528504

Muresk Institute

Building Close and Long-Lasting Relationships with Focal Customers: An Empirical Study of Seed Potato Purchasing by Filipino Potato Farmers

Peter J. Batt

This thesis is presented for the Degree of
Doctor of Philosophy
of
Curtin University of Technology

November 2003

Declaration

This thesis contains no material that has been accepted for the award of any other degree or diploma in any university

To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgement has been made.

Signature .....

Date .....

Abstract

In the highlands of the Northern Philippines, a model of long-term relationships between potato farmers and their preferred seed suppliers is proposed. In the absence of any certified seed system that might provide some guarantee of seed quality, farmers prefer to transact with those seed suppliers with whom they have had some favourable prior experience. Such suppliers provide both the best quality seed and, since most farmers must borrow the capital to purchase the seed, the most favourable terms of repayment.

As there is much uncertainty in the exchange, the farmer's relationship with their preferred seed supplier is based on trust. However, since the farmer's satisfaction with the exchange cannot be ascertained until after purchase, trust is antecedent to satisfaction. As satisfaction is derived from the economic benefits the farmer obtains, satisfaction will lead to the farmer's desire to maintain the relationship. Satisfaction is enhanced both by the seed supplier's willingness to extend credit and to provide information. As there is much variation between alternative seed supplier's offer quality, satisfaction will result in the farmer becoming more dependent upon that seed supplier who makes the best offer. Furthermore, having provided the farmer with financial assistance, seed suppliers will find that they have constrained their opportunities to use coercive influence strategies, for in the absence of any formal contract, farmer's may readily default on the loan. The use of coercive influence strategies will reduce both the farmer's trust in their preferred seed supplier and the farmer's desire to maintain the relationship.

While trust is more important in the transitional economies, critical problems emerge with the use of standardised item measures and scales developed in the industrial countries. Cultural specific adjustments are necessary to ensure social constructs such a trust are functionally equivalent. However, in the context of long-term relationships where satisfaction is also cumulative, introducing measures of both economic and social satisfaction have the potential to overlap with the generally accepted measures of trust.

Acknowledgements

If the completion of a doctoral thesis demonstrates a significant learning experience, then the submission of this thesis represents for its author, a paradigm shift, both in thinking and in direction.

If all students aim to develop and design their research methodologies, hoping to confirm the various hypotheses they have established with the minimum of angst, then this thesis is a dismal failure. Upon introducing the concepts of industrial purchasing behaviour and relationship marketing into a transitional economy, this thesis was unable to adequately explain farmer's relational behaviour. Yet, as a consequence, in attempting to find plausible explanations, a much richer field of enquiry emerged which provided far greater opportunities. In this respect, while it has taken more than five years to complete this thesis, the journey has only just begun. For inspiring me to commence my journey and for providing me with a legitimate ticket to travel the path, I am indebted to a great many people.

To Dr. Peter Schmiediche, past Director for the International Potato Centre (CIP) in the ESCAP region, I thank you for so enthusiastically believing that Western Australia could become the major supplier of seed potatoes to South East Asia. My subsequent involvement in the seed potato industry has since provided me with opportunity to travel to so many places and I have had the great pleasure of meeting so many wonderful people.

To Dr's Zenaida Ganga, Jocelyn Perez and Upali Jayasinghe. Thanks for providing me with the opportunity to undertake this study in the Cordillera and for your support during my three month stay at Benguet State University. Of course, I must acknowledge my trusted enumerator, Ralph Steve Galuba, who for almost six months battled the Halsema Highway twice a week to collect the data.

To Jennifer Lalor. What use is data unless someone can make sense of it? For all the assistance with data analysis and tuition along the way, I am most grateful.

To Associate Professor Nexhmi Rexha. After many years of searching for a discipline in which I could find solace, I thank you most sincerely for introducing me to industrial purchasing and the relationship marketing paradigm.

To Dr Beverley Webster. Thanks for the many hours of assistance, albeit without the reward it truly deserves, in trying (fruitlessly) to develop a model that would yield an acceptable solution.

To my research students: Francis Smit, Helen Wilson and Nyoman Parining who for whatever reason, agreed to join me in my exploration of long-term buyer-seller relationships in agribusiness. Fortuitously, the data collected from each of your respective studies has proved invaluable in gaining a greater understanding into the dynamic nature of relationships in an industry where the product is often highly seasonal, intangible and highly variable.

To GTZ. Having accepted the offer to complete an analysis of the supply chain for fresh potatoes in Vietnam, I was finally able to demonstrate the commercial value of this research approach.

To my supervisor and Associate Supervisor, Dr Roy Murray-Prior and Professor Murray McGregor, thanks for "volunteering" to take me aboard when I found myself abandoned by a larger School. It's both ironic and satisfying to now be on the Editorial Board of two prestigious international marketing journals who have both accepted agribusiness as an integral part of the marketing discipline.

Finally, to my wife Duin and my "Bean" who have both given up so much quality time to enable me to selfishly pursue my ambitions. Thank you both for your love and support and it is indeed to both of you that I dedicate this thesis.

Table of Contents

Chapter Eleven

Full papers are provided in the attached cd

List of Tables

List of Figures

Chapter One

INTRODUCTION

1.1 Background

Potato production in the Philippines is increasing. With high productivity per hectare, a short growing season and high market prices, potatoes generate higher returns per hectare than most other food crops (Beukema and van der Zaag 1990). However, the main reason for the expansion of potato production is farmers' desire to satisfy expanding markets and changing consumer preferences. Population growth and urbanisation has expanded the market for food crops and rising per capita incomes have stimulated the demand for more exotic foods to diversify diets (Horton 1987). Although potatoes are not a major component of the traditional diet in the Philippines (Poats 1984), potato consumption is generally increasing as consumers purchase greater quantities of processed potato products (van der Zaag 1990a). In parallel, potato consumption is shifting from a staple food to a snack food (van der Zaag 1992).

From 1970 to 1990, the area of potatoes cultivated in the Philippines increased from some 3,000 hectares (Crissman 1989) to 5,000 hectares (Department of Agriculture 1998). Productivity has also steadily increased from an average of 6.8 tonnes per hectare to 13.4 tonnes per hectare. Nevertheless, the average yield in the Philippines remains well below the potential yield that is currently estimated to approach 48 tonnes per hectare (Gayao *et al.* 1997). While many reasons are given for the poor productivity per hectare, it is widely acknowledged that the high cost of seed, the use of poor quality seed and inappropriate physiological age of the seed at planting are the major factors constraining potato production in the Philippines (Balaoing and Lazo 1967; Crissman 1987; Batugal *et al.* 1988; Crissman 1989; Mariano *et al.* 1991; Aromin *et al.* 1993; Callueng *et al.* 1993b; Sana *et al.* 1993; Rasco and Aromin 1994; Perez 1995a; Schmiediche 1995).

In the Philippines, potatoes are mostly cultivated in the Cordillera (Perez 1995a). Production is capital intensive and based on smallholder farming systems where, on average, farmers cultivate less than one hectare (Crissman 1989). Production is characterised by the excessive use of inputs (chemicals and fertilisers) because with no further land available, farmers realise that without applying large quantities of inputs they cannot maximise production per unit area. However, not only does seed quality have the greatest impact on productivity (Balaoing and Lazo 1067), but seed is also the most expensive input. In the Philippines, the cost of seed comprises between 31% (Perez 1995a) to 40% (Mariano *et al.* 1991) of production costs in the Cordillera but at lower altitude, seed costs may exceed 50% of production costs (Villamayor 1984; Rasco and Aromin 1994).

Unlike most other food crops, the potato is propagated vegetatively using high quality seed tubers. The edible tuber, which is an enlarged underground stem, contains most of the characteristics of a normal stem including dormant buds. Some weeks after planting these dormant buds will sprout which soon develop into shoots (Horton 1987). Because potatoes are vegetatively propagated, with each successive crop, the productivity of the seed generally decreases due to the accumulation of disease (Monares 1981: Kloos and van der Zaag 1988; Beukema 1990; Schmiediche 1995). During the growing season, plants may become infected with a systemic disease or a virus. Generally, those plants that become infected produce infected tubers which when replanted produce infected plants and a potential source of infection for other plants (Beukema and van der Zaag 1990).

The rate of seed degeneration determines the number of times a farmer can profitably use his own seed (Beukema 1990). The rate of seed degeneration varies from region to region and from season to season (Beukema and van der Zaag 1990) but is generally more rapid in tropical countries as insect populations are higher, there are more potential sources of infection and seed storage is more difficult (Beukema 1990). Therefore farmers must renew their seed more regularly.

In obtaining new seed, farmers source seed tubers from either a formal seed system or an informal seed system. In a formal system, seed is produced in an organised program, the fundamental objective of which is to produce seed which is guaranteed to be of the desired variety and within established tolerance limits, to be free of pests and diseases (Crissman 1990). However, for a number of agro-ecological, technical and institutional reasons, the formal seed system in the Philippines is unable to supply more than 15% of the total seed requirements (Jayasinghe *et al.* 1997).

While several attempts have been made to promote and establish a formal seed certification system in the Philippines, the fundamental constraint appears to be the high rate of seed degeneration. Seed quality deteriorates after only a few multiplications so by the time improved seed reaches the farmers it is already contaminated with numerous tuber-borne diseases (Schmiediche 1995).

As the Philippines is unable to produce sufficient quantities of good quality seed potatoes to satisfy the demand, seed has been traditionally imported from Europe. However, imported seed is expensive and there have been numerous problems associated with the untimely arrival of the seed, the physiological age of the seed and the suitability of the variety to the agro-ecological conditions experienced in the tropics (Balaoing and Lazo 1967). In order to reduce the cost of seed potatoes and to achieve more rapid and uniform emergence after planting, the International Potato Center (CIP) has proposed that the Philippines identify other potential seed growing areas that may provide a more appropriate source of seed. One growing area that has recently been identified is Western Australia (Schmiediche 1995).

In south-west Western Australia, potatoes are produced under the most ideal climatic and phytosanitary conditions imaginable (Schmiediche 1995). There is no bacterial wilt, no Potato Cyst Nematode, no late blight and no Potato Virus Y found in any of the seed producing areas. Quite simply, there is no other potato growing area in the world currently known to CIP where such "laboratory" conditions can be found.

Nevertheless, irrespective of the source, the high price of imported seed is generally beyond the financial capabilities of most small farmers. In order to make the seed more affordable, one or more subsequent multiplications of the improved seed is required in-country before it can be widely distributed.

In the absence of any formal seed system in the Philippines, potato farmers in the most favourable growing regions may become seed growers. Such growers are generally located at higher elevations where insect populations are lower and the cool temperate growing conditions prevent the premature aging of the seed. While growers may also use a number of techniques to reduce the spread of disease and to increase the yield of suitable seed sized tubers, there is no guarantee that the seed produced will be free from disease, for a disease infected tuber is often indistinguishable from a healthy tuber (Crissman and Hibon 1996). Furthermore, the seasonality of seed production, seed storage constraints and the inability to isolate seed producing regions from fresh potato production regions will adversely affect the quality of the improved seed. Farmers cash flow constraints and their inability to access sufficient capital may further contribute to the failure of the informal seed system to link seed potato supply with demand.

Potato farmers are most likely to purchase seed according to their financial capability (Crissman and Hibon 1996). Kool, Muelenberg and de Broens (1997) indicate that for products that involve substantial amounts of money, problem solving can be quite extensive and comprise a prolonged search for information and evaluation of alternatives. As a result, farmers are expected to choose the least cost solution that best satisfies functional criteria (Kool 1994). Concepts such as value-for-money (Kool *et al.* 1997) or value-in-use (Hutt and Speh 1995) may provide farmers with the means for choosing between alternative seed suppliers. However, Crissman and Hibon (1996) suggest that a farmer's decision to purchase seed is made knowing that the benefits will be realised over several seasons. Seed that is substantially free of pathogens will cost more to produce and therefore it will cost more to purchase (van der Zaag 1987; Monares 1981; Beukema 1990). However, improved seed is generally more productive.

As it is seldom possible to accurately ascertain seed quality simply by visually inspecting the tuber (Balaoing and Lazo 1967), in the absence of any certified seed system that might provide the farmer with some assurance of seed quality, the decision to purchase seed will evoke considerable risk. Where there is some doubt that a product will fail to meet expectations, buyers often embark upon an extensive evaluation of the alternatives (Hakansson, Johanson and Wootz 1977). Conversely, buyers may attempt to reduce perceived risk by splitting orders between several alternative suppliers or to purchase from well known suppliers with whom they have dealt in the past (Cunningham and White 1973). Cardozo and Cagley (1971) and Puto, Patten and King (1985) demonstrate that buyers are strongly attracted to well known or existing suppliers' as current suppliers are perceived as less risky. In new purchase situations, Dempsey (1978) and Anderson, Chu and Weitz (1987) suggest that buyers prefer to purchase from those suppliers' who are reputable market leaders, for they are perceived to be more trustworthy.

Since farmers are generally faced with a large number of alternatives and a limited amount of time in which to make the decision to purchase, farmers often simplify the purchasing task by purchasing inputs successively from the same supplier (Kool 1994). Repeat buying may result from a number of reasons including habit, avoidance of the need to make a decision, a perceived absence of choice or the lack of time to evaluate alternative suppliers. Furthermore, where farmers are unable to perceive any tangible difference in the functional criteria between alternative suppliers' offers, they may enter into long-term relationships with preferred suppliers where emotional and social criteria become decisive.

Horton (1987) suggests that because of the potential variation between different seed sizes, varieties, the physiological age of the seed and the health of the seed tubers, seed sales are highly dependent on customised marketing programs. Because of the relationships often established between seed suppliers and farmers (Crissman 1989) and processing companies and input suppliers (Higginbottom

1996), the farmer's decision to purchase seed may be influenced by the long-standing relationships that have been established with preferred seed supplier(s).

1.2 Objectives of the study

The aim of this dissertation is to utilise recent developments in relationship marketing theory (Morgan and Hunt 1994; Kalwani and Narayandas 1995; Wilson 1995; Sheth and Sharma 1997) to identify the underlying factors that influence the development of long-term relationships between Filipino potato farmers and their preferred seed suppliers.

More specifically, this thesis will seek to identify:

- the factors that impact upon a Filipino potato farmer's ability to purchase seed;
- the criteria Filipino potato farmers use in choosing between alternative seed suppliers;
- the nature of the long-term relationships between potato farmers and their preferred seed suppliers as influenced by power-dependence and the availability of alternative seed suppliers;
- the benefits to the relationship that arise from the preferred seed supplier's willingness to make relationship-specific investments (adaptations and innovations, education and training, and communication).

While providing empirical evidence about the nature of long-term buyer-seller relationships in agribusiness in the Philippines (about which there is very little information currently published) this study has been undertaken in the expectation that the results will facilitate the development of Western Australian seed potato exports to the Philippines. By better understanding customers needs and building close, long-lasting relationships with focal customers, it may be possible for Western Australian seed potato exporters to be elevated to the preferred supplier of choice.

1.3 Significance of the study

While an extensive amount of literature has appeared in recent years on the variables affecting the establishment and maintenance of long-term relationships in industrial markets (Ford 1984; Morgan and Hunt 1994; Wilson 1995), the vast majority of research has been undertaken in Europe and North America. Very little attention has been given towards the study of marketing relationships in the developing world (Frazier, Gill and Kale 1989).

According to Achrol, Reve and Stern (1983), Campbell (1985), Anderson and Weitz (1986), Hallen, Johanson and Seyed Mohamed (1991), Heide and John (1990) and John (1994), the environment will have a significant impact on the market exchange relationship. Anderson and Weitz (1986) suggest that when the market is dominated by a small number of suppliers, conditions favour the establishment of long-term relationships. Conversely, Ganesan (1994) suggests that when there is a diverse market with many products, customers and competitors, firms are more inclined to deal with multiple partners.

Lehmann and O'Shaughnessy (1974) note differences in the ranking of the importance of supplier selection criteria between purchasing firms in the USA and the United Kingdom. Cunningham and Homse (1982) and Ford (1982) show how distance influences supplier selection and the strategies adopted by suppliers to penetrate various industrial markets in Europe. Merrilees and Miller (1999) and Mavondo and Rodrigo (2001) discuss the relative importance of various relationship-building variables in China, while Dyer and Ouchi (1993), Nishiguchi and Brookfield (1997) and Hirakubo and Kublin (1998) describe the relative importance of long-term buyer-seller relationships in Japan.

While Ford (1982) and Hallen *et al.* (1991) suggest that technology is an important variable influencing business relationships, in developing countries poorly developed infrastructures often result in widespread production and distribution bottlenecks that impede the availability of products (and technology)

to producers and consumers. Governments often restrict production capacity, ownership, imports and prices, access to capital, technology and foreign exchange (Frazier *et al.* 1989). Furthermore, primary producers face greater uncertainty in output prices (Feder, Just and Zilberman 1985; Crissman and Hibon 1996). It is unlikely, therefore, that the models of channel relationships in both developed and developing countries will be similar because of their vastly different market conditions (Frazier *et al.* 1989) and the vagaries of climate. Hence this study is expected to contribute to the development of the relationship marketing paradigm by providing empirical evidence on the nature of such relationships in the primary industry sector within a transitional economy.

Furthermore, while various models of industrial buyer behaviour have been proposed by Robinson, Faris and Wind (1967), Sheth (1973) and Choffray and Lilien (1980), the majority of the research has been undertaken in corporate organisations where the decision to purchase is made collectively by that group of individuals who comprise the buying centre (Webster and Wind 1972). However, from an organisational perspective, a farmer's decision to purchase is expected to be very different from buyer behaviour in corporate organisations. In most of South East Asia, the majority of farms are small enterprises having more in common with households. Management, including purchasing, is mainly the responsibility of the farmer (Kool 1994).

Another important aspect of farm buying behaviour is the interdependency between expenditures on household consumption and production inputs. Given a particular level of household income, an increase in expenditure on farm production inputs can only be made at the expense of household consumption and vice versa (Kool 1994). Furthermore, while it is possible to evaluate some product attributes prior to purchase, the value of a great many other attributes can be realised only after the product has been purchased. Thus, while the present study is expected to provide an insight into the purchasing behaviour associated with intangible products, it will also provide further insights into the purchasing behaviour of small family firms. With the exception of Kool (1994) and File,

Mack and Prince (1994), there is very little evidence of any studies having been undertaken to empirically evaluate the nature of the long-term relationships between family firms and input suppliers.

1.4 Outline of the thesis

For simplicity and clarity, this thesis has been divided into various sub-sections. The following chapter (Chapter Two) will provide an introduction to the potato industry in Asia and more specifically, the potato industry in the highlands of the Northern Luzon (the Cordillera), where the study was conducted. Within this chapter, the various factors that influence the on-farm demand for seed will be examined.

Chapter Three provides a comprehensive review of the literature that will seek to describe the various factors that may influence a Filipino potato farmer's decision to purchase seed and their choice of seed supplier. The relevance of relationship marketing to the farmer's decision to purchase will be introduced.

Chapter Four will then develop from the literature, an empirical model to test the significance of long-term buyer-seller relationships between the farmer and their preferred seed supplier. A detailed methodology of the approach taken and the various analytical tools employed to analyse the results will follow in Chapter Five.

Chapter Six will provide a detailed demographic description of the respondents and the agronomic practices they currently employ to cultivate potatoes in the Cordillera.

Chapter Seven will describe the various factors that impact upon a Filipino farmer's decision to purchase seed and the implications for potential seed exporters.

Chapter Eight will describe the various criteria a Filipino potato farmer uses in making their decision to purchase seed. Chapter Nine will then examine the nature of the long-term relationships that exist between Filipino potato farmers and their preferred seed suppliers. The model developed in Chapter Four will be empirically tested using structural equation modelling to identify the sequential pathways between satisfaction, trust and commitment and the impact that the seed supplier's willingness to make relationship specific investments has on the relationship, moderated by the potato farmers dependence upon their preferred seed supplier.

However, for reasons that will be discussed, it is apparent that the model developed from the literature failed to adequately capture the nature of the long-term relationship between Filipino potato farmers and their preferred seed suppliers. While an alternative model is proposed and tested, it is abundantly clear that there are several underlying methodological issues that have impacted upon the ability of the model to adequately predict farmers' behaviour. These will be discussed in Chapter Ten with reference to the results derived from several other research projects that were undertaken in parallel with this study in related agribusiness sectors in Australia, Indonesia and Vietnam.

The final chapter, Chapter Eleven will return to the aims and objectives presented in this chapter. The results will be discussed with reference to the existing theory on industrial buying behaviour and long-term buyer-seller relationships. The final section will discuss the implications for potential exporters of Western Australian seed potatoes. The thesis will conclude with a comprehensive list of the references consulted and appendices.

Although the research itself was undertaken in the Philippines in 1999, many of the findings derived from this research have already been presented to numerous international conferences and journals where the work has been subjected to peer review. These papers are cited as appropriate throughout the thesis and for convenience are available in an attached cd (Appendix 5).

The cd also contains the four papers that are extensively used in the comparative analysis in Chapter Ten. In each of these papers the reader will find a detailed description of the research methodology employed including the sampling and data collection methods used to obtain information from respondents and the various tools utilised to analyse the data obtained.

Two of these papers rely on data collected by two Honours students (one of whom regrettably failed to graduate) and one on data collected by a graduate student. Students were personally supervised by the author for the entire duration of their research project and their contribution has been duly acknowledged. Data for the fourth paper was collected by the author in parallel with an international consulting project undertaken for Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) on the market for seed potatoes, fresh potatoes and processed potato products in Vietnam in 2002.

Chapter Two

AN OVERVIEW OF POTATO PRODUCTION AND MARKETING IN THE PHILIPPINES[1]

2.1 Chapter outline

Chapter Two provides an overview of potato production in the Philippines. The chapter begins with a brief botanical overview of the potato (*Solanum tuberosum*) and the features that differentiate it from most other food crops. Given that seed quality is the most influential factor determining the productivity of the potato crop, the chapter will explore the various dimensions of seed quality. The next section will provide an overview of potato production and marketing in the Cordillera, before embarking upon an examination of the seed system and the various factors that influence a farmer's decision to purchase seed. The chapter concludes with a summary of the key findings and implications for the study.

2.2 Introduction

The potato is one of about 2,000 species of the family Solanaceae. There are eight cultivated species of tuber bearing solanums and about two hundred wild species (Horton 1987).

Although classified as a dicotyledonous annual, the potato can persist vegetatively as tubers (Horton 1987). The tuber is an enlarged portion of an underground stem, adapted for the storage of photosynthates and reproduction of the plant. Tubers contain most of the characteristics of a normal stem including dormant buds or eyes. The eyes occur in a spiral pattern on the tuber, with most being found towards the apical end of the tuber. These apical buds normally sprout first. About two weeks after stems first emerge from the soil, young tubers begin to grow at

[1] The following chapter was drawn from Batt, Peter J. (1998), The Demand for Seed Potatoes in South East Asia, *Australian Agribusiness Review,* [on-line] http://www.agrifood.info and Batt, Peter J. (1999), The Potato Industry in the Philippines, *Global Potato News,* September, [on-line] www.potatocongress.org/columns/batt.htm

the tips of the stolons. For the tubers to enlarge, the amount of photosynthate available for translocation and storage must exceed that required by other parts of the plant for growth and metabolism.

For most potatoes, short days and moderate temperatures stimulate tuber initiation (Horton 1987). High day temperatures cause plant stress even under irrigation. When temperatures are higher than 25°C, the net rate of photosynthesis decreases and if night temperatures remain consistently above 20°C, tubers will not form. Fortunately, an increase in elevation is able to compensate for some difference in latitude hence many temperate European potato varieties grow and yield well in the tropical highlands.

The potato can be reproduced from seed, however, potatoes are highly heterozygous and seed purity can only be maintained by vegetative propagation (Horton 1987). Almost without exception, most farmers plant tubers. The need to propagate vegetatively is one of the most distinguishing features of potato cultivation, strongly influencing not only how potatoes are grown but also where, by whom and for what purposes.

2.3 Defining seed quality

No aspect of growing potatoes is more important than the selection of the best possible planting material, for the yield obtained from different stocks of the same variety under the same conditions of culture, depends more upon the quality of the planting stock than on any other single factor (Balaoing and Lazo 1967). Moreover, the use of high quality seed improves the productivity of traditional inputs such as labour, irrigation and cultivation practices (Monares 1981).

At planting time, the seed should be at such a stage that emergence takes place quickly and a sufficient number of strong stems develop from the seed tuber. The seed should be free of pests and diseases that could spread during the growing season and destroy the crop or contaminate soils that have otherwise been free

from infestation. To encourage a more uniform crop, the size of the seed tubers planted should not vary greatly. Thus, the variables that most influence seed tuber quality are: seed sanitation (health), physiological age, seed size and seed purity (not mixed varieties)(van der Zaag 1987; van der Zaag 1990b; Rasco 1994).

2.3.1 Seed sanitation

Because potatoes are vegetatively propagated, with each successive harvest, the productivity of the seed generally decreases due to the accumulation of disease (Monares 1981; Kloos and van der Zaag 1988; Beukema 1990). During the growing season, plants may become infected with various pathogens. Generally, those plants that become infected produce infected tubers, which when replanted, produce infected plants that provide a potential source of infection for other plants (Beukema and van der Zaag 1990).

In the tropics, bacterial wilt (*Ralstonia solanacearum*) is the most destructive disease, for it is endemic to the lowland tropics where it can persist in the soil for many years (Schmiediche 1995). Not only does bacterial wilt cause the eventual death of the plant, but infected tubers may rot prematurely. Planting infected seed tubers not only directly influences the productivity of the current crop, but it may also have an impact on the productivity of any future crops derived from that seed or grown in the same soil, for planting infected seed may contaminate soils that were previously free from infestation (Beukema and van der Zaag 1990).

2.3.2 Physiological age

Productivity per unit area is determined by the numbers of tubers produced per stem and the number of stems per hectare (Beukema and van der Zaag 1990). The number of stems per hectare is influenced by the seed rate and the number of sprouts that form from each seed tuber.

The number of eyes that sprout from the seed tuber depends on the physiological age of the seed tuber when planted. There are four stages: (i) dormancy; (ii) apical dominance; (iii) maturity; and (iv) senility. Dormant tubers produce no sprouts;

during apical dominance only one sprout grows; in maturity many vigorous sprouts grow; and in senility, the sprouts tend to be weak and thin. Young seed tends to be more vigorous and produces a later maturing crop with a higher yield potential (Horton 1987).

The length of the dormancy period depends on the variety, the environmental conditions under which the seed has been grown, the maturity of the seed at harvest, and how and for how long the seed has been stored. Seed that has been grown under high temperatures and short-days tends to have a shorter dormancy period (Beukema and van der Zaag 1990).

2.3.3 Seed size

Wiersema (1980)(cited in Crissman and Hibon 1996) states that potato growers implicitly purchase a potential number of sprouts or stems per kg of seed. The number of sprouts developing from a seed tuber is influenced by the size of the tuber (Beukema and van der Zaag 1990). Larger tubers generally produce more sprouts, but if larger seed is used, a greater weight of seed must be planted. However, large seed may be advantageous where the soil and weather conditions at planting are unfavourable, the growing season is short and there is the risk that during the first part of the growing season, the crop may be damaged by frosts, hail or drought. Conversely, using small seed tubers may result in a lower stem density and lower yield (Aromin *et al.* 1993).

Generally, seed of 35-80 g is used for potato production (Beukema and van der Zaag 1990). In the Cordillera, HARRDEC (1996) recommends using tubers that are 30-50 mm in diameter (or 40-60 g). However, while any seed size tuber can be used, there is an optimal seed tuber size whereby the potential number of stems is maximised for the weight of the seed tuber planted (Crissman and Hibon 1996). Smaller tubers have a higher value per unit weight than large seed tubers.

2.3.4 Variety

While many potato varieties have been developed and are cultivated throughout the world, most have been bred and selected under very specific environmental conditions (Beukema and van der Zaag 1990). When these varieties are cultivated under different agro-ecological conditions, many react adversely to the environment and only a few characteristics remain the same.

To yield well in the tropics, a variety must be able to cope with a higher temperature, higher humidity, a shorter day length, a shorter growing period and a higher incidence of pests and disease (Renia 1992). The variety must also have good storage capabilities and fit into the length of the cropping season. In the Cordillera, early maturing varieties are generally preferred for it is possible to achieve a multiple number of crops per year and there is always the risk of yields being suppressed by unfavourable environmental conditions and pest and disease infection (Horton 1987). Furthermore, depending on prices in the fresh market, farmers may choose to harvest before the crop is fully mature.

In selecting a suitable variety, farmers generally select higher yielding varieties with resistance to disease, good eating quality and the desired tuber characteristics in terms of skin colour, flesh colour, tuber size, tuber shape and storage capabilities (Horton 1987). However, farmers seldom use a single criterion in selecting or rejecting a variety. Rather, the decision is made with consideration towards a number of both positive and negative attributes (Callueng *et al.* 1993a). Even so, since consumers often prefer a certain variety, it may be more profitable for the farmer to grow an established, less productive variety because of the higher prices received (Horton 1987). Processors particularly are inclined to pay significant price premiums for preferred varieties (van der Zaag 1990a). Furthermore, the variety a farmer grows may reflect historical patterns of colonization and trade, the agro-ecological environment, the cropping system, food requirements and consumer's preferences (Horton 1987; van der Zaag 1990a).

2.4 Potato production in the Cordillera

Very little is known about the early history of potatoes in the Philippines, but presumably potatoes were first introduced to the Philippines by the Spanish during the era of the Spanish galleon trade between Acapulco and Manila (Balaoing and Lazo 1967). Gayao and Sim (n.d.) suggest that Spanish colonialists introduced the potato to Benguet Province sometime in the 18th century. The Spanish Governor, Don Blas de Banos is credited with distributing tubers among the indigenous farmers. Initial studies report the discovery of certain fine tubered, runner type potatoes, somewhat resembling the indigenous varieties found in South America, being cultivated by the farmers of Baguio and Mountain Province (Balaoing and Lazo 1967). While still cultivated by many small and remote villages, the majority of these native varieties have now been replaced by seed material introduced from Asia, Europe and North America.

Potato production in the Philippines remains centred in the highland mid-elevation areas of Benguet and Mountain Province in Northern Luzon (Crissman 1989). Traditionally as much as 86% of the land planted to potatoes has been located in the Cordillera, but more recently the proportion has declined to around 76% (Gayao and Sim n.d.). However, the apparent reduction in the area cultivated is not due to any real decline, but rather to the expansion of potato cultivation into other highland regions in Northern and Southern Mindanao, the Central Visayas and the lowland regions of Ilocos Norte and Cagayan (Perez 1995a).

Potato production in the Cordillera is currently estimated to exceed 295,600 tonnes per annum (Gayao *et al.* 1997). Production has expanded at an average rate of 8% per annum, primarily due to an increase in the area cultivated. Currently, some 5,680 hectares are devoted to potato production in Benguet and Mountain Province, but it is becoming more difficult to expand production in the region because of the limited availability of suitable land. As production shifts to more marginal land and as more of the forest cover is removed, greater amounts of land are becoming subject to erosion. Consequently there is a strong incentive to increase productivity per hectare. Over the last two decades, the average yield has

almost doubled from 6.7 tonnes per hectare to 11.2 tonnes per hectare (Crissman 1989).

There are two distinct potato production periods in the Cordillera (Horton 1987; Crissman 1989). The main (wet) season commences with planting in February-March for harvest June-July. Growing potatoes during August-September is considered very risky because the probability of heavy rain and typhoons is very high. The second and smaller cropping season occurs during the cooler dry season, with planting beginning in September-October. Late planting is seldom undertaken because of the increased risk of frost.

The most common variety grown in the Cordillera is Granola (Perez 1995a). The variety is early maturing, high yielding and produces a large proportion of big tubers. Granola also has some resistance to nematodes. However, the variety is not considered suitable for processing. While a wide range of new varieties are being assessed for their suitability in the Cordillera, the fresh market fails to differentiate between varieties and there is little variation in the prices paid.

Harvesting usually occurs 90-98 days after planting. However, depending on the season, potatoes may be harvested as early as 60 days after planting or as late as 150 days (Gayao *et al.* 1997). Farmers harvest their crop with consideration to market prices, the occurrence of pests and disease and weather conditions, although other factors such as credit obligations, farmer's cash needs, cultivation practices, or the availability of labour may also influence the decision when to harvest. Potatoes are most plentiful from January until early September, except during the typhoon season when the Halsema Highway (or Mountain Trail) is frequently closed. Potatoes become less abundant from late September until December, but unfortunately, consumer demand is highest during the Christmas period (Gayao and Sim n.d.).

The majority of the potatoes produced by farmers are sold to traders based in the municipality of La Trinidad or the city of Baguio (Gayao and Sim n.d.). These

traders consist of: (i) assembly-wholesalers; (ii) metro Manila agents; (iii) wholesaler-retailers; and (iv) contract buyers. Some farmers may sell their potatoes directly to processors through company agents or local assembly-traders, or direct to retailers. Prices are generally set by the metro Manila agents, depending on the volume of potatoes available in both the Divisoria market and Balitawak market. Prices also differ according to tuber size, with the larger tubers receiving the highest prices. For the processors however, prices are more or less fixed, irrespective of supply and demand.

All farmers perform some in-field grading, primarily by size. The larger tubers are generally purchased for processing, medium grade tubers are preferred by the fresh market and the smaller sizes are often retained by farmers to be used as seed. Farmers generally retain 14-16% of their harvest: 12% for seed, 2% for household consumption and 2% for other purposes (Crissman 1989).

Farmers and traders generally do not store fresh potatoes, although farmers may practice delayed harvest or in-ground storage when waiting for better prices, and traders may store for 1-2 days in order to assemble enough volume or to accommodate an over-supply of potatoes from farmers. Rotting in storage due to infection by bacterial wilt and other diseases and dehydration of the tubers generally result in high storage losses (Sim *et al.* 1997).

Potato production in the Cordillera usually occurs within a permanent upland vegetable cultivation system. Most farms are small, averaging only 1.3 hectares, and are often comprised of several small parcels of land, often at different elevations (Crissman 1989). Almost all cultivation activities are done manually as the mountainous terrain limits mechanisation. Family labour plus hired labour is utilised to assist in land preparation, planting, hilling-up, harvesting and hauling the potato crop to the roadside where it is available for the traders to collect (Gayao and Sim n.d.).

Nevertheless, potato production in the Cordillera is a very profitable activity. Potato producers in Benguet are among the wealthiest small farmers. Mariano *et al.* (1991) estimate that the gross margin for a potato crop approaches $US750 per hectare. More recently, HARRDEC (1996), estimates that the gross margin per hectare exceeds $US4,265.

