be conducted to develop the scientific orientation, entrepreneurial abilities and working knowledge of farm women on agricultural activities'. Padmanabhan (2001) emphasised the need for empowerment of rural women in agriculture through effective training and extension services.

Lessons learnt from the training

This training brought together two women's groups with different means of livelihood. Rigo-Koiari women came from a well-established cooperative, while Bautama women were individual smallholders. Follow-up interviews have shown that most of the women appreciated the importance of these farming activities after learning the reasons behind them. Their practices are now reflective rather than unreflective (unthinking and traditional). Yet, the comprehension level of the participants in the training was

Table 4. Irrigation knowledge after training

Post-test survey responses	Number of responses	Proportion of total respondents (%)
1. Are there any new methods you know about irrigation?		(*n* = 28)
a) Yes	28	100
b) No	0	0
2. These new methods of irrigation were learnt through:		(*n* = 28)
a) Parents	0	0
b) Relatives/friends	0	0
c) Attending this training	28	100
d) Other	0	0
3. Are you able to follow these methods?		(*n* = 28)
a) Yes	19	68
b) No	9	32
4. Are there any challenges in following these methods?		(*n* = 28)
a) Yes	24	86
b) No	4	14
4.1. If yes, the challenges are:		(*n* = 24)
a) Finance/funding to purchase materials for irrigation	17	71
b) Attitude of community in trying out new methods	6	25
c) Road infrastructure	6	25
d) Lack of support from family, relatives or friends	2	8
4.2. There are no challenges because:		(*n* = 4)
a) Financially secure	0	0
b) Support from family, relatives or friends	4	100
c) Other	0	0

not the same for each and small group learning may be a better way to proceed in future, allowing for individual capacities. Open group discussions also proved to be helpful. This training has enhanced these farmers' skills and knowledge.

Moreover, vegetable husbandry is a very practical concept. Hence, in future horticultural training where crop management or vegetable husbandry practices are involved, follow-up observations of applied horticultural practice in the field and reinforcing knowledge and skills learned during training must be arranged and faithfully conducted by the trainers and extension workers.

Table 5. Weed, pest and disease knowledge before training

Pre-test survey responses	Number of responses	Proportion of total respondents (%) (n = 28)
1. The main plants that compete in the main crop gardens are weeds such as:		
a) Nut grass	1	4
b) Kunai grass	1	4
c) Elephant grass	2	7
d) Others, such as milkweed, mimosa etc.	0	0
e) All of the above	25	89
2. The management practices used to manage weeds in the gardens are:		
a) Hand weeding	28	100
b) Spraying with herbicides	0	0
c) Do nothing	0	0
3. The pests that damage crops in the gardens are:		
a) Ladybirds	2	7
b) Caterpillars (green/brown/black)	12	43
c) Grasshoppers (small/big)	3	11
d) Beetles	2	7
e) All of the above	13	46
f) Other: rats/birds	7	25
4. The practices used to manage insect pests in the gardens are:		
a) Picking them off by hand	7	25
b) Using pesticide	3	11
c) Do both (a) and (b)	16	57
d) Other: belief that weeding helps to keep the insect pests away	2	7
5. Diseases observed in the gardens are:		
a) Plants dying from wilting	11	39
b) Plants changing colour	13	46
c) Fruits ripening immaturely	2	7
d) Leaves curling	1	4
e) Other: white spots/rotting before ripening/stunted plants/black spots	22	79
6. The practices used to manage diseased crops in the gardens are:		
a) Does nothing, due to lack of knowledge on how to manage diseased crops	10	36
b) Culling and destroying of affected plants	5	18
c) Spraying of fungicides/bactericides	7	25
d) Other: sterilising soil before nursery/applying wood ashes on infected crop area	6	21

Table 6. Weed, pest and disease knowledge after training

Post-test survey responses	Number of responses	Proportion of total respondents (%)
1. Are there any other weeds/pests/diseases you now know affect your garden?		(*n* = 28)
a) Yes	21	75
b) No	7	25
2. Other weeds/pests/diseases that affect the crops in the gardens are:		(*n* = 21)
a) Beneficial/harmful weeds	2	7
b) Diseases caused by fungi/bacteria	3	11
c) Sucking/chewing/cutting insects	2	7
d) All of the above	17	61
3. I know that these weeds/pests/diseases affect the crops in the gardens through:		(*n* = 28)
a) Parents	8	29
b) Relatives/friends	0	0
c) Attending this training	28	100
d) Other: seeing occurrence in the gardens/experiencing it on crops	17	61
4. Are you able to follow the new methods suggested?		(*n* = 28)
a) Yes	28	100
b) No	0	0
5. The methods used to manage weeds/pests/diseases are:		(*n* = 28)
a) Hand weeding	10	36
b) Using plant-derived pesticides for insect pests	2	7
c) Culling diseased crops	4	14
d) Spraying chemicals for insect pests/diseases	7	25
e) All of the above	18	64
6. Are there any challenges in implementing these methods?		(*n* = 28)
a) Yes	27	96
b) No	1	4
7. The challenges in following these management methods are:		(*n* = 27)
a) Finance/funding for implements needed to try out the new methods	22	81
b) Convincing family, relatives or friends in trying out new methods	4	15
c) Lack of support from family, relatives or friends	16	59
d) Other: attitude of community/land disputes	2	7

Table 7. Adoption and implementation of crop-management practices and irrigation based on the post-post-test

Training	Degree of adoption (%)		
	Full	Partial	None
Soil management	68	16	16
Irrigation	26	5	69
Weed management	90	5	5
Insect pest management	90	5	5
Disease management	84	16	0

Conclusion

The horticultural training for smallholder vegetable women farmers of Central Province has had a considerable impact and some adoption, resulting in changed horticultural and business practices. The women perceived that the application of training had improved production and lowered costs in terms of soil preparation and management of pests and diseases.They also claimed that adoption of training skills and knowledge had led to improved prices at the markets. This needs to be tested through observation and 'walking the chain' with a group of women. Long-term evaluation is essential to determine the extent and rate of adoption of training and changes to horticultural practices. Nonetheless, the women were enthusiastic about their training and their ability to implement new knowledge and skills, and men in their villages are now demanding similar training based on their priorities in horticulture, business and marketing.

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Developing floricultural supply-chain strategies—Papua New Guinea case study

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Abstract

This paper argues that for some developing countries, including PNG, enterprises such as floriculture can potentially be harnessed as a means of socioeconomic development. However, floriculture as a discipline, career and industry has not been fully explored to this end. Nevertheless, interest in the industry has been growing—not only among major players, but also among small-to-medium growers. The objective of this PNG case study was to develop a framework of supply-chain strategies for small-to-medium-scale floricultural businesses to consider. Data collection consisted of interviews and group discussions with industry stakeholders, and of supply-chain mapping conducted in Lae, Huon, Goroka and Port Moresby. Different supply dimensions were examined, including product lines, local versus cross-regional channels, chain professionalism and market segments of the chains surveyed. Depending on market segments, different levels of combinations of supply-chain push strategies, emphasising efficiency, and pull strategies, emphasising responsiveness to customer needs, were proposed. Since many individuals are involved in more than one chain, synergies exist for growers involved in different chains in terms of procurement, transport arrangement and cross-fertilisation of knowledge and skills. The research findings offer opportunities for existing floricultural businesses and supply chains to re-evaluate their match between core competencies and the way they conduct business. Also, research findings allow individual players to locate synergies in their businesses and chains. The lessons learned for academics, businesses and relevant government bodies are discussed.

Introduction

For some developing countries with conducive climates, floriculture can potentially be a means of socioeconomic development. At operational and management levels, there are some general supply-chain management issues shared among many developing countries. Nevertheless, supply-chain management strategies can be engineered to align chain capabilities with market requirements. The strategic points are discussed below.

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Floriculture for socioeconomic development

From many perspectives, floricultural industry building can be desirable for a country's socioeconomic development. At an individual level, many growers, florists and intermediaries alike start out in floriculture as a part-time engagement in their spare time and/or on their spare land. Consequently, there is less opportunity cost, sacrifice and/or lost benefit involved to venture into the business. More significantly in a socioeconomic realm, these players, often women, gain individual advantage. The substantive freedoms that these players enjoy allow them to better attain self-satisfaction (Sen 1999; Schischka 2006). At an industry level, growth in floriculture spurs derived demand in allied industries, such as supply and marketing of pots, vases and various ornamental arrangement accessories. At a macro level, for developing economies that import floricultural products that they can potentially produce, as is the

case in PNG, there is an added potential benefit of developing the domestic floricultural support sector. Furthermore, when an economy moves from an *ordinary economy* to an *experience economy*, there is an increasing role for floriculture. Ordinary economy refers to the situation whereby goods and services are offered to customers in order to help them manage their everyday life (Korkman 2006). In contrast, in an experience economy, people are looking for experiences through goods and services in a context. They are generally prepared to pay substantially more for *experience services* (Pine and Gilmore 1999; Gronroos 2007).

Supply-chain management in developing countries

A supply chain refers to a range of coordinated value-adding activities required to bring a product or service from conception, through the different phases of production and distribution, to end users (van Duren and Sparling 1998; Woods 2004; Fearne 2009). Interest in supply-chain management for food and fibre products among developing countries has risen as they aim to meet international standards with a view to exporting. Supply-chain management in floriculture in developing countries is relatively new, given its short history and the comparatively modest individual and collective learning experiences of most players in the industry. In a general context, there are Western supply-chain management models that may be revisited for their suitability to explain, predict and apply in developing countries, even where the social infrastructure is quite different.

In a recent study in Solomon Islands, for example, it was argued that a demand-driven approach of supply-chain management does not aptly explain how poor households sell their products, such as potato and yam. Rather, a production-driven model better accounted for what was happening in the marketplace because the producers grow mainly for own consumption and then sell the leftover produce. A hybrid model of supply-chain management was considered more useful in explaining current food supply chains in Solomon Islands (Bryceson and Dowd 2010; A. Ross, pers. comm. 2012).

In another study to explain the Chinese agroindustrialisation process, it was argued that the application of Western concepts of supply-chain management is contingent upon certain conditions of social infrastructure. The study determined that the conditions of social infrastructure necessary for Western-style supply-chain management were yet to be developed. Consequently, some successful Chinese agro-corporations are vertically integrated, such that coordination among supply-chain partners becomes superfluous (Wei and Zhang 2004).

Efficiency versus responsiveness strategies

Profitable supply chains focus on either operational efficiency or market responsiveness. These alternative focuses are sometimes referred to as 'push' or 'pull' strategies (Simchi-Levi et al. 2013). Push and pull strategies are consistent with Michael Porter's cost leadership and differentiated product strategies (Porter 1985, 1998; Porter and Kramer 2011). Firms using a push strategy focus on producing standard popular products in an efficient way to offer a competitive price to customers. Alternatively, firms may choose to be more responsive to individual customer requirements in order to offer specialised products and services and consequently gain a better price for employing a pull strategy. While both strategies require planning based on supply and demand, an operationally efficient strategy requires more internal planning, focusing on reducing waste and cutting cost. In floriculture, operational efficiency-related issues include planting design, fertilisation regime, field management of pests and diseases, cultivar evaluation and harvestable product yield. In contrast, a responsive strategy relies more on predictions based on market forces, consumer trends and other market intelligence. Responsiveness may involve questions such as customer preferences for product characteristics, plant cultivar evaluation, packaging requirements, typical vase life and service levels. Businesses may understand the difference between efficiency and responsiveness, but the question of how, when and to what extent to apply each strategy may not be obvious (Simchi-Levi et al. 2013). Strategically, the focus of each strategy depends on the level of competition, size and requirements of the customer segment, and competency areas of the business and the associated supply chain.

