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A NOTE ON ENTREPRENEURSHIP AS AN ALTERNATIVE LOGIC TO ADDRESS FOOD SECURITY IN THE DEVELOPING WORLD

LAURIE BONNEY
University of Tasmania
Hobart Tasmania Australia 7001
lbbonney@utas.edu.au

RAY COLLINS
The University of Queensland
Gatton, Queensland

MORGAN P. MILES
University of Tasmania
Launceston TAS 7250 Australia
Morgan.miles@utas.edu.au

MARTIE-LOUISE VERREYNNE
The University of Queensland
St Lucia Queensland Australia

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The purpose of this paper is to explore an ongoing application of the entrepreneurial method applied to the problem of food security in the developing world as an alternative logic. Food production and marketing channels in the developing world are often based on scientific logic starting with an ideal outcome and then strategically designing a plan to achieve it. This study is unique in that it describes the application of an entrepreneurial approach to food product and marketing in less developed nations. A field study is used to illustrate how entrepreneurship is being harnessed to help build a more efficient and effective agricultural value chain in Papua New Guinea (PNG) based on a more entrepreneurial approach. Value chain analysis uses effectual logic to leverage innovation and create value for the consumer, the organization and society; thereby enhancing food security for the desperately poor in PNG. The use of the entrepreneurial method is offered as an alternative model for future international aid interventions and policy.

Keywords: Entrepreneurial method; developing economies; value chain.

1. Introduction

Too often, individuals blame business for poverty that affects much of the world; however, rather than being the cause of poverty, business is part of the solution. The ability to bring

commerce to those in desperate need will encourage the economic development of these settings. Much of the world has made rapid economic progress over the last 20 years; however, that so many people remain in such desperate poverty should motivate management scholars to seek ways to encourage business and economic development in these places (Bruton, 2010).

2. Purpose

Sarasvathy and Venkataraman (2011) describe an entrepreneurial perspective as an approach to creating market opportunities that help alleviate the needs of the world's poorest through "unleash(ing) the potential of human nature." This paper explores how entrepreneurship as method has been harnessed to create a more efficient and effective agricultural system to better the lives of the poor using a case study of a developing nation, PNG. Specifically, we (1) investigate the exploitation of entrepreneurship as method within a vegetable production and marketing value chain that supplies food markets in Port Moresby, PNG; (2) illustrate the application of value chain analysis to create a better coordinated and more effective vertical marketing system designed to improve food security for the poor; and (3) explore how international development agencies, such as the Australian Centre for International Agricultural Research (ACIAR), leverage entrepreneurship as method to begin to enhance the quality of life for those bottom billion through the creation of value for consumers, organizations and society. This project extends the work of Collins *et al.* (2002) and Bonney *et al.* (2007a) on agricultural value chains by adapting Kotler and Keller's (2006) notion of a value creation equation and Morris *et al.* (2011) classification framework of corporate entrepreneurship to develop a framework of entrepreneurial value creation.

Bruton's (2010) recent call for action has stimulated scholars to consider how entrepreneurial initiatives may be used to improve the lives of those desperately poor residing in the world's less developed countries (LDCs) described by Collier (2007) as the "bottom billion." Sarasvathy and Venkataraman (2011) suggest that "large and abiding problems at the heart of advancing our species" that have not yet been solved through the "scientific method" may be potentially addressed through the entrepreneurial method. They argue that the entrepreneurial method reflects the increasingly resource-constrained reality of the rapidly growing and consumptive population. This entrepreneurial perspective uses an effectual conceptualization of problems to reframe "the problem space and reconstituting existing realities into new opportunities, whereas causal framing involves the discovery and exploitation of existing opportunities within a given problem space" (Dew *et al.*, 2009). Effectuation logic has many advantages over the traditionally used causal logic-dominated scientific method for international development initiatives. Sarasvathy (2001) found that innovation and business creation is an effectual, creative and dynamic process starting with the means the entrepreneur can leverage and ending with a unique outcome. Instead of strategic planning to determine what the desired outcome is for the international development initiative, effectuation logic suggests the international development agency

focus first on the means and resources that can be leveraged and use these means to create a new outcome.

With food security becoming more of a strategic issue for global geo-political stability because of rapid population increases in LDCs, increasing urbanization and rising demand for the use of agricultural resources for alternative sources of energy such as bio-fuels, world leaders are increasing their interest in food security (for example, see WikiLeaks, 2011). In this regard, Sarasvathy and Venkataraman's (2011) conceptualization of the entrepreneurial method has much to offer international development agencies when attempting to address the critical issue of how to create what the United Nations' Food and Agriculture Organization (2010)(www.fao.org) suggests when it proposes:

> *Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.*

Banerjee and Duflo (2007) report that among the very poor, "food typically represents from 56 to 78 percent of consumption among rural households and 56 to 74 percent in urban areas." The entrepreneurial methods would suggest the problem of food security for the very poor could be reframed to consider how this tragedy can be turned into an attractive market opportunity. For example, entrepreneurship scholars such as Prahalad and Hart (2002) and Hart and Christensen (2002), among others, suggest the very poor can be an economically attractive market segment with tremendous unmet needs when seen from this opportunistic entrepreneurial perspective.