However, while the potato is a high return crop, it is also a high cost crop. Because of land limitations, few potato growers adhere to the recommended crop rotations, consequently relying on greater quantities of purchased inputs to intensify production and to control the increasing incidence of late blight, bacterial wilt and potato tuber moth. However, few potato growers have adequate capital resources to finance the crop and most are forced to borrow heavily. Informal lenders (cooperatives, traders, credit unions, middlemen-financiers and the farmer's relatives and neighbours) outnumber formal lenders four to one (Tagarino, Cungihan and Paday-os 1998). While the average interest rate available from the cooperatives is 15% per annum, loans from the input-supplier financiers and trade financiers (middlemen) often exceed 4 - 7% per month.

Input-suppliers extend credit with the intention of being able to secure the farmer's crop at harvest and therefore avail themselves of the benefits of marketing the produce. The majority of input-supplier financiers are vegetable traders and many are potato farmers themselves. Credit is extended on the basis of long-standing, personal relationships in which trust between the parties overcomes the need for formal contracts (Crissman 1989).

2.5 Seed potato supply in the Cordillera

The rate of seed degeneration determines the number of times the farmer can profitably use his own seed (Beukema 1990). The rate at which the seed degenerates varies from region to region and from season to season. However, the rate of degeneration is more rapid in the tropics than it is in the temperate zones for the insect populations are higher, there are more potential sources of infection

and seed storage is more difficult. Therefore, farmers must renew their seed more frequently.

In the Cordillera, most farmers aim to replace their seed every three to five years (Crissman 1989). In obtaining new seed, farmers will purchase tubers from importers, national or regional seed potato programs, specialist seed producers, regions and or farmers known to be good seed producers, or from the fresh market (Beukema and van der Zaag 1990). However, in choosing to purchase seed other than that derived from a formal, certified seed system, a farmer's decision to purchase seed will evoke considerable risk, for it is seldom possible to accurately evaluate seed tuber quality only by examining the external features of the seed. Unfortunately, a disease infected tuber is often indistinguishable from a healthy tuber (Balaoing and Lazo 1967: Aromin *et al.* 1993; Crissman and Hibon 1996). Furthermore, there can be no guarantee that the seed will be of the desired variety or physiological age and that it will emerge quickly and uniformly.

2.5.1 The formal seed system

Where poor quality seed is the major factor limiting potato yields, substantial gains in productivity can be achieved by promoting the production and use of certified seed to reduce the risk of distributing tuber-borne pathogens (Balaoing and Lazo 1967; van der Zaag 1987; Beukema and van der Zaag 1990).

The fundamental objective of a certified seed scheme is to produce seed guaranteed to be of the desired variety and within established tolerance limits to be free of pests and diseases (Crissman 1990). The elements of a formal certified seed scheme include: new variety introduction and the maintenance of existing varieties; the selection and propagation of clean initial planting material (pre-basic seed); the multiplication of initial planting material (basic seed); the production and distribution of seed to growers (certified seed); and quality control. However, in implementing a formal seed program, a country may either adopt a complete seed program (which includes the production of basic seed), or rely on the importation of foundation seed material (Beukema and van der Zaag 1990).

For economic and technical reasons, seed potato production in most developing countries is based on imported seed that is usually multiplied in-country one or more times before distribution to growers (Beukema and van der Zaag 1990; Schmiediche 1995). However, imports are expensive and there are additional problems including the untimely arrival of the seed tubers resulting in delayed planting and disruptions to cropping schedules; imports are available for only part of the year, which may not necessarily coincide with the most desirable planting time; and tubers may not be of the desired physiological age for planting (Balaoing and Lazo 1967). Furthermore, there is always the risk of importing serious plant diseases.

The production of high quality pre-basic seed and basic seed requires a high level of technical expertise and is usually done by government organisations at specialist seed farms, by universities, research institutes or by selected growers (Beukema and van der Zaag 1990). However, in the production of certified seed, there are three alternatives: (i) to produce certified seed on government seed farms; (ii) supply basic seed to selected seed growers or seed enterprises (seed grower associations) to multiply under supervision; or (iii) to turn over relatively small quantities of seed to a large number of growers to multiply and rely on the informal farmer-to-farmer seed system to achieve widespread use and distribution (Crissman 1989).

Previous experience suggests that most government institutions are incapable of cost effectively producing and managing the large-scale production of certified seed (Monares 1981; Crissman 1987; Crissman 1989; Beukema 1990; Beukema and van der Zaag 1990; Wooster and Farooq 1994; Crissman and Hibon 1996). While formal seed certification programs have been introduced into many developing countries, formal seed programs produce only a small proportion of the total seed requirements (Beukema 1990). No seed certification program in Latin America supplies more than 10% of national needs (Monares 1981) and in contrast to North America where over 85% of the potato crops are grown from

certified seed and in Europe where the figure is around 70%, less than 5% of the potatoes cultivated in Asia are derived from certified seed (van der Zaag 1991).

Regrettably, from the inception of the German Technical Assistance Agency (GTZ) program in 1977, the Philippines has also been unable to successfully implement a certified seed multiplication program. Seed loans formed the principal means of expanding the volume of certified seed material. However, the seed repayment rates varied from only 68-100% (Crissman 1989). While storm damage may have contributed to the low returns, the concept failed because the majority of growers chose to avail themselves of more lucrative opportunities in the fresh market or to supply any one of the private seed schemes that were being simultaneously established by potato processing operations. The program also experienced several problems with viral contamination and bacterial wilt, both in the production of basic seed at the seed farm and in the production of certified seed in the farmer's fields. Difficulties were also experienced with inadequate infrastructure, high storage losses, frosts, typhoons and wash-outs, poor communication and inadequate coordination, which over the duration of the project saw little reduction in the dependence on imports.

2.5.2 The informal seed system

That seed which the formal seed program is unable to supply is sought from the informal seed system. The informal seed system consists of all farmer-based activities concerning seed production, distribution and utilisation (Crissman 1990). In the informal system, the farmer may produce his own seed or obtain it from other farmers (Beukema 1990).

In the Philippines, the farmer-based informal seed system supplies 90% of the seed tubers planted (Crissman 1989). Most of the seed is produced from fresh potato crops. At harvest, the farmers sell the larger tubers to the market and keep the small tubers for seed. However, there is a switching price above which the farmer may decide to sell all of the tubers harvested to the fresh market and to acquire seed off-farm at a later date. That decision will be influenced by the prices

in the fresh market, the seed storage facilities the farmer has at his disposal and the anticipated losses during storage (Beukema and van der Zaag 1990; Beukema 1990; Della Vedova and Brieva 1995).

In a well-developed market where production is relatively stable and the supply is fairly predictable, prices in the fresh market seldom vary. In such instances, there is a high rate of improved seed use (Crissman and Hibon 1996). However, in regions where the market price fluctuates wildly and yields are unpredictable, the demand for improved seed can be quite low (Beukema and van der Zaag 1990). Where the yields are low it is not only more difficult to justify the use of high quality seed (van der Zaag 1987), but it is often more profitable for the farmer to use low quality seed (Beukema 1990). Despite many of the problems associated with saving seed from fresh potato crops, farmers in the Cordillera have been able to retain their own seed for up to twelve generations without experiencing any further reductions in productivity (Mariano *et al.* 1991).

However, where farmers are growing only one potato crop per year, should they choose to retain their own seed, they will need to store it for between five to seven months. Without adequate storage facilities, losses during storage of 40% are not uncommon. More often than not, financial constraints force the farmers to sell all of the crop at harvest including the small seed tubers. As the planting season approaches, competition between farmers for the limited quantities of small tubers available may dramatically increase the price for the seed sized tubers. Potatoes that have been classified only by size in the fresh market may be re-classified as seed, thus not only changing their description, but also changing markets (Crissman and Hibon 1996). How much the farmer pays for replacement seed will depend upon the availability of seed, the demand for seed and seed quality.

Seed is the most significant cost of potato production in the Cordillera. Seed costs amount to 31% of total production costs (Perez 1995a), although Mariano *et al.* (1991) estimated seed costs to approach 40%. HARRDEC (1996) estimate that the cost of seed is 34% of the total production costs. Seed is expensive, even if it is

not purchased, for farmers have the option of selling the tubers to the fresh market, feeding them to livestock, or eating them themselves (Monares 1981).

Good quality seed is not only more productive, but it is also significantly more expensive to purchase (Monares 1981; van der Zaag 1987; Beukema 1990). While an efficient farmer can be expected to use a production input up until that point where the increase in the value of production from using an additional unit of input equals the marginal cost of that input (Crissman and Hibon 1996), most potato farmers in the Cordillera have financial limits as to how much they can afford to invest in producing a crop of potatoes. Since few farmers in the Cordillera have sufficient capital resources to outlay the funds required to purchase seed, the availability of finance and the cost of finance will influence the farmers decision to purchase seed potatoes (Crissman 1989).

Where the farmer is a member of a government approved seed scheme or a cooperative farmer group, low interest loans are often available to assist in the purchase of seed (Batugal *et al.* 1988; Tagarino *et al.* 1998). Where the farmer is cultivating the crop under contract for a processing company, the seed and other production inputs may be supplied (Crissman 1989). In other instances, farmers will make arrangements with wholesalers and traders to loan the seed and to repay the loan at harvest (Crissman 1989; Beukema 1990; Tagarino *et al.* 1998).

Furthermore, since most potato farmers in the Cordillera retain at least some proportion of their harvest for seed, a farmer's decision to purchase improved seed will be made knowing that the benefits will be realised over several seasons. As a result, what constitutes an adequate return on the investment will be determined by the farmer's attitude towards risk, the expectation of prices in the fresh market, inflation and the cost of credit (Crissman and Hibon 1996).

In many countries there are traditional seed producing areas where the rate of seed degeneration is lower and where seed may be grown at the right time of the year so that by the time it is delivered, it is of the desired physiological age (Beukema

and van der Zaag 1990). In the Philippines, the farmer-based seed system has its origins in the high elevation areas of Northern Luzon. It is generally accepted that seed grown in cool humid areas will behave as young seed for a longer period of time (Crissman 1989). Young seed is more vigorous, later maturing and higher yielding. There is also evidence to suggest that farmers who have land at different elevations may alternate planting, so that seed saved from potatoes grown at a high elevation for one season will be grown at a lower elevation for the next season and vice versa (Mariano *et al.* 1991; Perez 1995b).

However, Monares (1979) has demonstrated that significant differences in yield can be achieved depending on the source of the seed. Seed coming from the highlands was found to be highly variable. The variation in yield potentially means that farmers can achieve very different rates of profit from the same investment in seed, depending upon from whom and from where they purchased the seed. Consequently, in the absence of a certified seed system, a farmer interested in purchasing large quantities of seed will endeavour to visit potential seed suppliers in order to inspect the vegetative health of the crop, and wherever possible, to visit again at harvest to estimate the yield (Crissman 1989). This process combined with prior experience of the area or with the seed farmer, is usually sufficient. Farmer's who are too far away to make a personal inspection may be influenced in their decision to purchase by the reputation of the seed grower.

However, there are very few specialist seed potato producers in the Philippines (Aromin *et al.* 1993). The low price of seed tubers relative to price of potatoes in the fresh market discourages seed production. Farmers can achieve higher net incomes by directing their efforts towards maximising yield and tuber size, which usually results in the production of a smaller proportion of seed-sized tubers.

Nevertheless, there are a number of measures that a farmer can take to control the spread of disease. Farmers are able to use a variety of techniques during pre-planting, crop production and post-harvest to slow the rate of seed degeneration

(Crissman 1989). Farmers can avoid land known to be contaminated with bacterial wilt and nematodes (Horton 1987; Aromin *et al.* 1993); practice crop rotations (Horton 1987; Crissman 1989); use whole seed (Crissman 1989); use resistant varieties (Aromin *et al.* 1993); control insect pests (Beukema and van der Zaag 1990); rogue crops during the growing season (Beukema and van der Zaag 1990; Mariano *et al.* 1991; Aromin *et al.* 1993); or select desirable plants in the field (Kloos and van der Zaag 1988). At harvest, farmers can select seed tubers on the basis of size and health, discarding tubers that are either damaged or show obvious signs of infection (Aromin *et al.* 1993; Crissman and Hibon 1996). However, farmers cannot detect disease simply by looking at the tuber, hence seed borne diseases can be spread to other potato growing areas unnoticed (Balaoing and Lazo 1967; Aromin *et al.* 1993; Perez 1995b; Crissman and Hibon 1996).

2.6 Chapter summary and implications

Potato production in the Cordillera is a highly profitable activity. However, potato production in the highlands is also a very risky proposition. Not only is there the risk of completely loosing the crop due to typhoons but in a good year when yields are high prices in the fresh market may decline to such low levels that farmers are unable to fully recover the costs of inputs (which may include the purchase of seed).

Nevertheless, since there are few alternative crops that offer such attractive returns to farmers, potato production in the Cordillera is increasing. With very little new land available for expansion, production can only increase by improving productivity per unit area. That factor which has the greatest impact on the yield potential is the quality of the seed tubers planted.

In most industrialised countries, potato farmers' plant seed derived from a certified seed program. The fundamental objective of a certified seed scheme is to produce seed guaranteed to be of the desired variety, and within established tolerance limits, to be substantially free of pests and diseases (Crissman 1990).

However, for a number of agro-ecological and institutional reasons, previous attempts to establish a certified seed program in the Philippines have failed. As a result, the informal farmer-based seed system supplies 85% of the seed planted (Jayasinghe *et al.* 1997).

In an informal seed system, the farmer either produces his own seed or obtains seed from other farmers (Beukema 1990). With the fresh market providing a significant price incentive for the larger tubers, farmers generally retain the small tubers for seed. However, when prices in the fresh market increase, where farmers are severely cash constrained, where farmers have no capacity to store the seed, or where the crop has been lost to adverse weather conditions, farmers may be unable to retain any proportion of their harvest for seed. Furthermore, as the productivity of the seed declines with each successive generation, a point will be reached at which it becomes more profitable for the farmer to purchase new seed.

In purchasing seed for the next crop, seed may be procured from other farmers or from the fresh market. However, in both instances, in the absence of any certified seed program, the quality of the seed remains intangible and can only be evaluated several weeks after planting. While several dimensions such as tuber size, the freedom of the tuber from physical injury, the conditions under which the seed has been stored and whether or not it contains mixed varieties can be ascertained by a physical examination of the tuber, its vitality and the extent to which the tuber is substantially free of systemic diseases remains unknown. Consequently, the decision to purchase seed evokes considerable risk and uncertainty, for the inadvertent purchase of contaminated seed will not only have a significant adverse impact on the productivity of the crop, but any subsequent crops derived from the same seed or grown in the same soil.

In purchasing seed, the risk and uncertainty is aggravated by the volatility of price in the fresh market, the high price of the seed itself, and the knowledge that most small farmers must borrow the capital required to purchase the seed. In order to manage the risk, many farmers will refrain from purchasing improved seed,

continuing to use their own seed for as many as twelve generations. Farmers will also refrain from purchasing seed for a second crop, since there is a greater probability of loosing the crop to typhoons, or frost. Wherever possible, farmers will endeavour to purchase seed from recognised seed growing areas or from those farmers who have a good reputation for delivering good quality seed. Since many farmers must also borrow the capital required to purchase the seed and the chemicals and fertilisers required to cultivate the crop, there is mounting evidence of the justification for potato farmers to enter into long-term relationships with their preferred seed suppliers as a means of reducing risk in the input market.

Chapter Three

INDUSTRIAL PURCHASING BEHAVIOUR

3.1 Chapter outline

Drawing on the industrial purchasing behaviour literature, this chapter describes the various criteria potato farmers in the Cordillera are expected to use in choosing between alternative seed suppliers. Since most potato farmers in the Cordillera are small family enterprises, special attention is directed towards the limited literature that describes the industrial purchasing behaviour of family firms (File *et al.* 1994) and Kool (1994) who provides a comprehensive empirical analysis of farmer purchasing behaviour.

3.2 Introduction

To market effectively to organisations, it is first necessary to understand the way organisations purchase. Purchasing by organisations involves a complex set of activities undertaken by many members of the organisation, the development of choice criteria, supplier choice and ultimately purchase (Lilien, Kotler and Moorthy 1992). Various models of industrial purchasing behaviour have been proposed by Robinson, Faris and Wind (1967), Webster and Wind (1972), Sheth (1973), Choffray and Lilien (1980) and Hakansson (1982). However, all of these models of industrial purchasing behaviour have one thing in common; they are all problem-solving models.

In the widely used BUYGRID model proposed by Robinson *et al.* (1967), the buying process is dependent upon the buying situation. Collectively, these authors conceptualised three buying classes (new task, modified re-buy and straight re-buy), which in turn were characterised by three dimensions (newness of the problem, information requirements and consideration of the alternatives). Although both the new task and modified re-buy decision involve some degree of information search and deliberation about choice alternatives, the straight re-buy

occurs relatively automatically with minimal cognitive effort and very little conscious control.

Webster and Wind (1972) propose that organisational buying is influenced by four sets of variables: (i) environmental factors (cultural, economic, legal-political, physical and technological) which primarily act to constrain business activity; (ii) organisational characteristics (actors, goals and tasks, structure and technology); (iii) individual variables (cognitive structure, learning, motivation, perceived roles and preference structures); and (iv) interpersonal variables (the buying centre). While Webster and Wind acknowledge that ultimately all organisational buying is individual behaviour, they introduced the concept of the buying centre as a means of resolving the different wants and needs of different individuals. The buying centre, which includes all organisational members involved in the decision to purchase, is an informal cross-sectional decision-making unit in which the primary objective is the acquisition, importation and processing of relevant purchasing related information. Throughout the purchasing process, different members of the buying centre assume different roles, although in one organisation one individual may assume all roles (Lilien *et al.* 1992). Furthermore, the composition of the buying centre may change from one purchasing situation to another and the influence of different individuals may be more important at different times (Hutt and Speh 1995).

Sheth (1973) suggested that the industrial buying process was influenced by six situational variables; three product specific variables including time pressure, perceived risk and the type of purchase; and three company specific variables including orientation, size and the degree of centralisation. The Sheth model is mainly concerned with the psychological aspects of individual buyer behaviour. Sheth identifies several factors that cause individual members involved in the buying decision to have different expectations including the background of the individual, their information sources, perceptual distortions and satisfaction with past purchases. Background variables include education, role orientation and life-style (Lilien *et al.* 1992). While Sheth identifies the variables and attempts to

explain what effects these have on the decision to purchase, functional relationships are not identified. Like the Webster and Wind (1972) model, the desire for comprehensiveness leads to the inclusion of every possible influence, thus making the model very difficult to operationalise. Furthermore, since both models concentrate on the buyer's side, very little attention is directed towards whatever influence the supplier may exert upon the transaction.

In contrast, the interaction model developed by the IMP Group, concentrates on the relationships which exist between buyers and suppliers (Hakansson 1982). Unlike the earlier models of organisational buyer behaviour, the interaction model assumes that: (i) both buyers and suppliers are active participants in the market; (ii) the relationship between buyers and suppliers is frequently close and long-term; and (iii) links between buyers and suppliers often become institutionalised, requiring significant adaptations from either or both parties. The interaction model analyses industrial marketing and purchasing from the perspective of: (i) the interaction process; (ii) the participants in the interaction process; (iii) the environment within which the interaction takes place; and (iv) the atmosphere affecting and affected by the interaction.

3.3 How organisational buyers evaluate potential suppliers

Organisational buyers are influenced by both rational and emotional factors when choosing between alternative offers (Hutt and Speh 1995). Rational motives are usually economic and include such variables as price, quality and service, whereas emotional criteria are generally concerned with organisational status, security, risk avoidance, social, political or environmental concerns.

Quality, price and the ability to deliver are generally regarded as the most important economic criteria by which organisational buyers evaluate potential suppliers (Cunningham and White 1973; Lehmann and O'Shaughnessy 1974; Dempsey 1978; Wilson 1994).

Where there is no difficulty in accurately specifying the exact nature of the product and there are several reliable suppliers in the market, a buyer can simply choose that supplier who offers the lowest price from among all those suppliers who fulfil the functional requirements (Hakansson *et al.* 1977). However, where a number of alternative suppliers have equalled one another in terms of quality, delivery and price, various attributes such as the supplier's reputation, financial position, communication and attitude towards the buyer may become decisive (Dempsey 1978).

Hutt and Speh (1995) suggest that when industrial buyers purchase a product, they purchase not only a package of benefits derived from the physical product features, but also a bundle of services attached to the product. While the exact meaning of the term service varies with the nature of the product and the requirements of the buying organization, service may encompass such things as just-in-time delivery, the provision of technical assistance and support, innovations and adaptations, credit arrangements, support for special needs, or advance notice of impending price changes or shortages in delivery. Gronroos (1999) describes how the provision of these services greatly enhances the value of the core product. For technologically advanced products, without these value-added services, it is unlikely that the core product will have any value at all.

Leenders and Fearon (1993) identify preferred suppliers as being those who seek to identify better ways of servicing customers. Preferred suppliers attempt to find new ways of developing products and services that will allow customers to perform their activities more economically. A preferred supplier should provide the quality specified and deliver on time, as promised, at an acceptable price. Furthermore, a preferred supplier should react favourably to unforeseen needs such as suddenly accelerated or decelerated volumes of business, changes in product or deliver specifications, service problems or any other legitimate request. Preferred suppliers will warn ahead of time of material shortages, strikes and anything else that may affect the purchaser's operations. They will provide

technical support and other expertise when requested by customers or whenever the supplier believes it can assist the purchaser to remain competitive.

Kotler and Armstrong (1999) suggest that suppliers who are the most capable of offering quality products and services, competitive prices, reliable delivery, ethical corporate behaviour and honest communication are most likely to be rewarded as preferred suppliers. However, other decision variables may include service capabilities, technical support, geographic location and performance history. Monczka, Trent and Handfield (1998) add financial capability and stability as key decision variables.

Feigenbaum (1991) describes quality as a customer determination based upon their actual experience with the product as measured against their stated requirements. Here it is important to understand that quality does not necessarily mean best: quality means "fitness for the intended purpose". As a result, quality establishes the proper balance between the cost of the product and the customer value it renders. Quality means providing customers with products and services that consistently meet their specifications.

Anderson and Narus (1999) describe offer quality as the set of economic, technical, service and social benefits that a customer receives. Fundamentally, offer quality is comprised of the core product, the minimally augmented product, the augmented product and conceptually, the potential product. The core product is simply the functional ability of the product to solve the customer's basic problem. The minimally augmented product adds to the core product, the least amount or number of services, programs or systems that the customer considers absolutely necessary to do business with the supplier. This may include such aspects as payment and credit terms and the provision of customer services that deal directly with problems arising from the use or application of the core product. The augmented product adds to the core product those services, programs and systems that are necessary to meet a broader set of customer requirements and preferences in ways that add value or reduce cost. Finally, the potential product

encompasses any imaginable product or service variation that the supplier might undertake to either add value or to reduce cost in ways that differentiate it from alternative suppliers.

From a services marketing perspective, Gronroos (1990) describes the product specifications required by the customer as technical quality. However, quality is a measure not only of the physical attributes of the product, but also by the manner in which the product is delivered. Functional quality describes the way a supplier goes about delivering the product to the customer. While this fundamentally means being able to deliver the product when the customer wants it, by implication, it may also involve many inter-related activities such as production scheduling, storage and warehousing, and logistics.

All buyers emphasize the importance of reliability of delivery (Lehmann and O'Shaughnessy 1974; Hakansson *et al.* 1977; Ellram 1990). The timely and efficient receipt of goods is critical to the success of most downstream manufacturing and retail operations. For this reason, many customers prefer to purchase from local suppliers (Hakansson and Wootz 1975). Local suppliers are generally less expensive and offer more dependable service than those located at a distance. Delivery may be more prompt because the distance is shorter and there is less likelihood of transportation delays. More importantly, local suppliers gain greater knowledge of their customer's needs and may be more flexible in meeting their requirements (Leenders and Fearon 1993).

Larger suppliers may be more appropriate for high volume requirements where technology, quality and total cost of ownership may be critical. Smaller suppliers are often preferred for smaller requirements where flexibility, speed of response and availability are more important than price. However, large suppliers generally have greater stability and greater resources, thereby reducing the day-to-day risk of supplier performance (Leenders and Fearon 1993).

While economic criteria are important, buyers will, amongst other tactics, attempt to reduce the perceived risk of purchasing by either splitting orders between several alternative suppliers or to purchase from well known suppliers with whom they have dealt with in the past (Cunningham and White 1973: Shapiro and Bonoma 1984).

Cardozo and Cagley (1971) and Puto, Patton and King (1985) demonstrate that industrial buyers are strongly attracted to well known or existing suppliers, for current suppliers are perceived as being less risky.

The extent to which an industrial buyer continues to purchase from a supplier or the extent to which the buyer more strongly favours one supplier rather than another is called source loyalty. Wind (1970) hypothesised that source loyalty was a function of four major constructs: (i) task variables (price, quality, delivery and service); (ii) the buyer's past experience with the source; (iii) organisational variables such as the pressure to generate cost savings or the number of complaints; and (iv) work simplification variables. In the context of long-term buyer-seller relationships, increased customer satisfaction should result in greater customer loyalty (Fornell *et al.* 1996). However, Fornell *et al.* found customer loyalty to be lower in those industries in which customer satisfaction was primarily price driven.

Nevertheless, even in a commodity market where products are often undifferentiated and there is intense price competition from alternative suppliers, there is evidence to suggest that quality remains the most important variable in the buyer's decision to purchase (Batt and Thein 2001; Batt and Morooka 2003). Simpson, Siguaw and White (2002) demonstrate that purchasing on price alone may incur additional costs because of inferior quality, unreliable delivery, limited quantities and inadequate communication. Such may also be indicative of the shift away from adversarial arms-length transactions towards more cooperative long-term buyer-seller relationships (Wilson 1994). In such situations, buyers seek to lower costs and improve quality by selecting those suppliers who are the most

capable of making continuous improvements to products and processes and who are both more willing and able to support the product in the market. Thus, even in the pursuit of lower costs, quality remains the single most important variable in the decision to purchase (Wilson 1994; Simpson *et al.* 2002).

3.4 Farmer buying behaviour: a special case of industrial purchasing

Farmer's purchasing behaviour can be considered as a specific form of industrial buying behaviour because farmers purchase inputs to produce farm products (Kool 1994). However, from an organisational context, farmer's buying behaviour is vastly different from buyer behaviour in industrial organisations. The majority of farms are small-scale enterprises without functional departments and formalised procurement procedures. Management, including purchasing, is primarily the responsibility of the farmer who is both personally and individually responsible for all financial obligations arising from the operation of the farm.

Another important aspect of purchasing behaviour on family farms is the interdependence between expenditures on household consumption and production inputs. Given a particular income level, an increase in expenditure on farm production inputs can only be made in the short term at the expense of household consumption and vice versa (Kool 1994). However, given a particular type of farming and a particular production method, changes in the utilisation of farm inputs occur frequently, due to the substitution of inputs arising from changes in input prices, output prices and the prices of consumption goods.

However, farmer's purchase three different groups of inputs: (i) materials like seed, chemical fertilisers and pesticides which ultimately become part of the finished product; (ii) equipment and capital goods which have a useful life of more than one year and which, although they are used in the production process, do not become part of the finished product; and (iii) services and supplies whose costs cannot be assigned to any particular production process (Kool 1994).

Although the value of some attributes can be accurately and efficiently evaluated prior to purchase, the value of many other attributes is difficult or impossible to evaluate prior to purchase. Furthermore, farmers often have a limited amount of time in which to make the decision to purchase.

Where the transaction occurs frequently and there is little perceived risk, farmers are unlikely to evaluate the alternative suppliers every time they purchase. These products can be readily bought by ordering the desired amount of product from the current or preferred supplier (Kool 1994).

In the farm-input market, farmers tend to simplify the purchasing task and reduce perceived risk by purchasing inputs successively from the same supplier(s). This purchasing strategy is pursued for at least three reasons: (i) farmers have to combine the purchasing task with other management tasks on the farm. They can only spend a limited amount of time making the purchasing decision; (ii) farmers are continually confronted with technological developments and improvements. Due to the lack of time, farmers cannot critically judge all these developments and may come to rely upon suppliers for advice and expertise; (iii) the convenience of not having to make a new choice can reduce the cost (time) in making the decision to purchase (Kool 1994).

However, many satisfactory exchange experiences may also result in a certain level of commitment towards a preferred supplier that will condition both present and future decision-making. Commitment is a preferential behaviour towards a preferred supplier based on a conscious explicit evaluation (Kool 1994). These criteria may be related to either the product or to the supplier. When a farmer has a long-standing personal relationship with the supplier, switching costs are high thereby perpetuating a long-term commitment to purchase from that supplier. However, these long-term relationships generally exist without contractual arrangements, so that the farmer always has the possibility of switching to another supplier.

File and Prince (1996) suggest that with regard to purchasing by small family firms, most are highly suspicious of unknown suppliers and generally place more effort in pre-purchase search and qualifying behaviours when considering new suppliers. Such is not unexpected, because in the context of most family businesses, the business system and the family system are intimately related. As a result family businesses are more risk averse because family interests and needs are at stake in addition to those of the business. Such arises because the family system exerts its influence on the business system through participation in the ownership and management of the business. Even family members without a formal management or ownership role will have considerable influence in those decisions affecting the current or future wealth of the business. Consequently, for family firms, the same caution and risk averse behaviour that characterises the supplier search and evaluation process will operate during the post-purchase stage. Family businesses are loath to take up the search process again once a supplier has been selected and found to perform satisfactorily. Family firms, therefore, exhibit higher degrees of source loyalty.

Conversely, for more infrequently purchased goods (and probably more capital intensive goods) there will be some degree of information search and evaluation of the alternatives. Farmers will try to collect as much information as possible, both from memory and from external sources, about the available alternatives and choice criteria (Kool 1994). How much information farmers collect will no doubt depend upon the importance or the magnitude of the decision, the complexity of the product and the newness or uniqueness of the problem.

Newness of the problem is an important determinant of industrial buyer behaviour (Robinson *et al.* 1967; Anderson *et al.* 1987; McQuiston 1989). Newness is best conceptualised as unfamiliarity with the buying situation due to the absence of any previous experience with similar purchase decisions (McQuiston 1989). The less prior experience the farmer has, the more unfamiliar the purchasing task will be to them (Kool 1994), increasing the purchase uncertainty and the problem solving capacity required. Particularly when buying new innovative products, it is

unlikely that any member of the farm family will be capable of making an appropriate evaluation of the product. Consequently, the farmer will depend more upon external sources of information and more often than not upon the supplier. However, Feder, Just and Zilberman (1985) show that farmer's also rely heavily on information derived from other farmers.

Purchase complexity is the perceived lack of information relevant to buying a product (McQuiston 1989; Bunn 1993). Increased purchase complexity leads to greater uncertainty, which leads to higher levels of perceived risk. Perceived risk is the uncertainty that decision-makers face when they cannot foresee the consequences of their buying decisions (Kool 1994).

Product importance is the perceived significance of the buying decision in terms of the size of the purchase and/or the potential impact of the purchase on the functioning of the farm. Product importance refers to the perceived consequences of making the wrong decision. Conceptually, product importance is comprised of three aspects: (i) financial importance; (ii) relevance for the end product; and (iii) relevance for the continuation of the production process (Kool *et al.* 1997).

Not unexpectedly, product importance will determine the amount of time a farmer allocates to the purchase decision. The more important the decision, the greater the amount of time invested and the greater the number of people involved in the decision to purchase (Moriarty and Spekman 1984; McQuiston 1989). In most instances, since the farmer is actively engaged in the day-to-day operation of their farm, they are not only well informed about most aspects of their farm's operation but in most instances the farmer will also possess the majority of decision-making power (Kool 1994). However, where the decision to purchase may have far reaching consequences for the family, the farmer, the farmer's spouse, other family members and even employees may become involved in the decision to purchase. Thus, the responsibility for failure as a result of having made a poor decision is shared between more individuals. Alternatively, where the decision to purchase entails a high degree of uncertainty, farmers can also reduce perceived

risk by adopting one of several alternative strategies including trial purchasing, to purchase smaller quantities, to use multiple sources of supply, or to purchase from preferred well-known suppliers.

A farmer's buying behaviour is also constrained by the financial, technological and human resources on the farm. Such characteristics as the farm size and the type of farming activity will not only influence the choice of production possibilities but also the nature of the farmer's relationship with input suppliers (Kool 1994).

Large farms are strategically more important for input suppliers than small farms because larger farms purchase larger quantities of inputs and generally possess more sophisticated machinery because of the substitution of labour by capital. Large farms are also more likely to commit themselves to a sole supplier because the balance of power is more equitably distributed in the relationship (Kool 1994).

If modern technology is more risky than traditional farming practices, larger farms will devote more land in absolute terms (but less land in proportionate terms) to evaluating new technology than smaller farms (Feder *et al.* 1985). However, the relationship between farm size and the adoption of new technology will depend more upon such factors as land quality, access to credit, risk preferences, access to scarce resources, wealth, access to information, labour requirements and land tenure arrangements.

Irrespective, it is individuals who make the decision to purchase not organisations (Lilien *et al.* 1992). Each member of the buying centre has a unique personality, a different organisational function and a different set of personal goals and objectives. Personal characteristics such as age, education, purchasing experience, quality consciousness, market orientation and the farmer's attitude to risk will influence the farmer's purchasing decisions (Kool 1994). As farmers gain more buying experience with regard to a particular input, they are expected to put less effort into the next buying task. After each growing season, the actual yields,

revenues and profits are realised and this added information, as well as the experience accumulated during the period and information gained from other farmers, will update the parameters the farmer uses in making the next decision to purchase. With each successive crop, the farmer will become more proficient with the technology used on their farm (Feder *et al.* 1995).

Not unexpectedly, the environment will also exert a persuasive influence of farm purchasing behaviour. The environment affects farmers buying behaviour by providing information as well as prescribing various constraints and offering new opportunities (Kool 1994). Environmental factors determine the availability of goods and services to the farm. Technology has greatly improved productivity per unit area and as machinery replaces labour, the costs of production are steadily declining. Environmental factors also define the general business conditions within which the farm operates. This includes the legal environment, the political environment, physical constraints and the availability of capital. Moreover, farmers are being confronted with an increasing number of environmental regulations that constrain agricultural production and thus farmers purchasing behaviour.

Finally, the social system itself may influence farmers buying behaviour. The social system affects farmers buying behaviour by determining the values and social norms of farmers and those involved in both the sale of farm inputs and purchasing of farm outputs (Kool 1994).