Emergence of floricultural supply chains in PNG

One the world's largest tropical islands and with a large variation in topography (e.g. altitude), the nation of PNG is home to an enormous botanical diversity, including about 11,000 known types of plant, the most vibrant being the country's orchids, of which there are about 3,000 native species. PNG has

a generally moderate tropical climate in the lowlands and a mostly subtropical climate in the highlands. These diverse climatic conditions have facilitated the great diversity of flora. Although PNG has this wide array of plants, the practice of planting ornamental species tended to start with people who had acquaintances with foreigners, especially early missionaries, explorers and European settlers. However, commercial activity associated with the collection and culture of ornamental plants did not happen 'back then'. It was only about 5 years ago that PNG people started selling and buying flowers and other floricultural produce as a serious commercial activity. The emergence of floriculture as microenterprises occurred in 'an organic manner'. In villages of the Nasuapum areas of Lae, Morobe province, the spread of flower planting material was promoted by an event called *Sikan Han*. This occasion involves the exchanges of food and flower materials between villages. This ongoing event led to the formation of the Morobe Floriculture Group. Today, floriculture is a small, but growing private-sector enterprise in PNG.

Among common floricultural products marketed are tropical and subtropical flowering plants, such as anthurium, heliconia, orchids and a range of flowering gingers. Subtropical and temperate flowers include agapanthus, arum lily, carnation, day lily, gerbera, hippeastrum, rose and tuberose, along with indigenous, culturally significant cordyline foliage. Most of the flower cultivars are not native. This fact notionally contradicts the possible initial presumption that PNG natives are the best initial or immediate 'way forward' for PNG floriculture.

Some aid agencies have come to recognise the real significance of floriculture for livelihoods. In the recent past, they have funded many training workshops in PNG. The agencies include the Asian Development Bank, the Australian Agency for International Development (AusAID), Bris Kanda of New Zealand and World Vision, among others. However, the trainings have been predominantly on floristry per se, which is actually a downstream value-adding activity and just one of many facets of floriculture. Meanwhile, both conceptual and applied understanding of floriculture as an industry and the technical knowledge and capacity required to underpin its sustained growth have remained relatively limited.

The objective of this PNG case study was to develop a framework of supply-chain strategies for small-to-medium-scale floricultural businesses to consider. It formed part of the Australian Centre for International Agricultural Research (ACIAR) Project HORT/2008/011 (*Strategies for using floriculture to improve livelihoods in Indigenous Australian and Pacific island communities*). The approach to meeting this objective has been to examine different supply dimensions, including product chains, local versus regional chains, chain professionalism and market segments of the chains surveyed. Supply-chain push strategies, emphasising efficiency, and pull strategies, emphasising responsiveness to customer needs, are proposed for chains targeting various different market segments. Since many individuals are involved in more than one chain, real and potential synergies exist across different chains. The findings of research to date offer existing floricultural businesses and supply chains opportunities to re-evaluate their match between core competencies and the way they conduct business. Also, they allow individual players to locate synergies in their businesses and chains.

Data collection and methods

The observations and analysis presented in this paper are based on interviews, group discussions and supply-chain mappings conducted in 2011, 2012 and early 2013 with floricultural industry stakeholders, including growers, consolidators, florists, material suppliers and government officers. The areas 'surveyed' included the Lae and Huon districts of Morobe province, the Goroka district of Eastern Highlands province, Port Moresby (POM) and Central Province. In all, 23 growers or florists were surveyed from the Huon and Lae districts, 10 from POM/Central Province and 3 from Goroka district. The players interviewed encompassed subsistence growers through to medium-scale entrepreneurs. Some players were doing consistently well as either growers or florists, but others had variable profit outcomes.

Research findings

Socioeconomic aspects

Most floricultural growers in PNG have small blocks of land and grow only limited quantities of floricultural products. Florists typically seek to obtain products from individual growers through a personal alliance. This predisposition is somewhat at odds with horizontal integration as it is generally required to bulk up quantity at the grower level to

reliably and adequately supply commercial florists. In this scenario, growers ideally need to come together in support of the common goal. In this paper, the term florist does not usually refer to those who own a florist shop, as is common in developed countries. Rather, and for the most part, they are individuals who add value to cut flowers and foliage by making ornamental arrangements, including leis, corsages and hairpins. Many such players started floriculture by attending workshops, especially in floristry.

The industry participants surveyed often had simultaneous, overlapping roles as growers and florists. Some were growers turned florists. Others were florists turned growers. In the survey, '100% grower' was the case for only in 2 of the 23 interviewed players in the Huon and Lae districts, and 1 of the 10 in POM/Central Province. It can be asserted that most florists are also growers, but not as many growers are florists. This scenario means that there is little supply-chain functional differentiation. A positive aspect of this is that the players are generally very dynamic and highly motivated, looking to more than one supply-chain angle to enter into the burgeoning domestic floricultural trade. The downside can be reluctance in fixed cost investment, limited longer term planning, and generalisation rather than specialisation, which can lengthen the time to develop an industry per se. In turn, this situation encourages the players, often women, to continually assume multiple roles of growing, floristry and selling in their individual supply chains.

Women are known for their social network inclinations and abilities, which facilitate exchange of resources among them (Rosener 1990; Renzulli and Aldrich 2000). One important such resource is information. Not surprisingly, PNG women in floriculture have a positive networking experience. Nearly all women growers belong to one or more groups and each district surveyed had many informal floricultural groups. The overall most 'encompassing group' for floriculture is Papua New Guinea Women in Agriculture Development Foundation, which has branches at provincial and district levels. They run workshops when funding is available. Most group members know each other fairly well, including some being in extended family subgroupings. Relatively closer group ties are generally instrumental for players to get into floriculture quickly and to continue informed engagement in the industry through efficient information dissemination. One possible disadvantage for closer ties is that people with similar socioeconomic backgrounds can obtain circular (less useful) knowledge. The sociological theory of weak ties suggests that people who are less well known to each other are more likely to divulge needed information (Kirkbride et al. 1991; Lawler and Yoon 1993). Somewhat ironically, it was mentioned that one constraint of working together among group members or between supply-chain partners is relationships and trust. While there is a good basis of extension from the personal relationship to the business relationship, the nature of the relationships is different.

During periods of high demand, florists cannot meet this demand and have minor groups within which they seek support. Sometimes, broken trust resulted in a broken supply chain. Broken friendships are often the result of jealousy and gossiping. Petty issues can become nagging problems. To avoid or overcome this, there is a need for conscious effort among supply-chain partners to recognise and appreciate the benefits of collective good, such as consistency in supply and quality for their supply chain as a whole.

Industry overview

The floriculture industry in PNG is highly decentralised and characterised by numerous growers and florists, with few consolidators and wholesalers. Many growers are casual growers because they have outside or main jobs and/or other cash crops or livestock. The backgrounds of the growers and groups vary widely. The Bubia group in Lae, for example, is made up of teachers from Bubia Primary School and nearby growers. The Bubia NARI (National Agricultural Research Institute) group in Lae is made up of the wives of NARI staff. They have a competitive edge in terms of technical and market information gathering.

As mentioned, there is overlap between growers and florists. Astute entrepreneurial individuals, often women and especially teachers, have observed the unmet needs and wants in the marketplace. They engage people, also usually women, in their personal networks to help drive their individual value chains in one way or another. Collectively, these value chains are the basis for floricultural industry building in PNG. There are few consolidators and wholesalers because their roles are needed in only a few supply chains that sell products across regions, such as the Lae/POM or Goroka/POM supply chains.

While demand for floricultural products remains erratic, it is generally sufficient to yield profits for players in this nascent industry. Although many growers and florists do well, profitability varies widely among these players. Some growers reported that they are buying land to plant more cut flowers in order to meet increased demand. Others reported suffering losses and were removing some flowers grown due to information discrepancy, a lack of needed technical and management skills, and/or insufficient foresight. Upon questioning, expressions proffered included 'My plants did not flower at the right time!', 'The florist wanted other flowers!' and 'There were diseases in my flowers'. There are multiple challenges for many small-to-medium-scale supply-chain players hoping to realise benefits in the increasingly rapidly evolving industry.

Floricultural businesses in PNG, as in many Pacific island countries, often engage in multiple product lines. The lines include potted or poly-bagged plants of diverse species for hire and/or for sale, a wide variety of cut flowers, foliage and planting materials, and an array of value-added ornamental wreaths, bouquets and minor floricultural product arrangements, such as leis, hairpins and corsages. These various lines require differing technical and business skills and an understanding of the customer segments that the supply chain positions to target.

Researcher Professor Sherrie Wei interviews Maggie Seko from the Goroka District Floriculture Association during a floricultural value-chain survey conducted in Goroka, Eastern Highlands province, PNG. (Photo: Barbara Tomi)

Dimensions of floricultural supply chains

From the perspective of growers, floricultural supply-chain strategies depend on capability to provide the product, whether to supply local and/or cross-regional markets, current and desired levels of professionalism in the supply chain and, most importantly, the market segment/s to supply and serve. In reality, these factors interact. For example, cross-regional chains tend to be more professional than local chains. However, conceptually, these four dimensions are useful to examine PNG floricultural supply chains from different angles.

Product dimension

Three major product categories of supply chains are on offer in the marketplace. They are cut flowers and foliage, potted plants and ornamental arrangements. If need be, each product category can be examined specifically—like the ginger or the cordyline supply chains—for certain purposes. Most cut flowers are sold for PNG kina (K)1–2/stem or K5–10/bunch. Recently among cut flowers, torch ginger and beehive ginger have become highly sought after.

Customers are often attracted to a variety of potted plants that look luscious, with healthy growth, and which can be maintained as an investment for future income. Potted plants for hire by hotels and business houses are also a steady, profitable floricultural business line for some players. They fetch about K4–5/pot/day. At a POM cut-flower show in May 2013, the majority of participants' stalls were composed of potted plants rather than cut flowers. Goroka growers brought in a lot more temperate flowers, including cuttings and other planting materials, than other participants. This offering was indicative of more people in the region wishing to invest in different product lines. For ornamental arrangements, most are sold by pre-placement of orders. The price range for arrangements is wide—from K30 for a common, small one to over K500 for a special, large one.

Some stakeholders mentioned that they often know neither the common names nor scientific names for the cut flowers that they sell. For example, beehive ginger is called 'ice cream' by some. It can be confusing to value-chain actors and customers when players are referring to one product by different names. Thus, photo documentation of ornamental flower and leaf cultivars, such as cordylines, and of potted plant species would be useful.

Regional dimension

Local supply chains were examined in the Huon and Lae districts of Morobe province, POM, and the Goroka district of Eastern Highlands province. POM is a fast-growing city. Its population is approaching 1 million and it has high-end market segments to be serviced by the floriculture industry. Unlike Lae or Goroka, where there are no florist shops as yet, there are a few in POM. Lae has upmarket hotels, restaurants and offices, and a population base about 90,000 to be serviced by the floriculture industry. Most of the flowers in Lae are grown by women between the 10 Mile and Erap settlement areas such as Nasuapum, Wawin, Gabsongkeg and Busanim. One significant group of about 20 members, the Goroka District Floriculture Group, was formed in 2012. They grow a range of subtropical and temperate flowers serving the local market. These groups reflect increasing interest in floriculture in the region.

Even more significant were the two cross-regional Goroka/POM and Lae/POM supply chains. Both chains exploit the high-end market in POM. The potential for sending flowers from Lae to POM has been enthusiastically advocated by one potential entrepreneur ready to facilitate the undertaking. However, high airfreight costs mean that flowers must be grown and handled to achieve economies of scale that counterbalance freight costs. This is problematic for heavy flowers, like heliconia and ginger, on a per unit basis. Nevertheless, the potential for cordyline foliage, which is lighter per unit to ship, may be realised. In their individual capacity, some women surveyed in Lae took their cut flowers and foliage to POM to sell at the annual show.

The Goroka/POM cross-regional chains trade subtropical to temperate flowers that include agapanthus, arum lily, gerbera and tuberose. Significantly, the potential for Goroka floriculture is not necessarily limited to the domestic market. Through a risk-taking Fijian expatriate who has connections in Australia, the Kerefa Women's Association had two opportunities to send native cordyline foliage to Melbourne. While no profit was made, this outcome was due to management issues (discussed below under 'Overseas market segment').