International development agencies, such as ACIAR, have explored a more entrepreneurial perspective to leverage development resources. ACIAR provides funding to support the innovation of agricultural value chains in LDCs, attempting to use innovation-oriented social and bio-physical research to increase food security among the earth's poorest. This type of initiative illustrates the beginnings of a revolution in thinking from a scientific method-based causal logic to an entrepreneurship-as-method effectuation-based logic in international development agencies such as ACIAR.

3. The Entrepreneurial Method

The linear, scientific view that espouses entrepreneurs identify, evaluate and exploit opportunities has been criticized as not adequately reflecting the resource-constrained reality of our world (Shane and Venkataraman, 2000; Sarasvathy and Venkataraman, 2011). The entrepreneurial method, or effectual logic (Read *et al.*, 2009; Sarasvathy, 2001; Sarasvathy and Venkataraman, 2011), espouses that entrepreneurs co-create opportunities with stakeholders to allow goals to emerge over time through this interaction, given a set of means. Effectual reasoning is a creative process that is of particular use during venture creation. For example, effectual reasoning starts with the means of "what I know, who I know and who I am," and then leverages these means to achieve an often stochastic array of potential outcomes. Sarasvathy (2001) argues that effectuation

is underpinned by principles such as affordable losses, the importance of key relationships and the leveraging of contingencies, that when combined provides a logic of how successful entrepreneurs have forged new value creating organizations. These ideas have been seen in a number of entrepreneurial studies, both academic and practical. For example, Baker and Nelson (2005) show how resource-constrained firms do not allow internal or external limitations to create a barrier to enact opportunities, and instead, make do with what is at hand or by combining new resources. Reis (2011) also argues, from a more practical perspective, that this form of entrepreneurial thinking avoids waste, frequently adapts ideas, learns from mistakes and therefore, can do with fewer resources. These ideas may prove to be particularly useful in a developing economy in which resources are scarce, feasible opportunities are not obvious and relationships are crucial.

International development agencies are institutions grounded in the application of science and technology to the world's food and development problems. Schramm (2010) notes that, in the cases of Afghanistan, Haiti and Iraq, a scientific based command and control approach to economic reconstruction tends to fail. Although the scientific approach to problem solving has driven great advances in the production of food, such as the Green Revolution's hybrid seed technology's impact on reducing poverty and malnutrition in the LDCs from the 1950s to the 1980s (see Lipton, 2007), it does not help make a dynamic and prosperous economy (Schramm, 2010). With these technology interventions have also come unintended and undesirable consequences such as increased urbanization in LDCs, increased risk of large scale crop failure because of lower levels of bio-diversity and increased levels of debt incurred by substance farmers that adopt more sophisticated agricultural technology. An entrepreneurial dynamic perspective helps transform these problems into market opportunities to create value and generate wealth within the LDC. Instead of considering malnutrition as a problem primarily of food production, the entrepreneurial method forces an effectuation based systems approach, leveraging innovation to transform a series of spot markets into a more coordinated vertical marketing system and agricultural value chain.

Effectuation scholars (see www.effectuation.org) have suggested there is an effectual cycle that is recursive, dynamic and flexible; that results in both new outcomes and new means. The effectual cycle is divergent and expanding in contrast to the scientific method's convergent and contracting causal logic models and creates additional means through the interaction with customers and stakeholders. The process of effectuation logic begins with the "bird in hand principle," or the means, resources, partnerships and capabilities that can be initially leveraged. Then, effectuation logic suggests decisions are screened by potential loss. Actions that have an unacceptable loss are avoided, even if they might also result in a significant outcome. Interaction with customers, beneficiaries and partners is engaged in at the onset of the initiative to generate additional means and ends. Relationships are formed with various customers, beneficiaries and other stakeholders who commit to the co-creation of the future, creating new means and ultimately new outcomes. Figure 1 develops a generalized effectual cycle that illustrates international development initiatives.

Fig. 1. Generalized effectual cycle[1] for international development projects.