3.5 Chapter summary and implications

As a farm input, the demand for seed potatoes is derived from the demand for fresh and processed potato products (Vrolijk 1994). As farmer's buying behaviour is primarily directed towards finding least cost solutions that best satisfy functional criteria (Kool 1994), potato farmers in the Cordillera are expected to purchase that seed which has the greatest potential to increase productivity per unit area. However, in the Cordillera the decision to purchase seed will evoke

considerable risk. Since it is seldom possible to accurately ascertain seed tuber quality simply by looking at the tuber, in the absence of any certified seed system which might provide the farmer with some assurance that seed is of the desired quality, it is not until several weeks after planting and ultimately only at harvest (some 90-120 days after planting) that the farmer is finally able to evaluate the productivity of the seed.

The magnitude of the risk will be further enhanced by the knowledge that seed quality will have a significant long-term impact on the productivity of any other crops derived from that seed. Furthermore, since prices in the output market are extremely volatile, there is some risk that farmers may be unable to recover the costs of the seed. Since most small farmers do not have sufficient capital to purchase the seed (Tagarino *et al.* 1998), the farmer must enter into some credit arrangement with a seed supplier, trader or financial institution. Hence, in making the decision to purchase seed, the farmer will not only consider seed quality and seed cost, but also such aspects as payment and credit terms and the provision of various customer services to deal directly with problems that may arise from the use or application of the seed. Since most potato farmers in the Cordillera have no means of transporting the tubers, the ability of the seed supplier to deliver the seed to the farm at the time the farmer needs for planting may also be considered.

In order to reduce risk, farmers can be expected to purchase seed from those suppliers with whom they have had a satisfactory prior experience. From among the alternatives, such suppliers are expected to provide the best quality seed in the quantity required by the farmer, when the farmer needs it, at a competitive price.

Where farmers have no prior experience or it becomes necessary to identify an alternative seed supplier because the preferred supplier is unable to provide the quantity of seed required, or the farmer has inadvertently purchased poor quality seed on a previous occasion, farmers are expected to seek out those seed suppliers who have a good reputation. Acting upon information provided by other farmers, reputation may relate to an area or it may relate directly to those seed producers

who through practicing various agronomic techniques are able to reduce the rate of seed degeneration.

Chapter Four

DEVELOPING A CONCEPTUAL MODEL OF LONG-TERM BUYER-SELLER RELATIONSHIPS IN THE SEED POTATO INPUT MARKET IN THE PHILIPPINES[2]

4.1 Chapter outline

While the two previous chapters have provided an introduction to the potato industry in the Philippines (with especial reference to the study area in the Cordillera) and described in some detail the various factors that impact upon a potato farmer's decision to purchase seed, the following chapter will introduce the concept of relationship marketing. Because of the intangible nature of seed tuber quality and the credit arrangements that exist between farmers, input suppliers and traders, it is hypothesised that farmers will enter into long-term relationships with preferred suppliers as a means of reducing uncertainty in the input market. From the literature of buyer-seller relationships, a conceptual model and its associated hypothesises are developed.

4.2 Introduction

Uncertainty is the key dimension affecting organisations, inter-organisational relationships and the costs of transacting (Achrol *et al.* 1983). Uncertainty is defined as unanticipated changes in the circumstances surrounding an exchange (Noordewier, John and Nevin 1990, p 82). Unanticipated change arises in a number of ways: (i) need uncertainty arises from difficulties experienced in specifying the exact nature of the inputs (Hakansson and Wootz 1975; Hakansson *et al.* 1977; Hakansson 1982; Anderson *et al.* 1987; McQuiston 1989; Heide and

[2] The following chapter was developed from Batt, Peter J. and Nexhmi Rexha (1999), Building trust in agribusiness supply chains: a conceptual model of buyer-seller relationships in the seed potato industry in Asia, *Journal of International Food and Agribusiness Marketing,* Vol 11 (1), 1-17 and Batt, Peter J. (2001a), Why dissatisfied customers still desire long-term relationships, *Interactions, Relationships and Networks: Strategic Dimensions. Proceedings of the 17th Annual IMP Conference.* Norwegian Institute of Management (BI) [cd].

John 1990); (ii) input market uncertainty exists when the resource required is scarce and if the input market is concentrated (Hakansson and Wootz 1975; Achrol *et al.* 1983; Anderson and Weitz 1986; Heide and John 1990; Oliver 1990); (iii) market uncertainty reflects buyers incomplete knowledge of the market and potential source alternatives (Hakansson *et al.* 1977; Hakansson and Wootz 1979; Anderson and Weitz 1986; Oliver 1990); (iv) transaction uncertainty considers the problems (including performance ambiguity) associated in getting the product from the supplier to the buyer (Hakansson and Wootz 1975; Hakansson *et al.* 1977; Ford 1982; Hakansson 1982; Achrol *et al.* 1983; Jackson 1985; Heide and John 1990; Oliver 1990; Heide 1994); (v) uncertainty in the output sector is attributed to the poor marketing capabilities of channel actors further down the supply chain (Achrol *et al.* 1983; Anderson and Weitz 1986); and (vi) environmental uncertainty considers changes in the physical, technological and economic environment (Webster and Wind 1972; Heide and John 1990).

Uncertainty prompts firms to establish and to manage relationships in order to achieve stability, predictability and dependability in their relationships with others (Oliver 1990). Performance is thought to improve when more relational market structures are introduced in response to high levels of uncertainty. When suppliers are more inclined to respond favourably to a buyer's requests for changes, buyers are able to adjust more readily to changes in the environment and to manage uncertainty more effectively. Similarly, when buyers provide information to suppliers, the supplier, in turn, is better able to respond to the buyer's requests (Noordewier *et al.* 1990).

4.3 The benefits of long-term relationships

Firms are establishing relationships with their suppliers because it enables them to be more efficient and to be more effective (Anderson and Narus 1991; Kalwani and Narayandas 1995; Sheth and Sharma 1997). More industrial firms are realising that customer retention is more cost effective than customer creation

(Fornell 1992; Han, Wilson and Dant 1993; Kalwani and Narayandas 1995; Achrol 1997), especially in mature markets where it is more difficult to attract new customers (Bowen, Siehl and Schneider 1989).

By developing long-term relationships with their suppliers, buyers and sellers can achieve cost savings through: (i) reduced search and evaluation costs (Hakansson 1982); (ii) reduced transaction costs (Arndt, 1979; Hakansson 1982; Han *et al.* 1993); and (iii) the learning effects and relationship specific scale economies (Cunningham and Homse 1982; Gundlach, Achrol and Mentzer 1995).

However, the primary reason for establishing relationships with suppliers is that customers realise that suppliers create value (Evans and Laskin 1994; Morgan and Hunt 1994; Kalwani and Narayandas 1995; Wilson 1995; Sheth and Sharma 1997). Developing long-term relationships can have benefits including: improved access to markets and reliable market information (Low 1996); customers can anticipate improved access to a more reliable supply of production inputs (Arndt 1979; Hakansson 1982); improved product quality and performance (Landeros and Monczka 1989; Han *et al.* 1993); a higher level of technical interaction in the form of information exchange, potential product adaptations and technical assistance (Cunningham and Homse 1982); and greater support from suppliers in developing and launching new products (Landeros and Monczka 1989; Anderson and Weitz 1992).

Through becoming closer to customers and better understanding and satisfying customers needs, suppliers can achieve greater customer loyalty and higher repeat sales (Evans and Laskin 1994; Lohtia and Krapfel 1994; Kalwani and Narayandas 1995; Leuthesser 1997). Relationship marketing provides a stronger, longer-term customer benefit that is more difficult for competitors to match and it becomes more difficult for competitors to enter the market (Hakansson 1982; Turnbull and Wilson 1989; Heide 1994). Buyers become less sensitive to price competition and suppliers may benefit from higher prices (Kalwani and Narayandas 1995).

Suppliers benefit from being able to better plan and forecast production schedules (Lohtia and Krapfel 1994), coordinate deliveries and undertake joint promotions (Easton and Araujo 1994). The very existence of the relationship itself can be used to attract new customers (Jackson 1985) and there are greater opportunities for cross selling (Kalwani and Narayandas 1995).

However, if there is to be a relationship, there must be an expectation of repeat business. When the parties know they are in an extended arrangement, they are more willing to accept short-term disadvantages because things will even out in the long run. However, there is always the risk that either party may seek to take advantage of the situation by acting opportunistically. Therefore, if there is to be a meaningful long-term relationship, respective buyers and suppliers must learn to trust their opposite party to fulfil their obligations (Hakansson and Wootz 1979; Hallen *et al.* 1991; Han *et al.* 1993; Morgan and Hunt 1994; Achrol 1997).

4.4 Modelling long-term buyer-seller relationships

While an extensive amount of literature has appeared in recent years identifying the factors impacting upon the establishment and maintenance of long-term buyer seller relationships (Ford 1980; Dwyer, Schurr and Oh 1987; Wilson 1995), the greatest support has emerged for the key constructs of satisfaction, trust and commitment (Anderson and Narus 1990; Anderson and Weitz 1992; Han *et al.* 1993; Morgan and Hunt 1994). While numerous authors have empirically tested the nature of the relationships between satisfaction and trust (Swan, Trawick and Silva 1985; Anderson and Narus 1990; Ganesan 1994), trust and commitment (Morgan and Hunt 1994; Gundlach *et al.* 1995; Doney and Cannon 1997) and satisfaction and commitment (Anderson and Weitz 1992; Ganesan 1994), there are very few studies which empirically test the relationship between all three.

Using the key dimensions of satisfaction (Frazier 1983; Anderson and Narus 1990), trust (Dwyer *et al.* 1987; Moorman, Deshpande and Zaltman 1993; Ganesan 1994; Morgan and Hunt 1994) and commitment (Anderson and Weitz

1992; Ganesan 1994; Morgan and Hunt 1994; Gundlach *et al.* 1995), the seed supplier's relationship building investments (Easton and Araujo 1994; Hakansson and Snehota 1995; Ford, McDowell and Tomkins 1996) will be investigated in an atmosphere moderated by power and dependence (Heide and John 1988: Frazier, *et al.* 1989)(Figure 1).

4.4.1. Satisfaction

Satisfaction (or dissatisfaction) arises from the customer's feelings in response to an evaluation of one or more use experiences with the product (Woodruff 1997). Received value may lead directly to feelings of overall satisfaction, or indirectly, they may be compared to one or more standards such as values, predicted values or experience-based norms.

According to the disconfirmation of expectations model, customer satisfaction is the result of a comparison between a supplier's performance and the customer's expectations (Oliver 1980; Tse and Wilton 1988; Yi 1990: Fornell 1992). Whenever performance exceeds expectations, satisfaction will increase. Conversely, whenever performance falls below expectations, customers will become dissatisfied.

Expectations are beliefs about the likelihood that a product is associated with certain attributes, benefits or outcomes (Spreng, Mackenzie and Olshavsky 1996). However, since different customers may be either satisfied or dissatisfied by the same experience, customer satisfaction (or dissatisfaction) will be influenced by the pre-experience standards against which performance is ultimately compared.

Tse and Wilton (1988) indicate that there are three alternative approaches towards conceptualising the pre-experience standard. Ideal product performance represents the optimal product performance a customer would ideally hope for.

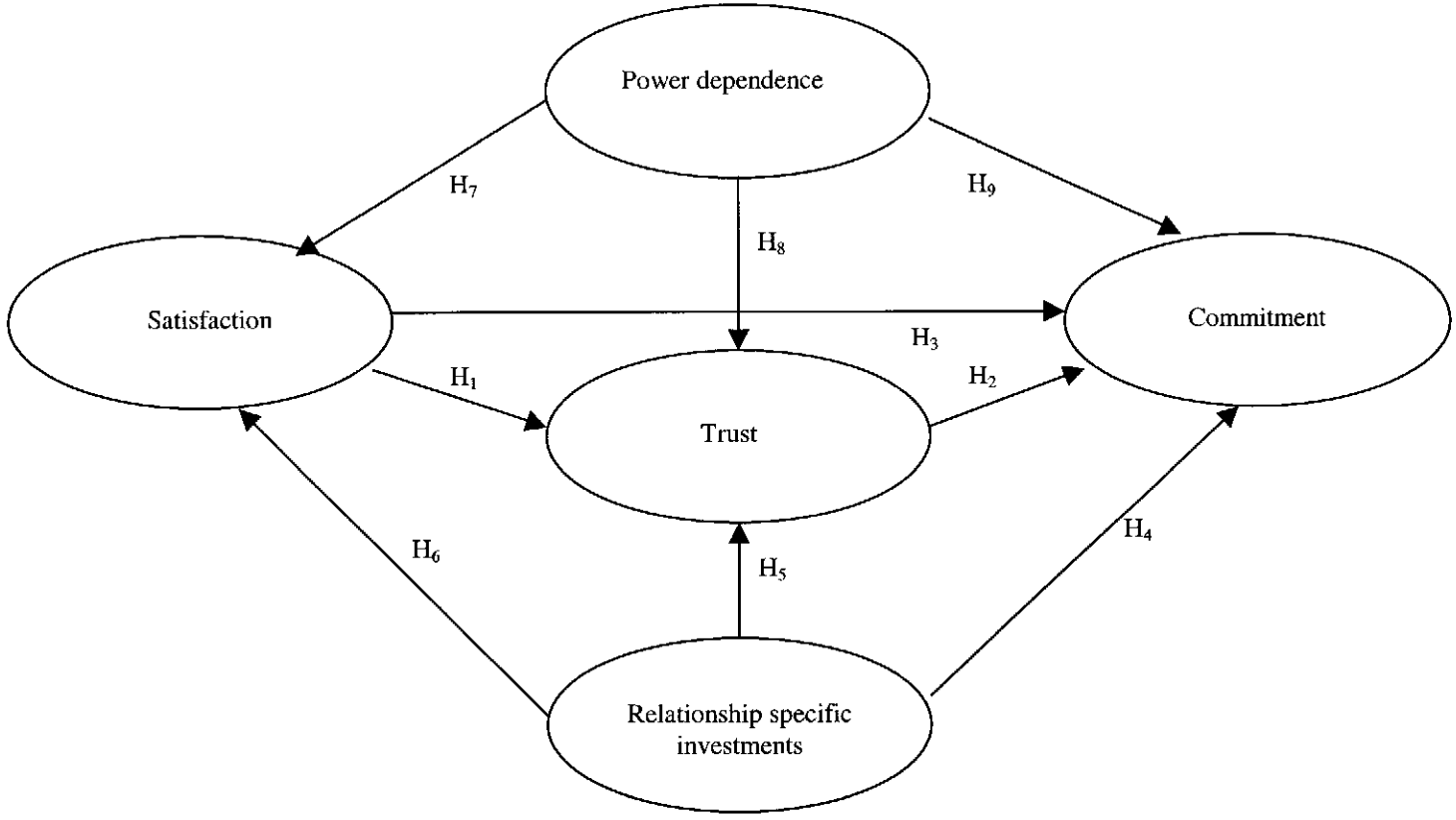


Figure One. Conceptual model of buyer-seller relationships in the Filipino seed potato industry

Conversely, expected product performance represents the product's most likely performance, reflecting what performance will probably be. Equitable performance represents a normative standard for performance based on the implicit relationship between an individual's costs and investments and anticipated rewards. This represents the level of performance the customer believes they ought to receive or deserve, given a perceived set of costs. Halstead (1999) introduces a fourth dimension, which she describes as the minimum tolerable. This represents the minimum standard of performance the product must achieve.

Fornell *et al.* (1996) believe that overall customer satisfaction has three antecedents: perceived quality; perceived value; and the customer's expectations. Perceived quality or performance is the customer's evaluation of their most recent consumption experience. Such is derived from two primary components: products must not only perform adequately on various instrumental dimensions (technical quality), but customers must also be satisfied by the manner in which they receive those products (functional quality) (Gronroos 1990). Swan and Combs (1976) argue that for customers to experience satisfaction, products must perform adequately on the key instrumental dimensions. If performance here is sufficiently good, then customers can experience satisfaction from the functional dimensions.

Even so, if customer expectations are met with regard to technical quality, customers can become dissatisfied if their expectations are not met with regard to functional quality. Mackenzie and Hardy (1996) suggest that in the early stages of a long-term buyer-seller relationship, technical quality is more important, because without it, the customer will experience dissatisfaction. As a consequence, it is unlikely that the relationship will develop further. However, as the relationship develops, functional quality becomes increasingly important and may, in part, compensate for temporary problems with the supplier's offer. Should there be any lapse in performance, improvements can be negotiated through communication. Continued superior performance on both dimensions will eventually move the

relationship to where the functional quality or relationship atmosphere is the most important aspect.

Finally, the customer's expectations will relate either favourably or unfavourably to whatever prior consumption experience the customer has had of the firm's offer and a forecast of the supplier's ability to deliver in the future (Fornell *et al.* 1996). Especially in mature, stable markets, expectations should accurately reflect the quality of the firm's current product offer. Customers should have expectations that are largely rational and reflect their ability to learn from experience and accurately predict the levels of quality and value they receive.

Perceived value is the perceived level of product quality relative to the price paid (Fornell *et al.* 1996). Value is achieved when the proper function is secured for the proper cost (Hutt and Speh 1995). Because functions can be accomplished in a number of different ways, the most cost efficient way of fully accomplishing a function will establish its value. Here, the concept of value-in-use constitutes the price that will equalise the overall costs and benefits of using one product over another. As channel member satisfaction is described as a positive affective state resulting from an appraisal of all aspects of a firm's working relationship with another (Frazier *et al.* 1989), Geyskens, Steenkamp and Kumar (1999) propose that satisfaction should capture both the economic and non-economic (psychosocial) aspects of the exchange.

Economic satisfaction is defined as the "channel member's positive affective response to the economic rewards that flow from the relationship with its partner" (Geyskens *et al.* 1999, p 224). An economically satisfied channel member considers the relationship a success when it is satisfied with the effectiveness and productivity of the relationship with its partner and the resulting positive financial outcomes. Since satisfaction has been described as the buyer's cognitive state of being adequately or inadequately rewarded for the sacrifices they have undergone in facilitating the exchange (Frazier 1983), economically, performance can be viewed as the key reward and price as the key sacrifice associated with the

exchange (Voss, Parasuraman and Grewal 1998). Collectively, these introduce the concept of equity in the exchange.

While Tse and Wilton (1988) propose that equity in the exchange be used as a comparison standard, Oliver (1997) argues that equity is a process of comparison. Equity generally refers to the fairness or rightness of something in comparison to other entities (Halstead 1999). Both Frazier (1983) and Anderson and Narus (1990) suggest that satisfaction with past outcomes indicates equity in the exchange. Equitable outcomes provide confidence that neither party has been taken advantage of in the relationship and that both parties are concerned about their mutual welfare (Ganesan 1994).

Social satisfaction is derived from the channel member's positive affective response to the non-economic aspects of the relationship in that interactions with the exchange partner are fulfilling, gratifying and easy. A channel member satisfied with the social aspects of the exchange appreciates the contact with its exchange partner and, on a personal level, likes working with the partner because it believes the partner is concerned, respectful and willing to exchange ideas (Geyskens *et al.*, 1999).

Particularly in the context of long-term buyer-seller relationships, it is important to differentiate between transaction-specific satisfaction and cumulative satisfaction. From a transaction-specific perspective, customer satisfaction may be viewed as a post-choice evaluative judgement of a specific purchase occasion (Oliver 1980). Conversely, cumulative satisfaction is an overall evaluation based on the total purchase and consumption experience with the goods or service over time (Fornell 1992). Whereas transaction-specific satisfaction may provide specific diagnostic information about a particular product or service encounter, cumulative satisfaction is a more fundamental indicator of the firm's past, current and future performance. It is cumulative satisfaction that motivates firms to invest in customer satisfaction, for satisfaction is derived not only from the current experience, but also all past experiences as well as all future or anticipated

experiences (Anderson *et al.* 1994). Consequently, satisfaction depends not only upon whether the current products and services meet customer's needs, but the anticipated quality of future products and services.

If satisfaction is not a static evaluation derived from a single transaction, then perhaps satisfaction is best viewed as a process extending across the entire consumption period within which an analysis of customer-product interactions is fundamental (Fournier and Mick 1999). Satisfaction is an active, dynamic process from which satisfaction emerges as the result of continual interactive negotiation between the customer and the product. Particularly in long-term buyer-seller relationships, where a repeated purchase situation is usually at the same time a pre-purchase situation, the satisfaction of both parties is the cohesive factor in the development of the relationship (Tikkanen, Alajoutsijarvi and Tahtinen 2000).

Hakansson and Snehota (1995) describe how the process and structural characteristics of exchange form the basis of a customer's perception of a supplier's performance. The process characteristics highlight the core features of the exchange process by examining the various activities, whereas the structural characteristics describe the content and nature of the relationship within which the activity takes place. The following process characteristics are typically found in inter-organisational relationships; cooperation, conflict, adaptation, routines and social interaction.

Anderson and Narus (1990) define cooperation as similar or complementary coordinated actions taken by firms in interdependent relationships to achieve mutual outcomes or singular outcomes with expected reciprocation over time. While Anderson and Narus found a strong, indirect and positive relationship between cooperation and satisfaction, Mackenzie and Hardy (1996) propose that cooperation will lead to satisfaction. Conversely, Morgan and Hunt (1994) and Ganesan (1994) see satisfaction as resulting in greater cooperation between channel members. Landeros and Monczka (1989) see cooperative buyer-seller relationships as encouraging both firms to behave cooperatively when unforeseen

contingencies emerge. Such requires a credible commitment between the firms, joint problem-solving activities, an exchange of information between the firms and joint adjustments to changing market conditions.

Conflict is one of the few constructs considered to have a direct negative effect on satisfaction (Frazier *et al.* 1989). Firms that lower the overall level of conflict in their relationship experience greater satisfaction (Anderson and Narus 1990). Conflict in channel relationships most often occurs over economic issues (Geyskens *et al.* 1999). Channel members that are satisfied with the economic rewards that flow from their relationship perceive their partner to be advancing their goal attainment as opposed to impeding or preventing it. Satisfaction then is determined by the congruence between the firm's goals for entering into the relationship, compared with what the firm actually achieves (Hakansson and Sharma 1996).

However, not all conflict is negative, nor does a relationship mean that all conflict has been resolved (Hakansson and Snehota 1995). A small amount of conflict may prove necessary to keep the relationship healthy. Occasional conflict can reduce the inertia in business relationships, reshaping existing routines into new, potentially more effective solutions (Tikkanen *et al.* 2000).

High levels of satisfaction will have positive consequences for the relationship (Frazier 1983). Customer satisfaction usually results in higher repeat purchases, referrals to other customers, positive word-of-mouth and lower transaction costs (Evans and Laskin 1994). High customer satisfaction should also result in increased loyalty for current customers, insulation of current customers from competitive efforts, reduced failure costs and an enhanced reputation for the firm (Fornell 1992). Satisfied customers are more likely to buy frequently and in greater volumes and to purchase other goods and services offered by the firm (Anderson *et al.* 1994). Satisfied customers are also less likely to engage in damaging negative word-of-mouth and are both more willing to pay for the benefits they receive and are more likely to tolerate modest increases in price.

Increased customer satisfaction should also enhance the overall reputation of the firm that can aid in introducing new products and lower the buyer's risk of trial. An enhanced reputation can be beneficial in establishing and maintaining relationships with key suppliers, distributors and potential allies.

4.4.2. Trust

For any particular potential exchange, trust will be critical if two situational factors are present: risk and incomplete buyer information. Since most potential sales transactions present some degree of risk and uncertainty to the potential buyer (Hawes, Mast and Swan 1989), without some degree of trust, the perceived risk may be too great for the transaction to occur.

More specifically, trust becomes important in an exchange whenever there is a high level of performance ambiguity (Singh and Sirdeshmukh 2000). In such circumstances, trust acts as an information resource that directly reduces the perceived threat of information asymmetry and performance ambiguity.

While a supplier's technical and functional quality impact upon satisfaction, both will also impact upon customer trust (de Ruyter, Moorman and Lemmink 2001). In those markets where relatively high levels of perceived risk are associated with the purchase of the product, customer trust can play a pivotal role in supplier selection and patronage. The development of trust depends both on the credibility of the product and the credibility of the service offered.

In the Philippines, the potato is not only a highly profitable crop, but it is also a high risk crop. While there is always the risk of completely losing the crop to typhoons, the most significant risk is associated with the purchase of seed. Seed is the major cost of potato production in the Philippines (HARRDEC 1996). However, more significantly, in the absence of any formal seed certification system which might otherwise provide the farmer with some assurance that the seed they have purchased is substantially free of pests and diseases, of the desired variety and physiological age, farmers are generally unable to ascertain the quality

of the seed they have purchased until some weeks after planting and it is only at harvest, 90 to 120 days later, that the farmer is able to evaluate the productivity of the seed. Thus there is much uncertainty associated with a farmers decision to purchase seed potatoes. To reduce that uncertainty, farmers can be expected to purchase seed from those suppliers who have provided them with good quality seed in the past, who have a good reputation among the other farmers and they feel they can trust.

Anderson and Narus (1990) define trust as the belief that the partner will perform actions that will result in positive outcomes for the firm and will not take unexpected actions that may result in negative outcomes (p 45). Moorman *et al.* (1993) define trust as the willingness to rely on an exchange partner in whom one has confidence (p 82).

While both of these definitions view trust as a behavioural intention that reflects reliance on the other partner, both definitions, in part, capture quite different aspects of the construct. Moorman *et al.* (1993) definition of trust as a belief, a sentiment or an expectation about an exchange partner, results from the partner's expertise, reliability and intentionality. This component of trust, which Ganesan (1994) describes as credibility, is based on the extent to which the buyer believes that the supplier has the necessary expertise to perform the activity effectively and reliably.

However, trust also relates to the focal firm's intention to rely on their exchange partner. Ganesan (1994) describes this component as benevolence, because it is based on the extent to which the focal firm believes that its partner has intentions and motives beneficial to it. A benevolent partner will subordinate immediate self-interest for the long-term benefit of both parties and will not take actions that may have a negative impact on the firm (Geyskens, Steenkamp and Kumar 1998).

In expanding the concepts developed by Thorelli (1986), Singh and Sirdeshmukh (2000) describe trust as an expectation of behaviour. Trust focuses on the belief

that an exchange partner will act in a manner that is responsible, with integrity and without injury to the focal firm. While this aspect of trust is also behavioural because it focuses on the partner's tendency to act, there is also a structural component that refers to the trust fostered by mutual hostages (Madhok 1995).

When trust exists, buyers and suppliers believe that long-term idiosyncratic investments can be made with limited risk because both parties will refrain from using their power to renege on contracts or to use a change in circumstances to obtain profits in their own favour (Ganesan 1994; Doney and Cannon 1997; Geyskens *et al.* 1998). Consequently, Heide (1994) considers inter-organisational trust to be a governance mechanism that mitigates opportunism in exchange transactions characterised by uncertainty and dependence. Trust reduces the need for structural mechanisms of control (Achrol 1997) and, over time, both firms learn to become more interdependent (Kumar 1996).

In building trust in buyer-seller relationships, Sako (1992) finds it necessary to differentiate between trust at three levels. Contractual trust is an expectation that the exchange partner will abide by its written or oral contractual obligations and act according to generally accepted business practice. Competence trust is derived from the assumption that the entrusted firm will carry out the activities competently and reliably. Goodwill trust arises where both parties have developed mutual expectations that the other will do more than what it is formally committed to perform. Here, the firm not only expects the other not to act opportunistically, but that it will, altruistically, go out of its way (McCutcheon and Stuart 2000). While history, cumulative interaction and transference may build the lower forms of trust the development of goodwill trust will require not only the absence of exploitation and coercion, but also a history of demonstrated good intentions. Not only must the buying firm demonstrate its trustworthiness, but it must also test the supplier's trustworthiness.

While Sako (1992) differentiates between contractual trust, competence trust and goodwill trust, Plank, Reid and Pullins (1999) contest that while trust is a global

belief on the part of the buyer that their exchange partner will fulfil their obligations, trust is comprised of three individual components: sales-person trust, product trust and company trust. Similarly, Anderson and Narus (1990) and Doney and Cannon (1997) find it necessary to differentiate between trust in an individual and trust in an organisation.

Swan *et al.* (1985) indicate how competence, customer orientation, honesty, dependability and likeability facilitate the development of trust between sales representatives and their customers. Moorman *et al.* (1993) argue that the interpersonal factors that most affect trust include perceived expertise, sincerity, integrity, tactfulness, timeliness and confidentiality. Crosby, Evans and Cowles (1990) contend that mutual disclosure, a cooperative rather than a competitive intention and the style and intensity of the communication between individuals is critical in establishing and maintaining interpersonal relationships.

While a buyer's trust in their supplier reduces the perception of risk associated with opportunistic behaviour, it also increases the buyer's confidence that short-term inequities will be resolved over the long period and it reduces the transaction costs in an exchange relationship (Ganesan 1994). Trust is the critical determinant of many factors related to performance including the more open exchange of relevant ideas and emotions; greater clarification of goals and problems; more extensive search for alternative courses of action; greater satisfaction with efforts; and greater motivation to implement decisions (Achrol 1997). Buyer's who trust their suppliers are less likely to use alternative sources of supply and are more likely to accept any short-term inequities that may arise in the exchange relationship (Kumar 1996). Trust increases the partners tolerance for each others behaviour, facilitating the informal resolution of conflict, which in turn allows the partners to better adapt to the needs and capabilities of their counterpart (Hakansson and Sharma 1996).

However, whether trust develops in a relationship will depend upon how the respective parties feel and behave and the value of the outcomes achieved. When

economic outcomes are high, the channel member may attribute a great deal of credit to their partner and the channel members attraction to and trust in their partner will increase (Geyskens *et al.* 1998). Conversely, when economic outcomes are low, the channel member will become frustrated and attribute blame to the partner, thereby leading to reduced trust (Frazier 1983). Mackenzie and Hardy (1996) propose that, as satisfaction increases so will trust.

> *H_1 there will be a positive association between the potato farmer's relational satisfaction and the trust the farmer places in their preferred seed supplier.*

While satisfaction arises from an evaluation of all aspects of the working relationship, the construct is conceptually rooted in both the past and the present. On the other hand, trust is a belief relating to future actions. While the basis for trust might also be rooted in the past, there is an implied future orientation. Satisfaction with the exchange may lead to some initial trusting behaviour and if the outcome is positive, as satisfaction increases, trust will increase and continue to build over successive transactions.

Nevertheless, since Anderson and Narus (1990) propose that satisfaction is the focal consequence of a good working relationship, satisfaction is a consequence of trust. Trust will have a significant positive impact on the partner's propensity to cooperate and to amicably resolve conflict. Since firms that are able to reduce conflict in their relationship are generally more satisfied with their partner, trust will indirectly affect satisfaction. Consequently, Geyskens *et al.* (1998) propose that trust will have a more direct impact on satisfaction. When the focal firm trusts its partner, it will feel more secure by way of an implicit belief that the actions of its partner will result in desired outcomes. Customers who trust their supplier feel less vulnerable which may increase the relational benefits the buyer derives from the transaction (Singh and Sirdeshmukh 2000).

4.4.3. Commitment

Moorman *et al.* (1993) define commitment as an enduring desire to maintain a valued relationship. Morgan and Hunt (1994) propose that a firm will commit to an exchange partner when the relationship is considered so important as to warrant maximum efforts to maintain it. Such implies that the relationship is important and that there is a desire to continue the relationship into the future (Wilson 1995). Hakansson and Snehota (1995) see commitment as the tendency to persist with a course of action, often without an apparent causal motive, on the basis of some vague expectation. Thus, to some extent, a commitment is an act of faith by which the respective parties handle uncertainty and complexity.

The essence of commitment in inter-organisational and interpersonal relationships is stability and sacrifice (Anderson and Weitz 1992). Commitment implies the adoption of a long-term orientation towards the relationship; a willingness to make short-term sacrifices in order to realise longer-term benefits (Dwyer *et al.* 1987). The long-term orientation is based on the assumption that the relationship is stable and will last long enough for both parties to realise the longer-term benefits.

Nevertheless, Gundlach *et al.* (1995) find it necessary to differentiate between attitudinal commitment and an instrumental component. Commitment is most often seen as an attitudinal construct described in terms of affective commitment, psychological attachment, identification, affiliation and value congruence (Achrol 1997). This type of commitment represents a partisan affective attachment to the goals and values of an organisation; to one's role in relation to the goals and values and to the organisation for its own sake. People develop affective commitment towards organisations they feel they belong to, which provide them with assistance and support during difficult times, offer long-term security, returns and employment, and whose future and fortunes they feel they can actively participate in determining. Affective commitment is therefore brought about by a person sharing, identifying with, or internalising the values of an organisation (Morgan and Hunt 1994).

Since commitment entails some vulnerability, a firm is more likely to commit to trustworthy exchange partners (Morgan and Hunt 1994). Trust leads to a high level of affective commitment and thus a strong desire to maintain the relationship (Anderson and Narus 1990; Gundlach *et al.* 1995; Spekman and Celly 1995; Kumar 1996; Geyskens *et al.* 1996).

> *H_2 there will be a positive association between the potato farmer's trust in their preferred seed supplier and the farmer's desire to maintain the relationship.*

Furthermore, a buyer who is satisfied with their exchange partner can be expected to allocate a higher share of its business to that supplier, compared to less satisfactory suppliers. Maximising customer satisfaction will create barriers to exit and establish switching costs, thereby minimising customer turnover or maximising customer retention (Fornell 1992). Particularly in long-term buyer-seller relationships, where a repeat purchase situation is usually at the same time a pre-purchase situation, the satisfaction of both parties is the cohesive factor in the development of the relationship (Tikkanen *et al.* 2000). High customer satisfaction usually creates bonds and a commitment between interacting firms that inevitably increases customer retention. Trust and commitment lead to cooperative behaviours that are more conducive to the long-term success of the relationship (Morgan and Hunt 1994).

> *H_3 there will be a positive association between the potato farmer's relational satisfaction with their preferred seed supplier and the farmer's desire to maintain the relationship.*

However, attitudinal commitments alone are a precarious quantity. Commitments that are not supported by investments lack staying power (Achrol 1997). Such investments have been described to include pledges, credible commitments, idiosyncratic investments and the dedicated allocation of resources (Anderson and Weitz 1992). Such credible commitments act as powerful self-interest stakes in

exchange relationships. All things being equal, these investments reinforce and escalate commitment over time (Gundlach *et al.* 1995).

More recently, the making of these investments and the allocation of resources to a relationship have been described as a calculative commitment. Once these investments have been made, they reduce the number of relationships that a firm may have without having to redirect costs (Williamson 1985). Geyskens *et al.* (1996) thus describe commitment as the perceived need to maintain a relationship given the significant anticipated termination or switching costs associated with departure. Morgan and Hunt (1994) view calculative commitment as being a cognitive evaluation of the instrumental worth of a continuing relationship with the firm. All gains and losses, positives and minuses and rewards and punishments are summed and evaluated.