To better exploit Lae/POM supply chains for cordyline foliage and Goroka/POM supply chains for cooler climate cut flowers, investment in supply and handling infrastructure should be considered. Fixed capital costs are problematic for small-or-medium-scale players individually or even jointly. However, there was talk that some foreign-owned mining companies, such as Morobe Mining Joint Venture in Lae, might be approached to assist.

Professionalism dimension

Broadly, three levels of floricultural supply chains were observed in PNG in terms of professionalism and levels of investment. At one end of the continuum, in POM, there are supply chains run by well-equipped businesses in a specialised, commercially focused manner. They capture a good share of the multiple market segments. They have vertically integrated production and distribution systems. For these established medium-scale companies, the complex and challenging task of supply-chain management is sidestepped because they perform all supply-chain functions, either under one company or within one line of command. Such corporate supply chains are poised to expand in a growing industry. However, non-corporate floricultural supply chains are more the focus of this study into floriculture to improve livelihoods.

In the middle, there are supply chains initiated by women with some knowledge and skills in growing, flower arrangement and marketing. The chain initiators are buyers of flowers who drive their individual supply chains. Growers in these chains supply to the chain drivers. To a certain extent, florists' personal networks make supply-chain management easier in a functional context. Most of these supply chains also do well and are trying to expand within constraints, such as lack of cold storage and other supply-chain-related issues.

At the lower end of the scale continuum, there are less organised supply chains comprised mostly of women with low levels of knowledge and skills. These are the least informed in terms of market information. They generally sell directly at roadside stalls or shows. Reflecting the need for better field management, they tend to let gingers or heliconias grow in poorly managed clumps, making, for example, harvest less efficient. As this practice is somewhat related to limited land size, the costs and benefits of growing in organised, managed rows might be assessed.

Market-segment dimension

An essential aspect of supply-chain management planning is market segmentation, targeting and positioning by chain players. In PNG, floricultural market segmentation is akin to distributional

channels. Different distributional channels tend to serve unique groups of customers. They are thus a convenient proxy for growers to know where their products go and which customer segments to service. For non-corporate supply chains, four distributional channels or unique market segments can be identified. These are: local consumers, through the selling channel of shows, festivals and roadside stalls; local business customers, through supplying local florists; cross-regional business customers, through, for example, florists in POM supplied by Lae, Huon and Goroka growers; and overseas customers, through selling to an exporter in POM. Currently, growers' customer segments are predominantly the first two segments. The third market segment, POM florists, is growing for the Goroka/POM chain. The fourth market segment, overseas customers, was tested only twice in the recent past, but it is put forward for contrast and consideration. Conceptually, the market segments entailed in the four marketing channels are unique. However, many people are involved in more than one channel serving more than the one market segment.

Local consumer segment. This market segment generally patronises shows, festivals and roadside stalls. For new floricultural growers, taking products to these venues is a low-cost test-market practice and an opportunity to interact with customers directly. For those who have other channels through which to sell, this channel is an outlet to make extra income. The majority of growers in all the areas surveyed sell an array of products at shows, festivals and by roadsides where there is good traffic. A few women in the one group can take turns to do the long hours of selling for a few days in a week. This is a pervasive practice in that many customers come to expect floricultural products on offer at the same spot on certain days of the week. This market segment is very diverse and the uses of the flowers vary, such as for churches, home beautification, businesses and florists to fill their orders. There are also impulse buyers who stop, watch and then decide to buy at point of sale. Despite sales fluctuations, on average, growers reported relatively good income through serving this diverse background of customers.

In terms of supply approach for this market segment, it is impractical for growers to cater for customer needs at all times, given a wide spectrum of customers in this marketing channel. A combination of moderate push and low pull strategies can be adequate. A moderate, rather than low, efficiency strategy is needed because this segment expects competitive prices. A low responsiveness strategy will be satisfactory because customer needs are divergent.

Local business customer segment. The customers of this market segment are generally florists or retail shop owners who buy products for commercial purposes. The customers either add value to make ornamental arrangements or sell products in their shops. Currently, only POM has a few florist shops. Other cities do not have a permanent outlet for market floriculture, although some women have been talking about starting the first florist shops in Lae and Goroka.

People rarely buy flower arrangements in open markets. Products sold through this channel are mostly made by customers placing prior orders. Such customers are business houses and government bodies. Occasionally, individuals order on special occasions, such as for weddings, office decorations, church decorations and Mother's Day. The profitability of flower arrangements and flower products depends on the number of shared special occasions in a year and the popularity of a high-quality service that prevails. On shared special occasions, the price of flowers/plants and flower products is twice or three times the normal price. Regarding service, business may prosper and expand as a result of preferred supplier status, or favouritism, by business houses and government bodies.

In this type of supply chain, there is significant income for both growers and florists. They often receive over K500/month from ornamental arrangements and potted plants. Income from minor floricultural arrangements of leis, corsages and hairpins is often over K200/month. Supply-chain relationships can be easy, given existing personal relationships between growers and florists. However, it was also reported that personal relationships could compromise business relationships at times, resulting in broken supply.

In terms of supply-chain strategies by growers for this market segment, a high level of operational efficiency, or high push strategy, may be needed because most of their customers buy for commercial reasons. For the level of responsiveness to customer needs, a moderate pull strategy rather than a low pull strategy, as in local consumer segment, is called for. This is because florists are now regular, identifiable customers of growers.

Cross-regional (POM) business customer segment. This is an up-market customer segment in POM. Like the second segment above, these

customers also buy products for commercial reasons to add value or to sell at their shops. Ideally, only superior-quality flowers with few or no defects and long vase-life potential should be sent to POM. This customer segment demands relatively efficient production and a high level of responsiveness through intimate knowledge of customer requirements.

Currently, there are at least two groups or supply chains sending products from Goroka to POM. These are the Kerefa Women's Association and the Eastern Highlands Province Women in Agriculture District Floriculture (EHPWIADF). Their chains take advantage of the relatively cool climatic conditions in Goroka to produce subtropical to temperate floricultural products for sales into high-end markets in the capital city. Marketing in these supply chains typically takes the channel of grower in Goroka – consolidator in Goroka – florist in POM – customer in POM. Retail prices for various products in POM are generally a three times mark-up from the prices that growers receive. It was reported that the Kerefa supply chain fetches higher prices in POM and that the growers involved get paid more.

Both Kerefa and EHPWIADF supply chains are driven by two very entrepreneurial florists in POM, who can be considered channel managers. Neither of the two florists is confident of the effectiveness of supply-chain management through correspondence. Rather, they make efforts to go to Goroka to train their growers on all aspects of technical production, harvesting and packaging. An integral part of the training by these supply-chain managers is on good business practices, such as reliability and delivering on time to the consolidation depot.

Supply-chain strategies for this market segment should be of high operational efficiency in order to offer high-quality products with competitive prices to cross-regional business customers. One reason is that some local chains in POM provide similar products. Hence, the business customers are more price sensitive than in the first two segments discussed above. A high level of responsiveness to customer needs is needed. Compared with the local business segment, more market research through 'walking the chain' activities would be beneficial for growers serving this market segment.

Overseas customer segment. This market segment is overseas business customers who are most likely wholesale distributors. The eventual customers would be overseas florists and consumers. Through an exporter, this customer segment will have specific requirements and demand high responsiveness at a reasonable price.

The theme of the 2013 Port Moresby cut-flower show was 'grow locally and sell globally'. In the recent past, two shipments of cordyline from Kerefa Women's Association in Goroka were sent to Melbourne through a consolidator in Goroka and an expatriate wholesaler/exporter in POM. Product-wise, there is little doubt that PNG's indigenous cordylines have unique attributes, which include attractive, vibrant colours. However, both shipments failed for different reasons. The first shipment suffered an insect-infestation problem and the second failure was attributed to growers not delivering punctually to the consolidation depot such that the prepaid reserved flight was missed. These setbacks substantiate observations in manufacturing industries that a supply chain breaks at the weakest link (Hansen and Birkinshaw 2007). Grower-level routines and practices are seemingly the weakest link in this supply chain as far as serving overseas customers is concerned. While anyone can grow cordyline, production expertise is needed to grow impeccable product. The concept of time and daily prioritisation by growers at the village level can be very different from those in the business world. Nonetheless, such lost opportunities may form part of a learning curve for players aspiring to serve the overseas customer segment in the future.

Supply-chain strategies for this overseas market segment demand a high level of operational efficiency coupled with a very high level of responsiveness to realise customer specification. A responsiveness requirement may be to meet precise product specifications through intimate working knowledge of the end-customers' requirements and practices.

Overall adoption of strategies

A summary of supply-chain strategies for growers by market segment is presented in Table 1.

Other factors affecting adoption of strategies include the level of competition, size of the customer segment and strengths and weaknesses of the associated supply chain. As most players are involved in more than one supply chain, there are various areas of endeavour that can yield synergies. These include procurement of planting materials for different customer segments and supply chains, management learning across chains, technical knowledge and skills sharing across groups, and transport arrangements for order fulfilment for more than one segment and supply chain.

Table 1. Summary of PNG floricultural supply-chain strategies by market segment

Strategy	Market segment (consumers)			
	Local	Local business	Cross-regional business	Overseas
Operational efficiency	Moderate	High	High	High
Responsiveness	Low	Moderate	High	Very high

Conclusion and lessons learned

In PNG, many women start floriculture from their group connections to earn good extra income. They are often players in one or more supply chains. These supply chains can be characterised on the four dimensions of product, region, professionalism and market segment. Unlike professional floricultural corporations, where supply-chain management is management under 'one house', small-to-medium floricultural supply-chain players need to position themselves based on the market segments they serve. Different market segments necessitate and entail different supply-chain strategies that emphasise different levels of operational efficiency and responsiveness. Supply-chain management strategies may seem to be non-urgent because, in general, there is good demand for floricultural products. However, when PNG experiences increasingly abundant supply in floriculture, as evidenced in many newly emerging grower groups, the supply chains need to adapt and manage according to market principles and modern management concepts. In the context of this case study, there are messages for academics, businesses and government bodies.

For academics

Many players obtain seemingly second-hand fragmented information and knowledge in their personal network and/or through attending workshops. Most training workshops conducted have been in floristry. While this is a major area of floriculture, it is not, and should not be seen as, a stand-alone panacea. Training workshops in cultivation and handling are not often offered and/or not generally delivered by people with expertise, partly because there are few technically expert floriculturists in PNG as yet. Consequently, growers are more or less left to themselves to piece together limited technical and management knowledge. This is one area that requires long-term strategic planning and investment to develop 'floriculture as a discipline' in order to uphold 'floriculture as a career' for serious players and to underpin 'floriculture as an industry' for PNG's ongoing and sustainable economic development. For instance and in due course, research in ornamental plant breeding and selection could create new horticultural products, including new floriferous hybrids and cultivars of, for example, indigenous orchids and 'gingers' for expanded niche, and eventually general, markets, with associated business development flow-on.

For small-to-medium businesses

While many small-to-medium businesses are making incomes from floriculture, they would benefit economically and professionally from viewing things from a supply-chain perspective. However, this is not such an easy thing to achieve. Supply-chain learning based on information exchange at all levels can be difficult. Fostering a supply-chain perspective would enable the players or actors to see where the weakest link is and to strengthen it. Positioning with regard to push or pull supply-chain strategies should be based on customer segments that the chain is serving. Chain players develop shared understanding and one of their critical challenges is to align personal motivation with whole-of-chain functioning and performance.

For government bodies

Government plays a pivotal role in industry development. Relevant government offices/officers are well positioned to influence the agenda of aid agencies to facilitate growth of PNG's burgeoning floriculture industry so as to realise its full socioeconomic potential. Currently, there is next to no investment in supply and handling infrastructure by small-to-medium floricultural industry participants. Such facilities require land and significant capital investment and, therefore, likely need the engagement of multiple parties coordinated by government. Another tangible benefit area is for government offices to provide information and training hubs for industry players—for example, hubs providing technical and general market information to vibrant small-to-medium businesses.