4. Value

4.1. *Value to consumers*

The need to craft specific value propositions for very poor consumers often requires radical innovation within the organization, its strategies, processes and, most importantly, its mental models. Porter's (1985) value chain framework maps the incremental value creation process within a firm based upon inputs, operations and marketing processes. Subsequent authors have extended Porter's concept of a value chain within a firm, to value chains as systems that extend from input suppliers, through primary and secondary processors, to wholesalers, retailers and most importantly, the final consumer (Bonney *et al.*, 2007a; Evans and Berman, 2001; Walters and Rainbird, 2006). In developed countries and LDCs alike, each organization in a value chain must seek to create value for consumers, often achieved by process innovations and new value propositions for consumers. For organizations seeking to serve an LDC's $2-a-day market segment; however, the causal "ends-based" logic of traditional value chain analysis is sometimes simply not useful. To serve this market segment, the more effectual means-based entrepreneurial logic that considers the level of resource endowment, capabilities and constraints of the value chain's organizations can harness vertical co-innovation to reduce costs while enhancing benefits to consumers (Sarasvathy, 2001).

Kotler and Keller (2006) describe value for consumers as a function of the difference between total benefits derived from the product and total costs incurred from the purchase, consumption and disposal of the product. Their (2006) model highlights the benefits and costs of consumer value creation and can be used to explain the competitive position of a market offering in both developed and developing economies. In the present study's context, benefits accruing to the consumer generally include (1) product related–for

example abundant, safe and nutritious food; (2) service–access to safe food; (3) reputational–social benefits derived; and (4) human, cultural and social benefits–if human capabilities are developed through better nutrition and experience. Costs include (1) monetary cost–the price of the product; (2) time and effort costs–in the case of produce, the time and effort to purchase, prepare, consume and dispose of it; and (3) psychological costs–if the produce is not fresh, safe or of sufficient quality, then there could be dissatisfaction, public health problems or even starvation.

4.2. *Value to the organization*

Entrepreneurship is *the* tsunami of innovation that overwhelms markets, wipes away entire industries and forces a recombination of resources into more valuable alternative uses (Schumpeter, 1934). Entrepreneurial initiatives are undertaken to achieve organizational objectives by meeting human needs, thereby creating social benefits. Corporate entrepreneurship (CE) is a creative and disruptive initiative in which an organization accepts the risks of pioneering radical innovation focused on the organization's products, processes, strategies or value propositions in the pursuit of competitive advantage (Covin and Miles, 1999; Morris *et al.*, 2011).

Work by Miller (1983) and Covin and Slevin (1989) conceptualized firm-level entrepreneurship as proactive, risk accepting, innovative initiatives adopted to enhance organizational performance (Covin *et al.*, 2006). CE, as conceptualized by Morris *et al.* (2011), has five generalized forms: (1) sustained regeneration; (2) organizational rejuvenation; (3) strategic renewal; (4) domain redefinition; and (5) business model reconstruction. Sustained regeneration is a focus of innovation on the product to create a more effective and/or efficient solution to consumers' latent and unmet needs (e.g., using genetically-modified seeds to create more desirable and useful produce). Organizational rejuvenation is directing innovation toward the organization and its processes to create superior effectiveness (e.g., adopting hybrid seed during the Green Revolution).

Strategic renewal transforms the organization's relationship with its external stakeholders and often reconfigures the rules and standards within a product market (e.g., establishing a coordinated vertical marketing system (see Etgar, 1976 for a discussion of vertical marketing systems). Domain redefinition is the application of innovation to create new markets and diversify away from an organization's core businesses into new product/markets (subsistence farmers shifting from food vegetable cropping to cash crops such as tobacco or cotton).

Business model reconstruction alters (1) *whom* the organization creates value for; (2) *what* capabilities are leveraged to create value; (3) *when* the organization plans to grow, mature, and/or be harvested; (4) *where* the organization positions itself in the market; and (5) *how* the organization plans to sustain itself and remain economically viable? For example, during the green revolution, farmers who adopted hybrid seed technology were often forced to concurrently incur debt for the first time. Hybrid seeds are sterile, and therefore, seed for planting could not be retained from last year's harvest but would have to be bought for cash, something substance farmers often did not have, forcing the farmer

to adopt the use of credit and financial leverage. These entrepreneurial initiatives directed at making a food value chain more effective and efficient force the re-conceptualization of how food is produced and marketed and how value is appropriated.

4.3. *Value to society*

Recently, efforts to extend the domain of entrepreneurship and broaden its scope to include a social context for opportunity creating initiatives have been made (see Sarasvathy and Venkataraman, 2011). Chell (2007); Dacin *et al.* (2010); Yunus *et al.* (2010); Luke *et al.* (2010); McMullen (2011); Trivedi and Stokes (2011); and Lumpkin *et al.* (forthcoming) are authors who have attempted to expand the domain of entrepreneurship to integrate traditional entrepreneurship with social issues and objectives. Scholars suggest social welfare objectives also acknowledge the importance of the financial performance of the social enterprise for its economic sustainability (Chell, 2007; Seelos and Mair, 2007; Yunus *et al.*, 2010).