However, a distinction must be made between a firm's commitment to a customer and its commitment to a market (Ford 1984). A supplier demonstrates commitment to a customer by directing its efforts solely towards meeting the needs of that customer. Such might be associated with: (i) favouring existing customers in times of product shortage; (ii) responding quickly to requests for a salesman to call; (iii) providing detailed technical information and following up on how products are used; (iv) the provision of delivery information; and (v) not directing marketing activities at acquiring new customers. However, a supplier may also demonstrate commitment to a specific geographic market by: (i) establishing a sales and service office in the market; (ii) providing working and service instructions and technical documentation in the buyers language; (iii) employing local sales staff; and, (iv) introducing a new product specifically for that market.

4.4.4. Relationship building investments

It is a characteristic of organisational markets that many transactions occur within the context of rich and stable relationships (Easton and Araujo 1994). However, in traditional marketing theory, transactions are described as a one-time exchange of

value between two parties who have no prior or subsequent interaction (Webster 1992). Transactions are assumed to be perfectly replaceable and transferable, with all the information required to consummate the exchange contained in the price-quantity function. There are no set-up costs involved in establishing an identity in the market since the history of past transactions is immaterial and the identity of the supplier is only of concern in as far as the personal or firm specific capabilities may affect the value of the goods being exchanged (Easton and Araujo 1994).

However, in industrial markets, the role of interpersonal contacts and social networks is a crucial element in exchange transactions (Cunningham and Turnbull 1982). Every person has some traits that may potentially interest an exchange partner and which will affect perceptions of value in the exchange. The cost of establishing this perception can be regarded as an investment that will facilitate exchange in the future (Easton and Araujo 1994).

Investments are a process through which resources are committed in order to create, build or acquire other resources to be used in the future (Easton and Araujo 1994). As such, buyer-seller relationships can be regarded as an investment. Through interacting with other firms and committing resources to specific relationships, firms have the opportunity to use relationships as a resource for the creation of other resources, product adaptations and innovations, process improvements, or to provide access to third parties (Hakansson and Snehota 1995). Relationships produce something that neither firm can produce in isolation and something that cannot be easily duplicated. Relationships have important effects on the development of technical competence and the capabilities of a firm. They affect the firm's productivity, innovativeness and competence and thus its performance potential.

However, relationships are mutually demanding as well as being mutually rewarding (Hakansson and Snehota 1995). If a company wishes to improve its relationship with a partner (or partners) to achieve future benefit(s), then in all probability, the firm will need to commit various resources to the relationship,

whether expressed in terms of managerial or sales force time, product or service development, process, financial or administrative adaptations (Ford *et al.* 1996).

Minimal investments are unilateral investments in assets that are committed to a limited range of business opportunities (Easton and Araujo 1994). Quite simply, these are the investments required to do business; for example, an investment in freezer capacity is mandatory if the firm wishes to enter the frozen food business. Such investments can be readily redeployed to alternative uses and alternative users without incurring a significant loss of value, albeit with respect to a limited range of business opportunities.

Conversely, an investment may be described as being relationship specific. Such tangible and intangible investments may generate a variety of assets with differing degrees of asset specificity. Some of these assets; for example, technological capabilities, may be general purpose and transferable to a broad range of new and existing relationships. Others may demand adaptations to product and production processes, delivery procedures, or the introduction and implementation of quality management systems (Easton and Araujo 1994) that are, by their very nature, more customer specific and therefore more vulnerable to potential loss should the relationship be terminated. Similarly, investments in specialist education and training, and providing competitive product and market information may prove to be substantial because of the economic consequences one party will incur if the relationship is terminated (Ganesan 1994). As a result, the exchange partner will incur significant switching costs if they seek an alternative trading partner.

Williamson (1985) suggests that making idiosyncratic (or relationship-specific) investments helps to stabilise relationships by altering the firm's incentive structure. By investing in the relationship, a channel member creates an incentive to maintain the relationship, for engaging in opportunistic behaviour and risking the dissolution of the relationship may be contrary to their long-term self interest (Anderson and Weitz 1992). In effect, when a channel member makes a pledge to its exchange partner, it weakens its own position by reducing the alternative

sources it can use to perform a channel function. While making pledges not only constrains the channel member, it also commits the channel member to the relationship. In the context of the Filipino seed potato industry, farmers are expected to seek to maintain their relationship with those seed suppliers who are prepared to make relationship specific investments that help them to grow potatoes and to share the risk of growing potatoes.

> *H_4 there will be a positive association between the relationship specific investments the preferred seed supplier makes to help the farmer grow potatoes and the farmer's desire to maintain the relationship.*

The seed supplier's willingness to make credible investments is also expected to provide a powerful signal to the potato farmer. Observing the exchange partner's pledges may cause the focal firm to become more confident in the other partner's commitment to the relationship, because the other party will sustain significant loss if the relationship is abruptly terminated (Heide and John 1988; Anderson and Weitz 1992; Lohtia and Krapfel 1994). Thus the willingness to make relationship-specific investments offers tangible evidence that the exchange partner can be believed, that they care for the relationship and are willing to make sacrifices having made such investments (Ganesan 1994). In this regard, the making of credible investments in the relationship provides strong signals of the channel partner's trustworthiness. With trust, both parties believe that even under unanticipated contingencies, rewards will be distributed in a fair and equitable manner. To the extent that suppliers make transaction-specific investments, buyers may realise such benefits as a decreased perception of the supplier's power and thus the reduced perception of risk owing to the lower potential for opportunism. Since the buyer values these benefits, they are expected to seek to develop a close long-term relationship with the supplier (Lothia and Krapfel 1994).

> *H_5 there will be a positive association between the relationship specific investments the preferred seed supplier makes to help the farmer grow potatoes and the farmer's trust in their most preferred seed supplier.*

Since satisfaction is a feature of a good relationship, each party involved in the exchange should be happy and satisfied with the performance of the other. Since relationships are based on some kind of match between the operations of two firms, one or both firms may find it necessary to adapt to the needs and capabilities of the other (Hallen *et al.* 1991).

Adaptations can be seen most clearly by such things as a supplier's modification of a product to suit a customer, delivering to meet buyer's production schedules rather than the supplier's or the joint establishment of a stock-holding facility (Ford 1984). The supplier may also modify production processes, use alternative logistics systems such as just-in-time and adopt various systems, including quality management, to meet the demands of a customer (Ganesan 1994). Mutual adaptations increase satisfaction, for customer satisfaction is derived from both product performance and the manner in which the customers receive the product (Tikkanen *et al.* 2000). Since buyers tend to be more satisfied with suppliers who make deliberate efforts to keep abreast of their changing needs (Leuthesser 1997), it is hypothesised that:

> *H_6 there will be a positive association between the relationship-specific investments the preferred seed supplier makes to help the farmer grow potatoes and the farmer's relational satisfaction.*

4.4.5. Power/dependence

Dependence refers to a firm's need to maintain a channel relationship in order to achieve desired goals (Frazier *et al.* 1989). Resource dependence theory suggests that firms engage in exchange transactions because they require resources from other firms (Pfeffer and Salanick 1978). When another channel member controls resources that the other channel member wants or needs, various power relations emerge that potentially enable the party controlling the resource to exert some influence or power (Andaleeb 1996).

When the outcomes obtained from the relationship are important or highly valued, the focal firm is more dependent (Heide and John 1988). The same is true when the magnitude of the exchange itself is higher (Lohtia and Krapfel 1994). The higher the percentage of sales and profits that are contributed by handling a supplier's product line and the greater the expectations of sales and profits in the future, the greater the focal firm's dependence (Frazier *et al.* 1989). Thus, a firm is considered more dependent upon a supplier when that supplier provides a larger proportion of its business.

Dependence is also increased when the outcomes from the relationship are comparatively higher than or better than the outcomes available from alternative relationships. Firms dealing with the best supplier are more dependent because the outcomes associated from dealing with that supplier are better than those available from poor performing suppliers (Heide and John 1988). In this respect, Anderson and Narus (1990) view dependence in the relationship as the outcomes given comparison level for alternatives. In this context, dependence is a measure that represents the overall quality of outcomes available to the focal firm from the best alternative exchange relationship.

When fewer alternative sources of exchange are available to the focal firm, or when replacing or substituting a current exchange partner is difficult because there are fewer alternatives, dependence will increase (Heide and John 1988; Frazier *et al.* 1989). Furthermore, the investment the firm has put into the relationship in terms of time, effort and money, as well as the perceived costs of switching to and commencing an alternative exchange relationship can also contribute to a firm's dependence upon another (Frazier 1983; Heide 1994; Lohtia and Krapfel 1994).

Firms are assumed to be motivated to reduce dependence, for dependence in an exchange relationship may make one party more susceptible to the power and influence of the other (Heide and John 1988). However, it is the firm's perception of its dependence relative to its partner that is of most interest in channel relationships. Relative dependence determines the extent to which a firm will have

influence over or be influenced by its partner (Anderson and Narus 1990). With increasing dependence comes greater vulnerability (Krapfel, Salmond and Spekman 1991), for the more powerful partner may be in a position to create more favourable terms of trade for itself (Heide and John 1988; Frazier *et al.* 1989).

When a channel member frequently pressures or coerces its partner into taking some action that it otherwise would not have taken or it is forced to forgo some positive outcome, the focal firm is expected to feel tension and frustration because its decision autonomy is constrained and its satisfaction with the exchange will decline (Frazier 1983). For the more dependent party, the fear of exploitation will reduce its satisfaction with the relationship (Anderson and Narus 1990). Since there is a lack of high quality seed in the Philippines (Balaoing and Lazo 1967; Crissman 1989; Rasco and Aromin 1994; Perez 1995), small potato farmers in the Cordillera are expected to be dissatisfied with both the quality and quantity of the seed available from seed suppliers. Since there are few alternative suppliers:

> *H_7 the more dependent the farmer is upon their preferred seed supplier the lower the potato farmer's relational satisfaction with their preferred seed supplier.*

However, dependence does not, in and of itself, inevitably result in exploitation (Geyskens *et al.* 1996). While the more powerful partner may use coercive power to achieve immediate compliance, the use of non-coercive influence strategies may signal trust and the desire to work together. Non-coercive influence strategies include information exchange, the discussion of business practices and requests (Frazier and Summers 1986). Satisfaction increases when non-coercive sources of power are employed (Frazier 1983). Furthermore, the weaker, more vulnerable partner is more likely to trust its exchange partner when it uses its power more constructively to promote joint interests (Geyskens *et al.* 1996).

With trust, performance outcomes can be more reliably predicted which may help the focal firm feel more secure in the relationship (Andaleeb 1996). Conversely,

when trust is lacking, as expectations become less certain, the dependence relationship will lose value, as the focal firm can no longer be assured that its needs will be fulfilled. Consistent with resource dependence theory (Pfeffer and Salancik 1978) and transaction cost theory (Williamson 1985), when the focal firm is more dependent upon another, it may find itself exposed to opportunism and potentially negative outcomes. Consequently:

> *H_8 the more dependent the farmer is upon their preferred seed supplier the less farmer's will trust their preferred seed supplier.*

While Anderson and Weitz (1989) observe that suppliers with a reputation for fairness engender greater trust, buyers who have been subjected to unfair trading practices and opportunism are more likely to demonstrate hostility towards their exchange partner (Kumar, Scheer and Steenkamp 1995). When trust is low, the relationship may still continue, but it may become intolerable because of outcome uncertainties and dysfunctional behaviours. Dependence and the potential fear of exploitation is expected to reduce the focal firm's motivation to continue the relationship (Wetzels, de Ruyter and van Birgelen 1998). If parties feel they are more dependent, they will not only become less emotionally involved in the relationship (Anderson and Weitz 1989; Kumar *et al.* 1995), but more likely to embark upon a calculated cost-benefit analysis of the relationship (Ganesan 1994; Spekman and Celly 1995).

> *H_9 the more dependent the farmer is upon their preferred seed supplier, the less likely they will be to maintain their relationship with their preferred seed supplier.*

Chapter Five
METHODOLOGY

5.1 Chapter outline

In order to test the hypotheses proposed in the previous chapter, data must be collected in a manner that will not only facilitate analysis, but also accurately represent the population from which it was taken. This chapter will describe the process of questionnaire design, its administration and subsequent data analysis. Various issues are raised which highlight some of the difficulties raised in conducting quantitative research in a developing country.

5.2 Introduction

While a considerable amount of literature is available which adequately describes the potato production system in the Cordillera (Horton 1987; Crissman 1989; Gayao and Sim n.d; Gayao *et al.* 1997; Sim *et al.* 1997 and Tagarino *et al.* 1998); the potato marketing system (Horton 1987; Crissman 1989; Perez 1995; Gayao and Sim n.d; Gayao *et al.* 1997 and Sim *et al.* 1997); and the seed potato system (Balaoing and Lazo 1967; Crissman 1989; Mariano *et al.* 1991; Aromin *et al.* 1993; and Bos 1998), the literature fails to provide sufficient and timely information adequate for the purposes of accurately identifying and understanding how a Filipino potato farmer's demographic background and the atmosphere within which the exchange transaction occurs, impacts upon the demand for seed, the farmer's choice of seed supplier and the nature of the relationship between the farmer and their preferred seed supplier.

Kool (1994) has demonstrated that a farmer's decision to purchase farm inputs is influenced by the level of expenditure on household goods. Webster and Wind (1972) propose that various individual factors are also likely to influence a potato farmer's decision to purchase. Feder *et al.* (1985) indicate how farm size, land tenure, the availability of labour, credit constraints, the farmer's attitude to risk and uncertainty, and the level of education that the farmer has achieved, will

influence the rate of adoption of agricultural technology. Since it is extremely unlikely that all farmers reside in identical households and pursue identical goals, have the same level of education and/or have adopted the same cultivation methods, variations in any one or more of these variables is expected to influence the farmer's decision to purchase.

5.3 Research approach

Fundamentally, in seeking to explore the nature of the long-term relationships that may exist between Filipino potato farmers and their preferred seed suppliers, two alternative approaches are available. Whereas the quantitative approach is typically used to answer questions about the relationships among measured variables for the purpose of explaining, predicting and controlling phenomena, the qualitative approach is typically used to answer questions about the nature of the phenomena for the purpose of describing and understanding the phenomena (Leedy 1997; p 104). Since it was the principal objective of this thesis to identify the underlying factors influencing a Filipino potato farmer's decision to purchase seed potatoes, the choice of seed supplier and the nature of the relationship between potato farmers and their preferred seed suppliers, a more quantitative approach was necessary so as to obtain data that would prove suitable for analysis.

Nevertheless, the two research approaches are not mutually exclusive and indeed, if both are utilised, the quality of the data collected may be greatly improved. Since much research has been undertaken in the Cordillera to describe both seed potato and fresh potato production and marketing, the variables used to describe the cropping system and the means for disposing of the crop are presumably well understood by potential respondents. Furthermore, Callueng *et al.* (1993a) has explored at considerable length, the various criteria that farmers employ in choosing between alternative varieties. However, there is no evidence of any previous studies being undertaken in the Cordillera to examine the criteria potato farmers use in choosing between alternative seed suppliers, nor is there any evidence of any previous studies having been undertaken to explore the nature of

the long-term relationships that may exist between potato farmers and their preferred seed suppliers. As a result, no empirical measures have been used, tested or validated to assist in the evaluation of these dimensions.

In developing measurement scales for this thesis, there are two alternative approaches. Where the social constructs are well understood and universal, there is a strong possibility that they can be readily transferred across national borders. Much of the original work of the IMP Group (Hakansson 1982) sought to evaluate the extent to which relationship building behaviour was consistent across cultures in a European setting. These were subsequently extended to Australia and North America in the subsequent IMP 2 study. While Bulmer and Warwick (1983) warn of the inherent dangers in transferring concepts and terms from an industrialised country to a developing country, the extent to which the relationship building concepts can be transferred from the developed to the developing world is simply not known.

The alternative approach is to conduct a number of qualitative studies in-country to explore the constructs prior to commencing the survey. However, where the chief investigator does not speak the indigenous language, providing simultaneous translation will not only disrupt the functioning of any focus group, but the translation itself may result in a significant loss of meaning.

5.4 Questionnaire design

In order to obtain the desired information, a structured questionnaire was developed based on the literature of seed potato production in Asia, industrial buying behaviour and relationship marketing (Appendix 1).

The questionnaire was divided into six sections. Lehmann (1985) suggests that in the development of a structured questionnaire, respondents should first be asked a number of simple descriptive questions both to establish rapport between the respondent and the enumerator and to provide a degree of confidence for the

respondent that the questions can be answered with no apparent difficulty or personal intrusion.

Section One

Section One sought to gather information about potato production and marketing, the seed supply system and the economics of potato production in the Cordillera, in part to provide a reference base against which the sample of farmers interviewed could be compared (since there was no formal database nor could the existing statistical data be relied upon to any great extent); but more importantly, to provide potential segmentation variables that might be used to explain any differences observed between the potato farmer's decision to purchase potatoes, their choice of seed supplier and the nature of their relationship with their preferred seed supplier.

Despite various other studies of the potato industry in the Cordillera having been conducted (Crissman 1989; Gayao *et al.* 1997; Sim *et al.* 1997; Jayasinghe *et al.* 1997 and Tagarino *et al.* 1998), with the exception of Bos (1998), no theoretical framework has been established for the development of the survey instrument. Furthermore, the majority of other studies were purely descriptive in that they had not sought to identify any variables that might explain observed differences in the farmer's agronomic or marketing practices.

Section One began with the following question:

1. Province in which farm is located .....

   Monares (1981); Villamayor (1984); Crissman (1989); Aromin *et al.* (1993); Crissman and Hibon (1996);

In the context of this study, province is expected to influence the planting time for potatoes, the quality of the seed and the prices farmers achieve for fresh potatoes. As one travels along the Halsema Highway from Atok to Buguias, the altitude gradually increases. As altitude increases, the risk of frost increases which, since potatoes are frost susceptible, may delay the planting date and or advance the

harvest date. The extent to which this may or may not influence productivity per unit is dependent on the levels of input used by the farmer and the quality of the seed.

At higher altitude, the cooler conditions result in fewer insect pests that markedly reduce the spread of viral disease. Consequently, the rate of seed degeneration is significantly less and farmers at higher altitude can generally retain a larger proportion of their seed for a longer period.

In the Cordillera, there is some relationship between province and accessibility to market. Since the road is in very poor condition and subject to frequent closure during the wet season, distance is measured not so much by distance travelled, but rather the time required to travel the distance. Farmers in Atok are much closer to the market than potato farmers in Buguias and may therefore be in a much better position to extract a higher price from the various traders.

2. Area of the farm .....
3. Proportion of land freehold .....
   leased .....
   Government .....

Monares (1981); Feder *et al.* (1985); van der Zaag (1986); Beukema and van der Zaag (1990); Pangilauan *et al.* (1993); Della Vedova and Brieva (1995); Schmiediche (1995);

Both the area of the farm and means by which potato farmers have access to that land is expected to influence a potato farmer's ability to raise capital. Due to the very steep terrain, there is very little new land available for cropping. As such, if farmers want to plant potatoes, they must either cultivate their own land or lease it from another farmer.

In a very comprehensive study of the seed potato system in the Cordillera, Crissman (1989) identified a number of itinerant potato farmers who had occupied and were cultivating Government land. Without legal title to this land, these

farmers have little opportunity to raise capital (to purchase seed) from the formal sources (banks and grower cooperatives)(Tagarino *et al.* 1998).

4. Area of farm cropped in potatoes .....
   First crop .....
   Second crop .....
   Third crop .....

   Monares (1981); Villamayor (1984); Horton (1987); Crissman (1989); Rasco and Aromin (1994); Della Vedova and Brieva (1995); Perez (1995);

5. Planting times (month); First crop .....
   Second crop .....
   Third crop .....

   Altoveros (1992); Della Vedova and Brieva (1995)

As the majority of potato farmers in the Cordillera produce a range of temperate vegetable crops (Crissman 1989), the farmer's demand for seed potatoes will be derived from the area of the farm planted in potatoes. Because of the risk of frost and flooding during the wet season, the main planting season is in February. At this time of the year, given the constraints previously identified, the quantity of good quality seed available is expected to fall well below the demand. However, for those farmers who are more risk averse and who choose to plant a second or third potato crop, the planting time (month) will have a significant influence on the demand for seed.

Since a potato farmer could plant up to three potato crops per year, the following questions (6-10, 12 and 13) were asked in relation to the first, second or third potato crop:

6. What proportion of your (FIRST) potato crop is grown from;
   cuttings .....
   seed tubers .....

   Haverkort (1986); Caringal and van der Zaag (1987); Upadhya (1987); Kloos and van der Zaag (1988); Demonteverde *et al.* (1993)

Although seed tubers are the most common method employed for planting a commercial potato crop (Horton 1989), two alternative techniques are sometimes practiced in Asia; the transplanting of plantlets derived from either true potato seed (TPS) or tip cuttings, generally taken from pathogen free plants maintained by a Government agency or university. Since there is no evidence of TPS being used by potato farmers in the Cordillera, farmers have two choices from which to obtain the seed they require.

7. Ideally what is the preferred seed size .....
8. What seed size is actually planted .....

   Monares (1981); Haverkort (1986); van der Zaag (1986); Horton (1987); van der Zaag (1987) Crissman (1989); Huda (1990); Altoveros (1992); Aromin *et al.* (1993); Rasco (1994); Crissman and Hibon (1996);

There is ample evidence to suggest that the majority of the potatoes planted in the Cordillera are derived from seed tubers (Balaoing and Lazo 1967; Crissman 1989). Beukema and van der Zaag (1990) indicate that tubers of between 35-80 g are most commonly used for seed, although, in the Cordillera, HARRDEC (1996) recommend planting tubers between 40-60 g. As the weight of each seed tuber increases, the number of tubers per kg will decline, thereby increasing the cost of each seed tuber. Understandably, cash constrained farmers will seek wherever possible to purchase smaller tubers. However, where insufficient quantities of seed of the desired size is available, farmers may have to compromise by using seed that is either smaller than or larger than the desired seed size. In both instances, since seed size may influence the number of stems that arise from the seed tuber, both the productivity per unit area and the distribution of tuber sizes in the resultant crop will be affected.

9. Ideally, what is the seed rate per hectare .....
10. At what rate per hectare is seed actually planted .....

    Monares (1981); Villamayor (1984); Haverkort (1986); Horton (1987); Crissman (1989); Beukema and van der Zaag (1990); Rasco and Aromin (1994); Crissman and Hibon (1996);

There is, understandably, a direct relationship between seed size and the quantity of seed (seed rate) required per unit area. Since potato farmers implicitly purchase a potential number of sprouts or stems per unit area, as the seed size increases, farmers will need to purchase a greater quantity of seed to plant the same area.

While many assume that the seed rate used in the Philippines is similar to that used in the temperate zones (1.8-2.5 tonnes per ha or 40,000 stems per ha), there is evidence to suggest that such is not entirely appropriate, for the seed rates used are often much lower because of the scarcity of seed and the high cost of seed. The seed rate used may also be influenced by agronomic factors and the farmer's attitude to risk. In the tropics, since the potato crop is generally of a much shorter duration, the seed rate may be increased to encourage a more rapid closure of the canopy. To minimise the risk associated with planting a second crop in the Cordillera, farmers may choose to plant the second crop at a lower seed rate.

11. Do you use cut seed?

    Crissman (1985); Demagante, van der Zaag and Boucaron (1986); Horton (1987); Beukema and van der Zaag (1990); Sana *et al.* (1993); Rasco and Aromin (1994);

In those instances where there is an acute shortage of seed or where potato farmers prefer to use larger tubers in the belief that they are less likely to be infected with tuber borne diseases (Della Vedova and Brieva 1995), seed cutting may be widely practiced. While there are various advantages and disadvantages associated with using cut seed, it does enable the farmer to use larger tubers without increasing the seed rate per unit area.

12. What proportion of the seed planted is;
    grower's own seed .....
    a gift from other farmers .....
    purchased from seed growers .....
    purchased from other farmers .....
    purchased from the open market .....
    purchased from farmer cooperatives .....
    purchased from seed merchants .....
    purchased from Government seed programs .....
    purchased from overseas seed suppliers .....

Monares (1981); Horton (1987); Crissman (1989); Beukema and van der Zaag (1990); Wooster and Farooq (1994); Aromin *et al.* (1993);

There is evidence to suggest that most potato farmers in the Cordillera endeavour to retain at least some proportion of their harvest as seed for planting a subsequent potato crop (Crissman 1989). However, not all potato farmers have the financial resources to enable them to retain sufficient seed and not all farmers have sufficient storage capacity. Other farmers, particularly those at lower altitudes or those whose seed has degenerated to such an extent that it is having a significant negative impact on productivity, may no longer wish to retain their seed. Other farmers may wish to take advantage of abnormally high prices in the ware market, whereupon they will sell their entire crop in the expectation that they will be able to purchase seed as the planting season approaches.

However, irrespective of the various reasons that may influence a potato farmer's decision to retain some proportion of his seed, since it is widely acknowledged that the production potential will decline with each generation (Haverkort 1986), at some point in time all farmers will need to repurchase seed. From the literature on seed potato production systems, a number of both formal and informal sources of seed are identified.

13. What is the cost of the seed per kg purchased from;
    seed growers .....
    other farmers .....
    open market .....
    farmer cooperative .....
    seed merchants .....
    Government seed programs .....
    overseas seed suppliers .....

    Beukema (1990); Renia (1992); Sana *et al.* (1993); Vrolijk (1994) Crissman and Hibon (1996);

Between the various alternatives, the cost to purchase seed will vary greatly. High quality seed produced by Government seed programs, or imported from those countries maintaining a certified seed system, will cost more to produce and by

necessity will cost more to purchase (Monares 1981). On the other hand, while seed purchased from the informal seed system (other farmers or the fresh market) is often much less expensive, there can be no guarantee that the seed purchased will be of the desired variety and physiological age or substantially free of pests and diseases that may contaminate the crop or the soil in the future.

14. Ideally, how much seed do you purchase per year .....
15. How much seed is actually purchased per year .....
16. Ideally, what proportion of seed is renewed per year .....
17. What proportion of seed is actually renewed per year .....
18. For how many crops do you retain your own seed .....

Crissman (1989); Beukema (1990); Mariano *et al.* (1991); Aromin *et al.* (1993); Wooster and Farooq (1994); Della Vedova and Brieva (1995); Crissman and Hibon (1996);

While the quantity of seed a farmer requires can be readily calculated from the area of potatoes cultivated, how much seed the farmer needs to purchase will be influenced by the quantity of seed the farmer has retained from previous crops and the losses incurred during storage. However, how much seed the farmer actually purchases will be a reflection on both the quantity of seed available in the market and the farmer's ability to pay for that seed.

It is widely acknowledged that with each generation the production potential of the seed will decline as it becomes increasingly contaminated with various pathogens (Beukema and van der Zaag 1990). The frequency with which the farmer needs to replace their seed will be influenced by the quality of the seed purchased and the various measures the farmer employs to prevent or to reduce the incidence of pests and diseases that may exert an adverse impact on seed quality. While an astute farmer can be expected to replace some proportion of seed with each planting, the extent to which they are able will once again depend the quantity of seed available in the market and their ability to pay for that seed.

19. How many times are potatoes grown in same ground per year .....

Since many diseases (including bacterial wilt) reside in the soil (Beukema and van der Zaag 1990) and since most farmers in the Cordillera retain some proportion of their crop for seed (Crissman 1989), the longer the duration between potato crops, the less quickly the seed will degenerate. Those farmers who cultivate only one crop of potatoes in the same soil per year are expected to purchase smaller quantities of seed less often.

20. What is the most significant cost of production .....

21. Assuming that it costs $US2,000 per ha to cultivate potatoes, what proportion of your costs of production is;
    seed .....
    fertiliser .....
    chemicals .....
    irrigation .....
    labour .....
    mechanisation .....

    Mariano *et al.* (1993); Rasco and Aromin (1994); HARRDEC (1996)

While it was not the intention of this study to develop an accurate gross margin for potato production in the Cordillera, these questions sought to identify what farmers believed was the most significant cost of production. In order to obtain some measure of relativity, using the gross margin prepared by HARRDEC (1996) as a benchmark, farmers were asked to estimate how they would allocate a conceptual costing of $2,000 per hectare between the various inputs. On numerous occasions seed has been reported as being the most significant cost of potato production in the Cordillera (Mariano *et al.* 1993; Perez 1995a).

22. Harvest times (month); First crop .....
    Second crop .....
    Third crop .....

23. What proportion of your (FIRST) potato crop is;
    sold to local village market .....
    sold to other village markets .....
    sold to traders/wholesalers .....
    sold direct to processors .....
    retained for your own consumption .....
    retained for stock food .....
    retained for seed .....
    given away to other farmers/family .....

    Horton (1987); Crissman (1989)

24. What is the average price per kg that you receive for the fresh potatoes you sell from your (FIRST) crop to;
    the local village market .....
    other village markets .....
    traders/wholesalers .....
    direct to processors .....

    Horton (1987); Crissman (1989); Beukema (1990); Beukema and van der Zaag (1990); Huda (1990); Altoveros (1992); Wooster and Farooq (1994); Crissman and Hibon (1996);

Although the month of harvest provides in itself very little information relevant to the study, it does provide an indication of the crop duration. Although poor seed quality is most often recognised as the major constraint limiting productivity per unit area, the short duration of the crop (from 60-90 days) is also a significant factor, since the majority of tuber bulking generally occurs in the latter period.

More important, however, is the identification of the means by which the farmer disposes of his fresh potato crop. In the context of this study, it is important to identify what proportion of the harvest is retained for seed. Since there is a higher likelihood of loosing the second crop due to adverse conditions, it is unlikely that farmers would intend retaining much of this crop for seed. Furthermore, higher prices in the output market would further discourage the farmer from retaining any significant proportion as seed.

In his review of the seed potato system in the Philippines, Crissman (1989) noted the emergence of long-term relationships between potato farmers and their preferred seed suppliers as a means of facilitating the exchange. Seed suppliers advanced seed and other inputs (chemicals and fertilisers) to farmers in the expectation that they would recover these costs from marketing the fresh potato crop. While these relationships are founded primarily on trust, the extent to which they are upheld is expected to depend upon the relative difference in the prices received from the various output markets. If farmers are able to obtain a better price from an alternative trader, these relationships may be forgone.

The extent to which these relationships are maintained will depend, in part, upon the number of alternative markets to whom the farmer may sell their potatoes and the various formal and informal communication systems that provide the farmer with reliable market information. If the seed supplier is perceived to be exploiting the farmer's weaker position by, for example, offering prices significantly lower than those currently prevailing in the output market, the farmer is expected to pursue an alternative exchange partner.

Section Two

Section Two sought to identify the various constraints that impacted upon the farmer's decision to purchase seed.

The first question was an open-ended question that simply asked farmers to identify the most important factors that influenced their decision to purchase seed. Based then on an extensive review of the literature, farmers were asked to rate 34 items on a scale from 1 to 7, where 1 was "not at all important" and 7 was "very important".

The positioning of the open-ended question before the closed-response questions was quite deliberate. Not only did it signal the direction in which the research was to proceed but it provided an opportunity to ensure that the major variables

believed to influence the farmer's decision to purchase seed had been captured. Furthermore, it provided respondents with an opportunity to voice their opinion without being influenced by the closed-response statements that followed (Lehmann 1985).

1. availability of seed at planting time

   Balaoing and Lazo (1967); van der Zaag (1986); Kloos and van der Zaag (1988); Crissman (1989); Altoveros (1992); Aromin *et al.* (1993); Calleung *et al.* (1993); Pangilauan *et al.* (1993); Crissman and Hibon (1996)

2. quantity of seed required

   Beukema (1990); Huda (1990); Crissman and Hibon (1996)

3. seed rate per unit area

   Villamayor (1984); Haverkort (1986); Crissman (1989); Beukema and van der Zaag (1990); Rasco and Aromin (1994); Crissman and Hibon (1996)

4. yield difference between new seed and the farmers own seed

   Altoveros (1992); Perez (1995); Crissman and Hibon (1996)

5. high cost of seed

   Balaoing and Lazo (1967); Batugal *et al.* (1988); Kloos and van der Zaag (1988); Crissman (1989); Mariano *et al.* (1991); Aromin *et al.* (1993); Callueng *et al.* (1993b); Sana *et al.* (1993); Rasco (1994); Rasco and Aromin (1994); Perez (1995a); Schmiediche (1995); Crissman and Hibon (1996)

6. high cost of certified seed

   Beukema (1990)

7. origin of the seed

   Crissman (1989); Aromin *et al.* (1993); Crissman and Hibon (1996)

8. seed is imported

   Balaoing and Lazo (1967); Crissman (1989)

9. pathogen tested (certified) seed

   Crissman (1989); Beukema (1990)

10. availability of cash to purchase seed

    Crissman (1989); Beukema (1990)

11. cost of farmers own seed

    Monares (1981); Beukema and van der Zaag (1990); Crissman and Hibon (1996)

12. cost of credit

    Batugal *et al.* (1988); Crissman (1989); Crissman and Hibon (1996)

13. availability of credit

    Crissman (1989); Della Vedova and Brieva (1995)

14. availability of irrigation

    Monares (1981); Della Vedova and Brieva (1995)

15. availability of other farm inputs

    Crissman (1989); Mariano *et al.* (1993); Rasco and Aromin (1994); Scott (1994); Della Vedova and Brieva (1995); Perez (1995); Crissman and Hibon (1996);

16. availability of farm labour

    Caringal and van der Zaag (1987); Crissman (1989);

17. proximity to seed supplier

    Huda (1990); Aromin *et al.* (1993)

18. physiological age of the seed

    Haverkort (1986); Crissman (1989); Rasco (1994); Crissman and Hibon (1996)

19. anticipated losses in storing own seed

    Batugal *et al.* (1988); Crissman (1989); Altoveros (1992); Pangilauan *et al.* (1993); Rasco and Aromin (1994); Della Vedova and Brieva (1995)

20. rate of seed degeneration

    van der Zaag (1986); Crissman (1989); Altoveros (1992); Sana *et al.* (1993); Della Vedova and Brieva (1995);

21. market price for fresh potatoes

    Altoveros (1992); Crissman and Hibon (1996)

22. relative price of seed potatoes and fresh potatoes

    Beukema and van der Zaag (1990); Della Vedova and Brieva (1995)

23. expected yield of fresh potatoes

    Batugal *et al.* (1988); Crissman (1989); Beukema and van der Zaag (1990); Altoveros (1992)

24. anticipated future yields of fresh potatoes

    Haverkort (1986); Crissman and Hibon (1996)

25. expected yield of seed potatoes

    Haverkort (1986); Altoveros (1992)

26. anticipated profitability of the potato crop

    Monares (1979); Beukema and van der Zaag (1990); Pangilauan *et al.* (1993); Crissman and Hibon (1996);

27. seasonal variations

    Monares (1979); Raghubanshi and Tewari (1983); Haverkort (1988); Crissman (1989); Mariano *et al.* (1991); Crissman and Hibon (1996)

28. uncertainty of price in ware market

    van der Zaag (1986); Crissman (1989); Crissman and Hibon (1996)

29. farmers attitude to risk

    Beukema (1990); Crissman and Hibon (1996)

30. previous purchase of seed

    Crissman (1989); Crissman and Hibon (1996)

31. seed size

    van der Zaag (1986); van der Zaag (1987); Altoveros (1992); Aromin *et al.* (1993); Rasco (1994); Crissman and Hibon (1996)

32. variety

    Monares (1981); van der Zaag and Horton (1983); Haverkort (1986); Altoveros (1992); Calleung *et al.* (1993); Scott (1994); Della Vedova and Brieva (1995); Perez (1995); Schmiediche (1995); Crissman and Hibon (1996)

33. seed purity

    Beukema (1990); Aromin *et al.* (1993); Rasco (1994)

34. freedom from disease

    Balaoing and Lazo (1967); Kloos and van der Zaag (1988); Crissman (1989); Beukema (1990); Mariano *et al.* (1991); Aromin *et al.* (1993); Sana *et al.* (1993); Rasco (1994); Perez (1995); Crissman and Hibon (1996)

Section Three

Given the considerable importance afforded in the literature towards the selection of the most appropriate variety for the agro-ecological conditions experienced in the highlands of Northern Luzon, a detailed investigation of the criteria used by farmers in selecting their most preferred variety was undertaken. Since it is most unlikely that Filipino potato farmers will use the same varieties grown in Western Australia, having some knowledge of the criteria Filipino potato farmers used in selecting a variety could assist in the identification of more appropriate varieties in Western Australia for seed multiplication and subsequent export.