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Developing land-use agreements in commodity cash crop production that meet the needs of landowners and smallholders

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This paper reports on the research to design a Clan Land Usage Agreement (CLUA) for oil palm smallholders planting oil palm on the customary land belonging to others in West New Britain province and Northern Province. These oil palm holdings are known in the industry as customary rights purchase (CRP) blocks and they make up approximately 15% of the total area of smallholder oil palm in West New Britain. The CLUA was designed to deal with the increasing number of land disputes on CRP blocks. To develop the CLUA, lengthy in-depth interviews and meetings were held with smallholders and landowners to document: the types of land transactions on CRP blocks; how tenure and access rights were acquired by migrants; and the underlying causes of the land disputes on CRP blocks. This information formed the basis of a CLUA template that was acceptable to landowners, migrant smallholders and the broader industry. The completed CLUA template provides more secure land tenure for CRP growers and ensures that all members of the landowning group with customary rights to the land where these CRP blocks are located consent to the land transactions with migrants. By designing the CLUA in partnership with landowners, migrant farmers and other industry stakeholders, the likelihood of the CLUA being accepted was significantly improved.

Introduction

Disputes involving land use and land ownership are commonplace in PNG, especially between customary landholders and migrant smallholders who acquire blocks of land from them for cash crop production, including oil palm. One of three objectives of Australian Centre for International Agricultural Research (ACIAR) Project ASEM/2006/127 (*Commercial sector/smallholder partnerships for improving incomes in the oil palm and cocoa industries in Papua New Guinea*) was to 'develop effective land-use agreements between the commercial sector and customary landowners'. This paper outlines the research approach and methods the project adopted to design a new Clan Land Usage Agreement for use by oil palm smallholders in West New Britain province and Northern Province, PNG.

Land tenure arrangements

Approximately 31% of the PNG's oil palm production is from smallholder blocks, with the balance produced on the plantations of PNG's two oil palm companies, New Britain Palm Oil Ltd and Hargy Oil Palms Ltd. There are three categories of smallholder oil palm producers distinguished by land tenure (Table 1):

- smallholders residing on agricultural state leasehold land on Land Settlement Schemes (LSSs)

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- village oil palm (VOP) growers cultivating oil palm on their own customary land
- non-clan members who have 'purchased' customary land belonging to others—customary rights purchase (CRP).

The differences in property rights among these primary types of land-tenure arrangements sometimes influence smallholder productivity, attitudes to replanting, investment levels in farm inputs and tenure security (Koczberski et al. 2001; Curry and Koczberski 2009).

Over the past 10–15 years, customary landowners, largely in the Hoskins area of West New Britain province and to a lesser extent at Bialla (West New Britain) and Popondetta (Northern Province), have been 'selling' land to non-clan members for oil palm development. These oil palm blocks are known in the industry as customary rights purchase (CRP) blocks and they make up approximately 15% of the total area of smallholder oil palm in West New Britain.

It is expected that CRP blocks will continue to grow in number, especially in West New Britain. At Hoskins and Bialla, there is enormous demand for land by migrants from mainland PNG attempting to secure a future for themselves and their families in the relatively prosperous oil palm belt bordering Kimbe Bay. Also, for LSS settlers, especially from highly populated blocks, the acquisition of a CRP block offers a way to reduce population pressure on their existing LSS blocks. The high cost of LSS blocks puts them beyond the reach of most LSS growers (prices for a 6-hectare LSS block at Bialla and Hoskins range from PNG kina (K)40,000 to K80,000 compared with K3,000–4,000/hectare for a CRP block). The acquisition of a CRP block is even more critical for second-generation LSS settlers who have lost access to land in their home villages. Similarly, company and government employees who have spent much of their working lives in West New Britain and raised their children there, see the 'purchase' of a CRP block as a way to secure a livelihood in retirement and/or provide a future for their children.

Disputes over land ownership

Increasingly, the Oil Palm Industry Corporation (OPIC), the government agricultural extension service, was noting a growing number of disputes and evictions on CRP blocks. The disputes indicated that the current procedures of OPIC for dealing with new oil palm plantings on CRP blocks needed revision. While many of the early CRP land transactions were

Table 1. Numbers of smallholder blocks and areas of cultivation by project site

Land tenure type	Project site				
	Bialla (West New Britain province)	Hoskins (West New Britain province)	Popondetta (Northern Province)	Milne Bay province	New Ireland province
Land Settlement Scheme (LSS)					
No. of blocks	1,593	2,368	1,128	–	–
Area (ha)	7,755	12,928	4,215		
Area as a % of total smallholder area	64	51	30		
Village oil palm (VOP) (customary)					
No. of blocks	1,782	4,114	4,554	773	1,256
Area (ha)	4,068	9,140	10,020	1,837	2,478
Area as a % of total smallholder area	34	36	70	100	98
Customary rights purchase (CRP)					
No. of blocks	70	959	25	–	26
Area (ha)	200	3,114	50		55
Area as a % of total smallholder area	2	13	0.4		2

undocumented, with only oral agreements between the clan leaders and 'outsiders' acquiring blocks, many of the more recent transactions have been recorded on a Clan Land Usage Agreement (CLUA) form, which was initially designed by OPIC for village oil palm (VOP) producers planting oil palm on their own customary land.

However, there were problems with the existing CLUAs on CRP blocks:

- The size and boundaries of land parcels were not specified.
- Written agreements typically did not specify the agreed sale price of the land, nor the amount and timing of payment instalments.
- No details were provided on the specific land-use rights of the 'purchaser'.
- There was no written evidence that the clan had agreed to the land 'sale' and for the land to be released to a non-clan member for the cultivation of oil palm.

This lack of written documentation has led to much misunderstanding and disputes between the 'purchaser' and the customary landowners. Furthermore, because most of these land transactions were not in accordance with customary law, they were technically illegal. This meant that the transactions did not comply with the Roundtable on Sustainable Palm Oil (RSPO) principles and therefore risked undermining PNG's RSPO accreditation. RSPO accreditation aims to ensure fair and transparent agreements between oil palm growers, milling companies and other stakeholders in the industry, as well as limiting detrimental environmental impacts. Its principles and criteria stipulate a commitment to transparency and a participatory approach to establishment of land-use agreements with landowners.

Requirement for improved land-use agreements

It became apparent early in the ACIAR project that there was an urgent need to prevent the land disputes by developing an effective new CLUA for smallholders cultivating oil palm on the customary land belonging to others. In addition, it was necessary that this new CLUA be designed to comply with RSPO principles, provide more adequate land-tenure security for CRP growers and ensure that all members of the landowning group agreed to, or benefited from, such land transactions.

Methods and process

As part of developing a new CLUA for use by smallholders cultivating oil palm on someone else's customary land, the ACIAR research team set out to:

- document the types of land transactions occurring and how tenure and access rights were acquired by migrants and maintained through time
- understand the underlying causes of the rising number of land disputes on CRP blocks
- develop a template for a new CLUA that met the needs of, and was acceptable to, landowners, migrant smallholders and the broader industry
- develop guidelines for OPIC for dealing with land transactions on CRP blocks
- raise awareness of the new CLUA.

The research team spent considerable time conducting meetings, informal interviews and workshops with members of landowning groups involved in the 'sale' of customary land and with migrant farmers cultivating oil palm on customary land. The team also worked closely with OPIC because it was the organisation's role to eventually implement the new CLUA and to oversee land transactions on customary land. Thus, numerous meetings and workshops were held with OPIC extension officers and land officers. The methods and approach used to meet the points above are discussed below.

Document land transactions and understand the underlying causes of the land disputes on CRP blocks

This first step in the research entailed interviewing individual members of landowning groups involved in 'selling' land and migrant smallholders who had 'purchased' customary land to cultivate oil palm. Several focus-group meetings were also held with landowning groups. The purpose of the interviews and meetings was to gather information on the types of agreements and land transactions that permitted 'outsiders' access to customary land to cultivate oil palm. The research team interviewed dozens of smallholders and landowners in several villages in the Hoskins, Bialla and Popondetta areas.

The interviews and meetings were conducted in a way that encouraged landowners and migrant smallholders to tell their 'stories'; that is, to tell the research team about their own experiences, anxieties and perspectives on land transactions. It was not

unusual for these interviews and meetings to run for 2–3 hours. The lengthy open discussions helped the research team to develop a sound understanding of the land transactions with 'outsiders' on customary land and were important in shedding light on the following:

- the broad range of land transactions and agreements occurring between migrants and landowners—most were informal, with ambiguous oral or written agreements (typically not including the agreed 'sale' price of the land and the amount and timing of payment instalments)
- how tenure and access rights were acquired by migrants and how they were maintained through time
- the near absence of land surveys undertaken on CRP blocks to record their boundaries
- clan members' knowledge of and consent to land transactions. There was little evidence the majority of the clan members had consented to the land transactions or had received a share of the cash from the land 'sale' (youth, in particular, felt they had lost out and had been denied their 'birthright')
- factors underlying the land-tenure disputes between migrants and customary landowners that sometimes led to the eviction of migrants
- essential elements of any new CLUA that both landowners and migrants desired to see included.

Understanding and documenting in detail the disputes between 'outsiders' and landowners were crucial for the design of a new CLUA that would meet the needs of the two groups and reduce the incidence of land disputes. It became apparent in interviews that landowners and migrants had very different interpretations of their land dealings and this was the basis of many misunderstandings leading to the disputes. For example, many of those acquiring land believed that:

- they owned the block outright and their children could inherit the land. This is not the case in law, as the land remains customary land with the potential for the block to be reclaimed by the customary landowners on the death of the 'purchaser'
- they had permanent ownership of the block, and therefore had the right to poison and replant their senile palms without the consent of the customary landowners. Many customary landowners argued that the initial grant of land for oil palm was for a single planting round and the land could be resumed by the customary landowners at the end of a cultivation cycle
- they had the right to invite anyone to reside on the block, such as their relatives from their home villages. Customary landowners often claimed that it was only the 'purchaser' and their immediate family who had been granted residency rights.

Customary landowners believed that:

- they had the right to evict those who caused law-and-order problems. Many 'purchasers' thought this was none of the business of the customary landowners
- when blocks were 'sold' in the past at a lower price than the current going price, they were entitled to be paid the difference in the value between the earlier 'sale' price and the current value
- when the price of oil palm rose sharply, as it did in early 2008, they had been cheated because they 'sold' the land when oil palm prices were lower. Landowners thought that the 'purchaser' was receiving benefits unfairly from the higher prices. This could lead customary landowners to demand additional cash payments from CRP blockholders.

A key point underlying disputes was that many migrants interpreted the land transfer as a commodity transaction that conferred on them individual and permanent ownership (like freehold title). From this perspective, the land was to be held in perpetuity by the migrant. In contrast, the original landowners involved in the transaction drew on customary principles that viewed land as an inalienable resource held by the kinship group and thereby argued that 'outsiders' were 'guests' on their land and had only acquired use rights for oil palm and not permanent and exclusive land rights. These use rights were contingent on migrants' participation in customary exchange and fulfilling other social and economic obligations. Importantly, they did not extend to other land-use activities apart from oil palm cultivation.

By understanding the factors leading to land disputes and the differing views of land transactions held by the two groups, the research team was able to identify two important elements required in a new CLUA template. First, both groups wanted a more transparent process in land dealings and, especially from the customary landowners' perspective, they wanted the land transaction to accord with customary law. Second, given that customary landowners and migrants interpreted land transactions differently, there was a need in the negotiations to design a new CLUA to reconcile their disparate perspectives, with the objective of giving greater tenure security to

'outsiders' while recognising the underlying customary tenure rights of the landowning group.