Can the transformative power of the entrepreneurial method be harnessed to create a better life for those who suffer in the despair of deep poverty and food insecurity? Can entrepreneurship be a potential solution to some of the systemic problems in the developing world, such as tribalism, tradition and political threats that constrain economic development and diminish social welfare? Recent work by Sarasvathy and Venkataraman (2011) suggests the answer is that entrepreneurship as method may be one alternative to solve the growing food security problem in the long run. Table 1 illustrates how innovation in the fresh food value chain can potentially generate value to society by enhancing food security and creating entrepreneurial capabilities. Table 2 illustrates the relationship

Table 1. A proposed social value equation: value to society of innovation in the agribusiness value chain.

Social Value of Innovation	Benefits to Society	Costs to Society
Inputs	Increase in importance of knowledge and technology Increase in marketing, communication, and relational capabilities of value chain members	Requires some form of continuing education of value chain members — both technical and managerial
Innovation Process	Lower cost, higher quality products Cultural change in orientation towards the consumer Management development experience Enhanced opportunity awareness, assessment and exploitation capability Potential to build wealth through the creation of intellectual property rights	Cultural push-back because of "outsiders — non tribal member" inputs Innovations too resource intensive and, therefore, increase financial and performance risk to value chain members A poor fit with cultural values may result in push back.

Table 1. (*Continued*)

Social Value of Innovation	Benefits to Society	Costs to Society
Outcomes — Superior Product, Management Development of Agribusinesses, and higher consumer satisfaction	Better nutrition for consumers Increased assortment and availability of higher quality produce Improved profitability or economic performance for value chain members Lower food costs Higher quality food Potential for exports Fewer imports Increase in technical capability Enhanced food security Access to education Employment	More efficiency may result in less employment Marginal land may be put into production Unintended environmental consequences Potentially greater differences between haves and have nots Political interference may redirect wealth? May lose some traditional products or services Value created may not be shared equitably among chain members.

between the Morris *et al.* (2011) forms of CE and the value equation in a typical LDC agricultural value chain.

5. Co-Organizational Innovation Interfaces

Co-organizational innovation linkages have been conceptually and tentatively explored by Teng (2007) as a mechanism of exploiting entrepreneurship to create competitive advantage in a highly developed economy. Likewise, Thorgren's *et al.* (2009) empirical work on inter-firm linkages and corporate entrepreneurship in Sweden found a self-reinforcing positive relationship between corporate entrepreneurship and inter-firm knowledge transfer. Work by Bonney *et al.* (2007b) and Bonney *et al.* (2007a) showed that co-innovation in agribusiness value chains results in lower costs, higher consumer value and performance advantages.

Although inter-firm innovation can provide synergistic and other benefits, a number of disadvantages specific to the LDC context must be considered. Discontinuities between organizations in terms of their operations, values, staffing and risk perception, coupled with lack of trust, relationship diversity and clashing cultures, may hamper innovation. This complexity is intensified when the firms are heterogeneous, for example exhibiting significant differences in organizational size, orientation, technological capability, processes, or ethics. Although these differences commonly occur between local firms within LDCs, when multi-national corporations (MNCs) set up in LDCs, the problem can be far greater. Despite their obvious differences, MNCs must rely on local partnerships because leveraging existing capabilities through this form of collaboration has low opportunity costs, can provide scale and helps with the development of new firms in the host country. Local partner-MNC differences can stifle normal operations, let alone the practice of innovation.

Table 2. Form of corporate entrepreneurship value chain initiative and its impact on consumer value in the case study.

Value[2] to Consumers	Sustained Regeneration[1] PRODUCT INNOVATION	Organizational Rejuvenation[1] PROCESS INNOVATION	Strategic Renewal[1] INNOVATION OF STRATEGY	Business Model Reconstruction[1]
Product[2]	Providing the product attributes preferred by consumers including innovation of quality			
Service[2]	Complementary services to product innovations, such as training to use new products	Altering the distribution network to lower costs (including human costs) and provide enhanced services		
People[2]/Human and Social Benefits			Leveraging tribal networks to create marketing and production co-ops that aggregate produce to gain economies of scope and scale	Selling to large institutional consumers and selling directly to retailers
Image[2]/Reputation			Quality image improves because of improved communication with stakeholders?	
Monetary[2]		Adopting more modern vegetable cropping methods to drive down costs; innovation to increase value improves income		
Time and Effort[2]		Process efficiency means less time and effort has to be expanded on production of products and reduced waste.		
Psycho-Logical[2]	Enhancing food safety and cleanliness			Repositioning in value chains, etc.?