Section Three began with an open-ended question that asked farmers to identify their most preferred varieties. Since there are very few varieties that are ideally suited for all uses, farmers were asked another open-ended question that sought to identify which varieties were used for the fresh market and which were used for processing. Since some varieties also perform better at different times of the year, farmers were asked whether they used the same variety all year round or used different varieties for different planting times.

Based on an extensive review of the literature, farmers were then asked to rate 20 criteria on a scale from 1 to 7, where 1 was "not at all important" and 7 was "very important".

1. availability of seed at planting time

   Balaoing and Lazo (1967); Kloos and van der Zaag (1988); Crissman (1989); Altoveros (1992); Aromin *et al.* (1993); Pangilauan *et al.* (1993)

2. high cost of seed

   Balaoing and Lazo (1967); Batugal *et al.* (1988); Kloos and van der Zaag (1988); Crissman (1989); Mariano *et al.* (1991); Aromin *et al.* (1993); Callueng *et al.* (1993b); Sana *et al.* (1993); Rasco (1994); Rasco and Aromin (1994); Perez (1995); Schmiediche (1995); Crissman and Hibon (1996)

3. seed rate per unit area

   Villamayor (1984); Crissman (1989); Rasco and Aromin (1994); Crissman and Hibon (1996)

4. price of tubers in the ware market

   van der Zaag (1990b); Altoveros (1992); Crissman and Hibon (1996)

5. productivity per hectare

   Batugal *et al.* (1988); Crissman (1989); Beukema and van der Zaag (1990); Altoveros (1992);

6. variety traditionally grown

   Horton (1987); Crissman (1989); van der Zaag (1990b)

7. tuber shape

   Horton (1987); Crissman (1989); van der Zaag (1990a); Calleung *et al.* (1993)

8. tuber size

   Horton (1987); Crissman (1989); Calleung *et al.* (1993)

9. flesh colour

   Horton (1987); Crissman (1989); van der Zaag (1990a); Calleung *et al.* (1993)

10. skin colour

    Horton (1987); Crissman (1989); van der Zaag (1990a); Calleung *et al.* (1993)

11. storage characteristics

    Horton (1987); Crissman (1989); Altoveros (1992); Calleung *et al.* (1993)

12. fast maturing

    Horton (1987); Crissman (1989); Altoveros (1992); Callueng *et al.* (1993a)

13. resistance to disease

    Horton (1987); Crissman (1989); Demonteverde *et al.* (1993)

14. eating characteristics

    Horton (1987); Calleung *et al.* (1993); Demonteverde *et al.* (1993)

15. processing qualities

    Crissman (1989); van der Zaag (1990a)

16. suitability to growing environment

    Horton (1987); Crissman (1989); Schmiediche (1995)

17. vigorous growth

    Calleung *et al.* (1993)

18. drought tolerance

    Lamont (1993)

19. heat tolerance

    Villamayor (1986); Renia (1992); Callueng *et al.* (1993a)

20. new variety

    Monares (1979); Crissman (1989); Callueng *et al.* (1993a); Rasco (1994)

Section Four

Section Four sought to identify the various factors that impacted upon the potato farmers' choice of seed supplier.

The first question was an open-ended question that simply asked farmers to identify the most important factors that they used in choosing between alternative seed suppliers. Based then on an extensive review of seed production systems and the industrial purchasing literature, farmers were asked to rate 33 questions on a scale from 1 to 7, where 1 was "not at all important" and 7 was "very important".

Using a classification system derived from Gronroos (1990) and Parasuraman (1998), the 33 questions were subdivided into three blocks: technical quality, functional quality and service quality. The technical quality dimensions sought to evaluate the physical attributes of the seed itself. Based on literature reported by Crissman (1989), Beukema (1990), Beukema and van der Zaag (1990), Rasco (1994) and Crissman and Hibon (1996), the following attributes were identified. All questions began with the words, "I choose a supplier who is able to provide seed"

1. of the desired variety
2. of the desired physiological age
3. that is pure (not mixed varieties)

4. of the desired size
5. that is free of pests and disease
6. that is certified
7. that substantially improves yield
8. from recognised seed growing areas
9. from other countries (imported)

The functional quality dimensions sought to evaluate the seed supplier's ability to deliver the seed when it was required, in the quantities required, at a competitive price. Based on the literature reported by Cunningham and White (1973), Lehmann and O'Shaughnessy (1974), Hakansson and Wootz (1975); Dempsey (1978) and Ellram (1990), the following questions were asked. All questions began with the words, "I choose a supplier who"

10. is able to provide seed in the quantities required
11. is able to deliver seed at planting time
12. is willing to meet my immediate needs
13. can deliver seed to my farm
14. is close to my farm
15. has a good reputation
16. has a strong customer base
17. is financially strong
18. can provide seed that is competitively priced
19. is technically capable
20. is technically competent

The service quality dimensions sought to capture those variables that supplement or augment the core product offer (Parasuraman 1998). Based on the industrial purchasing literature reported by Lehmann and O'Shaughnessy (1974), Dempsey (1978), Ellram (1990), Ellram (1991) and Athaide, Meyers and Wilemon (1996), the various item measures were adapted for use in the Filipino seed potato

industry, based largely on Crissman's (1989) report. All questions began with the words, "I choose a supplier who"

21. can offer credit
22. offers favourable terms of repayment
23. offers to supply other farm inputs
24. offers continuous product support
25. offers to provide technical information
26. offers to provide training programs
27. is capable of introducing new varieties
28. is in frequent communication with me
29. offers to provide market information
30. enables me to visit their facility
31. frequently visits my farm
32. buys my fresh potato crop
33. shares the risk of growing potatoes

Section Five

Section Five sought to evaluate the nature of the long-term relationship between potato farmers and their preferred seed suppliers. However, unlike the previous four sections, because of the multidimensional nature of several of the constructs under evaluation (satisfaction, trust, commitment, power/dependence and the making of relationship specific investments), multiple item measures were used rather than single item measures. The various item measures employed were a combination of existing scales, scales adapted from the literature and new scales.

Section Five began with an open-ended question that asked respondents to describe their relationship with their preferred seed supplier. Respondents were then asked to respond to a total of 44 questions on a scale from 1 to 7, where 1 was "I disagree a lot" and 7 was "I agree a lot".

Relational satisfaction

The potato farmer's relational satisfaction with the exchange was evaluated using the two dimensions of economic and social satisfaction proposed by Geyskens *et al.* (1999). Inadvertently, however, the decision to evaluate satisfaction in this manner created a methodological problem, for in the literature on satisfaction, the construct is most often measured using a rating scale anchored at one end by satisfaction and at the other by dissatisfaction (Frazier *et al.* 1989; Crosby *et al.* 1990; Ganesan 1994; Dorsch, Swanson and Kelly 1998).

Various other measures of satisfaction (used in conjunction with the satisfaction-dissatisfaction scale) include rating scales anchored by pleased-displeased (Crosby *et al.* 1990; Ganesan 1994; Dorsch, Swanson and Kelly 1998), favourable-unfavourable (Crosby *et al.* 1990; Dorsch *et al.* 1998), happy-sad (Frazier *et al.* 1989; Ganesan 1994), and contented-disgusted (Ganesan 1994).

Economic satisfaction was evaluated by six item measures developed from the literature:

S1. It is more cost effective for me to rely on my existing supplier rather than to search for alternative suppliers

Anderson *et al.* (1987); Ellram (1991); Gundlach *et al.* (1995)

S2. Dealing with my current supplier is less risky

Anderson *et al.* (1987)

S3. Seed from my supplier is consistently good

Anderson *et al.* (1987)

S4. The seed I obtain from my supplier substantially improves the productivity of my potato crop

Anderson *et al.* (1987)

S5. My existing seed supplier provides the best seed

Anderson *et al.* (1987); Frazier (1983)

S6. My seed supplier purchases my fresh potatoes at a mutually agreed price

Social satisfaction was evaluated by six item measures developed from the literature. While many of these variables are recognised as being antecedents towards satisfaction, the manner in which the questions have been asked seeks to evaluate the extent to which they were present. By implication, if the variable is present, the respondent should feel satisfaction.

S7. My seed supplier often exceeds my expectations

Anderson and Narus (1990); Morris, Brunyee and Page (1998)

S8. There is good cooperation between my seed supplier and myself

Frazier (1983); Anderson and Narus (1990)

S9. There is much conflict between my seed supplier and myself

Frazier (1983); Frazier *et al.* (1989); Anderson and Narus (1990); Anderson and Weitz (1992); Leuthesser (1997); Morris *et al.* (1998)

S10. My supplier is quick to handle complaints

Ford (1984)

S11. My supplier treats me fairly and equitably

Frazier (1983); Ganesan (1994)

S12. I feel I am adequately rewarded by my seed supplier

Frazier (1983)

Trust

Since trust is one of the most comprehensively researched variables there are a number of tried and tested item measures that exist in the literature. Trust was evaluated using eight item measures;

T1. I trust my supplier

Anderson and Narus (1990); Crosby *et al.* (1990); Doney and Cannon (1997); Bennett and Gabriel (2001);

T2. I have confidence in my supplier

Kumar *et al.* (1995); Campbell (1997)

T3. I believe that my supplier has the necessary expertise to provide good quality seed

Bennett and Gabriel (2001)

T4. My supplier always considers my best interests

Crosby *et al.* (1990); Ganesan (1994); Kumar *et al.* (1995); Doney and Cannon (1997);

T5. My supplier is not always sincere

Crosby *et al.* (1990); Kumar *et al.* (1995); Dorsch *et al.* (1998)

T6. My seed supplier always keeps his promise

Crosby *et al.* (1990); Kumar *et al.* (1995); Doney and Cannon (1997); Dorsch *et al.* (1998); Bennett and Gabriel (2001)

T7. I believe in the information provided by my seed supplier

Doney and Cannon (1997)

T8. My preferred seed supplier has a good reputation

Doney and Cannon (1997)

Commitment

Commitment, or more specifically (in the context of this study), the desire to maintain the relationship, was evaluated using two item measures which have also been extensively used in exploring long-term buyer-seller relationships.

C1. I expect to continue to interact with my supplier in the future

Anderson and Weitz (1992); Bennett and Gabriel (2001)

C2. I expect my relationship with my seed supplier to continue

Ganesan (1994); Kumar *et al.* (1995); Dorsch *et al.* (1998)

Relationship-specific investments

The seed supplier's willingness to make relationship-specific investments was by its very nature, comprised of a large number of variables drawn from the literature on communication within buyer-seller relationships, the willingness of the seed supplier to make adaptations, provide technical support, education and training and to make whatever other investments were deemed desirable to assist the farmer. The twelve item measures used to evaluate the seed supplier's willingness to make relationship-specific investments were either drawn from or adapted from the literature, or new item measures developed.

R1. My seed supplier provides all the inputs for my potato crop

R2. My preferred seed supplier provides financial assistance during difficult times

Ford (1984)

R3. When seed is scarce my supplier does everything possible to satisfy my needs

Ford (1984)

R4. My preferred seed supplier is willing to share the risk of crop failure

R5. My supplier seems willing to help me grow potatoes

Ford (1984)

R6. My supplier keeps me well informed on technical matters

Ford (1984); Anderson and Weitz (1992); Bennett and Gabriel (2001)

R7. My supplier keeps me well informed on prices in the fresh potato market

R8. My supplier often advises me of potential supply problems

Anderson and Narus (1990)

R9. My supplier willingly adapts his product offer to meet my needs

Ford (1984): Athaide *et al.* (1996); Bennett and Gabriel (2001)

R10. My supplier frequently asks me how he might improve the level of product quality and service

Athaide *et al.* (1996)

R11. My seed supplier is willing to share the cost of evaluating new varieties

Athaide *et al.* (1996)

R12. My seed supplier spends time with me to ensure I know what to expect from the seed I have purchased

Ford (1984); Athaide *et al.* (1996);

Power/dependence and the availability of alternatives

Six item measures were used to evaluate the extent to which potato farmers were potentially dependent upon their preferred seed suppliers.

D1. I am more dependent upon my preferred seed supplier than they upon me

Frazier et al. (1989); Noordewier et al. (1990)

D2. If my relationship was suddenly terminated I would have great difficulty finding an alternative supplier

Heide and John (1988); Frazier *et al.* (1989); Ganesan (1994); Heide (1994)

D3. I have no choice other than to adhere to me preferred seed supplier's demands

Frazier *et al.* (1989); Morgan and Hunt (1994)

D4. My preferred seed supplier controls all the information in our relationship

D5. My preferred seed supplier has all the power in our relationship

Frazier *et al.* (1989)

D6. My seed supplier determines what I grow, when I plant and when I harvest

Two item measures were used to evaluate the extent to which a potato farmer could be dependent upon their preferred seed supplier because no alternative seed suppliers were readily available.

D7. I am free to choose another supplier at any time

Heide and John (1988)(R); Heide (1994)

D8. I source seeds from a number of suppliers

Heide and John (1988); Ganesan (1994)

A single item measure was used to capture the construct (C_{alt}) described by Anderson and Narus (1990) whereupon a potato farmer could become dependent upon that seed supplier who provided the best seed.

D9. My seed supplier has the best seed offer relative to the alternatives

Anderson and Narus (1990)

Although not derived directly from the power-dependence literature, the final item measure sought to evaluate the extent to which the preferred seed supplier might endeavour to take advantage of the farmer by behaving opportunistically.

D10. My preferred seed supplier sometimes acts opportunistically
Anderson and Weitz (1992); Gundlach *et al.* (1995)

Appearing generally in the behavioural norms literature, the tendency to engage in opportunistic trading practices is expected to have a significant negative impact on satisfaction, trust and the desire the maintain the relationship (Parkhe 1993; Gundlach *et al.* 1995). This variable was included primarily for descriptive purposes rather than to be considered as a moderating variable.

Section Six

Section Six sought to gather some demographic information about the potato farmer and their immediate household that may influence the farmer's decision to purchase seed and/or the nature of their relationship with their most preferred seed supplier.

1. Number of people in the household .....
2. Number of family members working on the farm .....
3. Farmer's level of education .....
4. Number of years experience growing potatoes .....
5. Proportion of income from sale of agricultural products .....
   off-farm .....
   potatoes .....
6. Marital state .....
7. Farmers age .....

5.5 Questionnaire format

The questionnaire was prepared in English, in the expectation that it would be translated into the indigenous language (Ilacano). To test for completeness and clarity of expression, the questionnaire was proof read by two academics from the Highland Agriculture and Resources Research and Development Consortium (HARRDEC), Benguet State University, who were fluent in both languages. Since no problems in the translation of the various item measures were noted, particularly those dealing with the social relationship variables and since the majority of potato farmers in the Cordillera spoke English, the questionnaire was administered in English.

In the preparation of the questionnaire, various efforts were taken to ask questions in a manner that could not readily be misconstrued. Wherever possible, the vocabulary used was simple and direct, avoiding jargon or technical terms that may be unfamiliar to farmers. Various measures such as "...this supplier has gone out on a limb for us" (Ganesan 1994) were deleted, irrespective of their value or validity in measuring the desired constructs.

5.6 Pre-testing the questionnaire

Prior to undertaking the main survey, a convenience sample of potato farmers was drawn from those attending a seed potato workshop at HARRDEC and from those potato farmers in close proximity to Benguet State University (La Trinidad). The questionnaires were checked for completeness and the data entered into EXCEL for a preliminary evaluation of the means and standard deviations.

Although no modification of the questionnaire was deemed necessary, it was apparent that for several of the importance scales, particularly those dealing with the technical quality dimensions, most respondents rated most of these variables as being "very important" (7). However, that was not entirely unexpected, as each

of these variables would have a significant impact on the productivity of the potato crop and any other subsequent potato crops derived from that seed.

5.7 Selection of the respondents

It is widely acknowledged that the majority of the potatoes cultivated in the Cordillera are grown in close proximity to the Halsema Highway in both Benguet and Mountain Province (Crissman 1989). Potato production occurs primarily in one of seven municipalities; six are located in Benguet Province (Atok, Bakun, Buguias, Kabayan, Kibungan and Mankayan) and one in Mountain Province (Bauko)(Gayao *et al.* 1997)(Table 5.1).

Table 5.1. Potato Production Areas and Volume in the Cordillera.

Municipality	Production area (ha)			Production volume (tonnes)		
	Dry	Wet	TOTAL	Dry	Wet	TOTAL
Atok	702	722	1,424	22,451	12,271	34,722
Bakun	405	815	1,220	8,090	13,855	21,945
Bauko	415	168	583	23,234	7,578	30,812
Buguias	2,512	3,449	5,961	47,719	75,867	123,586
Kabayan	123	27	150	4,069	1,299	5,368
Kibungan	260	244	504	6,247	4,399	10,646
Mankayan	642	482	1,124	39,168	29,384	68,552
TOTAL	5,059	5,907	10,966	150,978	144,653	295,631

Excluding Bauko because it was in the adjoining Mountain Province and Kabayan since it was the smallest municipality, farmers were selected from each of the remaining five municipalities in proportion to the total area of potatoes planted.

In the absence of any reliable list of potential respondents, face-to-face personal interviews provided the only means of contacting potential respondents. However, in order to approach farmers, it was first necessary to seek permission from the headman in the village (the barangay captain) who also provided contact names and addresses of suitable respondents. Contact names and addresses for additional respondents were sought during the interviews with farmers, in what is often

described as the snowball technique (Kumar, Aaker and Day 1999). While this method of data collection prevents the estimation of population parameters from the sample values, Bulmer (1983) argues that under conditions of assumed homogeneity, non probability samples may yield data which is equally satisfactory, although a great deal cheaper to obtain than large scale probability samples.

5.8 Data collection

During January to July 1999, 235 potato farmers in survey area were interviewed. Under the circumstances, personal interviews were considered to provide the only means for effectively gathering the information required from the farmers. In the absence of any mailing list and a very poor telecommunication system, the option of conducting either a mail survey or telephone survey was excluded. Furthermore, given both the length and complexity of the survey instrument, the respondent's ability to fully understand English and to use the rating scales provided, personal interviews provided the only means of assuring accurate responses from the participants selected.

After making contact with the farmer and arranging a suitable time for the interview, interviews were conducted in the farmer's home by a trained enumerator employed from HARRDEC, Benguet State University, who was fluent in both English and the indigenous language.

At the commencement of the interview, respondents were advised that their participation was entirely voluntary and that their responses would be used only for the intended research purposes.

On average, interviews took up to three hours to complete. Recognising that respondent fatigue was inevitable in conducting a survey of this length, the enumerator stopped at regular intervals, offering the farmer a cigarette and/or discussing informally any number of issues that related to either the production or

marketing of the farmer's potato crop. Although many of the respondents had been interviewed in the past, farmers were inherently cautious in completing any formal survey, hence the enumerator had to first develop a rapport with the farmer and to gain their trust.

5.9 Data analysis

The questionnaire was designed and developed with the intention of analysing the data using the Statistical Package for Social Sciences (SPSS).

At the end of each week, the data collected was encoded and transferred onto a specially developed encoding form (Appendix 2) for subsequent entry into the SPSS program (in Australia). Unfortunately, the SPSS program was not available at Benguet State University (which necessitated the use of the EXCEL program for the analysis of the pre-test results).

After all the data had been entered, a frequency output, mean and standard deviation for all variables was undertaken to check that the data had been correctly entered and to identify any missing data and outliers. This resulted in the deletion of two respondents, primarily because of incomplete data. On the basis of these frequency outputs, particularly for Sections One and Six, the farmer's demographic, agronomic and marketing responses to many of the questions were grouped to facilitate subsequent analysis using cross tabulations.

A second preliminary evaluation of the data was undertaken to check for the normality of data distribution. Normal probability plots were prepared and examined for both kurtosis and skewness. At this point in time, it became immediately apparent that many of the fixed-response questions (where farmers had been asked to respond on a scale of 1 to 7), were not normally distributed. Most farmers responded to the various statements by anchoring the majority of their responses at either end of the scale; for example, most farmers either rated a variable as being important or very important (scoring it with either 6 or 7), or

vigorously disagreed with a statement (scoring it with either a 1 or 2). Because of the severity of the problem, the data could not be rectified.

Since the assumption of normality is fundamental to all univariate and multivariate data analysis (Hair *et al.* 1998), the extent to which this would impede any subsequent data analysis could only be evaluated after examining the results.

5.9.1 Univariate data analysis

Cross-tabulations

Considered one of the more elementary tests, cross-tabulations require fewer assumptions to construct and serve as the basis of several statistical techniques such as chi-square (Kumar *et al.* 1999). Primarily used to learn how a dependent variable varies from group to group, cross-tabulations were used to identify how the farmer's demographic background, agronomic and marketing practices, impacted upon the farmer's decision to purchase seed, the farmer's choice of seed supplier and the farmer's relationship with their preferred seed supplier. Those variables that proved most capable of differentiating between the farmers were subsequently used in cluster analysis.

Scheffe's test

For Question 42 (variables influencing the farmer's decision to purchase seed), Question 46 (variables influencing the farmer's choice of variety) and Question 52 (variables influencing the farmer's choice of seed supplier), farmers were asked to respond to the various items on a scale of 1 (not at all important) to 7 (very important). A number of post hoc procedures are available to determine whether there was any significant difference between the means including Scheffe's method, Tukey's extension of the Fisher least significant difference (LSD), Duncan's multiple range test and the Newman-Kuels test. While all of the methods have quite low levels of explanatory power, Hair *et al.* (1998) report that Scheffe's method is the most conservative with respect to Type 1 errors.

Regression analysis

The object of regression analysis is to relate one or more independent or predictor variables to a dependent or response variable (Kumar *et al.* 1999). Regression analysis was used primarily to check both the significance and the direction of the hypothesised relationships before undertaking structural equation modelling.

5.9.2 Multivariate data analysis

A number of multivariate techniques were employed to analyse the data including factor analysis, structural equation modelling and cluster analysis.

Exploratory factor analysis

Factor analysis was undertaken for two purposes. With regards to Question 44 (variables impacting upon the farmers decision to purchase seed), Question 48 (criteria used in the farmers choice of variety) and Question 52 (criteria used in the farmers choice of seed supplier), exploratory factor analysis was undertaken to identify any underlying constructs, for it seemed highly unlikely that farmers would use all 34, 20 and 33 criteria respectively in making their decision.

In the second instance, since the majority of the scales used to evaluate the nature of the potato farmers' relationship with their seed supplier were untested (Question 54), exploratory factor analysis was undertaken to identify which variables loaded onto their intended construct and those which cross-loaded across multiple constructs. This preliminary analysis was necessary to avoid problems of multiple collinearity during structural equation modelling.

For factor analysis to be reliable, Hair *et al.* (1998) state that there should be at least five times more observations than there are variables to test. For the relationship dimensions, since the maximum number of variables was 44 and the sample size was just 233, it was apparent that the technique would be operating close to this limit.

In each instance when factor analysis was employed, the farmers' responses were analysed using principal component analysis, with varimax rotation and Kaiser normalisation. Those items with factor loadings below 0.5 or with cross-loadings greater than 0.4 were excluded (Nunnally 1978).

Further clarification of the items contributing to each factor was achieved by applying the reliability coefficient (Cronbach 1951). Where the alpha coefficient was below 0.5, the factor was excluded from further analysis.

Structural equation modelling

Structural equation modelling is a statistical methodology that takes a confirmatory approach to the analysis of a structural theory bearing on some phenomenon (Byrne 2001). In simple terms, structural equation modelling estimates a series of interdependent multiple regression equations simultaneously within a single model, even in those instances when a dependent variable becomes an independent variable in subsequent relationships (Hair *et al.* 1998).

Structural equation modelling generally begins with the construction of a path diagram. Using the AMOS Graphics mode (Version 4.01)(Arbuckle 1997), the diagram presented earlier in Chapter 4 (Figure 1) was duplicated.

The five constructs (relational satisfaction, trust, continuity, relationship specific investments and power/dependence) were subsequently expanded to include each of the indicator variables that impacted directly upon the construct (identified from the exploratory factor analysis) and their associated error term. Since all indicator variables loaded only onto the construct to which they were assigned, that variable with the largest factor loading for each construct was assigned a score of 1.0.

Hair *et al.* (1998) indicate that for the purposes of structural equation modelling, three item measures (indicator variables) is the preferred minimum number because using only two increases the chances of reaching an infeasible solution.

Five to seven indicators should be used wherever possible. Furthermore, structural equation modelling is very sensitive to the distributional characteristics of the data, particularly the departure from multivariate normality or a strong kurtosis in the data. The lack of multivariate normality can be troublesome because it substantially inflates the chi-square statistic and creates an upward bias in critical values for determining coefficient significance.

It is generally suggested that the minimum sample size to adequately utilise structural equation modelling is 200 (Hair *et al.* 1998). The absolute minimum is 10 respondents per parameter, but should the data depart from normality, the ratio should increase to a minimum of 15 respondents per parameter. With a total of nine parameters to be tested and a data file containing 233 responses, it was evident that the sample size was sufficient.

In order to evaluate the goodness of fit, Hair *et al.* (1998) describe measures of two types: measures of absolute fit and measures of incremental indexes. Measures of absolute fit are calculated on the basis of the hypothesised model alone, whilst incremental indexes are based on the differences observed between the hypothesised model and an alternative model.

Measures of absolute fit

The likelihood ratio chi-square statistic is the most common estimation procedure (Hair *et al.* 1998). A large value of chi-square, relative to the degrees of freedom, signifies that the observed and estimated matrices differ significantly. Conversely, low chi-square values that result in significance levels greater than 0.05 indicate that the actual and predicted input matrices are not statistically different. However the chi-square measure is very sensitive to sample size; as sample size increases, this measure has a greater tendency to indicate significant differences even for equivalent models. Thus, if the sample size becomes large enough, significant differences will be found for any specified model.

The goodness-of-fit index (GFI) is a measure of the relative amount of variance and covariance jointly accounted for by the model (Bryne 2001). It represents the overall degree of fit (the squared residues from prediction compared with the actual data), but is not adjusted for the degrees of freedom (Hair *et al.* 1998). Ranging in value from zero (poor fit) to 1.00 (perfect fit), values closer to 1 indicate a better fit.

The adjusted goodness of fit (AGFI) differs from GFI in that it adjusts for the number of degrees of freedom in the specified model (Byrne 2001). As such, it also addresses the issue of parsimony by incorporating a penalty for the inclusion of additional parameters (Marsh, Balla and McDonald 1988).

Incremental fit measures

Bentler and Bonett's (1980) normed fit index (NFI) is one of the most popular incremental or comparative indexes of fit. The NFI is a relative comparison of the proposed model to the null (independence) model (Hair *et al.* 1998). More recently however, Bentler (1990) revised the NFI to take sample size into account and proposed the comparative fix index (CFI)(Bryne 2001). Values for both the NFI and the CFI range from zero to 1.00, with the minimum value for either considered to be greater than 0.95.

The Tucker-Lewis Index (TLI), also known as the non-normed fit index (NNFI), combines a measure of parsimony into a comparative index between the proposed and the null models, resulting in values from zero to 1.00 (Hair *et al.* 1998). Values close to 0.95 are indicative of a good fit (Bryne 2001).

The root mean square error of estimation (RMSEA) takes into account the error of approximation in the population (Bryne 2001). Expressed per degree of freedom, the RSMEA is sensitive to the number of estimated parameters in the model. Values less than 0.05 indicate good fit, with values as high as 0.08 indicating reasonable errors of approximation in the population.

Cluster analysis

Cluster analysis seeks to group individuals or objects into clusters so that the objects in the same cluster are more similar to one another than they are to objects in other clusters (Hair *et al.* 1998). The resulting clusters should then exhibit high internal (within cluster) homogeneity and high external (between clusters) heterogeneity.

For the purposes of this thesis, cluster analysis was undertaken in the hope of identifying major groups of farmers within the population. Given that cluster analysis seeks to maximise the variance between groups, these groups might then respond quite differently to the various factors that influence the on-farm demand for seed, the farmer's choice of seed supplier and the nature of the farmer's relationship with their seed supplier.

Cluster analysis began with an initial evaluation of the data to identify those agronomic and demographic variables within which there was the most variance. Items exhibiting minimal variance were excluded from further analysis because of their inability to differentiate between respondents and their ability to confound the results. However, since those variables with the largest dispersion will exert more impact on the final solution (Hair *et al.* 1998), prior to analysis it was necessary to standardise the data. Each of the final variables selected for cluster analysis was then converted to their standard (z) scores.

Using the squared Euclidean distance between each pair of observations and Ward's method, the standardised scores were entered into hierarchical cluster analysis. Using the methodology described by Hair *et al.* (1998), the mean distance between clusters was used to estimate the number of clusters. However, cluster analysis is a somewhat imprecise and highly subjective method of multivariate data analysis. The solution is not unique as cluster membership for any number of solutions is dependent upon the number of variables used and which variables are used. Moreover, cluster analysis will create clusters, regardless of the true existence of any structure in the data. Using too few clusters

will result in a significant reduction in the homogeneity within the clusters, yet creating too many clusters may result in groups being formed which, while they may vary somewhat in terms of the variables used to create the clusters, do not behave or respond any differently to marketing stimuli.

Having then identified a potential number of solutions, these same variables were entered into the k-means cluster function (in SPSS) and both the composition of the clusters and the number of respondents within each cluster identified. The output provided a description of the means for each variable for each group and identified which farmers belonged to which cluster. ANOVA identified which if any variables were redundant in that they failed to adequately differentiate between the clusters. These variables were subsequently deleted and the process repeated to assess the stability of the resultant clusters. The final cluster solution was saved and later utilised to identify any significant differences in response between the various clusters.

Discriminant analysis

Discriminant analysis involves deriving a variate that will discriminate between a priori defined groups (Hair *et al.* 1998). Discrimination is achieved by setting the variate's weight for each variable to maximise the between-group variance relative to the within-group variance. Discriminant analysis was used to ascertain whether there was any significant difference between the resultant cluster means and the independent variable(s) under consideration.

As a practical guideline, Hair *et al.* (1998) recommend that each group should have at least 20 observations. However, just as important is the relative size of the groups, for larger groups have a disproportionately higher chance of classification.

5.10 Chapter summary and implications

Undertaking a formal survey in a developing country is fraught with difficulty. In the absence of any database from which a sample of potential respondents can be

selected, by necessity the survey must rely upon the drawing of a non-probability sample. As the primary respondents in each village were selected by the barangay captain and the snowball technique subsequently employed to identify other potential respondents, some sample bias was inevitably introduced. Furthermore, using a non-probability sample, it is impossible to calculate the sample error (Ward 1983). Without drawing inferences from previous studies that have been conducted, it is impossible to obtain any measure as to how closely the sample selected approaches the population parameters. Fortunately, since most potato farmers in the Cordillera are resident landowners the population is relatively static, although subtle changes may occur over time in the composition of the household.

In the administration of the surveys themselves, a skilled enumerator from HARRDEC was sub-contracted to conduct the interviews. Having been involved in several other surveys of potato farmers in the Cordillera and being fluent in both English and Ilacano (the indigenous language), the enumerator was readily accepted by the respondents. While relying on just one enumerator standardises interviewer bias, it does introduce the possibility of enumerator fatigue and fraud. Consequently, a high degree of trust between the enumerator and the principal investigator was imperative. On several occasions, the principal investigator travelled with the enumerator into the field to observe the process of data collection, although, since the principal investigator did not speak the indigenous language, it was not possible to verify or validate with other respondents that the survey had been conducted, nor was any verification undertaken so as not to undermine the enumerators standing or reputation in the community. Considerable time was also spent with the enumerator to ensure that he understood the questionnaire structure and each of the key dimensions.

Although it was recommended by HARRDEC that the survey be administered in English, English is not the respondents' primary language. Some doubt must emerge as to whether all respondents were able to adequately comprehend all the questions posed to them. This was most likely to arise with regard to Section Five

(the relationship dimensions), for these are complex socio-economic variables that are expected to lie outside the respondent's realm of consideration. Bulmer and Warwick (1983) suggest that, "concepts and terms which are familiar from use in the industrialised countries cannot automatically be transferred for use in survey work in a developing country" (p 32).

Finally, some consideration must be given towards non-response error and interview fatigue. Interviews took an average of three hours to complete. In the first instance, the enumerator was referred to the potential respondent, either by the barangay captain or by other farmers. Farmers could if they so desired, choose not to participate in the survey. However, having gained the farmers consent and arranging a suitable time to conduct the interview in the farmers house, many other external variables may influence the quality of the farmers response. Various efforts to reduce these externalities were undertaken including conducting the interviews at night, undertaking the interviews in a relaxed informal manner and when necessary, providing regular breaks, cigarettes and discussing a broad range of issues relating to either the production or marketing of potatoes or any other topic that the respondent wished to discuss.

Chapter Six

A DESCRIPTION OF THE RESPONDENTS POTATO PRODUCTION AND MARKETING SYSTEM AND THE SEED SUPPLY SYSTEM IN THE CORDILLERA

6.1 Chapter outline

The previous five chapters have provided the background to this thesis in which the research problem has been identified, the literature reviewed, a conceptual model proposed and a methodology presented for data collection and analysis.