As information was being gathered from customary landowners and migrant smallholders to develop a new CLUA, the research team also kept in close contact with OPIC and provided it with summaries of the findings being gathered from interviews and meetings. Working closely with OPIC ensured it was part of the process of developing a new land agreement. Throughout the process, the team stressed that the new CLUA was a joint initiative of the PNG Oil Palm Research Association (PNGOPRA) and OPIC to ensure that OPIC felt it had a stake in the research process and the changes being proposed.

Develop a template for a new CLUA and guidelines for OPIC to manage CRP blocks

Once sufficient information had been obtained from customary landowners, migrants and OPIC, work began on developing a new CLUA template. This was an iterative process over several years wherein regular consultation took place with landowners, migrants and OPIC. During this process, the team conducted many workshops and meetings with OPIC at Bialla, Hoskins and Popondetta to refine the template. The discussions regarding the CLUA template were concerned with making CRP land transactions more transparent and developing clear definitions of the rights and obligations of both parties (see Koczberski et al. 2012 for further detail). Another point discussed at length was the request by landowners that the template should state explicitly that the outsider acquiring the land was not purchasing the land outright as in freehold title, but rather obtaining usufruct rights to land for defined purposes and for a specified period of time.

When a final draft of the CLUA template was complete, OPIC arranged for members of the research team to meet at its headquarters in Port Moresby with the project and field managers from each site to discuss the draft template. This meeting was essential for OPIC's endorsement of the CLUA at the national level.

The key elements incorporated into the new CLUA template included:

- clarification that the person was not purchasing the land outright as in freehold title, but rather leasing the land for a specified period (one planting cycle of 25 years)
- a three-party signatory process involving the lessee, clan leaders and an OPIC lands officer
- transparency—public witnessing of the signing of the CLUA in the village
- agreement that the customary owners relinquish any use rights or management rights to the land for the duration of the CLUA
- clearly defined land boundaries
- a description of the rights and obligations of the clan leaders disposing of the land, other clan members and the lessee
- provisions for future contingencies (for example, consideration of what provisions should be made for dealing with renewal of the CLUA, the death of the lessee during the term of the CLUA, or if the CLUA were to be revoked for some reason)
- payment details
- inclusion of dispute resolution procedures
- inclusion of an approved block inspection report.

Arriving at the final CLUA template took almost 3 years. While this may appear to be a long period before an outcome was achieved, this unhurried process was critical to allow time for detailed deliberation and discussion on this very sensitive topic. OPIC and the research team were keenly aware that the introduction of the new CLUA had the potential to destabilise the tenure security of some migrant smallholders if not handled well.

Alongside the new CLUA template, the research team assisted OPIC to modify its land administration system to manage CRP blocks and the new CLUA. To achieve this, the research team and OPIC designed a document, 'Step-by-step guidelines for dealing with smallholder customary rights purchase blocks', which provided a seven-step set of guidelines of how to deal with CRP enquiries, conduct community meetings with landowners when a CRP request is made to OPIC, a template for a block inspection survey report and instructions for the final signing and lodgement of the new CLUA.

Conduct awareness raising of the new CLUA

To introduce the new CLUA, it was necessary to conduct extensive awareness-raising among customary landowners and migrant smallholders. OPIC and PNGOPRA have continued to increase awareness of the new CLUA among smallholders in West New Britain province since the conclusion of the ACIAR project in December 2012. The awareness-raising meetings with landowners and migrant smallholders are important because they provide smallholders with an understanding of the need for a new CLUA

on CRP blocks and an awareness of the potential benefits of the new CLUA for both landowners and CRP growers. Also, detailed information is provided on the rights of the landowners and CRP growers and the importance of transparency. Thus, clan members are made aware of their right to be aware of all land transactions on their customary land, the agreed 'sale' price of the land and how payments will be made. Finally, awareness is heightened on how the CLUA complies with RSPO requirements.

Research outcomes

The project has been successful in achieving endorsement of the new CLUA by OPIC at the national level, and there is a commitment to introduce it to all sites where land is being transferred to non-clan members for oil palm cultivation. A version of the new CLUA has been introduced at Hoskins (over 90% of CRP blocks are in the Hoskins oil palm project). It is anticipated that the new CLUA will:

- reduce disputes between customary landowners and outsiders and within landowning groups because land transactions are more transparent, and the rights and obligations of each party are clearly outlined
- assist CRP blockholders to obtain interest-free loans from the milling companies for farm inputs
- support the companies to comply with RSPO requirements relating to land-use rights for both the lessor and lessee (in particular, proof of land ownership and defined land boundaries)
- provide lessons for how wider land-reform policies could be undertaken in PNG
- be suitable for introduction at all sites. The CLUA template has a considerable degree of flexibility in it and can be tailored to individual circumstances in terms of payments, land-use rights and the period of the agreement.

Reaching a successful conclusion to the ACIAR project in the form of a CLUA template that was accepted by the industry was the result of several factors. Three key elements are highlighted here. First, and most importantly, were the very lengthy consultations and discussions the research team held with all stakeholders. The interview data highlighted how differing interpretations of land transactions between landowners and CRP growers were the cause of many land disputes. It was also made clear in interviews that landowners wanted the new CLUA to ensure customary ownership was maintained at the group level while migrant farmers sought secure use rights to the land for oil palm cultivation. Recognising these key principles early in the project helped pave the way for discussions on the design of a new CLUA template that provided use rights for 'outsiders' for a fixed time period with clear recognition of the underlying and inalienable land rights of the customary landowners.

Second, a strong commitment by OPIC, PNGOPRA and the Australian partners that a solution to the land disputes on CRP blocks was essential, despite the challenges. In collecting information from landowners and CRP growers for the design of a new CLUA, the research team and OPIC were mindful that by publicly focusing on ways to improve CRP land transactions, there was the potential that the research could stir up tensions between migrants and customary landowners. Thus, the project required commitment and sensitivity by team members to pursue such a challenging and time-consuming task. The commitment is reflected in the ongoing work by OPIC and PNGOPRA, since the project finished last year, to facilitate the introduction of the new CLUA.

Third, introducing the new CLUA benefited from two measures taking place within the oil palm industry during the project. In late 2010 to early 2011, a World Bank–funded project, the Smallholder Agricultural Development Project (SADP), began in West New Britain province and Northern Province. Part of the SADP project was to assist with the infill planting of oil palm in villages. Several of the villages in the Hoskins area had CRP blocks and the World Bank team would not approve planting on CRP blocks without evidence of a formal and 'legal' land agreement between the customary landowners and migrant smallholders. This helped to reinforce the necessity of introducing the new CLUA. At the same time, the oil palm industry was seeking RSPO certification. The new CLUA assisted the companies to comply with RSPO criteria relating to land-use rights (in particular, proof of land ownership and defined boundaries of the land) and transparency in land transactions.

Conclusion

The large number of smallholders cultivating oil palm on customary land belonging to others presents an enormous challenge to the industry, especially given the rising disputes and insecure tenure of CRP blocks. The ACIAR project found that current

procedures for dealing with new oil palm plantings on CRP blocks and the CLUA used on village oil palm (VOP) blocks did not provide adequate land tenure security for the 'outsider' 'purchasing' or leasing land. Nor did the existing CLUA ensure that all members of the landowning clan agreed to or benefited from these land 'sales'. Therefore, there was a need to develop a new CLUA for CRP blocks and review current practices relating to land transactions on customary land.

The methodological framework adopted focused on lengthy periods of fieldwork, collecting qualitative data from key stakeholders. Numerous meetings, interviews and workshops were conducted with members of the landowning groups involved in the 'sale' of customary land, CRP growers and OPIC extension officers to gather information on the underlying causes of the rising number of land disputes on CRP blocks and the differing interpretations of land transactions by landowners and 'outsiders'. This engagement at the local level ensured the design of a new CLUA template was based on a clear understanding of the local sociocultural context and, in particular, indigenous principles and concepts of property rights. By designing the new CLUA in collaboration with landowners, migrant farmers and OPIC, the likelihood of the CLUA being accepted was significantly enhanced.

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Two-way learning: key gender lessons from participatory community workshops with smallholders in the Baiyer Valley and Kerevat areas of Papua New Guinea

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Abstract

The development literature suggests that women continue to face inequality in the agriculture sectors of most developing countries. In this paper, gender implications arising from four community workshops in two regions of PNG are presented and discussed. The workshops formed part of a baseline study to investigate ways to improve the business knowledge and practices of women food crop smallholders within a larger project. In the baseline study, a rapid participatory learning and action research approach was underpinned by asset-based community development and appreciative inquiry. The paper outlines the two-way learning methodology from community workshops that explored the gender dynamics within an agricultural context. Two specific activities from the workshops and the findings as they relate to gender differences and the gendered division of labour within the communities are described.

The activities provided an opportunity for local community members and leaders to reconsider and re-evaluate existing social relations that had mostly been taken for granted. The community workshops have demonstrated that communities are willing to reorientate their thinking to seek more effective ways of family collaboration.

Introduction

Women smallholders are keys to PNG family livelihoods—they produce essential subsistence crops and they market or exchange the surplus while undertaking valued social roles, such as family care. Yet, the benefits of their family and agricultural labour do not necessarily translate to improved family livelihood and family security. In this paper, a project aiming to provide locally relevant training to support improved business acumen for women is described. A two-way learning methodology is outlined in an attempt to reveal the gendered divisions of labour and resources.

Knowledge is culture-dependent. Two-way inquiry learning encourages people from different cultures to identify their shared and differing knowledge levels and perspectives. Through such a process there is the potential for the generation of new understandings that can better inform action (Hooley 2002). Aslin and Brown (2004, p. 8) place such a process within the broader project of utilising 'local knowledge, specialised knowledge, strategic knowledge and integrative knowledge for sustainable change'.

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The background: PNG, women smallholders and the project

PNG can be thought of as a two countries in one. One 'country' relates to PNG's rich mineral resources that have enabled significant development of the mining industry and engagement with a range of transnational companies. Although this part of PNG provides significant income to the country, very few people are directly involved—estimated to be 30,000 (full-time) and 80,000 (casual) (Papua New Guinea Chamber of Mining and Petroleum 2012)—out of a total population of around 6.7 million (DFAT 2013). In stark contrast, the other 'country' within PNG is where the majority of the population is found and where the majority of the daily labour is occupied—that is, the rural agriculture sector. Hence, the PNG economy is highly dualistic, with a formal sector (largely, but not exclusively, mining) focused on export and an informal sector dominated by subsistence and semi-subsistence activities. Rural poverty is a significant issue for PNG, with over 90% of the nation's poor living in rural areas and over 80% being rural-based subsistence farmers (ADB 2012). As a result, rural livelihoods, including agriculture, support the majority of the PNG population.

In PNG, it is largely (85%) the women who produce food (Peter 2012, p. 44). Food crops are important to PNG households, and women are the primary growers and sellers. Like most developing countries, at the smallholder level in PNG, women are key players as they produce subsistence crops as well as taking an increasing role in cash cropping, which pays for education, health and family obligations. Much of this cash activity is in the informal sector (Cahn and Liu 2008). Hence 'women's access to financial services, agricultural extension, education, health care and human rights are, therefore, key to assuring food security for all' (Camara et al. 2011, p. 141).

Given this context, PNG women smallholders and their families are the focus of a new ACIAR project ASEM/2010/052 (*Examining women's business acumen in Papua New Guinea: working with women smallholders in horticulture*). The project is being conducted in the Baiyer Valley of the Western Highlands province (partnering with the Baptist Union of PNG), Kerevat in East New Britain province (partnering with the National Agricultural Research Institute—NARI) and Central Province (partnering with the Pacific Adventist University, the Fresh Produce Development Agency and NARI). This project derives from an earlier exploratory ACIAR exercise that investigated ways of 'improving women's business acumen' by identifying what were impediments and what were enablers to participation in food production and marketing (Chambers et al. 2011).