1: Morris *et al.* (2011)
2: Kotler and Keller (2006)
3: Vargo and Lusch (2004)

6. Method

6.1. *The case study*

This paper presents the early findings from an ongoing field study of entrepreneurship within the agribusiness sector in PNG. The U.S. Central Intelligence Agency's 2010 Fact book (www.cia.gov) estimates that PNG's per-capita income is in the lowest quartile globally, with a skewed income distribution as illustrated by a Gini index of 50.9, similar to several sub-Saharan nations such as Niger and Zambia. Approximately 36 percent of the population lives below a self-reported poverty line. Many people in Papua New Guinea exist in desperate poverty that has 82 percent of the population working in agriculture but generating only 21 percent of GDP (Coppel, 2004; Birch *et al.*, 2009). Tribalism, lack of public infrastructure, public safety concerns, very inefficient food production and marketing and lack of education all contribute to PNG's food security problems.

The case study presented here was conducted by a project team from the Tasmanian Institute of Agricultural Research (TIAR) and Papua New Guinea's Fresh Produce Development Agency and National Agricultural Research Institute, and funded by the Australian Center for International Agricultural Research (ACIAR) in 2008 and 2009. Study methods included interviews, site visits, value chain analysis and group discussions.

Agricultural production in PNG is predominantly carried out by subsistence farmers using very traditional methods. Family subsistence needs are largely met by the household's production on its own land, and so the family is not compelled to rely on regular sales to obtain daily necessities (Benediktsson, 1998; Worinu, 2007). However, the issue of food security in PNG, as in other LDCs, is emerging as the population continues to rapidly increase and become more urbanized, and therefore, much more dependent on the purchase of food. For the impoverished market segment, this creates food security issues in terms of the risk of malnutrition.

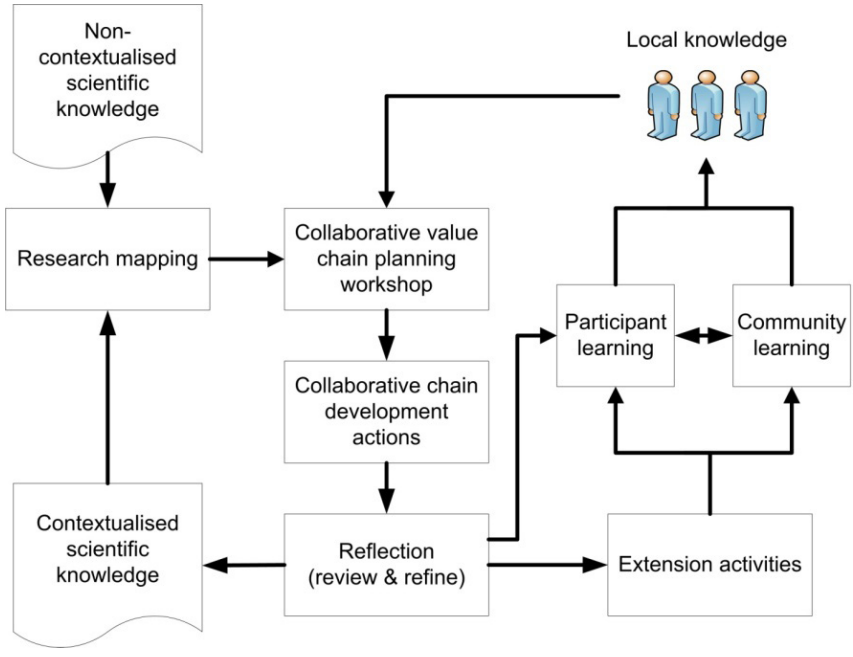
Commodity supply chains traditionally operated in a perfectly competitive market structure characterized by many buyers and sellers exchanging a largely homogenous product with no vertical marketing coordination throughout the channel (in contrast to the highly coordinated vertical marketing systems that have emerged in specialty and organic food markets where the culture is one of "selling through" the other supply chain members in a mutually beneficial arrangement and that tend to create a monopolist competitive market structure). In the case of the field study, no vertical coordination between food producers and distributors existed prior to the value chain intervention.

In the case of PNG's food supply chain, few farmers used innovation to improve the consistency of supply or the quality of their produce because economic or social incentives were few. This perpetuated poverty for subsistence farmers (Vermeulen and Cotula, 2010) and, combined with the cost of accessing education and health services, drove significant internal migration from rural areas to major urban centres (Bourke and Harwood, 2009). In particular, this caused social and environmental problems in the peri-urban areas around the capital, Port Moresby. The PNG Fresh Produce Development Agency (FPDA) conducted the only major study of fresh vegetable supply to Port Moresby and estimated the shortfall in vegetable production could be as high as 80,000 tons per annum (Liripu, 2008).