This is the first chapter to present the results gathered from this research study. As there was no formal database from which to select respondents, the chapter seeks to confirm the previous work of Crissman (1989), Gayao *et al.* (1997) and Bos (1998), before undertaking a detailed analysis of the seed potato system in the Cordillera. The chapter concludes by suggesting that there are two distinct groups of farmers who are expected to respond differently to various market stimuli.

6.2 Description of the sample

The majority of respondents were selected from the two major potato-growing areas of Buguias (45%) and Atok (30%). On the basis of the statistics provided by Gayao *et al.* (1997), the proportion of the sample that should have been drawn from Atok was 14% with 58% of the sample selected from Buguias. While every effort was made to draw the sample in proportion to the area of the potatoes cultivated in Benguet Province, the ease with which respondents could be contacted had some influence on data collection, especially following the early onset of the wet season which made it difficult to travel much beyond Atok.

The results of this study confirm that the majority of potato farmers in Benguet and Mountain Province are relatively small farmers. Farm sizes in these provinces ranged from a minimum of 0.05 hectares to a maximum of 8.0 hectares, with a

mean farm size of 0.62 hectares. More than 52% of the potato farmers interviewed cultivated between 0.25 hectares and 0.60 hectares. Fewer than 10% of the farmers cropped more than 1 hectare of land (Appendix 3).

Most potato farmers (97%) cropped their own farmland. Fewer than 3% either leased other farmers' land or occupied Government land. Potentially this indicated that most potato farmers in the Cordillera had some collateral with which they could secure the capital required to finance their potato crop. However, for those farmers who needed credit, most continued to borrow money from the informal credit providers (seed suppliers and vegetable traders) because of the flexibility associated with repayments and high risk of crop failure (Tagarino *et al.* 1998).

The area of the farm cropped in potatoes ranged from a minimum of 0.05 hectares to a maximum of 5.0 hectares, with the mean cropping area of the farm cropped in potatoes approaching 0.34 hectares. Over 88% of the farmers interviewed cultivated between 0.1 and 0.25 hectares of potatoes. Only 7% of farmers cultivated more than 1 hectare of potatoes.

The majority of farmers interviewed (58%) had been growing potatoes for more than 10 years. Most farmers (95%) were married and living in households with more than two occupants. Over 72% of farm households had four or more occupants. However, in the majority of cases (71%), only one member of the farm household worked full-time on the farm. Most potato farmers (92%) had no formal post-secondary education.

The majority of farmers (70%) derived 100% of their income from the cultivation of arable crops. For most farmers (93%), 50% of the on-farm income was derived from the cultivation of potatoes.

6.3 Sample validation

In estimating the area of potatoes cultivated in the Cordillera, Gayao *et al.* (1997) conducted interviews with 145 respondents including potato farmers and municipal officials; including the municipal agricultural office, the Office of the Mayor, Planning and Development, and sometimes the Municipal Assessors Office. On the basis of their records and responses, the area and volume of potato production in the Cordillera was ascertained.

Potato production in the Philippines occurs as an integral part of a permanent upland vegetable cultivation system (Crissman 1989). Horton (1987) indicates that the majority of vegetable farms in the Cordillera range in size from 0.3 to 4.0 hectares, with an average just over 1 hectare. Crissman (1989) reported that the average farm size in the Cordillera was 1.26 hectares. Bos (1998) suggests that the average farm size in Atok ranged from 0.4 hectares to 0.85 hectares. With the average farm size in this study approaching 0.62 hectares (and a standard deviation of 0.72), the sample best approximates that recorded by Bos (1998). Given the disproportionately large number of respondents drawn from Atok, such is entirely understandable. Nevertheless, the sample is not judged to be sufficiently different from that reported by either Horton (1987) or Crissman (1989) to be considered invalid.

Further support for the validity of the sample is extracted from an analysis of land occupancy rates and the area of potatoes cultivated. While Crissman (1989) reports that the majority of potato farmers in the Cordillera are long-term squatters on government land, Gayao *et al.* (1997) describes most potato farmers (99%) as owning their own land. In this study, 97% of farmers indicated that they cropped their own land.

While the average farm size in this study approached 0.62 hectares, the area of the farm planted in potatoes was seldom absolute. Most farmers grow potatoes either in conjunction with or in rotation with a range of other vegetable crops. For the

average farm in the Cordillera, approximately 55% of the farm was cropped in potatoes (0.34 hectares). Bos (1998) reported that between 0.25-0.46 hectares or 54-62% of the farm was planted in potatoes. While Gayao *et al.* (1997) did not estimate the size of the average farm in the Cordillera, they did indicate that the average area of each farm planted in potatoes ranged between 0.68-0.96 hectares.

For some 70% of the potato farmers surveyed in the Cordillera, the sale of agricultural produce was their sole source of income. A further 25% of potato farmers derived more than 80% of their household income from the sale of agricultural produce. At least 50% of the income farmers derived from the sale of agricultural produce was from the sale of fresh potatoes. Gayao *et al.* (1997) report that some 95% of the farmers they surveyed were principally involved in intensive vegetable production. However, some 23% of farmers also derived a proportion of their household income from non-farm sources.

6.4 Potato production in the Cordillera

The main crop of potatoes was planted from February through May for harvest May through August, indicative of a cropping period of some 90 days duration (Appendix 3). However, the crops planted in February-March were often left for a longer period of time (up to 120 days), depending on the prevailing market conditions and the general condition of the crop. Invariably, the main crop was harvested by the end of August, depending upon the arrival of the monsoons.

Most farmers grow only one crop of potatoes. However, for those farmers who are less risk averse, a second crop of potatoes was often planted from August to October. Crops planted in August-September were generally planted to take advantage of the higher prices achieved during the Christmas and New Year festive season. Crop duration averaged 90 days and where possible was extended to take advantage of the greater productivity per unit area. However, potato production at this time of the year is very risky. Not only is the crop exposed to the constant threat of both early and late blight, but there is also the possibility of

total destruction from typhoons. Furthermore, crops planted from November to December run the risk of frost damage.

6.5 Economics and marketing of the fresh potato crop

For the majority of potato farmers in the Cordillera, the cost of chemicals was the most significant cost of production. For over 75% of farmers, the cost of chemicals purchased for the control of pests and diseases exceeded 25% of production costs. Fertilisers were the other major cost of production. For almost 68% of farmers, the cost of fertilisers exceeded 25% of production costs (Appendix 3).

Conversely, for over 87% of potato farmers in the Cordillera, the cost of seed was less than 25% of production costs. However, it would appear that many farmers had significantly under estimated the true cost of seed. For over 40% of farmers, seed costs were estimated to be less than 10% of production costs. Presumably, because farmers were retaining that proportion of the harvest that was considered too small for the fresh market to use as seed, the opportunity cost of that seed was perceived to be minimal.

In general, farmers retained between 10-30% of the first crop for use as seed, with most farmers (59%) retaining 20% of the crop for seed. The proportion of the fresh potato crop sold to village markets, processors or retained for either their own consumption or for disposal as a gift was relatively insignificant. Conversely, most farmers (98%) sold 80% or more of their fresh potato crop to potato and vegetable traders.

The majority of farmers (66%) received an average price of Ps 9-12 per kg for that proportion of their crop sold to local potato and vegetable traders. However, the prices farmers received were highly dependent upon the potato supply and demand. Prices ranged from less than Ps 8 per kg to exceed Ps 27 per kg, with an average price of Ps 13.3 per kg.

With regard to the disposal of the second crop, some 69% of the farmers growing a second crop retained between 10-30% of the crop for seed to plant another crop, with most farmers (60%) retaining 20% of the crop for seed. However, the majority of farmers (97%) sold more than 80% of the second crop to potato and vegetable traders. The proportion of the crop sold to village markets and processors was insignificant, although some 7% of farmers retained as much as 10% of the harvest for their own consumption.

In general, the prices received from the traders for the sale of the second crop was somewhat higher and the range of prices much greater. The average price farmers received from traders for the second potato crop was Ps 15.7 per kg.

While no attempt was made in this study to determine whether there was any significant difference in the price farmers received for different sized tubers in the fresh market, Batt (1999) suggests that the potato crop is typically graded after harvest into one of five grades; (i) jumbo; (ii) extra large; (iii) large; (iv) medium (seed) and (iv) small. The price for jumbo tubers is approximately two times the price received for medium tubers hence there is a real incentive for farmers to produce larger tubers for the fresh market. However, since that proportion of the crop that farmers will retain for seed is selected from the medium grade tubers, seed potato prices and the availability of seed are expected to vary with fresh potato prices. When tuber size is the main variable used for selecting seed material, Crissman and Hibon (1996) suggest that there is a switching price at which a sack of medium grade potatoes may be considered suitable for either the seed potato market, or the fresh potato market. Hence, the proportion of the crop that the farmer retains for seed will be influenced by the prices in the fresh potato market.

Based on the data collected in this study, it appears that there is a switching price: as prices in the fresh market fall, farmers generally retain a greater proportion of the harvest for seed. At a price of Ps 9-10 per kg, over 43% of farmers will retain some proportion of the crop for seed, but at Ps 11-12 per kg, only 17% of farmers

retained a proportion of the crop as seed. For those farmers who generally retain between 11-20% of the crop as seed (58%), 47% of farmers retained 11-20% of the crop for seed at Ps 9-10 per kg, but at Ps 11-12 per kg, only 23% of those farmers who retain 11-20% of the crop will continue to do so. While this may suggest that the majority of potato farmers are somewhat opportunistic and will attempt at every opportunity to gain some advantage from higher prices in the fresh market, there is a small proportion of farmers (6%) who will continue to retain as much seed as they require, even when prices in the fresh market have exceeded Ps 20 per kg.

6.6 The seed supply system

For the main crop, the majority of farmers (99%) use seed tubers. Less than 1% of farmers used stem cuttings as an alternative means of planting the potato crop. Seed tubers were either selected from their own potato crops or purchased from other potato farmers. Almost 60% of potato farmers sourced a proportion of the seed that they required from other potato farmers. The quantity of seed sourced from official, government seed schemes (the formal seed system) was negligible (Table 6.1).

While no potato farmers were currently importing seed themselves, there are a few seed merchants importing seed from Europe and North America. However, none of the respondents indicated that they had purchased seed from these merchants and no respondents indicated that they had purchased potatoes from the fresh market to be subsequently used as seed.

The cost of the seed purchased from other farmers for the main crop ranged in price from Ps 10-20 per kilogram, with 75% of farmers paying between Ps 13-15 per kg (Table 6.2).

Table 6.1. The source of seed for the main potato crop in the Cordillera.

Frequency												
Seed source	**Percent of seed sourced**											**N**
	0	10	20	30	40	50	60	70	80	90	100	
Farmers own seed		1	2	1		16	1	2	2	3	116	144
Gift from other farmers			1									1
Purchase from other farmers		3	2	2	1	16	1	1	2	1	43	72
Purchase from open market												
Purchase from cooperative				1								1
Purchase from merchants												
Purchase from Govt		1										1
Import												

Percent												
Seed source	**Percent of seed sourced**											**Total**
	0	10	20	30	40	50	60	70	80	90	100	
Farmers own seed		0.7	1.4	0.7		11.1	0.7	1.4	1.4	2.1	80.5	100
Gift from other farmers			100									100
Purchase from other farmers		4.1	2.8	2.8	1.4	22.2	1.4	1.4	2.8	1.4	59.7	100
Purchase from open market												
Purchase from cooperative				100								100
Purchase from merchants												
Purchase from Govt		100										100
Import												

Table 6.2. Cost of seed purchased from other potato farmers for planting the main potato crop.

Peso per kg for seed tubers for the main potato crop										
Frequency										
10	11	12	13	14	15	16	17	18	19	20
2		5	18		35	1		3		6
Percent										
10	11	12	13	14	15	16	17	18	19	20
2.9		7.1	25.7		50.0	1.4		4.3		8.6

Ideally, most farmers (92%) intended to plant the main crop of potatoes using a seed rate between 2 tonnes and 2.5 tonnes per hectare. However, 48% of farmers had to use a seed rate between 1.8 tonnes and 2.0 tonnes per hectare (Table 6.3).

Table 6.3. Ideal and actual seed rates used by farmers for planting the main potato crop in the Cordillera.

Seed rate	Frequency		Percent	
	Ideal	Actual	Ideal	Actual
700 kg per ha		1		0.5
900	1		0.5	
1000	3	8	1.6	4.2
1200	1	1	0.5	0.5
1300	1	2	0.5	1.0
1400	1	1	0.5	0.5
1500	3	5	1.6	2.6
1600	1	1	0.5	0.5
1800	1	22	0.5	11.5
1900		1		0.5
2000	54	70	28.1	36.5
2100		9		4.7
2200	8	10	4.2	5.2
2300	19	32	9.9	16.7
2400	13	14	6.8	7.3
2500	83	9	43.2	4.7
2600	1	4	0.5	2.1
2700	1	2	0.5	1.0
2800	1		0.5	
3000	1		0.5	
N	192	192	100.0	100.0

The seed rate used by Filipino potato farmers will be influenced not only by the availability of seed, the variety, the intended market and the agro-ecological conditions under which the crop is cultivated, but also by the size of seed available. For large seed, there are fewer seed pieces per unit weight than smaller seed, consequently, if farmers are to achieve the same number of stems per hectare then a greater quantity of large seed must be planted.

The majority of potato farmers interviewed (72%) sought to purchase seed between 41-60 mm (Table 6.4). Given that 77% of farmers actually used seed within this size range to plant their main crop, this would suggest that, at least for the main crop, seed of the desired size was readily available.

Table 6.4. Ideal and actual seed size used by farmers for planting the main potato crop in the Cordillera.

Seed size (mm)	Frequency		Percent	
	Ideal	Actual	Ideal	Actual
6-10	4	7	2.1	3.7
11-15	12	13	6.3	6.9
16-20	13	7	6.9	3.7
21-30	3	3	1.6	1.6
31-40	22	12	11.6	6.4
41-50	85	115	45.0	61.2
51-60	50	31	26.5	16.5
N	189	188	100	100

For those farmers who planted a second ware potato crop, all used seed tubers to establish their crop. Seed tubers were either selected from the farmer's previous crop (68%) or purchased from other farmers. While some 16% of farmers purchased all of the seed they required from other farmers for the second crop, no farmers purchased seed from the open market, cooperatives or seed merchants, and at that time of the year no seed was available from the government seed schemes. The cost of seed purchased from other farmers to plant the second crop, ranged from Ps 10-18 per kg, with almost 50% of those farmers who purchased seed for the second crop paying an average price of Ps 15 per kg.

For those farmers who planted a second crop of potatoes, most (88%) intended to use a seed rate between 2 tonnes and 2.5 tonnes per hectare. However, only 70% of farmers actually used a seed rate between 2.0 tonnes and 2.5 tonnes per hectare. A much larger proportion of farmers (25%) actually used a seed rate less than 2.0 tonnes per hectare. Such would suggest that potato farmers were more risk averse at this time. Farmers attempted to minimize their exposure to risk at this time by using smaller seeds, which, per unit weight, cost less to purchase per piece.

6.7 On-farm seed management

Most farmers (98%) intended to use a proportion of the seed they retained from their current potato crop, to plant one or more subsequent crops (Table 6.5).

Table 6.5. Number of crops for which potato farmers in the Cordillera retained their own seed.

No of crops seed is retained	Frequency	Percent
0	3	1.3
1	45	20.0
2	22	9.8
3	43	19.1
4	58	25.8
5	15	6.7
6	24	10.7
7	5	2.2
8	2	0.9
9	8	3.5
N	225	100.0

Farmers generally retained their own seed for between 3 to 4 generations (45%), although some 20% of farmers intended to use the seed they had purchased for only one subsequent crop and some 11% of farmers intended to use the seed for up to six subsequent crops.

If farmers were to retain any seed to plant a subsequent crop, they would need to have some on-farm capacity to store the seed. The on-farm storage capacity ranged from as little as 100 kg to as much as 40 tonnes, with a mean of 3.8 tonnes. Irrespective, because the productivity of the seed declines after each generation

with the increasing incidence of pests and disease, farmers must periodically renew their seed. Almost all potato farmers (94%) indicated that they would like to renew all of their potato seed at least once every year (Table 6.6).

Table 6.6. Ideal and actual proportion of seed replaced per annum by potato farmers in the Cordillera.

Percent of seed replaced	Frequency		Percent	
	Ideal	Actual	Ideal	Actual
0	2	3	0.9	1.3
10	1	7	0.5	3.1
20	3	13	1.3	5.8
30	1	7	0.5	3.1
40				
50	3	17	1.3	7.6
60		1		0.5
70				
80	3	12	1.3	5.3
90		12		5.3
100	211	153	94.2	68.0
N	224	225	100.0	100.0

However, in reality, only 68% of farmers were able to replace all of their seed every year. Such would suggest that seed was either unavailable or that farmers were either unwilling or unable to purchase a greater quantity of seed. Similarly, while some 91% of farmers indicated that they intended to purchase some seed every year, only 74% were actually able to do so (Table 6.7). Most farmers (62%) purchased less than 500 kg of seed per year.

In purchasing seed tubers, the majority of potato farmers (85%) purchased seed from well-known seed suppliers. Only one farmer regularly purchased certified seed, with a further 12% of farmers purchasing certified seed sometimes, presumably when it was either available or when they could afford to buy it (Table 6.8).

Having purchased the seed, it was apparent that most farmers (55%) endeavoured to retain seed quality to the maximum extent possible by always rouging the crop to remove those plants that were visibly infected by pests and disease.

Table 6.7. Ideal and actual quantity of seed purchased per annum by potato farmers in the Cordillera.

Seed purchased	Frequency		Percent	
	Ideal	Actual	Ideal	Actual
0	17	44	9.0	25.4
1-100 kg	3	19	1.6	11.0
101-250	6	24	3.2	13.8
251-500	79	64	42.0	37.0
501-750	32	13	17.0	7.5
751-1,000	26	1	13.8	0.6
1,001-1,500	10	3	5.3	1.7
1,501-2,000	8	2	4.3	1.2
2,001-2,500	4	1	2.1	0.6
2,501-3,000	1	2	0.5	1.2
More than 3,001	2		1.2	
N	188	173	100.0	100.0

Table 6.8. Seed management practices in the Cordillera.

Seed management practises	Percent		
	Never	Sometimes	Always
Purchase certified seed	87.2	12.4	0.4
Purchase from well known suppliers	15.0	73.4	11.6
Rogue the crop	36.5	7.7	55.8
Positively select	59.2	32.6	8.2
Choose disease free land	30.5	63.9	5.6
Practice crop rotation			100.0
Apply pesticides			100.0
Grow seed in isolation	94.0	4.7	1.3
Grade seed before storage	1.7	26.6	71.7
Treat seed before storage	94.8	0.9	4.3
Test for latent disease	98.3	1.3	0.4

However, only 19% of farmers always practiced positive plant selection, whereupon, prior to harvest, the farmer would select the best plants in the field to retain as seed. Since the proportion of the harvest that farmers will retain for seed is determined primarily on the basis of seed size, the danger is that if farmers do not use positive plant selection, they may inadvertently select the small seed tubers from those plants that are performing less well and which may be contaminated by disease.

While most farmers graded the seed before storage (71%), 95% of farmers did not treat the seed with chemicals prior to storage to prevent or reduce the spread of pests and diseases. Potentially, this leaves the seed more exposed to infection, particularly by potato tuber moth and various fungal pathogens.

All farmers indicated that they practiced crop rotation. However, for many of these farmers, it is abundantly clear that their rotations are inadequate. While the majority of farmers planted only one potato crop in the same soil per year (63%), some 13% of farmers planted a subsequent potato crop within six months of harvest. A period of less than six months between crops will potentially lead to a greater accumulation of pests and disease and a more rapid rate of seed degeneration.

However, while potatoes are a highly profitable crop in the Cordillera, there is an acute shortage of land. Even where farmers may seek to extend the duration between potato crops, in the absence of any other land, they may have no choice. Furthermore, the land may be already infected with significant plant pathogens including bacterial wilt. Only 5% of potato farmers always sought to plant in disease free land, with 31% indicating that they never purposely chose disease free land. Rasco and Aromin (1994) report that only 12% of the potato farms in the Cordillera are free of bacterial wilt.

Where seed is scarce, farmers may be tempted to cut the larger tubers. However, where the tubers are contaminated by pathogens or where the tubers have been stored either too long or in an inappropriate environment, farmers often experience significant losses in productivity after using cut seed. The majority of farmers (86%) indicated that they never used cut seed. For those farmers who occasionally used cut seed, the major reason given was the lack of seed (86%). The major problem arising from the use of cut seed was the greater incidence of wilting (50%) and tuber rotting (23%), both of which are probably related to infection by bacterial wilt.

6.8 Preferred varieties

Granola was the variety cultivated by the majority of potato farmers (99%) in the Cordillera (Table 6.9). The second most popular ware potato variety was a locally bred variety selected by the Northern Philippines Root Crops Research and Training Centre at Benguet State University. Registered by the National Seed Industry Council under the name Igorota, the variety was suitable not only for the fresh market but also for processing.

The second most popular variety grown for processing was another locally bred variety registered under the name Solibao. While several other temperate zone potato varieties were cultivated in the highlands, the quantities grown were relatively insignificant.

Table 6.9. Varieties of potatoes grown in the Cordillera.

Variety	Fresh market		Processing market	
	Frequency	Percent	Frequency	Percent
Granola	224	99.6		
Igorota	40	17.8	6	50.0
Solibao			4	33.3
Creata	8	3.6		
Disco	8	3.6		
Kennebec			3	25.0
Others	3	1.2	3	25.0
N	225		12	

Granola was the most widely grown variety for both the first and second crop of potatoes cultivated. Igorota was also grown in equal proportions in both the first and second crop.

6.9 Segmenting the seed market

Most modern marketing texts extend the view that high growth companies succeed by identifying and meeting the needs of certain kinds of customers, not

all customers, for special kinds of products and services, but not all products and services (Hutt and Speh 1995). Since the business market is comprised of three broad sectors: commercial enterprises, institutions and government, whether firms elect to operate in just one or all three sectors, they will encounter a diversity of organisations, purchasing structures and decision-making styles. As each of these sectors and indeed, the many market segments that exist within each sector, often have quite unique needs, firms that are able to recognise and respond to these different needs will be the most effective and efficient.

While Wind and Cardozo (1974) recommend a two-stage approach to industrial market segmentation, given that the target customers are small-scale potato farmers in the highlands of the Northern Philippines, it is anticipated that the farmer's decision to purchase seed will have more in common with the purchase decisions made by the farm household. Consequently, it would seem appropriate to identify potential market segments at the individual farm level by incorporating those personal and on-farm variables that are most likely to influence the farmer's decision to purchase seed. Those variables thought not only to be important but also relevant to the study included: the area of the farm, the area cropped in potatoes, the planting date, the planting rate, the quantity of seed purchased, the number of crops for which seed was retained and various demographic variables including place of residence, highest level of education achieved, the percentage income derived from potatoes and the number of years the farmer had been growing potatoes. Since many of these variables were interrelated; for example, the quantity of seed purchased was influenced by the area of the farm planted in potatoes and the planting rate, using the methodology described by Hair *et al* (1998), the list of variables was reduced to just four: the area of the farm planted in potatoes, the number of years for which seed was retained, the number of years the farmer had been growing potatoes and the proportion of household income derived on the farm.

However, in choosing the final variables for inclusion in the cluster analysis, there was an additional and quite unexpected factor that had to be taken into

consideration. While the majority of farmers had responded fully to Sections 1-5 of the survey instrument, for whatever reason, there were significant gaps in the completion of the demographic variables (Section 6). Since cluster analysis will operate only when all respondents have answered all those variables entered, if all the initial variables chosen had been selected, more than half of the respondents would have been excluded. Furthermore, the gaps in the data were sufficiently large that any attempt to use data replacement techniques would have introduced an unacceptable margin of error. The danger, of course, is that some variables which might have been very good predictors of cluster membership were excluded.

Using the standardised z scores for all four variables, hierarchical cluster analysis (using the squared Euclidian distance and Ward's method) produced three feasible alternatives: two cluster, three cluster and four cluster solutions. These variables were then entered in the k-means clustering method (in SPSS) and each of the solutions evaluated in terms of both the composition of the clusters and the number of respondents within each cluster. The solution that appeared optimal was a two cluster solution, for the three cluster solution contained one outlier and the four cluster solution simply divided the largest cluster from the initial two factor solution into two smaller clusters (Table 6.10 and 6.11).

Table 6.10. Final cluster centres.

Variables	**Mean**		
	All	**Clusters**	
		1	**2**
Area cropped in potatoes (m^2)	3,445	15,357	2,647
Number of crops which seed is retained	3.5	6.2	3.4
How many years farmers has been growing potatoes	13.4	20.8	12.9
Percent of household income derived from the sale of farm products	95	76	96
Cluster membership	223	14	209

Table 6.11. ANOVA for cluster variables.

Variables	Mean square		F	P
	Cluster	Error		
Area cropped in potatoes	89.78	0.64	141.26	0.00
Number of crops which seed is retained	26.16	0.88	29.84	0.00
How many years farmers has been growing potatoes	24.28	0.92	26.43	0.00
Percent of household income derived from the sale of farm products	40.56	0.58	69.50	0.00

From an evaluation of the final cluster centres, it was apparent that those farmers who belonged to Cluster One were significantly larger farmers. Not only had they been growing potatoes for longer, but they also intended to retain their seed for longer. These farmers were also observed to draw significantly less of their total household income from the sale of agricultural products produced on the farm.

6.10 Chapter summary and implications

Most potato farmers in the Cordillera endeavour to replace some proportion of their seed every year. However, whereas some 94% of potato farmers indicated that they would ideally like to renew all of their potato seed every year, in reality only 68% of farmers were able to do so. Similarly, whereas 91% of farmers indicated their desire to purchase seed, only 74% were able to do so.

Such would indicate that for various institutional and agro-ecological reasons, the seed system in the Cordillera was either unable to meet the farmers demand for seed and/or that farmers had insufficient capital to afford to purchase the quantities of seed they required.

Jayasinghe *et al.* (1997) suggest that the formal seed system in the Cordillera is currently unable to satisfy more than 15% of the demand for seed. Concurrently, this study would suggest that the formal seed system was unable to satisfy more than 13% of the seed demand. Consequently, the major source of seed is derived from either that which the farmer retained from their own potato crop or seed they

have obtained from other farmers, either by purchasing the seed outright or in lieu of cash payments for farm labour. Nevertheless, the fundamental issue that remains is whether the shortage of seed is derived from the lack of sufficient quantities of good quality seed or the farmer's inability to purchase improved seed.

If the shortage of seed was the fundamental problem, farmers could reasonably be expected to pursue every alternative source of supply, such as purchasing seed from seed merchants and importers, or alternatively, as Crissman (1989) suggests, to purchase seed from the fresh market. However, there was no indication of farmers purchasing seed from seed merchants, importers or the fresh market to plant either the main crop or the second crop. Thus, it would seem more likely that the small quantity of seed purchased by farmers is due not so much to the unavailability of seed, but rather the farmers inability to pay for it.

According to HARRDEC (1996) and Gayao and Sim (n.d.), seed costs amount to around 36% of production costs. With farmers paying an average price of Ps 15 per kg for seed from the informal seed system, reducing the seed rate from 2.5 tonnes per hectare to between 1.8 tonnes and 2.0 tonnes per hectare represents a potential saving of between Ps 7,500-10,500 per hectare (20-28%), thereby reducing seed costs to 28-31% of production costs.

While there was no significant difference between the average price at which farmers purchased seed to plant the main crop (Ps 14.7 per kg) and the second crop (Ps 14.2 per kg), the lower seed rate at which farmers planted the second crop is an appropriate risk reduction strategy to reduce their exposure to financial loss. Planting the second crop in August-September is always risky because of the possibility of typhoons and heavy rain destroying the crop. Planting from October to November potentially exposes the crop to frost, which, if severe enough, can destroy the haulm, thereby reducing productivity per hectare. Consequently, in planting the second crop most farmers used their own seed with only 18% of

potato farmers purchasing some seed for the second crop and only 9% purchasing all the seed required.

In making the decision to use their own seed, it is apparent that many farmers significantly under valued the cost of their seed. For over 87% of potato farmers in the Cordillera, the cost of seed was less than 25% of production costs, with 40% of farmers estimating that seed costs were less than 10% of production costs. Presumably, because farmers were retaining that proportion of the harvest that was considered too small for the fresh market to use as seed, the opportunity cost of that seed was perceived to be minimal. Since prices in the fresh market are influenced by tuber size, if seed sized tubers are worth only one half of the average price (Ps 4.5-6.0 per kg), seed costs could quite conceivably be as low as 11-15% of production costs. Furthermore, if farmers are forced to retain what seed they have for a greater number of crops, the longer the seed is retained, the more it will degenerate and the further its value will decline, thereby further reducing the costs of seed as a production input.

The emergence of two quite distinct clusters was not entirely unexpected. Established business practice suggests that any potential seed supplier will seek to conduct business with those farmers who can most afford to purchase the product. Generally, these are the larger farmers who, it is observed, have been cultivating potatoes for a longer period of time and who currently, through diversifying their business, draw most of their income from off the farm. However, what is surprising is that these same farmers are more likely to retain the seed they have purchased for a longer period of time. While the small sample size makes it impossible to empirically test for any association, it would seem that these more wealthy farmers endeavour to purchase the very best quality seed available. Having made that investment, since good quality seed will degenerate at a slower rate, they endeavour to retain that seed for a longer period of time so as to maximise its yield potential.

While the extent to which cluster membership impacts upon the farmer's decision to purchase seed and the nature of their relationship with their seed supplier will be examined in the following chapter, the small size of Cluster 1 (14 respondents) will make it very difficult to demonstrate any statistically significant relationships.

Chapter Seven

FACTORS IMPACTING UPON THE DEMAND FOR SEED POTATOES IN THE CORDILLERA[3]

7.1 Chapter outline

This chapter will examine the various factors, both internal and external, that potentially impact upon a potato farmer's decision to purchase seed. Since it is most unlikely that all farmers will be influenced by each variable to the same extent, some variables are expected to be more or less important for some farmers than they are for others. Given the importance of selecting the most appropriate variety to meet both the needs of the market and the agro-ecological conditions experienced in the Cordillera, particular attention will be directed towards the various criteria potato farmers utilise in selecting their preferred variety.

7.2 Introduction

In order to maximise productivity and profitability, farmers are expected to purchase the best quality seed available. Seed quality is defined by four variables: seed sanitation, seed purity, seed size and the physiological age of the seed (van der Zaag 1987; van der Zaag 1990b; Rasco 1994). However, good quality seed costs more to produce and therefore it will cost more to purchase (Monares 1981). As many farmers are cash constrained (Crissman 1989: Tagarino *et al.* 1998) or have limited on-farm storage, it may become necessary for them to compromise and purchase seed of the quality they can afford. For other farmers, the decision to purchase seed will require the farmer to secure a personal loan. A farmer's decision to borrow capital is expected to be made in a similar manner to any other long-term investment. They will consider the expected increase in productivity, not only for the current crop but for any other potato crops derived from the same

[3] The following chapter was developed from Batt, Peter J. (2001b), Variety: The key driver of demand for seed potatoes in the Philippines, *African Crop Science Journal,* Vol 9 (1), 317-329.

seed; prices in the output market; the cost and availability of credit; and their attitude to risk.

In the absence of a certified seed program, potato farmers in the Cordillera will face considerable risk and uncertainty in their decision to purchase seed. Not only is there the risk of purchasing seed that is already contaminated by various plant pathogens, but there is no guarantee that the seed purchased will be of the desired variety or physiological age. Furthermore, seasonal variations associated with the early arrival and the intensity of typhoons may have a significant negative impact on both productivity and profitability.

The magnitude of the investment in terms of the quantity of seed required to plant the area of land available is also expected to influence the decision to purchase. Although it is widely acknowledged that seed quality has the greatest impact on productivity (Balaoing and Lazo 1967; Batugal *et al.* 1988; Crissman 1989; Mariano *et al.* 1991; Aromin *et al.* 1993; Callueng et al. 1993b; Sana *et al.* 1993; Rasco and Aromin 1994), without access to other inputs such as chemicals and fertilisers, labour and irrigation, the full benefits of purchasing improved seed may not be realised.

Finally, in order to reduce some of the risk associated with purchasing seed, farmers may prefer to purchase seed from a known origin (Crissman 1989; Mariano *et al.* 1991; Perez 1995b) or to purchase from those seed suppliers with whom they have had a favourable prior experience.

7.3 The importance of the decision to purchase seed

Given the high cost of seed, the impact that seed quality may have on both the productivity and profitability of cultivating potatoes and the adverse consequences of making a poor decision on the well-being of the farm household, farmers are expected to spend more time making their decision to purchase seed than they

would ordinarily spend in making their decision to purchase fertilisers and chemicals, or in deciding to whom they will sell their potato crop after harvest.

Indeed, most potato farmers in the Cordillera were found to spend significantly more time making their decision to purchase seed than they did in purchasing fertilisers and chemicals, choosing which variety to grow, from which supplier to purchase seed, or to whom they would sell the crop after harvest (Table 7.1).

Table 7.1. Amount of time Filipino potato farmers take in making their decision to purchase and sell potatoes.

Decision time	Mean	SD
to purchase seed	5.04[a]	1.41
to purchase fertilisers and chemicals	3.90[b]	1.95
which variety to grow	3.02[c]	1.54
From which supplier to purchase seed	2.91[c]	1.00
to whom to sell the ware potato crop	1.33[d]	0.71

where 1 is "not a long time" and 7 is "a great deal of time"
those items with the same superscript are not significantly at different p = 0.05

Just as the farmer's decision to purchase seed will deplete the household's financial resources, the purchase of chemicals and fertilisers will also result in a reduction in the farm household's equity position. However, whereas the decision to purchase seed may be made in the expectation that a proportion of the harvest will be retained to replant one or more subsequent potato crops, the time frame for the recovery of the investment in chemicals and fertiliser is more short term and is expected to be recovered in full from the sale of the harvest.

The decision about what variety to grow is to a large extent dependent upon the availability of seed of alternative varieties. Since the market is dominated by Granola, many farmers probably do not even realise they have a choice. However, as Callueng *et al.* (1993a) report, many farmers may be actively looking for seed of improved varieties because of their dissatisfaction with the quality of the seed generally available. Since most "new" varieties are derived from seed that has been imported, seed of "new" varieties is perceived to be more productive. If this is true, those farmers who have purchased imported seed may perceive that they

have a distinct marketing advantage and will therefore be reluctant to distribute the improved seed to other farmers (Bos 1998).