Project objectives

The overall aim of the project is 'to improve the uptake and impact of training and small business development of women smallholder food crop producers in Central Province, East New Britain and the Western Highlands of PNG'. The project explores the question, 'In the light of the cultural and contextual issues of each region, what are better ways to improve the business knowledge and practices of women food crop producer smallholders?' In each of the three regions, 60 women from two communities in each region are being recruited—a total of six communities, providing data from a minimum of 180 families over 3 years.

This study aims to: identify the impact of gender and cultural dynamics through rapid collaborative ethnographies with each village; trial and evaluate a range of ways to improve women's food-crop business knowledge and skills; and identify and develop financial skills and opportunities through the provision of training by local and national agricultural and financial literacy providers. The project provides data on improved local strategies that enhance women's food-crop production and security.

There are two objectives, each with a related key research question. The first objective is to understand women food-crop producers' context, business knowledge and practice in each region in order to develop and facilitate ways to improve their overall skills (research question—to determine what are the cultural, gender and regional factors that impact on the development of food-crop business skills of women smallholders). The second objective is to understand the financial practices and issues for families in order to develop ways to improve the business finance practices of women food-crop producers (research question—to determine what are the family, gender, regional and cultural factors that impact on the improvement of financial practices of women food-crop producers).

Gender and gender dynamics as a contested space

The Constitution of PNG embodies the government's commitment to equality for both women and men within family, community and society, and the government has recognised the centrality of gender equality for sustainable development and poverty reduction (Government of Papua New Guinea 2012). Despite this, gender roles and the gendered division of labour are strongly entrenched in PNG social and family relations and gender inequality can be seen in access to education and employment and in high levels of violence against women (Lewis et al 2008; McCalman et al. 2012; World Bank 2012).

The argument that women remain marginalised in PNG links to cultural beliefs that see women as inferior to men. Colonisation, missionary and church influences add complexity to culturally based gender inequalities. Despite some regions of PNG being under a matrilineal system of land inheritance, PNG society is generally patrilineal and overwhelmingly patriarchal. Deep-rooted social beliefs position women as subordinate to men, underpinned by the view that women are the property of men and are expected to obey (Cahn and Liu 2008).

However, a contradictory view proposed by Gustafsson (2002) argues that the work performed by men and women is complementary, in that men and women control different skills, although what they do in their own sphere of activity has consequences for the other gender, the household and ultimately for the community. Thus, in Gustafsson's view, the big difference between Papua New Guinean and European gender concepts is not whether men and women have equal access to resources, to public performances and to the same kind of work, but that the parts they play are equally important for the system to function (Gustafsson 1999, pp. 118–119). Kinship structures and gender complementarities are features of gender relations for many indigenous peoples, but in PNG there are complex factors that lead to the subordination of and discrimination against women (Stern 1999; Cahn and Liu 2008; United Nations Secretariat of the Permanent Forum on Indigenous Issues 2010).

One significant and objective indicator of gender inequity in PNG is the level of gender-based violence against women (Lewis et al. 2008; World Bank 2012). Violence undermines women's confidence, affects women's health and is a significant barrier to women's full participation in society (Cahn and Liu 2008, p. 134; World Bank 2012). A recent assessment of PNG gender issues (World Bank 2012, p. 12) reports that:

> FSV [family and sexual violence] is widespread and pervasive, and has a devastating impact on the lives of individuals, families and communities. The high prevalence of such violence in PNG is a cross cutting issue, with very serious implications for public health and social policy, economic development, and justice and law enforcement.

Women do not gain equal access to profits from agricultural production and this reduces household welfare. As developing-country household-income studies show (Macintyre 2000; Mason and King 2001; Garap 2004), up to 75% of income earned by women typically goes to support the family, while the contribution of men's income to the family can be as low as 25%. In PNG, men typically control the income earned from women's labour in commodity production. Women's labour input alone may not give them rights to the income generated from their labour, which can result in gendered conflicts over women's labour as well as remuneration from commodity production (Koczberski 2007). Gendered patterns of control over income do vary across the country, depending on the region as well as the type of crop, and will vary at the individual family level. In some cases, cash income belongs to, and is in the control of, whoever produces the goods for sale, while in other cases, women produce goods and men market them and/or control the resulting income (Cahn and Liu 2008). Koczberski (2007) suggested that finding economic incentives to encourage women and other individual family members to participate in commodity production and developing ways to redistribute income within the household have great potential to improve rural household incomes as well as the gendered distribution of income within households.

Starting with this body of knowledge produced by previous researchers, our first step and the focus of this paper was to open up the topic of gender roles with smallholder families themselves.

Creating a two-way learning space: the community workshop methodology

The data presented in this paper are drawn from four community workshops that were held as part of the ACIAR project baseline study. These community

workshops were complemented by a community leaders' focus group and an administered baseline survey conducted with women smallholders. We took a rapid participatory learning and action research approach which, as is explained below, was underpinned by asset-based community development and appreciative inquiry.

Although participatory learning and action has gained in popularity over the past two decades, there are differing ways in which it is understood and enacted. One rationale for its use is that increased participation leads to greater efficiency as people take ownership of any agreed action through their involvement in the learning process. The other rationale sees participation as a right, and a way to mobilise collective action and local community building (Pretty 1995). In our case, we wanted to encourage engagement by the community and provide an approach that would build community capacity and enable us to hear and understand the priority issues.

Asset-based community development (ABCD) and appreciative inquiry reflect an 'empowerment' philosophy that understands local communities as resilient and resourceful and that provides forums for community members to identify and build on the assets in a community as a key resource (Green and Haines 2012). Communities in developing countries are often presented with projects that identify their deficits as the first step, which immediately creates a power divide between the project and its participants. Appreciative inquiry (Cooperrider et al. 2003) provides processes that turn attention to what works in communities and why.

We are conscious that the processes used in appreciative inquiry and ABCD may result in false or simplistic consensus, and sensitive dynamics, such as those between genders, may be masked. Further, collective group processes on their own rarely reveal structural power and hegemonic worldviews. Despite these limitations, we believed that it was crucial to provide a workshop environment where people could surface their own issues and elucidate their own knowledge and in this way leave the workshop with new perspectives, enhanced perspectives or having confirmed existing perspectives. Using Aslin and Brown's (2004, p. 8) 'local knowledge, specialised knowledge, strategic knowledge and integrative knowledge', the community workshops in this study indeed provided local knowledge, and some specialised knowledge, which we plan to harness with strategic knowledge (from literature and key informants) to identify integrative knowledge—that is, knowledge that is built up from the complementary aspects of the other three forms of knowledge. In this way, any action decided upon will be informed by a co-construction of meaning across different knowledge types.

The workshop and activities methods

The workshops were held in two communities in Kerevat and two in Baiyer Valley and, since this paper, two more have been held in Central Province. Each day-long workshop was held in an accessible local community facility. The local project leaders were asked to invite a cross-section of the community: 15 men, 15 women and 10 young people. Morning tea, lunch and afternoon tea were provided. The aim of the day was to explore local food-crop practices, seasonal impact, gender roles, community assets, income sources and financial practices, and hopes for the future.

The two activities that generated the data used for this paper were designed to document and begin discussion on gender differences and the gendered division of labour. Raising gender issues must be done in a culturally sensitive way. Therefore, the large group was divided into four smaller groups for these gender-sensitive activities—younger men, younger women, older men and older women. The activity and reporting back was led by an experienced trilingual PNG ethnographer, who facilitated the discussion in a culturally sensitive and effective manner.

The following section describes the activities and presents some of the initial findings, which will become the basis for further in-depth examination in future community activities and ethnographic research. It is important to note that as far as possible the participants' words have not been changed.

Activity 1: a day in the life of a smallholder

The aim of this activity was to enable community members to explore and share information on the daily activities of a typical village member. It aimed to raise awareness of the work done by men and women in the community and bring to the fore any differences in perceptions about the work of the opposite gender. This enabled the research team to gain an understanding of gender roles and potential disparities as well as begin raising the awareness of gender roles at the local level.

The full group was divided into its subgroups of young women, older women, young men and older

men. Each group was given a large sheet of paper with the hours of the day (from 5 am to 10 pm) written down the side. The group then entered their activities on a typical day. Each group was then given a new piece of paper with the hours of the day and was asked to record what they see as the typical day of the opposite gender, e.g. young women record a typical day of a young man. Figure 1 shows a group of young women from the Kerevat region completing the 'day in the life' activity. The two sheets of one age group were then displayed to the large group—for example, the typical day of young women as seen by young women themselves, alongside the typical day of young women as seen by young men.

The facilitator then asked each group to comment on the others' perspective and share what they thought. The questioning included 'Is this true?' 'When might this happen?' 'When does it not happen?' This approach surfaced the gender disparities. The facilitator monitored the reactions and, with the strategic use of humour, enabled people to laugh at the differences as they began to think about them. For example, one senior male group member said they sit down in the evening and plan the family's activities for the next day; the women strongly disagreed, saying that rarely happens. The facilitator defused the situation by pointing out that the group had written the words 'family planning' which could have been interpreted as contraception planning. Everyone laughed at the word play with great hilarity but at the same time the point was clearly made about different perceptions of daily life.

In concluding this type of introductory analysis, it was important that the facilitator explained that this was a first look at different roles and that we would work together on the issues across the life of the project, deepening our shared understanding as we go. People were invited to think about any new insights they had with a focus on how family members can share skills, time and workload.

Activity 2: talking tables

'Talking tables', based on the original idea known as the World Café, is a discussion process that draws on individual and collective learning through 'conversations that matter' (Brown and Isaacs 2005). The idea is to create spaces that are more informal and that encourage friendly but in-depth discussions on selected topics. The process can be used with people from diverse educational backgrounds and ability, with paid staff, government and non-government representatives as well as with local village community members. We have found the process encourages (but, of course, does not guarantee) meaningful conversation (narratives) and in-depth exploration of key issues, stimulates innovative thinking, deepens relationships and ownership of outcomes and encourages more meaningful interactions between participants.

According to the amount of time available, four or five tables can be planned. Each table has a different question. On each table, there is a large piece of butcher's paper and a number of pens to enable all participants to record their ideas on the paper. Ideally, participants should have a pen each and record their ideas as they go, but in settings where there is low literacy, participants often prefer to have one person act as the scribe.

The process used in this study was to have four large sheets of paper, each with a separate question, and the group was divided into the same four subgroups as earlier, so that people felt comfortable in a like group. The questions were:

- What do women spend money on?
- What do men spend money on?
- What are the positives and negatives of '*wantok* giving'?[3]
- Why don't people use banks?

On the first table, or rotation, the group wrote down all their ideas regarding the question on that table/paper. After 10–15 minutes, people moved as a group on to their next table/paper where they added to, challenged or extended what had already been written on the sheet. After a further 10–15 minutes, people again moved and continued to add, challenge or extend comments. On the third and fourth table, people were encouraged to look for patterns, insights and emerging perspectives; that is, *they* began the data analysis. On the last table, each group was asked to nominate one person to report back to the large group, which then enabled the whole group to hear and discuss the cumulative findings and emerging themes.

[3] The question on '*wantok* giving' is particularly important in PNG where the *wantok* practices oblige people to give money and resources to any person within their *wantok* group. 'The *wantok* system can be loosely defined as the system of relationships (or set of obligations) between individuals characterized by some or all of the following: (1) common language, (2) common kinship group, (3) common geographical area of origin, and (4) common social associations or religious groups' (ADB 2012, p. 90).

Figure 1. Young women from Kerevat completing the 'day in the life' activity (Photo: Katja Mikhailovich)

Figure 2. Older women's group from the Baiyer Valley region (Photo: Katja Mikhailovich)

Gender lessons revealed by the activities

The activities provided an opportunity for local community members and leaders to begin to consider social relations that for many, to that point, had been primarily taken for granted. The following sections outline aspects of the gendered division of labour and resources as well as highlighting how gender dynamics are in transition.