6.2. *Research methods*

Knoppen and Christiaanse (2007) argue that multidisciplinary approaches are necessary to provide improved explanations for the dynamic, complex interactions involved in the appropriation, coordination and adaptation processes in supply chain operations. This has prompted many international development agencies to use a systems approach to help overcome the complexity of efficient and effective food production and distribution in LDCs. Hence, ACIAR adopted a multidisciplinary approach to the development of value chains in PNG based upon entrepreneurial, sustainable, low-input horticultural production and management principles. This project's objective was to provide food security for Port Moresby while providing income opportunities for subsistence farmers.

Data were collected on the physical flows, communication flows and relationships from observations (to map the "means" of innovation and material flows), and semi-structured and focus group interviews using convergent/divergent interview techniques with a wide range of value chain participants, including the market buyers. Data were analyzed using qualitative content and thematic analysis, aided by the computer application NVivo (Version 8) to identify themes. This formed the basis for the development of potential "value chain innovations," which were validated with value chain participants. Figure 2 illustrates the rapid value chain research and development method used to explore the existing but uncoordinated vertical marketing system.



Source: derived from Chambers and Spriggs (2009).

Fig. 2. A rapid value chain research and development method.

The iterative and ongoing processes captured in Fig. 2 and used in the study's rapid value chain research and development method consists of a five stage model: (1) situating the marketing system; (2) channel member and community focus groups; (3) creating and implementing an action plan; (4) reflection and improvement; and (5) participant and community learning.

Stage 1 — Background research on the marketing system
Mapping the physical movement of vegetable products from production to the consumer, as well as socio-economic mapping of the individuals and businesses, involved the social, cultural, political and economics rules governing the behavior of actors in the uncoordinated vertical markets of PNG.

Stage 2 — The channel member and community focus group workshops
Step 1: A women's only workshop was conducted to identify their capacities and problems in the marketing system from their perspective.
Step 2: Conducting the main workshop will involve the representatives of all the stakeholders in the fresh produce marketing system (farmers, collectors, wholesalers, transporters and retailers). This workshop will be constructed to encourage collaborative discussion of problems and strategies, ending with an action plan for change. It involved:

- Seeking agreement on objectives based on the preliminary research. When participants are in agreement about the objectives, divergent issues and concerns may be dealt with because there is a common goal.
- Divergent phase
  - Participants are asked to suspend judgements and to listen openly and actively to other people's issues, problems and ideas and to creatively tackle problems;
  - Information of relevance to participants is shared from the mapping research done prior to the workshop;
  - Building trust, based upon understanding the viewpoints and problems of other members of the marketing system, by establishing conversations between the growers, transporters, supermarket managers and wholesalers; and
  - A convergent phase during which plans for the actions are conducted to improve the vegetable marketing system.

Stage 3 — Implementation of the action agenda
Decisions of the workshop are being documented by

- Capturing the process and outcomes in reports circulated to community leaders for communication to the workshop participants;
- Ensuring the action plan is coordinated by designated stakeholders;
- Following up on an agreed date to review implementation of the action plan; and
- Forming a steering committee of stakeholders, nominated by all stakeholders at the workshop, to ensure the action plans determined by the workshop participants are carried out. This reinforces ownership of problem solving is in the hands of those most affected rather than the research team *per se*.

Stage 4 — Reflection and improvement
This stage reflects the iterative process of acting, learning and changing practices. In particular, it demonstrates the three interacting domains of

- Research and sharing that research;
- Capacity building to develop awareness, skills and the ability to achieve the important goals; and
- Achieving practical outcomes through people working together.

This process was achieved by the appointment of a representative steering committee to monitor the project. The reflexive process involves regular progress reporting to the steering committee and annual reporting to the stakeholder and donor agencies. This reflects on experiences and actions taken, recommends improvements to those actions and develops the next phase of research and development.

Stage 5 — Participant and community learning
The participants discuss their experiences and the actions proposed to improve processes and practices. Where the value chain analysis identified a lack of context-specific scientific knowledge resulting in the establishment of bio-physical research trials (e.g., suitable crop varieties or low-input soil management systems), the results feed into this process of participant and community learning through community reporting processes and extension activities such as field days, training courses and demonstration plots. As the cycle is completed, the enhanced local knowledge and context-specific scientific knowledge developed contributes to the next iteration of planning and action to improve the efficiency and effectiveness of the food value chain.

7. Findings and Value Chain Problems

7.1. *The types of markets*

This study found six distinct categories of food markets in PNG. Main market outlets for fresh produce were the informal roadside and local markets (Type 1); distant informal markets in major urban centres (Type 2); community entrepreneurs who acted as "aggregators" (Type 3); commercial wholesalers (Type 4); formal markets (Type 5), such as those run by local government; and direct to the institutional markets, such as hospitals, hotels, and mines (Type 6) (Birch *et al.*, 2009).