The relatively short amount of time spent in choosing a seed supplier suggests that farmers either don't have a choice; that is, there are few alternative seed suppliers available or that, as a result of favourable prior experience, most farmers have identified a seed supplier from whom they prefer to purchase seed.

Similarly, the short amount of time spent in deciding to whom the farmer will sell the harvest means one of two things; farmers have no choice because, through the credit arrangements they may have entered into with traders and seed suppliers, the product is presold (Crissman 1989). Alternatively, because of the highly volatile nature of prices in the fresh market, farmers may simply avail themselves of the opportunity to maximise income by selling their potatoes to whichever trader offers the highest price on the day.

While these issues will be explored further in the chapters that follow, using the two cluster solution developed in the previous chapter, discriminant analysis suggests that the larger farmers (Cluster 1) spend significantly more time making the decision as to which variety to grow. These same farmers are also observed to spend significantly more time selecting the supplier from whom they intend to purchase seed tubers (Table 7.2).

Table 7.2. Amount of time Filipino potato farmers take in making their decision to purchase and sell potatoes by cluster.

Decision time	Cluster means		P
	1	2	
to purchase seed	5.36	5.11	0.507
to purchase fertilisers and chemicals	4.36	3.80	0.307
which variety to grow	**4.07**	**2.94**	**0.008**
from which supplier to purchase seed	**3.64**	**2.86**	**0.004**
to whom to sell the ware potato crop	1.43	1.29	0.424

Both of these responses imply that the larger farmers have more choice, presumably because they are wealthier and can afford to spend more to obtain seed of the desired quality and variety.

Nevertheless, most potato farmers (70%) make their decision to purchase seed 3-4 months before the seed is required (Table 7.3)

Table 7.3. When Filipino potato farmers place their order to purchase seed.

Months before planting	Mean	SD
Less than one month	4	1.7
1-2 months	62	27.0
3-4 months	162	70.4
5-6 months	1	0.4
Longer than 6 months	1	0.4
N	230	100.0

This suggests that the farmer's decision to purchase seed is a planned decision, rather than a decision made on impulse. Farmers would only make the decision to purchase seed this far in advance if there was some doubt about the ability of the preferred seed supplier to deliver the desired quantity. This implies that while seed may be available from a number of suppliers, there are a limited number of suppliers with whom the farmer wishes to transact.

7.4 Importance of variables influencing the on-farm demand for seed

Variety, seed purity, seed size and the origin of the seed were found to be the four most important variables influencing a potato farmer's decision to purchase seed (Table 7.4). With the low standard deviation and significant $Z_{skewness}$ coefficient, each of these variables would seem to be important for most potato farmers.

Three of these parameters (variety, seed purity and origin of the seed) have a direct impact on the quality of the seed and hence its productivity.

Table 7.4. Importance of variables influencing a Filipino potato farmer's decision to purchase seed.

	Mean	SD	$Z_{skewness}$
Variety	6.99[a]	0.02	**-10.70**
Seed purity (not mixed varieties)	6.98[a]	0.14	**-6.65**
Seed size	6.97[a]	0.24	**-7.43**
Origin of the seed	6.95[a]	0.38	**-8.19**
Availability of other farm inputs	6.93[a]	0.29	**-4.49**
Physiological age of the seed	6.92[a]	0.44	**-6.42**
Expected yield of fresh potatoes	6.91[a]	0.29	**-2.87**
Market price of fresh potatoes	6.91[a]	0.37	**-4.95**
Farmer's attitude to risk	6.90[a]	0.45	**-5.17**
Anticipated profitability	6.89[a]	0.44	**-4.72**
Rate of seed degeneration	6.88[a]	0.45	**-3.81**
Availability of credit	6.88[a]	0.41	**-4.02**
Freedom from disease	6.88[a]	0.34	**-2.58**
Anticipated future yields of fresh potatoes	6.83[a]	0.49	**-3.61**
Availability of cash to purchase seed	6.82[a]	0.51	**-2.49**
Availability of farm labour	6.80[a]	0.51	**-3.08**
Availability of irrigation	6.74[a]	0.57	**-2.24**
Availability of seed at planting time	6.70[a]	0.98	**-4.00**
Uncertainty of price in the fresh potato market	6.69[a]	0.64	**-2.33**
Seasonal variations	6.69[a]	0.57	-1.68
Cost of credit	6.64[a]	0.82	**-2.60**
Previous purchase	6.46[b]	0.80	-1.16
High cost of seed	6.40[c]	0.74	-0.92
Total quantity of seed required	6.37[d]	0.61	-0.65
Proximity to seed supplier	6.34[d]	0.74	-0.73
Relative price difference between seed and fresh potatoes	6.32[d]	0.91	-0.98
Seed rate per unit area	6.16[e]	0.66	-0.28
High cost of certified seed	6.01[f]	0.98	-0.84
Cost of retaining seed	5.93[g]	1.10	-0.60
Anticipated losses in storage	5.82[h]	1.04	-0.33
Expected yield of seed potatoes	5.80[h]	1.16	-0.41
Yield difference between new seed and farmers seed	5.69[i]	1.11	-0.18
Pathogen tested (certified) seed	5.30[j]	0.68	-0.69
Imported seed	5.06[k]	0.70	-0.07

where 1.0 is least important and 7.0 is most important
those values with the same superscript are not significantly different at p = 0.05
$Z_{skewness}$ coefficient indicates data is not normally distributed where value exceeds 1.96 at p = 0.05.

Seed size is an important consideration from two perspectives. In the first instance, there is a direct correlation between seed size and the quantity of seed required to plant an area of ground. As the seed size increases, farmers will need

to purchase a greater quantity of seed to obtain the desired number of seed pieces. In order to reduce their expenditure on seed and their exposure to risk, farmers can be expected to purchase as many seed pieces as they can per unit weight. However, there is a minimum seed size below which the productivity per unit area will decline. When soil and weather conditions are unfavourable at planting, the growing season is short and there is some risk during the early part of the growing season that the crop may be damaged by frost, hail or drought, large seed may be more advantageous (Beukema and van der Zaag 1990).

The other variables considered most important in the farmer's decision to purchase seed may also be grouped under their impact on productivity (physiological age of seed, seed sanitation, the rate of seed degeneration, the availability of other farm inputs, labour and irrigation), profitability (market price, profit, cost and availability of credit, availability of cash), or uncertainty (farmer's attitude to risk, the uncertainty of price in the ware market, seasonal variations in productivity and the availability of the seed at planting time).

Since most farmers rated most of these variables as being very important in their decision to purchase seed, there was a strong possibility that significant correlationships may exist between several of these variables. Indeed, principal component analysis revealed six factors that collectively explained over 75% of the variance in farmer's responses (Table 7.5).

Factor One (magnitude of the investment) captured four variables that collectively evaluated the capital cost of purchasing seed. The total cost of purchasing seed related not only to the cost of the seed, especially the high cost of imported seed, but also the anticipated planting rate (quantity per unit area) and the total quantity of seed required (the area to be planted).

Factor Two (seed retention) included four variables that appeared to indicate that the purchase of new seed was indeed a long-term investment. Potato farmers often

purchased seed with a view to retaining a subsequent proportion of the harvest as seed for subsequent crops (Haverkort 1986).

Table 7.5. Factors influencing a Filipino potato farmer's decision to purchase seed.

Variable	Factor loadings					
	1	2	3	4	5	6
High cost of seed	.824					
Total quantity of seed required	.779					
Seed rate per unit area	.771					
High cost of certified seed	.712					
Expected yield of seed potatoes		.859				
Cost of retaining seed		.812				
Anticipated losses in storing seed		.811				
Yield difference between new seed and farmer's own seed		.764				
Availability of farm labour			.795			
Availability of other farm inputs			.792			
Rate of seed degeneration			.748			
Availability of irrigation			.694			
Farmer's attitude to risk				.840		
Anticipated profitability				.814		
Expected yield of fresh potatoes					.878	
Anticipated future yield of potatoes					.803	
Variety						.923
Seed purity						.909
Eigenvalue	2.86	2.84	2.56	1.87	1.74	1.72
Percent variance	15.9	15.8	14.2	10.4	9.7	9.6
Cumulative percent variance	15.9	31.7	45.9	56.3	66.0	75.6
Cronbach's alpha	.838	.859	.814	.799	.797	.772
Factor mean	6.24	5.81	6.84	6.90	6.86	6.98

However, in making their decision to retain a proportion of the harvest as seed, farmer's had to forgo the opportunity to sell that seed in the market, to feed it to livestock or to eat it themselves, whilst incurring potential financial loss associated with tuber rotting and infection during storage (Crissman and Hibon 1996). Furthermore, there is the recognition that as the seed degenerates (the yield difference between the new seed and farmers own seed) the farmer will need to retain a greater proportion of the harvest for seed (Haverkort 1986).

Factor Three (complementary inputs) included variables that indicated that the farmer's decision to purchase seed was made with consideration not only to the

rate of seed degeneration, but also to the availability of other complementary inputs including labour, irrigation, fertilisers and chemicals for pest and disease control. Monares (1981) indicates that the use of high quality seed improves the productivity of traditional inputs such as labour, irrigation and cultivation practices.

Factor Four (risk aversion) captured two variables: the farmer's attitude to risk and the anticipated profitability of the potato crop. Growing potatoes in the Philippines is inherently risky. Not only is there the constant risk of losing the crop to typhoons, but in a good season when yields are high, prices in the output market may be so low that the farmer is unable to recoup the initial investment in seed (Crissman 1989). Such a situation is aggravated by the knowledge that most small potato farmers have borrowed the capital to purchase the seed and other inputs, potentially exposing them to coercive influence strategies by various credit providers.

Factor Five (productivity) captured two variables that incorporate the expected yield and the anticipated future yield of the fresh potato crop. Crissman and Hibon (1996) suggest that a farmer's decision to purchase improved seed is made knowing that the benefits will be realised over several seasons. However, the benefits will decline progressively as the seed degenerates.

Factor Six (variety) comprised two variables that indicated the farmer's desire to purchase seed of their most preferred variety and indeed, to purchase a line of seed that did not contain a mix of varieties. Factor Six was observed not only to have the highest mean score but since it also explained the least amount of variance, this implies that this construct was important to all potato farmers in the Cordillera.

Using the two cluster solution developed from the previous chapter, discriminant analysis confirmed that Factor Six was important to all farmers for there was no significant difference between the two respective clusters (Table 7.6).

Table 7.6. Factors influencing a Filipino potato farmer's decision to purchase seed by cluster.

Factor	Cluster means		P
	1	2	
Magnitude of the investment	6.02	6.26	0.153
Seed retention	6.00	5.81	0.484
Complementary inputs	6.66	6.86	0.051
Risk aversion	**6.64**	**6.94**	**0.000**
Productivity	**6.43**	**6.90**	**0.000**
Variety	7.00	6.98	0.583

Discriminant analysis did however reveal a significant difference between the clusters with respect to Factor Four (risk aversion) and Factor Five (productivity). Both factors were found to be significantly less important for the 14 farmers in Cluster One.

Given that the farmers in Cluster One drew significantly less of their household income from the sale of agricultural produce, they may be less concerned about the profitability of the potato crop and less risk averse. Presumably for a similar reason, the farmers in Cluster One indicated that they were less concerned about the productivity of the seed.

With an additional 8 years experience in the potato industry, the farmers in Cluster One were presumably able to take better care of the seed they had purchased, for not only did they retain the seed for longer, but on average, they renewed 30% less of their seed (Table 7.7).

Table 7.7. Seed retention and cost of seed by cluster.

	Cluster means		P
	1	2	
Number of years seed retained	**6.21**	**3.37**	**0.000**
Percent seed renewed	**54.6**	**84.8**	**0.000**
Cost of seed (as % cost of production)	**25.8**	**16.1**	**0.002**
Cost of seed (Ps per kg)	**16.6**	**14.3**	**0.011**

However, although the farmers in Cluster One retained their seed longer, the cost of seed as a proportion of the total cost of production was observed to be significantly higher. This suggests that the farmers in Cluster One were more willing (and able) to pay a higher price for the seed they purchased. Indeed, the farmers in Cluster One did pay 16% more for the seed they purchased which implies that the farmers in Cluster One acknowledged that there was a meaningful positive relationship between seed quality and price. By purchasing better quality seed, there was less risk, the seed was more productive and if farmers applied appropriate treatments in the field to reduce the rate of infection, the seed would degenerate at a much slower rate, enabling them to keep the seed longer. However, while the larger farmers may have been prepared to pay more to purchase seed, they do not buy significantly more seed (Table 7.8).

Table 7.8. Quantity of seed purchased by cluster.

Kg of seed	**Cluster means**		**P**
	1	**2**	
Quantity of seed purchased (ideal)	1040	712	0.193
Quantity of seed purchased (actual)	500	330	0.227

Although Crissman (1989) identified the farmer's need for credit as an antecedent in the establishment of long-term relationships between farmers and seed suppliers, neither the availability of credit nor the cost of credit was present in the final factor solution. To determine whether any one group of farmers was more or less dependent on credit, both of these variables were tested using discriminant analysis (Table 7.9).

Table 7.9. Cost and availability of credit by cluster.

	Cluster means		**P**
	1	**2**	
Cost of credit	6.57	6.88	0.603
Availability of credit	**6.64**	**6.91**	**0.013**

While there was no significant difference between the two clusters with respect to the cost of credit, the availability of credit was rated significantly higher by the smaller farmers (Cluster Two), implying that access to credit was more of a problem for the smaller farmers.

7.5 Criteria farmer's use in their choice of variety

In choosing between alternative varieties, the four most important attributes that Filipino potato farmer's considered was tuber size, tuber shape, skin colour and the suitability of the variety to the growing environment (Table 7.10). Once again, the low standard deviation and high $Z_{skewness}$ coefficient would suggest that these variables were important to most potato farmers in the Cordillera.

Table 7.10. Importance of the criteria Filipino potato farmer's use in selecting which variety to grow.

Attribute	Mean	SD	$Z_{skewness}$
Tuber size	6.96[a]	0.28	**-8.17**
Tuber shape	6.95[a]	0.30	**-6.31**
Skin colour	6.95[a]	0.34	**-8.53**
Suitability to the growing environment	6.94[a]	0.37	**-7.17**
New variety	6.91[a]	0.54	**-7.89**
Flesh colour	6.91[a]	0.43	**-6.04**
Price in the fresh potato market	6.88[a]	0.40	**-3.89**
Vigorous growth	6.85[a]	0.46	**-3.67**
Fast maturing	6.82[a]	0.42	**-2.20**
Resistance to disease	6.81[a]	0.43	**-2.22**
Availability at planting time	6.74[a]	0.51	**-2.03**
Productivity per hectare	6.68[a]	0.57	-1.76
Variety traditionally grown	6.63[b]	0.64	-1.91
Eating quality	6.44[c]	0.93	-1.58
Cost of seed	6.33[d]	0.72	-0.79
Seed rate per hectare	6.17[e]	0.68	-0.65
Storage characteristics	5.67[f]	1.05	-0.18
Drought tolerance	4.73[g]	1.06	-0.26
Heat tolerance	4.62[g]	1.02	-0.39
Processing quality	4.55[g]	0.70	0.09

where 1 is not at all important and 7 is most important
values with the same superscript are not statistically different at p = 0.05
$Z_{skewness}$ coefficient indicates data is not normally distributed where value exceeds 1.96 at p = 0.05.

The first three attributes (tuber size, tuber shape and skin colour) are no doubt related to the marketability of the tubers. Farmer's perceive that the market prefers large tubers, with a round, uniform shape and smooth, yellow skin (Callueng *et al.* 1993; Sim *et al.* 1997). The suitability of the variety to the environment will affect both its productivity and its profitability. According to HARRDEC (1996), even the very best cultural practices seldom compensate for the poor choice of variety.

Those aspects which Filipino farmer's considered most important in choosing a variety included vigorous growth, fast maturity and resistance to disease. Profitability was influenced by two dimensions; productivity per hectare and prices in the ware market. However, since most farmers rated the majority of variables as being very important in choosing their most preferred variety, it would seem highly likely that significant correlationships may exist between several of the variables. Principal component analysis revealed four factors that collectively explained 72% of the variance in farmer's responses (Table 7.11).

Table 7.11. Factors influencing a Filipino potato farmer's choice of variety.

	Factor			
	1	2	3	4
Fast maturing	0.867			
Resistance to disease	0.848			
Eating quality	0.818			
Productivity per hectare	0.796			
Price in the fresh market	0.580			
Vigorous growth	0.569			
Tuber size		0.929		
Skin colour		0.877		
Flesh colour		0.836		
Tuber shape		0.833		
Drought tolerance			0.864	
Heat tolerance			0.849	
Processing quality			0.635	
Suitability to the environment				0.860
New variety				0.820
Eigenvalue	3.744	3.306	1.994	1.755
Percent variance	24.96	22.04	13.29	11.70
Cumulative percent variance	24.96	47.00	60.29	71.99
Cronbach's alpha	0.837	0.888	0.735	0.615
Factor mean	6.74	6.94	4.62	6.92

Factor One (performance) was comprised of six variables, four of which evaluated the performance of the variety in the field (fast maturing, resistance to disease, vigorous growth and productivity per hectare) and two variables that evaluated the performance of the variety in the market (eating quality and price in the fresh market).

Factor Two (physical characteristics) was comprised of four variables including tuber size, skin colour, flesh colour and tuber shape. Factor Two was found to have the highest mean score and was thus the most influential in the farmer's choice of variety. Since these are the main criteria used by consumers in their decision to purchase potatoes (Batt 2002), this suggested a strong commitment towards cultivating those varieties that were preferred by consumers.

Conversely, those characteristics that were perceived as being least important included the suitability of the variety for processing, its heat tolerance and drought tolerance (Factor Three). With regard to the suitability of a variety for processing, all of these variables are interrelated. In the tropics, the majority of varieties used for processing have been found to have a much lower specific gravity compared to the same potatoes when cultivated in a more temperate environment. A lower specific gravity is the result of both higher growing temperatures and shorter days (Villamayor 1984). High temperatures will induce the more rapid conversion of starch to reducing sugars, even after only short periods of storage (Horton 1987). Furthermore, many of the varieties traditionally used for processing in the temperate countries are susceptible to hollow heart and cracking in the tropics as a result of inconsistent rainfall and/or irrigation. Nevertheless, for those potato farmers in the Cordillera who may be endeavouring to supply potatoes for processing, the suitability of the variety for processing will be significantly less important for those farmers who are cultivating potatoes only for the fresh market.

Factor Four (adaptability) assessed the suitability of the variety to the agro-ecological conditions experienced in the Philippines. The importance attached to new varieties suggests that farmer's are dissatisfied with the varieties currently

available. However, Callueng *et al.* (1993a) suggests this dissatisfaction arises more from the poor quality of the seed currently available.

The smaller farmers (Cluster Two) rated the adaptability of the variety significantly higher than the larger farmers (Table 7.12).

Table 7.12. Factors influencing a Filipino potato farmer's choice of variety by cluster.

Factor	Cluster means		P
	1	2	
Performance	6.58	6.77	0.113
Physical characteristics	6.93	6.96	0.535
Suitability for processing	**5.40**	**4.57**	**0.000**
Adaptability	**6.53**	**6.97**	**0.000**

Following the argument proposed by Callueng *et al.* (1993b), it would appear that the smaller farmers experience more difficulty in procuring sufficient quantities of good quality seed.

Conversely, it is apparent that the larger farmers rate the suitability of the variety for processing significantly higher than the smaller farmers. From the customer's perspective, a processor would prefer to transact with a few, large farmers rather than a multitude of small growers with highly variable standards of tuber quality. Since the larger farmers also rated the importance of other farm inputs marginally lower than the small farmers, the possibility that more of the larger farmers have entered into agreements with processors who supply all the inputs (including seed, chemicals and fertilisers) is worthy of investigation.

7.6 Chapter summary and implications

The decision to purchase seed is a significant long-term investment for most potato farmers in the Cordillera. With the exception of the 1% of farmers who do not intend to retain any of their harvest for seed, most farmers will retain some 15% of their harvest to plant one or more subsequent crops.

However, as the productivity of the seed declines with each generation, most farmers recognise the need to replace some proportion of their seed each year. Depending upon the quantity of seed purchased and the price at which that seed is purchased, the cost of seed will represent between 15 - 40% of the costs of production. For the average farm household, this level of expenditure on a single input exposes the household to considerable economic risk. The investment is made all the more uncertain by the potential variation in seed quality (for there is no certified seed program in the Philippines), environmental uncertainty and price uncertainty in the output market.

In order to reduce that perceived risk, farmers will spend a considerable amount of time making their decision to purchase seed. This decision will be made with regard to: the magnitude of the investment itself (the quantity of seed required and the cost of the seed); the ability to retain a proportion of the harvest to be used as seed for planting another potato crop; the availability of complementary inputs; the productivity of the seed; and the anticipated seed quality. The farmer may then make a decision based upon the stability of prices in the output market and the farmer's personal risk aversion.

Not unexpectedly, the farmer's risk aversion will be influenced by a number of personal factors. The larger and more experienced farmers (Cluster 1) tend to be less risk averse than the smaller, less experienced farmers. One of the major reasons for these farmers being less risk averse is the knowledge that they are much less dependent upon the potato crop for their sole source of income because most have other business interests off the farm.

These same farmers, recognising the marked differences in seed quality between alternative seed suppliers, spend more time searching for those seed suppliers who offer better quality seed. In part, this may involve identifying those seed suppliers who have access to new varieties, for according to Callueng *et al.* (1993a) most new varieties have been imported and therefore are perceived to be substantially free of the major pathogens that can reduce productivity. Recognising that there is

a significant positive relationship between seed quality and price, the farmers in Cluster One generally pay more to purchase the seed they require.

Nevertheless, in selecting which variety to grow for the fresh market, farmers give consideration not only to the productivity of the variety, but also its ability to meet the needs of the market. The fresh market is currently perceived to demand large tubers, with a yellow skin, yellow flesh and an even, uniform shape. Presumably, over time, consumers have learned to associate these characteristics with the desired eating quality. However, these same characteristics are a poor indicator of the suitability of the variety for processing.

Chapter Eight

FACTORS IMPACTING UPON A POTATO FARMER'S CHOICE OF SEED SUPPLIER IN THE CORDILLERA[4]

8.1 Chapter outline

The following chapter will explore the major variables that influence a Filipino potato farmer's choice of preferred seed supplier. The chapter begins with a brief review of industrial purchasing behaviour before examining the importance of the technical, functional and service quality dimensions. Since some farmers may value some dimensions more than others, discriminant analysis is employed to identify any significant differences between the respective clusters.

8.2 Introduction

Quality, price and the ability to deliver are generally regarded as the most important criteria by which organisational buyers evaluate potential suppliers (Cunningham and White 1973; Lehmann and O'Shaughnessy 1974; Dempsey 1978; Wilson 1994).

In describing quality, Gronroos (1990) finds it necessary to distinguish between technical quality and functional quality.

Technical quality describes the customer's specifications, most often in terms of a physical description of the product. For seed potatoes, these quality dimensions include tuber size, variety, seed purity, physiological age and freedom from seed-borne pathogens.

[4] The following chapter was developed from Batt, Peter J. (2001c), Factors influencing a potato farmer's choice of seed supplier: empirical evidence from the Philippines, *Journal of International Food and Agribusiness Marketing,* Vol 12 (2), 71-91.

Functional quality describes the way a supplier goes about delivering the product to the customer. While this fundamentally means being able to deliver the product when the customer wants it, it may also involve many inter-related activities such as storage, logistics, ordering and invoicing (Gronroos 1995). For this reason, customers may prefer to purchase from local suppliers. Local suppliers are generally less expensive and more dependable than those located at a distance (Hakansson and Wootz 1975).

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

Hutt and Speh (1995) describe how when industrial buyers purchase a product, they purchase not only a package of benefits derived from the physical product, but also a bundle of services attached to the product. These benefits are to varying degrees, more or less important to different customers. However, these benefits also bring with them a range of costs. The costs include not only the price of the product, delivery and service, but also the risks of product failure. A buyer may find that a supplier offering the lowest price has the highest overall cost.

Because functions can be accomplished in a number of different ways, the most cost-efficient way of accomplishing a function will establish its value. Value-in-use is defined as the product's economic value to the user relative to a specific alternative (Hutt and Speh 1995). Value-in-use centres on a specific use situation and constitutes the price that would equalise the overall costs and benefits of using one product rather than another. Particularly for capital goods (such as seed potatoes), these cost needs to be calculated over the useful life of the product. As discussed in the previous chapter, it is apparent that some farmers are willing to

pay a higher price to purchase high quality seed in order to reduce the risk of failure.

8.3 Variables influencing a Filipino potato farmer's choice of seed supplier

In response to an open-ended question, some 41% of potato farmers in the Cordillera indicated that obtaining seed of the desired physiological age was an important consideration in choosing between alternative seed suppliers Not unexpectedly, obtaining clean seed that was substantially free of pests and diseases (38%), and obtaining seed of the desired variety (29%) were reported as being important in the farmer's choice of seed supplier (Table 8.1).

Table 8.1. Variables said by Filipino potato farmers to influence their choice of seed supplier.

Variable	N	Percent
Offer seed with desired physiological age	94	40.9
Clean seed (seed sanitation)	87	37.8
Seed is available of the desired variety	66	28.7
Seed purchased increases production	66	28.7
Origin of the seed	50	21.7
Seed suppliers reputation	44	19.1
Offer favourable terms of repayment	42	18.3
Offer seed of the desired size	31	13.5
Offer cheap seed	28	12.2
Competitively priced seed	22	9.6
Rate of seed degeneration	17	7.4
Demand for potatoes in the fresh market	17	7.4
Availability of seed	16	6.9
Offer credit	16	6.9
Growing potatoes for a long time	7	3.0
Financially strong	7	3.0
Seed suppliers credibility	5	2.1
Personal relationship with seed supplier	3	1.3
Can supply imported seed	2	0.9
Seed available at planting time	2	0.9
Buy back fresh potatoes harvested	2	0.9
Technical expertise	1	0.4
Offer to supply other farm inputs	1	0.4
N	230	272.0

Origin of the seed (22%) and the seed supplier's reputation (19%) were additional indicators of the farmer's desire to obtain high quality seed.

Although the need to obtain credit was cited by only 7% of farmer's, financial considerations were nevertheless important. Some 22% of farmer's indicated that obtaining seed that was competitively priced was important to them, with a further 18% pursuing those seed suppliers who offered more favourable terms of repayment.

However, in responding to 33 fixed-response statements, the two most important variables influencing a Filipino potato farmer's choice of seed supplier were the seed supplier's reputation and the seed supplier's ability to provide tubers that were not contaminated with a mix of more than one variety (Table 8.2).

While there was no significant difference between the first seventeen variables at $p = 0.05$, this primary group contained all of the technical quality variables (except certified seed and imported seed), most of the functional quality variables (54%) and three service quality variables (although two of these; the willingness to offer credit and favourable terms of repayment could just as easily be described as functional quality dimensions and the third, provision of new varieties, could, in the context of earlier findings, be classified as a technical quality dimension). It was also evident, given the low standard deviation and the high $Z_{skewness}$ coefficient that these variables were important to most potato farmers in the Cordillera.

Consequently, most potato farmer's in the Cordillera will seek to identify those seed suppliers who provide the best quality seed in terms of the impact that seed will have on the productivity of their crops. The low importance assigned to most of the service quality variables indicates that these are very much of secondary importance (with the exception of the seed supplier's willingness to offer credit and favourable terms of repayment).

Table 8.2. Variables influencing a Filipino potato farmer's choice of seed supplier.

	Mean	SD	$Z_{skewness}$
Supplier has a good reputation	6.97[a]	0.18	**-7.96**
Supplier provides pure (not mixed) seed	6.97[a]	0.34	**-13.80**
Supplier is financially strong	6.96[a]	0.22	**-6.08**
Supplier provides seed of desired physiological age	6.96[a]	0.27	**-7.87**
Supplier provides seed from a recognized seed area	6.95[a]	0.27	**-6.12**
Supplier has a strong customer base	6.95[a]	0.32	**-8.04**
Supplier provides seed that improves yield	6.95[a]	0.22	**-4.08**
Supplier offers favourable terms of repayment	6.94[a]	0.35	**-6.97**
Supplier offers competitive pricing	6.91[a]	0.36	**-4.98**
Supplier provides seed of the desired size	6.91[a]	0.31	**-3.81**
Supplier provides seed of desired variety	6.90[a]	0.31	**-3.12**
Supplier provides seed free from pests and disease	6.89[a]	0.36	**-3.22**
Supplier can provide desired quantity of seed	6.74[a]	0.47	-1.43
Supplier can offer credit	6.73[a]	0.67	**-2.61**
Supplier can deliver seed at planting time	6.70[a]	0.54	-1.74
Supplier introduces new varieties	6.55[a]	0.71	**-2.77**
Supplier offers continuous product support	6.47[b]	0.71	**-2.46**
Supplier is technically capable	6.21[c]	0.74	-1.81
Supplier provides technical information	6.21[c]	0.67	-0.53
Supplier offers other farm inputs	6.12[c]	0.72	-0.60
Supplier is technically competent	6.07[d]	0.55	-0.28
Supplier can meet immediate needs	6.00[e]	0.55	-0.31
Supplier provides training programs	5.79[e]	0.65	-0.74
Supplier can deliver seed to my farm	5.66[f]	0.70	-0.38
Supplier is close to my farm	5.54[g]	0.76	-0.62
Supplier can provide certified seed	5.33[h]	0.63	1.11
Shares the risk of potato growing	5.29[h]	1.48	-1.13
Supplier is willing to provide market information	5.23[i]	1.41	-0.08
Supplier provides imported seed	5.11[i]	0.66	-0.39
Supplier lets me visit their farm	4.94[j]	1.30	0.07
Supplier is in frequent communication with me	4.51[k]	0.98	0.69
Supplier visits my farm	4.23[l]	0.89	1.02
Supplier buys my ware potatoes	4.20[l]	0.93	0.33

where 1.0 is least important and 7.0 is most important
those values with the same superscript are not significantly different at p = 0.05
$Z_{skewness}$ coefficient indicates data is not normally distributed where value exceeds 1.96 at p = 0.05.

Since so many variables were rated as being very important, there was a strong possibility that significant correlations might exist between several of the variables. Principal component analysis revealed five factors that collectively explained over 74% of the variance (Table 8.3).

Table 8.3. Factors influencing a Filipino potato farmer's choice of seed supplier.

	Factor loadings				
	1	2	3	4	5
Strong customer base	.909				
Good reputation	.820				
Financially strong	.815				
Provides seed of desired physiological age	.800				
Offers favourable terms of repayment	.797				
Competitive pricing	.722				
Technically capable		.888			
Technically competent		.860			
Provides technical information		.770			
Provide desired variety			.826		
Provide quantity of seed required			.626		
Meet immediate needs			.607		
Visits my farm				.924	
Frequent communication				.917	
Seed is of the desired size					.855
Seed is free from pests and diseases					.825
Eigenvalue	4.131	2.519	1.876	1.753	1.635
Percent variance	25.81	15.75	11.73	10.95	10.22
Cumulative variance	25.81	41.56	53.29	64.24	74.46
Cronbach's alpha	.905	.849	.699	.844	.725
Factor mean	6.95	6.16	6.54	4.36	6.89

Factor One suggests that farmer's will seek to procure seed from those seed suppliers who have a good reputation. In purchasing seed potatoes, reputation is a very complex construct; not only is it a measure of the seed supplier's credibility (strong customer base and financial strength), but it is also a measure of the extent to which the seed supplier is able to satisfy the farmer's demand for seed which is competitively priced and of the desired physiological age. Seed suppliers who were perceived to have a strong customer base and to be financially strong were more likely to offer favourable terms of repayment and to provide seed that was competitively priced. Since many farmers in the Cordillera must borrow the capital to finance the crop, the major source of finance is the seed supplier (Tagarino *et al.* 1998). In most cases, the seed supplier extends credit on the basis that they will market the farmer's potato crop, deducting the cost of the seed and interest charges and returning the balance to the farmer. Since market prices often fluctuate widely and yields are highly unpredictable, choosing a seed supplier who

is financially strong will limit the farmer's exposure to financial ruin, for in the event of crop failure, a financially strong seed supplier may allow the farmer to repay the loan over many years.

Factor Two (technical competence) captured the farmer's preference to purchase from those seed suppliers who could provide technical information and who were perceived to be technically capable and technically competent. Feder *et al.* (1985) indicate that limited access to information is one of the major constraints to the rapid adoption of new technologies in the developing world. Given that most farms in the Cordillera are smaller than 0.6 hectares, farmers may be under pressure to actively search for better technologies to increase productivity per unit area. As technology is constantly changing and as the farmer becomes more proficient with the technology utilized, the potential for further gains in productivity arise. However, whether or not the farmer is able to take advantage of this opportunity is dependent upon whether they have access to the information.

Factor Three (functional quality) captured the seed supplier's offer quality in terms of their ability to deliver the quantity of seed required of the desired variety, and to meet the farmer's immediate needs. Although most potato farmers order the seed they require 3-4 months before planting, most farmers store at least some proportion of their harvest to use as seed for a subsequent crop. As a result of losses incurred during storage, the farmer may discover that he has insufficient seed available to plant the intended area. Another confounding variable could be the farmer's relative cash position at the time of planting. Should the farmer have land available and ready access to cash, the decision to purchase additional seed may be made at that instant. However, this issue may not relate to the seed at all, but rather to the seed supplier's ability to respond quickly to the farmers need for cash to purchase the chemicals required to control various pests and diseases that if unchecked have the potential to seriously reduce yields.

Factor Four (reassurance) captured the importance of information exchange and face-to-face communication between the farmer and their preferred seed supplier.

In the absence of a well developed telecommunications infrastructure, face-to-face communication and regular visits by the seed supplier to the farmer's property provided the most appropriate means for exchanging information and resolving any problems which may have arisen relating to the purchase of the seed.

Factor 5 (seed quality) captured two of the most important technical quality dimensions; seed tuber size and seed sanitation. Small tubers are preferred by most potato farmers, because if larger tubers are used a greater weight of seed per unit area must be planted (Beukema and van der Zaag 1990). Of course, seed that is substantially free of pests and diseases will have a greater yield potential, not only for the current crop, but any other potato crops derived from that seed. It was thus no surprise to find that Factor Five, since it explained the least amount of variance, was also one of the most important factors. The low variance suggested that this factor was important for all potato farmers in choosing between alternative seed suppliers.

However, while Factor One was the most important variable, it was also found to explain the most amount of variance. Since Factor One indicated the greatest potential to explain any difference between the farmers, clarification was sought by introducing the two cluster solution from Chapter 6 and performing discriminant analysis. It was found that Factor One (reputation) was significantly more important for the smaller farmers (Cluster Two)(Table 8.4).