The community workshops were carefully designed to enable individuals to initially consider the gendered division of labour and resources, as a precursor to exploring the sensitive next step of gender inequality. PNG is a patriarchal society; however, in the two regions of the study, one is patrilineal (Baiyer Valley) and the other is matrilineal (Kerevat). In the Kerevat communities, the impact of a matrilineal distribution of resources and land inheritance was raised as an issue of concern by both men and women. By contrast, in the Baiyer Valley, in the highlands, although land pressure was a concern, the patrilineal inheritance system was not raised as a problem. This indicates how male inheritance rights are a taken-for-granted part of PNG culture. We suggest that is an issue for discussion in East New Britain province because it stands apart from the majority of traditional land-inheritance practices of PNG.

Gender and the division of labour: insights from the 'day in a life' activity

The 'day in a life' activity was revealing to members of each of the community groups and often there was consensus between genders about the daily roles of men and women. As can be seen in Tables 1 and 2, selected from one of the Baiyer Valley workshops, it was men who noted the disparity between men and women in relation to how hard some women work. In every location, men were highly engaged in the analysis of daily activities.

The different domestic workloads between genders became apparent via this activity. However, at the same time, the range of contributions to the family beyond direct labour in the home and in the garden also became clear. For example, in the Baiyer Valley, the male role relating to tribal conflict was evident. The men who participated in the workshop noted how part of daily life is negotiating with other men regarding civil issues. It is interesting to note that the public role of peacemaking, negotiation, and dispute resolution was recorded as a routine activity for men, and 'paying compensation' was a budget item in a number of the discussions about family spending patterns. In Kerevat, the women cited an additional range of daily activities of men that included 'commitment for family need, school commitment, church commitment'. Such public activities were not recorded as women's work in any of the regions.

The importance of the 'day in a life' activity in awareness raising, as well as a research activity, was reflected in the comments of community leaders. While it is important not to generalise from an individual's comments, given the role and status of the community leaders (local-level government councillor, magistrate, minister, minister's wife, village recorder) and the assignment of the comment in a formal response to the research team, such comments do reflect an important public position.

Baiyer Valley community leader:

> To be honest, women work more than men in those activities they listed down. They do more than men. Women in our community work harder than men.

Through the 'day in a life' activity discussions, the importance of social interaction across a day for both men and women became apparent. While women spent a considerable part of the day on domestic chores, gardening and selling produce, they clearly acknowledged the place of social interaction, especially with other women. Table 3 shows one example of how talking with other women (gossip, telling stories, catching up) were activities that were integrated across the whole day.

Although productive work was the dominant feature of most groups' reports, the young men self-reported the lowest level of activity in gardening and family work and, in most of the discussions, young men's recreational activities were seen as problematic. In the Baiyer Valley region, community members reported the growing use of drugs (marijuana) and alcohol, which they estimated affected 10% of young men. In Kerevat, where there was greater access to recreational activities, there was a wide range of non-productive activities recorded (Table 4), although, interestingly, this was not highlighted or discussed in any of the summary discussion sessions.

Table 1. Typical day of an older man (Baiyer Valley, Western Highlands province)

Older men's activities as seen by older women	Time	Older men's activities as seen by older men
Wake up; pray, if they are Christians	5 am	Wake up and pray
Fetch water for drinking water Gardening Cut grass Dig ditches/drains, wrap green bananas, weeding, dig cassava for pigs, cut firewood	6 am	Help prepare the children and prepare to do my daily chores
	7 am	Feed pigs/chicken or go to town if there is a need
	8 am	Gardening, but if there is a worship program, attend it or go elsewhere. Some are employed so they go to work
	9 am	
	10 am	
Gather food for family and return home and have lunch	11 am	
	12 noon	Lunch, rest or chew betel nut
Go to the market, meet with friends	1 pm	Wash, watch sports on the field, go to the market or visit the court grounds (where peace is negotiated or issues are sorted out in small groups or as a community)
	2 pm	Gather firewood or go fishing
Fetch water for cooking. Go to the bush to feed pigs (those with many pigs have the pig houses in the bush, far from the house so food for pigs will be easily accessible and also to keep them away for hygiene purposes)	3 pm	Feed pigs or sometimes go for fellowship
	4 pm	
	5 pm	Help women prepare dinner
Dinner and pray	6 pm	Those who went to walk around in the market return home around this time
Family time	7 pm	Dinner time, some men return home around 8 pm
	8 pm	
Sleep	9 pm	Family time and sleep

Table 2. Typical day of an older woman (Baiyer Valley)

Older women's activities as seen by older men	Time	Older women's activities as seen by older women
Wake up and pray	5 am	Devotion
Breakfast and feeding pigs	6 am	Breakfast
Go to garden, weeding, planting	7 am	Children's breakfast, get children ready for school
Gardening, women with babies have extra work to do all day	8 am	Gardening, planting, weeding, digging and harvesting
	9 am	
	10 am	
	11 am	
	12 noon	Lunch or break, washing, resting and eating
	1 pm	
Looking for food for family and animals	2 pm	Continue gardening
	3 pm	
Feeding pigs	4 pm	
Return home and prepare dinner	5 pm	Fetching water
Family dinner time	6 pm	Preparing evening meal
	7 pm	Eating dinner
Making billum [traditional string bags] and others sleep because they work hard during the day	8 pm	Devotion time
	9 pm	Sleep
Sleep time and prayer (some ladies stay up until 11 pm, or even 1 am)	10 pm	

Table 3. Typical day of an older woman (Kerevat, East New Britain province)

Older women's activities as seen by older men	Time	Older women's activities as seen by older women
Normal wake up time	5 am	Devotion, prepare breakfast for school children and family
Preparation of breakfast and school children's food	6 am	Do the washing up and cleaning around the house
	7 am	Tell stories, chewing betel nuts, smoking
Family work	8 am	Find friends to gossip/'find lies'
Garden	9 am	Prepare tools to go to the garden
Clean around the house Laundry Feed animals, fetch water	10 am	Start walking to the garden. On the way to the garden, meet somebody on the road and start telling stories and chewing betel nut again
Care for young children (if relevant)	11 am	Start working and continue working till around 3 pm
	12 noon	
	1 pm	
	2 pm	
Other women's activities (church or community)	3 pm	
Go to market	4 pm	Collect food for dinner and return home
Prepare for meal around 6 pm	5 pm	Prepare dinner for family
Have dinner	6 pm	Dinner time
Do the washing of the plates	7 pm	Do the washing of the plates and clean the house
Leisure time Church fellowship Family discussion Visitation After hours, sustainable activities Program setting for next day	8 pm	Bathing time. Story time and catching up with other ladies while bathing at the well

Table 4. Typical day of a young man (Kerevat)

Young men's activities as seen by young women	Time	Young men's activities as seen by young men
Chewing betel nut and smoking on the road[side]	5 am	Wake up
	6 am	Breakfast
Cleaning garden	7 am	Feed pigs
Gambling	8 am	Gardening and house chores
	9 am	
	10 am	
	11 am	
Fishing and swimming	12 noon	Rest and lunch
	1 pm	
Sports activities	2 pm	Wash and relax
	3 pm	Sports, selling food (betel nut and cigarettes), gambling (playing cards) fishing
Resting	4 pm	
Drug bodies hanging on the streets [people affected	5 pm	
by drugs loitering]	6 pm	Dinner
Dinner and rest with family	7 pm	Family time
	8 pm	Go watch movies
Sleep at 9 or 10	9 pm	Sleep

Gender and the distribution of resources: insights from the 'talking tables' activity

The 'talking tables' process triggered considerable discussion and community analysis on the differences between how men and women spend money. As the final sheet was an accumulative record of the views of each subgroup (older men, older women, younger men, younger women), the summary presentation and discussion enabled the whole group to consider the analysis. In some cases, the group challenged the summary, while in other cases there was agreement, but in both scenarios, community dialogue and clarification took place (see Box 1).

Across this group, there was agreement by both men and women, as reported in the summary provided by the group below:

> Alcohol, cigarette, drugs—these are what men spend money on, such activities are destroying their families. Men who spend money on these things end up forgetting their families and children. Cigarette and alcohol destroys their lives and many times when they die we always conclude that a witch killed them but it is these activities that ruin their lives. We always say someone is living in poverty, but we forget that this person created this themselves as they spend money on other unnecessary things and when their real need arises they have nothing left. Most times we use money unwisely and we do not realise that we are inviting poverty to come into our lives. … It is hard to find money but it is easier to spend it.

The discussions in Kerevat about men's spending followed similar lines:

> There are some important things that men spend money on: school fees, clothes, food, mobile phones. Others are not important at all—alcohol (not helping the family), womanising (flick[4]) and family does not benefit at the end of the day, gambling (the family becomes poor because the father of the house spends the money).

In one Kerevat community, there was open disagreement between the men and women about the rationale behind women's spending, as shown in Box 2.

The women made the following comments:

> Not all women buy all the things that are listed, women do not wear new clothes every Sunday. If they do not spend money on things listed, then the family will not have enough things. It is true that women buy food, soap and all household needs and some women who have enough money can afford electric appliances (sewing machine, chain saw etc.).

In general, women's spending across the four communities did focus on family needs. One exception was a Kerevat comment concerning witchcraft: 'Mothers buy witchcraft to attract their husbands or to stop them from marrying many ladies'. Another

Box 1. What do men spend money on? (Baiyer Valley)

- Negative—buying *buai* [betel nut] and beer, men spend money on unnecessary things that do not benefit the family. Men spend money on gambling or horse race or pokies—that money should be used to buy a chicken for the family.
- Compensation—wastes money for the family—law-and-order problems cause this and something should be done.
- Giving money to *wantok*—too much.
- Giving money to new ladies—government law must be tightened to stop this.
- School fees are expensive—government should be subsidise.

Box 2. What do women spend money on? (Kerevat)

- Dressing—hair food [products], shorts (six-pocket [fashion]), perfume, earrings, new clothes every Sunday
- Kitchen utensils—spoons, plates, pots, cups etc.
- Food—rice, sugar, salt, tea, buns
- Washing detergent—soap, powdered soap, brush, bleach etc.
- Household needs—kerosene, sewing machine, lawn mower, chain saw, garden tools, grass cutter, generator, petrol, washing machine

[4] Flick is a Tok Ples (local language) term that refers to paid sex

comment regarding women's spending was made by one of the young men's groups in Kerevat commenting on young women's 'grooming' (which came up in the 'day in the life' activity as well as in the 'talking tables'):

> (In our community), we have traditional law that governs us, so when you dress up and do hair etc., think about your action and what you do, so the men can respect you. Rape can occur and people will gossip about you, so grooming is good but think about your body and do well.

Although these comments were not taken up further in the workshop, they reflect widely prevalent attitudes across the world about sexual violence and women, in which blame is attributed to women for violence perpetrated against them. The United Nations (UNFPA et al. 2005) noted that poor women are more vulnerable to all forms of violence because they live in uncertain and dangerous environments. For example, in this project, PNG women smallholders often have to travel to markets, which can pose a risk to their physical safety. If smallholder families are to improve and sustain their livelihoods, the unequal gender division of farm and family labour must be considered, but it cannot be considered in isolation from other gender factors, such as attitudes to women. This is clearly pertinent to the contexts in which this research is taking place in PNG.

Gender roles in transition: insights from the community leaders

The communities that contributed to the baseline study illustrated how gender relations are dynamic and changing. In the Baiyer Valley, this was demonstrated in the closing speech of one community leader, as he recognised the growing leadership roles taken up by women.

> In PNG culture at a mumu [communal feast] it is the man who is asked to carve the pig; he then gives the leg of the pig to a valued man to cut up and serve. Today, it is now women who are bringing in development to the community and it is now women who should receive the honour of receiving the leg of the pig. The process that [the research team] have used is like this process. They have respected the role of the leader and I am pleased to see this ... This project can change the mindset and I welcome the project.

In the debrief meeting, two of the Baiyer Valley women project leaders supported those comments as follows:

> [In the past] Men were the bosses and leaders in the community. Things have changed and ladies are now leading [us] to almost everything in the community and men in [this community] have realised their leadership roles.