7.2. *Poor infrastructure for marketing*

The road, telecommunications and finance systems in regional PNG presented major constraints on the vegetable marketing system. The country did not have a national, inter-connected road system and non-arterial roads are very poorly maintained because of the terrain and climate. Although cell phone telecommunications were improving, the lack of Internet services outside major urban centres and patchy cell phone reception meant that only the most basic marketing information was available. Finally, the banking system did not operate outside of the major towns, greatly constraining economic development.

7.3. *Lack of economies of scale and coordination in marketing*

Small farmers generally transported bags of vegetables to markets on public buses and then sold their produce around the various outlets. Prices received were highly variable partly because of the variability of supply and demand, but also as a result of the post-harvest deterioration caused by damage during transport and rough handling of the product. In addition, frequent harassment and intimidation of the farmers occurred at the markets.

7.4. *Poor marketing channel inter-relationships*

The channel can be conceptualized as a series of linked markets in which price was the only means of communication between buyer and seller; the relationships involved were transactional and short-term with price only-based coordination; there was no trust, commitment or management of supply. In PNG, all parties regularly engaged in opportunistic, exploitative behavior that invited reciprocal behavior, thus reinforcing the pattern. In particular, farmers were subjected to frequent harassment and therefore, they often sold their produce to the first buyer to avoid further conflict and danger.

7.5. *Transformation of the value chain through the entrepreneurship method*

A more efficient and effective approach to enhancing food security was the strategic innovation of creating a more interrelated vertical marketing system in which quality and quantity were more coordinated throughout the value chain. This preferred marketing system was based on an improved low-input, more environmentally sustainable production system producing a flow of higher quality vegetables into Port Moresby. The model being implemented in PNG uses three forms of corporate entrepreneurship to create value: (1) product innovation achieved through a better understanding of market and consumer preferences; (2) process innovation through radically improved farming production methods; and (3) business process innovation through changing how produce is distributed and marketed.

The entrepreneurial method allowed the major problems within the value chain to be reframed as opportunities. The present study's consumer and producer focus group discussions suggested customers were willing to pay more for higher quality, safer produce that meets their preferences. This information was used to redesign the vegetable production process to deliver produce that more closely conforms to the market demand. More advanced farming technologies were introduced to enhance production efficiencies. In addition, the "means" of a tribal social structure in PNG was leveraged through effectual reasoning — considering who I am and who I know — to create small "vegetable production cooperatives" where farmers from the same tribe would "pool" their produce to create some bargaining power with respect to price and terms. In addition, this pooled marketing process generated both economies of scale and scope, allowing the tribe to forward contract directly with retailer.

Business model reconfiguration is being accomplished by leveraging the tribal co-op model, reducing the cost of produce transport, transactions and marketing by accumulating

produce from the entire tribe and spreading the costs (and risk) among more families. One concern business model innovation addressed was safety — often in the past the farmer's wife was responsible for transporting the produce to market and then selling it; typically selling to the first buyer who made an offer because of physical dangers in both travel and marketing. The reconfigured value chain allowed the risk to be ameliorated by minimizing the exposure to transport or the market by any single farmer.

The revitalized value chain is being redesigned to be a vertical marketing system with contracts linking the wholesalers and larger institutions (such as government agencies, hospitals, hotels and mines) to the farmer marketing cooperative, which accumulated the outputs of many small farmers and then marketed the produce as a single economic entity. Vegetables are brought from remote farms and villages to designated collection points where small, all-terrain vehicles with refrigerated boxes regularly collect produce. The price the farmer received is based upon weight and quality. The produce is pre-graded by the cooperative using a simple visual grading system. The produce is then transported out to a major arterial road and loaded onto a larger refrigerated vehicle for transport to a single contracting market outlet. This specialist freight service maintained product quality and often backhauled farm inputs and consumer goods for the villagers, reducing their need to travel to Port Moresby. The use of a trading account enabled farm inputs and consumer goods to be paid for by the proceeds of vegetable sales, thus avoiding the need for large cash payments. In some instances, cooperatives establish their own "retail stores." This approach is most effective in remote, isolated areas where travel to market is costly, difficult and infrequent.

The very tentative success of this model is dependent on all chain participants acting in a trustworthy manner with the intent to develop long term partnerships and collaboratively innovate or "co-innovate" to solve the chain's problems to efficiently and effectively meet consumer needs. The use of an entrepreneurial method underpinned by effectuation logic and implemented by the rapid value chain process forced the ACIAR team to consider who they were, what they were and who they knew could help as they approached this initiative. Affordable losses through the collaborative value chain planning workshops were established with an understanding that different partners might face very different consequences of a loss. The rapid value chain research approach also helped the ACIAR team develop new partners, resulting in additional generated new means. Contingencies were exploited by workshops and skill development training and a flexible approach to creating this new vertically coordinated value chain. For example, a particular focus was the training needed to improve the productivity and safety of women in vegetable marketing and encouraging young people to see a future in rural-based vegetable production businesses.

8. Conclusion

We hope this study stimulates a less bureaucratic and more entrepreneurial approach to international development projects in the international development community. The application of the entrepreneurial method and effectual logic is an attempt to enhance the

food security for the poor of a LDC, in this case PNG, and offers an alternative framework for future international development projects. The entrepreneurial method leverages the powerful tools of corporate entrepreneurship, rapid value chain analysis (in this case) and effectual logic to move toward more effectively and efficiently increase food security in a LDC.

Three populations of interest exist in many international development projects: (1) the individuals; (2) the organizations that comprise the value chain; and (3) society. Metrics to measure value in all three contexts could be based on the conceptual work of (1) Kotler and Keller (2006) to estimate the total value of the product for the ultimate consumer; (2) Hunt and Morgan's (1995, 1997) resource advantage theory to capture efficiency and effectiveness of the organizational members of the agribusiness value chain; and (3) Taguchi's (1987) social loss perspective of quality and the World Business Council for Sustainable Development's (World Business Council for Sustainable Development, 2000) eco-efficiency framework (Isaksson *et al.*, 2011).

The WBCSD's eco-efficiency framework uses zero waste as the ideal outcome, and then considers product redesign, process reengineering, market repositioning and the beneficial reuse of the waste stream by revaluing by-products as mechanisms for decreasing the waste stream. Although Taguchi's (1987) social loss perspective of quality simply states that quality products cause no loss to society, its simplicity is its power. Social loss is measured by the negative externalities resulting from the production, procurement, use and disposition of a product, which, in Taguchi's framework, must be internalized and offset to create positive outcomes. In Taguchi's framework, these positive offsets could include benefits to society such as (1) better nutrition; (2) management and business development; (3) enhanced health; or (4) something as simple as financial benefits to the poor because of lower priced produce. Table 3 summarizes the items that could be potentially used to measure value before and after the value chain CE initiatives for each population.

Food security, like many other prevalent human problems, may be most effectively addressed by a more entrepreneurial approach, reframing the problem as an opportunity for some to appropriate value while helping meet basic human needs. As the world slips once again into economic turmoil, governments will not have adequate resources to address all of the critical needs of an ever-expanding population. Entrepreneurship may be one potential solution for international development agencies to consider.

Can the entrepreneurial method solve all of the world's problems–most definitely not! Can food security for the global poor be enhanced through the application of the entrepreneurial method–maybe in some situations? The entrepreneurial method offers an alternative logic to how an issue is conceptualized. For example, recent work by Sheth (2011) on marketing in emerging markets suggests there are many phenomena that can be reframed into exploitable economic opportunities that will foster growth in emerging markets and help the global poor. Likewise, when Schramm (2010) suggests that "economic reconstruction must be rethought" he is suggesting we include entrepreneurship as one way to attempt to better the "economic lives of the poor" (Banerjee and Duflo, 2007). The purpose of this paper was to use a case study to illustrate how an alternative

Table 3. Items used to operationalize the impact of an entrepreneurial method on value chain performance in PNG case study.

Population	Metric (Changes because of impact of CE on value chain initiatives)
Organization	Is resource efficiency increasing relative to competition increasing?[1]
	Is market position relative to competition increasing?[1]
	Is economic performance relative to competition increasing?[1]
	Are relative resource costs diminished?[1]
	Has quality (in terms of variance) increased?[3]
	Has relative market position been strengthened?[1]
	Has relative financial performance increased?[1]
	Has stakeholder satisfaction increased?[4]
Consumers	Has assortment &/or selection &/or quantity available improved?[5]
	Has quality in terms of fitness for use, nutrition, taste, or freshness increased?
	Has price decreased?[5]
	Has product availability improved?[5]
	Has distribution and marketing improved?[5]
Society	Has malnutrition decreased?
	Have jobs and human capabilities been increased?[2]
	Have negative environmental or social consequences of the value chain been diminished due to the innovations?[2, 4]
	Has society incurred any loss due to the externalities of the innovations?[3]
	Are there positive externalities or spill-over effects, including increased levels of education, participation in commerce or new business formation?

1: Hunt and Morgan (1995, 1997)
2: World Business Council for Sustainable Development (2000)
3: Taguchi (1987)
4: Isaksson *et al.* (2011)
5: Kotler and Keller (2006)

logic–the entrepreneurial method–can be applied to the problems of the poor–in this case to address food security issues in the developing world. It is hoped this study will stimulate additional research into how the power of entrepreneurship and effectuation might be applied to other issues facing the global poor.

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