Similarly in Kerevat, the extensive organisation of the East New Britain Women and Youth in Agriculture Cooperatives Society[5] reflects a level of community and male support for women and youth initiatives. Although these groups are based on family units, women are taking leadership roles with the support and agreement of men. As one woman leader said, 'It is time for men to step back and support the women from behind—it is [the women's] turn for training'.

It was clear that gender relations are in a state of change, as evident in the position taken by one Kerevat male leader:

> Kuanua[6] is a matrilineal society. The man works and sweats for the land but the land and possession will be owned by his children. Today, in our society women and men work equally, I believe that women are good managers and accountants. I do not believe in children's right and women's right, instead we are all equal, we are a collective society.

Conclusion

Despite the rhetoric of gender equality, the development literature suggests that women continue to face inequality in the agriculture sector and our preliminary work to date supports this. World Bank et al. (2009) have argued that gender issues must continue to be tackled in agricultural development where gender inequalities in access to, and control over, resources are persistent and where gender differences, arising from the socially constructed relationship between men and women, affect the distribution of resources between them.

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5 This organisation comprises 25 registered cooperatives with 15 affiliated and waiting for registration (registration is with the Department of Commerce, Innovation Promotion Authority); average group size is 20–25, with the aim to move from subsistence agriculture to an agribusiness model.

6 This community leader stressed that the people of the Kerevat area should be referred to as Kuanua: 'We would like to ask people to refrain from calling this community Tolai, meaning Mr Liar; we would like to be called the Kuanua Society'.

Previous research has indicated that the establishment of commodity crops for export and contract farming of horticultural crops have fuelled gendered household tensions and, as a result, there are struggles over access to, and control of, household labour, resources and income (Koczberski 2007; Bourke and Harwood 2009). The changing nature of agriculture is having an impact on functional traditional gender roles in PNG; however, the community workshops in this study have demonstrated that communities are willing to consider how to reorientate to more-effective ways for families to work towards improved livelihoods through improved collaboration.

Having begun a gender-awareness process, the project now aims to use a community education approach to support families to develop shared family goals. Through two-way participatory learning and action, we hope to understand what discourses and ways of understanding will promote a positive outcome. We are aware that there will be questions that need to be explored in separate gender groups, but we believe that these results are best fed back to the communities to consider together. Vallance (2007, 2008) has argued that, in PNG, the depth of research knowledge depends on collaborative development approaches that reflect and maximise the Melanesian ways of knowing and sharing.

The place of two-way learning is paramount. As can be seen in the following closing speech by a Kerevat woman leader, collaborative research can provide mutually beneficial learning as well as deeper understanding of the data that are generated:

> Many organisations come and go and they write up the report that we never see. We thank you for saying that you will write up the report on what we said and you will document it and we will see the results … We believe we will benefit because the activities were really good and we learnt a lot from them. Other research organisations have come and gone and have said things that are not true about us. They called us uncivilised … On behalf of the mothers once again we say thank you very much.

We share the goal of each of these communities to improve and sustain family livelihoods through enhanced agriculture. As we further develop relationships with the communities, we hope that trust will enable the complex gender and cultural questions to be mutually considered.

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Report on workshop discussion sessions

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1. The 'share and learn' theme of the workshop was endorsed by all participants and there was willingness to speak openly about the strengths and weaknesses of various research approaches as well as about different socioeconomic research philosophies. All parties participated in the vigorous discussion and question sessions, which were interspersed between the paper presentations. Adequate time was allowed for these discussions. Furthermore, the overall workshop program was structured in such a way that time was available for project-specific interactions and also for inter-project discussion outside the formal workshop sessions.
2. The complexity of the sociocultural environment of PNG farming systems means that it is difficult to predict how livelihood improvements can best be made. It also means that such improvements (for example, new technologies or crops) are not likely to succeed if they are promoted without sufficient reference to the prevailing sociocultural context. But what constitutes 'sufficient reference'? This obviously varies according to circumstances, but must be greater than zero essentially in all cases. This is being increasingly recognised, even in the more traditional agro-biophysical institutions of PNG. Furthermore, socioeconomic research institutions or departments are moving from an independent, and static, to a more collaborative and dynamic interaction, with scientists and others seeking to promote change. Methodologies such as participatory action research (PAR) that provide an ability to meld research with the circumstances of potential adopters, are still relatively new in PNG (Spriggs et al.[2]). They have further to run, in terms of both commitment by research institutions, and in finding cost-effective implementation strategies to guide potential interventions. One discussant preferred an alternative label, and slightly broader concept, to PAR, namely 'participatory learning and action', with an implied stronger emphasis on stakeholder learning. This would sit well with a workshop view about the need for a stronger emphasis on capacity building of PNG collaborating institutions in Australian Centre for International Agricultural Research (ACIAR) (and other) projects, to increase the sustainability of project operations and enhance longer term impacts.

   A key output of the intensive village-based work (e.g. Apis et al.) is that there are myriad activities that take up people's time and labour. Any notion that villagers have 'idle' time with near-zero opportunity cost is incorrect.
3. Defining appropriate stakeholders for implementing the two-way communication between the 'community' (farmers, others) and researchers requires careful thought—in some cases, a relatively narrow selection of farmers, scientists and extensionists may suffice. In other cases, such as supply-chain work from the highlands to the lowlands, a broader range of stakeholders is required and there is a bigger task in managing such an exercise.

   Government institutions, sometimes from a range of departments, would typically also need

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[2] Papers mentioned are in: Hickey G. (ed.) 2013. Socioeconomic agricultural research in Papua New Guinea. ACIAR Proceedings No. 141. Australian Centre for International Agricultural Research: Canberra. [These proceedings]

to become involved. However, at certain levels of government, their capacity to be involved is weak, so integration of government effort across a range of departments becomes even more problematic. In the current PNG situation, district-level involvement is more important than provincial level, since the district level is better resourced, but with weaker human capacity. With the marketing orientation of PNG farmers increasing, the role of the private sector becomes more relevant.

In addition to care being taken regarding the choice of participating stakeholders, discussants saw other key requirements for implementing PAR-type methodologies, including strong facilitators for workshopping, plus detailed preparatory work to set the scene (e.g. Chang, Irving and Villano) and to bring all participants to the same level of prior knowledge.

4. In light of the complexity mentioned above, some of the papers in this workshop reflected quite intensive village-level research efforts, and the question was raised as to how generalisable these studies are (i.e. are the findings applicable beyond the particular case-study village?). Complexity is combined with diversity (i.e. lack of homogeneity in moving to different areas, often over just a short distance). This limits extrapolation potential—a fundamental problem recognised by the participants. One approach for dealing with the situation is to undertake in-depth village surveys to unearth hypotheses or principles, which may then be tested in other villages in a more focused and lower cost way, possibly even by direct observation. Perhaps more research effort could go into exploring this line of enquiry (i.e. how to make in-depth village-level studies more generalisable, from the perpective of agricultural research).

   An example of the value of in-depth understanding is demonstrated in the paper on a new Clan Land Usage Agreement (CLUA) template (Koczberski et al.). This was developed following in-depth village studies and consultations, and then pilot tested. The new CLUA was then found to be broadly applicable elsewhere. (The geographical promulgation of the agreement was enhanced by having an industry body (the Oil Palm Industry Corporation) with a mandate and the resources to implement the agreement.) So, in-depth village-level studies definitely have a place in agricultural research, provided there are strategies in place to maximise the impact of such studies. Because of the heavy resource requirements for such research, the selection of the village(s) requires care and preparatory work (and perhaps some initial 'pilot testing' to check the practicalities of working in a particular place, since some villages are insurmountably intractable).

   One could spend vast resources trying to unravel the mysteries of complex PNG smallholder farmers. Most farmers grow multiple crops, or mixtures of trees and crops, and often on the same parcel of land. Apart from biophysical complexity, there is the added dimension of PNG farmer goals and aspirations. It was recognised that these are multifaceted and often go beyond income-related parameters to encompass more psychic and cultural benefits (e.g. acceding to clan or family obligations). The sharing aspect that pervades PNG society is a dimension that can inhibit productivity improvements at the individual level. There was some discussion about the 'happiness' of villagers. According to one survey, happiness was high, although there were reservations about the ability to capture the nuances of the term in a single survey, especially given possible interpretation problems.

5. It was suggested that farmer goals are often more geared towards satisfaction rather than optimisation, but there were also contrary views expressed at the workshop. The more generic implication is that PNG farmers' aspirations and goals are not the same as perceived/assumed by outside experts, or others who may be trying to assist with interventions. It is important to understand farmers' goals and ambitions in order to try to respond to perceived needs, rather than outside ideas being imposed or promoted. A stakeholder workshop is the key place where that understanding can be initiated.

   Some 'new' methodologies related to PAR were raised in the discussion. These represent nuances in relation to 'standard' PAR. The latter is usually 'problem-based' or 'constraints-based' in its approach. These other methodologies are appreciative inquiry (AI) and asset-based community development (ABCD) (e.g. Pamphilon et al.). These two, which have similarities with one another, take a perspective of building upon existing and perceived *strengths*, and consequently may serve better to bring a sense of empowerment to people and communities,

which may help to bring about change. This is especially important where there is a community self-help orientation. Alternatively, where an 'outside' agricultural research intervention is envisaged, then stakeholders will likely include scientists, with some kind of preconceived ideas, and farmers. In this case, *participatory* action research implies some form of interaction between the two to jointly design and implement change.

6. Women in PNG are critically important for agriculture but their roles and contributions are often downplayed by men. Hence, women are underutilised from a national perspective. Methodologies to ensure that their voices are heard in research projects include: holding separate interviews with men and women; asking questions of men and women about their perceptions of the other's role (and then facilitating a more common understanding); and developing training programs specifically tailored for women (Seta-Waken et al.), with the design of those programs being based upon a detailed analysis of respective needs (Palaniappan et al.). There can be unintended (negative) consequences for women from research interventions. For example, households may gain access to credit from a microcredit pilot study, but the associated debt burden may fall disproportionally higher on women, while they may not have gained a benefit from the loan.
7. The presentations and discussion sessions in the 2-day workshop were split—one day with a highlands focus and one day with a lowlands focus. Of course, there are climatic and geographical differences between the two, but the interest of workshop discussants was primarily about whether socioeconomic methodologies are, or should be, different between them. The consensus was that the similarities between the two regions outweigh the differences from this particular perspective. Relative remoteness (whether in the highlands or lowlands) predominates. Roads and other infrastructure are pervasive constraints throughout the country. Highlanders were seen to be more entrepreneurial (a positive from the perspective of achieving impact), but more suspicious of researchers and generally requiring more 'massaging' to achieve research collaboration. Women's issues of heavy workload and lack of control over household finances are common in both regions. From the point of view of the application of various socioeconomic methodologies and the broad issues that might be addressed, the highlands and lowlands were seen as being similar. Of course, crops grown and agronomic practices do vary between the two.
8. There is not a strong savings culture in PNG. Microfinance can potentially help in this situation (Chang et al.). Many farmers have put loans attained from microfinance schemes to good use, achieving results of 100–200% returns. But problems with implementation (design) from the financial providers' perspective, and lack of sufficient financial management training for receivers (even though this is theoretically a prerequisite to obtaining a loan), have caused problems. Some farmers abuse the escalation clauses in the scheme, whereby if smaller loans are repaid, then farmers can become eligible for larger loans. So some farmers simply borrow and repay the smaller loans without actually investing, until they become eligible to receive larger loans, with no intention to repay.
9. There was considerable discussion about the many attractive features of, and potential for, floriculture in PNG for all actors in the value chain. Flowers are a relatively high-value crop and fairly easy to grow, with scope to expand the range of species grown. As well, there is much potential for value adding, and strong and historical involvement of women (Wei et al.). Against this, the PNG market size is likely to be quite small, and thus susceptible to oversupply. Longer term, supply to places such as Singapore could be possible and this could expand the market significantly. There was a thought that the Australian market could be difficult to enter due to heavy quarantine restrictions.

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