Table 8.4. Factors influencing a Filipino potato farmer's choice of seed supplier by cluster.

Factor	Cluster means		P
	1	2	
Reputation	**6.84**	**6.97**	**0.002**
Technical competence	6.31	6.17	0.373
Functional quality	6.57	6.54	0.792
Reassurance	**5.21**	**4.28**	**0.000**
Seed quality	6.86	6.91	0.548

As Factor One was a composite factor containing both technical quality dimensions (physiological age of the seed) and functional quality dimensions, the factor was decomposed to identify which item measures explained the variance. The three item measures found to be significantly different were physiological age of the seed, competitive price and favourable terms of repayment (Table 8.5).

Table 8.5. Importance of Factor One item measures in a Filipino potato farmer's choice of seed supplier by cluster.

Variables	Cluster means		P
	1	2	
Strong customer base	6.93	6.99	0.120
Good reputation	7.00	6.98	0.672
Financially strong	7.00	6.97	0.581
Desired physiological age	**6.86**	**6.99**	**0.008**
Favourable terms of repayment	**6.64**	**6.99**	**0.000**
Competitive pricing	**6.64**	**6.96**	**0.000**

All of these variables were found to be significantly more important to the smaller farmers (Cluster Two). The larger farmers (Cluster 1) were much less concerned about the price of the seed and the importance of favourable terms of repayment presumably because they had greater access to capital and could negotiate better terms than those generally available to the smaller farmers.

The reduced importance on the physiological age of the seed would suggest that the larger farmers, being more able to pay a substantially higher price for the seed, were more able to purchase higher quality seed. As a result, the ability of the preferred seed supplier to provide certified seed and imported seed was significantly more important to the larger potato farmers (Table 8.6).

Table 8.6. Importance of seed quality in a Filipino potato farmer's choice of seed supplier by cluster.

Variables	Cluster means		P
	1	2	
Supplier can provide certified seed	**5.93**	**5.26**	**0.000**
Supplier can provide imported seed	**5.64**	**5.08**	**0.001**

Conversely, Factor Four (reassurance) was rated as being significantly more important by the larger farmers than it was for the smaller farmers. The larger farmers (Cluster One) demanded a greater frequency of visits to their farm and more frequent communication between the preferred seed supplier and themselves.

8.4 Chapter summary and implications

Since an examination of the factor means suggested that the seed supplier's reputation, seed quality, functional quality and their technical competence (to produce good quality seed) were important for all potato farmers, each of these factors could be considered as a pre-requisite. Unless the seed supplier was able to meet or to satisfy some pre-established minimum level of performance on each of these factors, the supplier would not be considered within the farmer's evoked set.

Quite clearly, with regard to the seed supplier's reputation, while it was envisaged that this would relate primarily to the seed suppliers ability to deliver good quality seed, the small farmers (Cluster Two) evaluated the seed supplier's reputation primarily by their ability to provide seed at a competitive price and to provide more favourable terms of repayment for the loan. Presumably this meant that the seed supplier would treat the farmer fairly and equitably and not seek to take advantage of them. These issues, which relate to relational satisfaction, trust and opportunism, will be explored in the following chapter.

As for the larger farmers (Cluster One), since they spend significantly more time choosing between alternative seed suppliers and are willing to pay more to procure good quality seed, they also expect a higher level of support from their preferred seed supplier. This support comes primarily in the form of greater communication and more frequent visits to the farm. Presumably, the purpose of these visits is to resolve any problems that may arise with the performance of the seed or a new variety.

Chapter Nine

EXPLORING THE NATURE OF LONG-TERM BUYER-SELLER RELATIONSHIPS IN THE FILIPINO SEED POTATO INDUSTRY

9.1 Chapter outline

This chapter begins with a description of the key relational variables existing between potato farmers in the Cordillera and their preferred seed suppliers. Utilising the model described in Chapter 4, principal component analysis was performed to identify the key constructs before testing the model using structural equation modelling (Amos 4.01). Regrettably, the hypothesised model fails to adequately fit the data. Various attempts to resolve the problem by re-specifying the model are constrained by the lack of normality, indicative of a more fundamental problem associated with the research methodology.

9.2 Describing the long-term buyer-seller relationships between potato farmers and their preferred seed suppliers

Although both Crissman (1989) and Tagarino *et al.* (1998) indicate that most potato farmers in the Cordillera were in some way dependent upon their preferred seed supplier, it was found that most potato farmers in the Cordillera were able to act independently of their preferred seed supplier (Table 9.1). Most farmers had complete control of their own farming enterprises, deciding for themselves what crop they would plant, when they would plant the crop and when they would harvest the crop. Farmers did not have to adhere to the seed supplier's demands, nor did the preferred seed supplier wield all the power or control all of the information in the relationship. Furthermore, most farmers indicated that they were free to choose an alternative seed supplier at any time and were, if necessary, able to purchase seed from several alternative suppliers. Even if the farmer's relationship with their preferred seed supplier was suddenly terminated, most farmers indicated that they would have little difficulty in finding an alternative seed supplier.

Table 9.1. Relational measures between Filipino potato farmers and their preferred seed suppliers

Items	Mean[a]	SD	Z_{skew}
Relational satisfaction			
There is good cooperation between my seed supplier and myself	5.99	0.58	-0.52
My supplier is quick to handle complaints	5.96	0.39	-0.83
My seed supplier provides the best seed	5.92	0.63	-0.26
My supplier treats me fairly and equitably	5.83	0.50	-0.98
The seed I obtain from my current seed supplier substantially improves the productivity of my crop	5.76	0.49	-0.45
Dealing with my current seed supplier is less risky	5.75	0.58	-0.04
Seed from my preferred supplier is consistently good	5.69	0.71	-0.51
It is more cost effective for me to rely on my existing seed supplier rather than to search for alternatives	5.60	0.79	-0.86
My seed supplier often meets my expectations	5.44	0.65	-0.34
I feel I am adequately rewarded by my seed supplier	4.36	0.69	1.66
Purchases fresh potatoes at an agreed price	1.79	1.44	1.84
There is much conflict between my seed supplier and myself	1.70	0.79	**2.12**
Trust			
I trust my most preferred seed supplier	6.17	0.49	0.34
I believe that my seed supplier has the necessary expertise to provide good quality seed	6.12	0.51	-0.21
I have confidence in my preferred seed supplier	5.97	0.37	-0.82
My seed supplier has a good reputation	5.93	0.40	-0.98
I believe in the information provided by my preferred seed supplier	5.74	0.55	-1.18
My preferred seed supplier always keeps their promises	5.58	0.64	-1.27
My seed supplier always considers my best interests	5.42	0.63	-0.40
My seed supplier is not always sincere	2.21	0.89	**2.16**
Power/dependence			
I am free to choose another supplier at any time	6.40	0.78	**-2.09**
My current seed supplier has the best seed relative to the alternatives	5.73	0.68	-1.49
I source seeds from a number of suppliers	4.16	1.15	-0.61
My preferred seed supplier sometimes acts opportunistically	4.04	0.81	-0.56
I am more dependent upon my seed supplier than they are upon me	3.93	0.45	-1.69
If my relationship was suddenly terminated, I would have great difficulty in finding an alternative supplier	1.58	1.15	**2.26**
I have no choice other than to adhere to my seed suppliers demands	1.31	0.87	**3.92**
My seed supplier controls all the information in our relationship	1.27	0.74	**3.53**
My seed supplier has all the power in our relationship	1.24	0.70	**3.31**
My seed supplier determines what I grow, when I plant and when I harvest	1.22	0.63	**3.42**

Table 9.1. Relational measures between Filipino potato farmers and their preferred seed suppliers (contd)

	Mean[a]	SD	Z_{skew}
Continuity			
Expect relationship to continue	6.92	0.32	**-4.21**
Will continue to interact with seed supplier	6.90	0.36	**-4.48**
Relationship specific investments			
Adapts product offer	4.89	0.67	0.56
My preferred seed supplier seems willing to help me grow potatoes	4.73	1.03	0.37
My preferred seed supplier is willing to share the risk of crop failure	4.72	1.14	0.27
My supplier frequently asks how he might improve the level of product quality and service	4.69	0.83	0.72
My supplier spends time with me to ensure I know what to expect from the seed I have purchased	4.61	0.92	-0.11
Provides seed even when it is scarce	4.28	0.83	0.48
My seed supplier advises of supply problems	3.79	0.90	0.57
My preferred seed supplier provides financial assistance during difficult times	3.68	1.04	1.01
My preferred seed supplier is willing to share the cost of evaluating new varieties	3.29	1.13	1.15
Keeps me informed on technical matters	3.28	0.97	1.56
Well informed on market price	3.26	0.90	1.37
My seed supplier provides all the inputs for my crop	1.45	0.90	**2.12**

[a] where 1 is "I disagree a lot" and 7 is "I agree a lot"
$Z_{skewness}$ coefficient indicates data is not normally distributed where value exceeds 1.96 at $p = 0.05$.

Nevertheless, there was strong evidence to suggest that most farmers expected to continue to transact with their preferred seed supplier. Presumably, the farmer's decision to continue to transact with their preferred seed supplier substantially reduced the risk associated with purchasing seed of unknown quality.

The preferred seed supplier was generally trusted and had a good reputation. Farmers believed that their preferred seed supplier had the necessary expertise to provide good quality seed and were confident that their preferred seed supplier could deliver good quality seed. Most were willing to believe the information provided by their preferred seed supplier, indicative of a high level of credibility. Although marginally lower, most potato farmers reported that their preferred seed supplier always kept their promises. Since the preferred seed supplier generally

considered the farmer's best interests and was most often quite sincere in their business transactions, there was evidence to suggest that most preferred seed suppliers also acted benevolently towards the farmer.

Generally there was evidence of good cooperation and minimal conflict between the farmer and their preferred seed supplier, with most farmers believing that their preferred seed supplier had met their expectations. However, in comparison to the other item measures, it would appear that many farmers felt they had been inadequately rewarded. Such would suggest an element of dissatisfaction, either with the quality of the seed received, the prices received from the output market, or both.

With most farmers reporting only moderate levels of satisfaction with regard to the consistent quality of the seed purchased and the modest improvement in productivity achieved, poor quality seed remains a significant constraint. To the extent that the preferred seed supplier provided the best quality seed relative to the alternatives, farmers can rationally be expected to locate the best seed supplier. However, in the absence of a certified seed system, the quality of the seed generally available will fall well below that which farmers have come to expect. Presumably, this comparison is based on the superior performance of imported seed or the farmer's involvement in various seed improvement programs. Either way, farmers have some knowledge as to the seed quality they believe they should be able to obtain.

With regard to the prices received in the output market, some dissatisfaction was also evident. The preferred seed supplier seldom purchased the farmers' potatoes at an agreed price, presumably because farmers wanted a higher price than that which the market was willing to pay. However, since most farmers indicated that they had been treated fairly and equitably, this would suggest that where the farmer had entered into some credit arrangement with the preferred seed supplier, the proportion of the gross receipts returned to the farmer were perceived to be fair and equitable. Nevertheless, there was some possibility that the preferred seed

supplier could choose to act opportunistically. However, without reliable market information, it would prove very difficult for the farmer to detect that opportunism, unless the farmer sold similar quality potatoes to more than one trader on any one particular day.

Most potato farmers in the Cordillera indicated that their preferred seed supplier did not provide all the inputs for the crop, nor was the preferred seed supplier always willing to provide financial assistance or to share the risk of crop failure. Most seed suppliers were perceived to be quite poor in regularly providing market information and technical information, despite most farmers indicating the need for more information. Nevertheless, most farmers indicated that their preferred seed supplier was willing to adapt their product offer and to take various steps to improve the level of product quality and the service offered. Most seed suppliers were perceived to be willing to help the farmer grow potatoes and to take the time to explain to farmers what they could expect from the seed they had purchased. Some were even willing to advise of supply problems and to advise when seed was scarce.

While seldom reported in most data outputs, in this instance the $Z_{skewness}$ coefficient has been recorded. This is particularly troublesome for it indicates that eleven of the item measures used are not normally distributed. What is particularly disturbing is that the greatest departure from normality occurs with the two item measures used to evaluate the key dependent variable (commitment).

Working with data that is normally distributed is the most fundamental assumption in multivariate analysis (Hair *et al.* 1998). Any significant variation from normality may invalidate most statistical tests and seriously compromise the operation of most multivariate data analysis techniques and is especially critical when used in structural equation modeling.

While a number of data transformation techniques are available to accommodate non-normal data distributions, including taking the square root, logarithms or even

the inverse of the variable (Hair *et al.* 1998), none of these techniques were able to adequately rectify the problem. Such is indicative of a more fundamental problem associated with questionnaire design and data collection.

9.3 Operationalising the constructs

Since it was not possible to repeat the data collection process, the decision was made to push ahead and to investigate to the maximum extent possible, the nature of the long-term relationships between Filipino potato farmers and their preferred seed suppliers.

In order to proceed, it was first necessary to define the key dependent variable. Exploratory factor analysis was used to confirm that the two item measures used to evaluate the farmer's desire to maintain their relationship with their preferred seed supplier were adequately correlated. Principal component analysis (with varimax rotation and Kaiser normalization) produced a single factor, which, with a Cronbach's alpha coefficient of 0.962 was considered very robust (Table 9.2).

Table 9.2. Continuity: the dependent variable

Continuity items	**Factor loading**
Expect relationship to continue	.984
Will continue to interact with seed supplier	.984
Cronbach's alpha = 0.9624	

The remaining 42 independent and moderating measures were then entered into exploratory factor analysis. The initial result produced a ten-factor solution that collectively explained 70% of the variance. However, nine item measures were observed to cross-load with factor weightings greater than 0.4 and there were three items with a factor loading less than 0.5. Furthermore, four single factor item measures emerged which explained just 8% of the variance. Since none of these related directly to the hypotheses to be tested, all four items were excluded and the exploratory factor analysis repeated.

After removing these items, a second run produced a five-factor solution that explained 60% of the variance. For four of the factors, the structure of the constructs remained basically unchanged. However, the fifth factor that emerged proved to be unreliable (Cronbach's alpha = 0.285) and was subsequently excluded. Similarly, those variables that cross-loaded by more than 0.4 were excluded and the analysis repeated.

Following these changes, the third attempt resulted in a very robust solution that adequately captured the three independent variables and one moderating variable. Collectively, this solution explained 74% of the variance (Table 9.3).

With a factor mean of 1.32, Factor One (dependence) comprised five item measures that indicated beyond any doubt that the majority of potato farmers in the Cordillera were not dependent upon their preferred seed suppliers. The preferred seed supplier did not have all the power or control all of the information in the relationship. Farmer's did not have to adhere in anyway to the seed supplier's demands, nor did the preferred seed supplier have any influence on the farmer's cropping pattern. Furthermore, most farmers indicated that they would experience little difficulty in finding an alternative seed supplier should the relationship be suddenly terminated.

This result was not entirely unexpected. Since most potato farmers in the Cordillera retained up to 20% of their harvest for seed, there was little need for them to purchase additional seed unless they were intending to expand the area of potatoes cultivated, they had experienced inordinately high losses during storage, or the farmer had made a conscious decision to seek to replace some proportion of their seed. Most farmers made the decision to purchase seed when they could afford to, for seed was generally available in the quantities most farmers required. Since over 87% of the seed supplied came from the informal seed system, it was no surprise to find that farmers had many alternative seed suppliers.

Table 9.3. Results of principal component analysis.

Relational items	Factor loading
Dependence	
My seed supplier controls all the information in our relationship	.914
My seed supplier determines what I grow, when I plant and when I harvest	.900
My seed supplier has all the power in our relationship	.900
I have no choice other than to adhere to my seed suppliers demands	.830
If my relationship was suddenly terminated, I would have great difficulty in finding an alternative supplier	.793
Economic satisfaction	
Seed from my preferred supplier is consistently good	.826
The seed I obtain from my preferred seed supplier substantially improves the productivity of my crop	.791
Dealing with my preferred seed supplier is less risky	.790
It is more cost effective for me to rely on my existing seed supplier rather than to search for alternatives	.776
My preferred seed supplier has the best seed relative to the alternatives	.670
Relationship-specific investments	
My preferred seed supplier provides seed even when it is scarce	.812
My preferred seed supplier provides financial assistance during difficult times	.744
My preferred seed supplier advises of supply problems	.641
Trust	
My preferred seed supplier always keeps their promises	.908
I believe in the information provided by my preferred seed supplier	.902

	Dependence	Satisfaction	RSI	Trust
Eigenvalue	4.131	3.270	2.035	1.718
Percent variance	27.54	21.80	13.57	11.46
Cumulative variance	27.54	49.34	62.91	74.37
Cronbach's alpha	0.943	0.862	0.800	0.826
Factor mean	1.32	5.70	3.92	5.65

While it was expected to capture the farmer's social and economic satisfaction with the exchange, most of the social dimensions were found to cross-load with trust. As a result, most were excluded. Consequently, Factor Two (economic satisfaction) comprised five item measures that evaluated seed quality and the positive impact that good quality seed had on the productivity of the crop. In the absence of any certified seed system that might provide the farmer with some assurance that the seed they had purchased was substantially free of pathogens,

farmers endeavoured to purchase seed from those seed suppliers who have provided good quality seed in the past. Dealing with the preferred seed supplier was perceived to be less risky. Since seed quality cannot be readily ascertained by a visual inspection and there is much variation in seed quality between alternative suppliers, farmers considered it more cost effective to rely upon existing seed supplier(s), rather than to search for alternatives.

The final variable to be included in economic satisfaction came not from the proposed measures of satisfaction, but from dependence. Proposed initially by Anderson and Narus (1990), potato farmers were expected to be more dependent on those suppliers who provided the best quality seed, relative to the alternatives (C_{alt}). However, since farmers have indicated that they are not dependent upon their preferred seed suppliers, it was most appropriate that this variable was found to correlate with the other measures of economic satisfaction.

Factor Three (relationship-specific investments) comprised just three item measures. Although a total of 12 item measures were initially proposed to capture the seed supplier's willingness to invest in their relationship with the farmer, most were excluded because of cross loading with either satisfaction or dependence. The remaining three variables evaluated the extent to which the preferred seed supplier was willing to advise of supply problems, to provide seed when it was scarce and to provide financial assistance when it was required.

In describing commitment, Ford (1984) suggested that a supplier could demonstrate their commitment to a customer by directing their efforts solely towards meeting the needs of that customer. Such might be associated with favouring existing customers in times of product shortage or providing detailed technical information and delivery information. Indeed, this dimension seems to have captured the various instrumental commitments that the preferred seed supplier was willing to make to secure the farmer's business. Since two of these commitments are not readily transferable (willingness to provide seed when it is

scarce and to provide finance when required), they are considered to constitute a relationship-specific investment.

Factor Four (trust) comprised two item measures, both of which were measures of the seed supplier's credibility (always keeping promises and belief in the information provided). The other trust dimensions were found to cross-load with both satisfaction and dependence and were excluded.

Anticipating that these relational constructs may be more or less prevalent among some farmers, discriminant analysis was performed using the pre-determined clusters. As expected, some significant differences were detected (Table 9.4).

Table 9.4. Results of principal component analysis by cluster.

Factor	Cluster means		P
	1	2	
Dependence	**2.52**	**1.22**	**0.000**
Economic satisfaction	5.83	5.69	0.309
Relationship-specific investments	**4.81**	**3.84**	**0.000**
Trust	5.89	5.65	0.105
Continuity	**6.78**	**6.94**	**0.035**

The larger farmers (Cluster One) were found to be more demanding of the need for the preferred seed supplier to make various relationship-specific investments. This required the preferred seed supplier to provide financial assistance during difficult times, provide seed when it was scarce and to advise of supply problems. As a result, the larger farmers were found to be more dependent upon their preferred seed supplier. However, the larger farmers were also less likely to maintain their relationship with their preferred seed supplier. Although the literature suggests that firms will endeavour to escape from those relationships in which they are more dependent (Heide and John 1988), the larger potato farmers have entered into these relationships by choice. Since there was a high degree of economic satisfaction and trust in the exchange, the only possible explanation for this behaviour is their constant desire to identify the best possible source of seed.

When and if a better seed supplier could be identified, given that there were few switching costs, the larger farmers could readily change seed suppliers.

9.4 Specifying and testing the structural equation model

Having identified significant differences between the two clusters with respect to three of the constructs, ordinarily, the sample would be split into two and the proposed hypotheses tested for each cluster. However, since Cluster One contains only 14 farmers, this is simply not possible.

Using the graphics mode in the AMOS (Version 4.01) program, each of the three independent variables (economic satisfaction, relationship specific investments and trust), the key dependent variable (continuity) and the moderating variable (independence) were entered into the model with each of their associated indicator variables and error terms (Figure 2).

To test the model, two data input options are available. Where exploratory factor analysis produces a "clean" solution, there is a minimum of cross loading between the item measures and all factors extracted meet the minimum standards of reliability, the saved factor scores may be used directly. The option, having identified from exploratory factor analysis which item measures load onto which construct, is to assign the appropriate item measures to their respective construct. Hair *et al.* (1998) suggests that if generalisability or transferability is desired, the use of the surrogate variables rather than the factor score is more appropriate.

The initial information provided by the AMOS output file was encouraging. With 170 distinct sample moments and 60 distinct parameters to be estimated, there were 110 degrees of freedom, indicative of an over-identified model. As the minimum was achieved, the estimation process yielded an admissible solution (Bryne 2001) (Table 9.5).

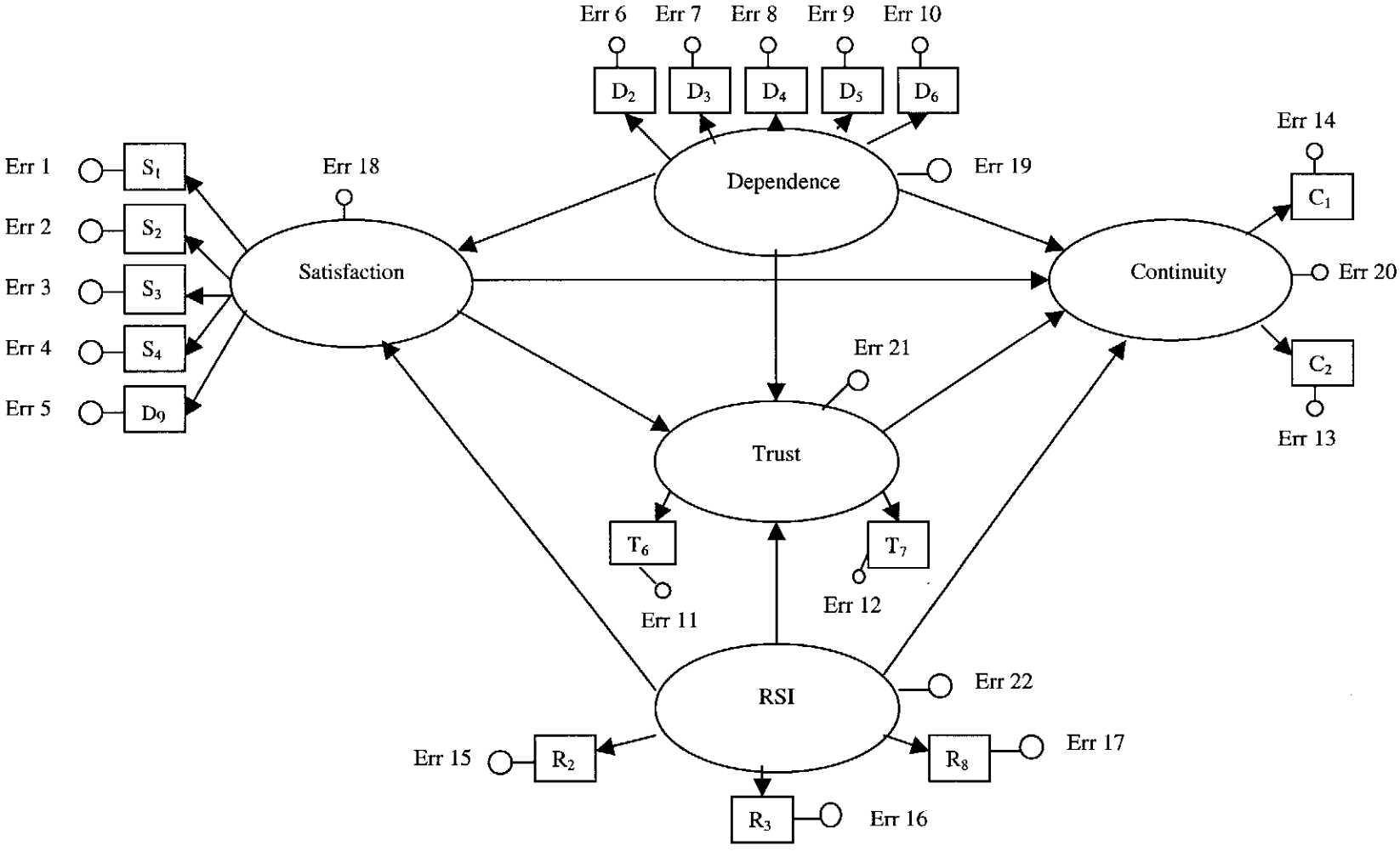


Figure Two. AMOS 4.1 Graphics model

Table 9.5. Amos output data[5].

Number of distinct sample moments = 170
Number of distinct parameters to be estimated = 60
Degrees of freedom = 110

Chi-square = 351.42
Degrees of freedom = 110
Probability level = 0.000

	Estimate	SE	CR
Satisfaction to trust	0.175	0.061	**2.866**
Trust to continuity	0.061	0.035	1.734
Satisfaction to continuity	0.087	0.029	**3.059**
RSI to continuity	1.684	1.496	1.125
RSI to trust	0.594	0.528	1.125
RSI to satisfaction	3.291	0.949	**3.470**
Dependence to satisfaction	0.124	0.074	1.690
Dependence to trust	-0.148	0.060	**-2.465**
Dependence to continuity	-0.361	0.029	**-12.253**

	NFI	RFI	IFI	TLI	CFI
Default model	0.979	0.971	0.985	0.980	0.985
Saturated model	1.000		1.000		1.000
Independence model	0.000	0.000	0.000	0.000	0.000

	PRATIO	PNFI	PCFI
Default model	0.719	0.704	0.708
Saturated model	0.000	0.000	0.000
Independence model	1.000	1.000	1.000

	RMSEA	LO 90	HI 90	PCLOSE
Default model	0.097	0.086	0.109	0.000
Independence model	0.680	0.671	0.689	0.000

	AIC	BCC	ECVI
Default model	471.423	481.517	2.032
Saturated model	340.00	368.598	1.466
Independence model	16611.478	16614.338	71.601

[5] Midway through the data output, AMOS reported that one of the error terms associated with the key dependent variable was negative. The most obvious solution would be to simply remove the variable and its associated error term, but having done so, the model failed to run at all and numerous efforts to resolve the problem proved unsuccessful. Sweetwaters Corporation, the designers of the AMOS program, were unable to offer any advice to resolve this problem. Even the alternative of using summated factor scores (Hair *et al.* 1998) failed to resolve the problem, ultimately resulting in a less than optimal model being accepted. As anticipated earlier, the deviation from normality probably did have a significant adverse affect on the ability of the program to analyze the data to the full extent possible.

However, the primary interest of structural equation modeling is to determine the extent to which the hypothesized model adequately describes the sample data. In structural equation modeling, the null hypothesis (H_0) being tested is that the model will hold true in the population. Hence, in contrast to traditional statistical procedures, it is hoped that the null hypothesis will not be rejected (Bryne 2001). With a chi-square value = 351.42, this would seem very unlikely. Furthermore, the probability value associated with the chi-square estimate represents the likelihood of obtaining a chi-square value that exceeds the chi-square value when H_0 is true. The higher the probability associated with the chi-square test, the closer the fit between the hypothesized model and the data. With p = 0.000, the model should be rejected. However, both the sensitivity of the likelihood ratio test to the size of the sample and its dependence on the central chi-square distribution (which assumes the model fits perfectly in the population) has led to numerous problems (Bryne 2001). The chi-square value tends to be high when either the model does not hold and when the sample size is large.

The next step in determining an acceptable model fit is to examine the estimated values for each of the parameters under consideration (Bryne 2001). These parameter estimates should exhibit the correct sign and size and be consistent with the underlying theory. While negative estimates were observed between the moderating variable (dependence) and both trust and the farmer's desire to maintain their relationship with their preferred seed supplier, it was hypothesized in both instances that as dependence increased, both trust and the farmers desire to continue their relationship would decrease. However, while this was true for both trust and the desire to maintain the relationship, the association between dependence and satisfaction was observed to be non significant and positive.

While the standard error (SE) was considered to be within the acceptable limit for each of the hypothesized relationships, the critical ratio (CR) revealed that four of the nine hypotheses were not significant. Based on the level of significance sought (p = 0.05), the critical ratio needs to be greater than or equal to 1.96 (Byrne 2001). Since non-significant parameters (with the exception of error variances) are not

important to the model they should be deleted. Their inclusion will significantly reduce many of the parsimonious goodness-of-fit measures.

Bentler and Bonett's (1980) normed fit index (NFI) is the most practical criterion of choice (Bryne 2001). However, since the NFI has a tendency to under-estimate fit in small samples, the comparative fit index (CFI) is preferred. For a good model fit, both values should exceed 0.95. Since the NFI was 0.979 and the CFI was 0.985, both are indicative of a good model fit. Since both the relative fit index (RFI) and incremental index of fit (IFI) both exceed 0.97, this provides further evidence of a good model fit.

Giving attention now to the parsimonious measures of model fit, both the PNFI and the PCFI are greater than 0.70, which falls within the range of expected values (Bryne 2001). No doubt, removing the non-significant associations between trust and continuity; the willingness of the seed supplier to make relationship specific investments and trust; the willingness of the seed supplier to make relationship specific investments and the desire to continue the relationship; and the association between dependence and satisfaction would greatly improve these measures.

The root mean square error of approximation (RMSEA) takes into account the error of approximation in the population (Bryne 2001). Since values ranging from 0.08 to 0.10 indicate only a mediocre fit, with an RMSEA of 0.097, it was clear that some improvement in the proposed model was possible.

The next group of measures to be considered were the Akaike's information criterion (AIC) and the Browne-Cudeck criterion (BCC). Both criteria address the issue of parsimony in the assessment of model fit, taking into account the goodness-of-fit and the number of estimated parameters. For a good model, the fit statistics for the default model should be smaller than both the saturated and the independent model (Bryne 2001). Since the fit statistics for the default model are

marginally higher than the saturated model but significantly lower than the independent model, there is room for improvement.

Finally, the expected cross-validation index (ECVI) provides a means of assessing in a single sample, the likelihood that the model will cross-validate across similar sized samples from the same population. Specifically, it measures the discrepancy between the fitted covariance matrix in the analyzed sample and the expected covariance matrix that might be obtained in another sample of similar size. The model having the smallest ECVI exhibits the greatest potential for replication (Bryne 2001). Again, the default model was observed to be marginally higher than the saturated model, but significantly lower than the independent model.

9.5 A revised model

Returning to the initial likelihood estimates, it was observed that while relational satisfaction led to trust, trust did not lead to a desire to maintain the relationship. Without a significant positive association between trust and the desire to maintain the relationship, trust was more likely to be an independent variable rather than a dependent variable. Although the vast majority of literature indicates that trust is a key determinant in building and maintaining long-term buyer-seller relationships (Dwyer *et al.* 1987; Morgan and Hunt 1994), in an established relationship it is quite conceivable that after many repeat transactions, trust has been established. Since both Anderson and Narus (1990) and Geyskens *et al.* (1998) propose that trust leads to satisfaction, there is sufficient theoretical support to examine the reverse association.

Firstly, in order to test the revised direction of the trust-satisfaction relationship, a simple linear regression was performed, first using trust as the dependent variable and then relational satisfaction as the dependent variable. It was observed that the error term was marginally lower for the trust to satisfaction path (0.507), rather than the original satisfaction to trust path (0.534), supporting a change in the direction of the satisfaction-trust association.

Upon observing the revised output file from AMOS, it was apparent that eight of the nine hypotheses were now significant. While an association between trust and the farmers desire to maintain their relationship with their preferred seed supplier could not be established, the association between the seed supplier's willingness to make relationship specific investments and both trust and continuity was significant and positive. However, while the association between dependence and satisfaction was now significant, it still proved to be positive (Table 9.6).

Table 9.6. Revised model output data.

	Estimate	SE	CR
Trust to satisfaction	0.254	0.097	**2.608**
Trust to continuity	0.061	0.035	1.734
Satisfaction to continuity	0.087	0.029	**3.059**
RSI to satisfaction	2.559	1.126	**2.273**
RSI to trust	0.391	0.172	**2.273**
RSI to continuity	0.334	0.100	**3.346**
Dependence to satisfaction	0.156	0.073	**2.134**
Dependence to trust	-0.127	0.061	**-2.081**
Dependence to continuity	-0.361	0.029	**-12.253**

Despite the improvement in the ability of the revised model to accurately predict the hypothesized relationships, the various measures of model fit did not improve, suggesting at best, a very mediocre model.

9.6 Chapter summary

As predicted by the revised model, there was a significant positive association between trust and satisfaction. While no significant association could be found between trust and the farmers desire to maintain their relationship with their preferred seed supplier, a significant positive association between satisfaction and the farmer's desire to maintain their relationship provided sufficient inducement for the farmer to pursue a long-term relationship. As predicted, there was a significant positive association between the willingness of the preferred seed supplier to make relationship-specific investments and trust, satisfaction and the farmer's desire to continue to transact with their preferred seed supplier.

Although, as hypothesized, there was a significant negative association between dependence and trust and the farmers desire to maintain their relationship, the association between dependence and satisfaction was found to be positive and therefore the hypothesis was rejected.

In order to explain this unexpected result, simple linear regression was performed using each of the five item measures of satisfaction as the dependent variable and each of the five item measures of dependence as the independent variable. For the four power dimensions (the extent to which the preferred seed supplier controlled all the information; the extent to which the seed supplier determined what the farmer grew and when the farmer grew it; the extent to which the seed supplier had all the power in the relationship; and the extent to which the farmer had to adhere to the seed supplier's demands), there was no significant association between dependence and satisfaction. However, with regard to the final variable (the difficulty the farmer would experience in finding an alternative seed supplier if the relationship was suddenly terminated), the association was both significant and positive. Presumably, since the preferred seed supplier provided the best quality seed available, a significant positive association between satisfaction and the difficulty in finding an alternative supplier (dependence) arose. Theoretical support for this association is provided by Heide and John (1988), Frazier *et al.* (1989) and Andaleeb (1996).

Conversely, in investigating the nature of the association between dependence and both trust and continuity, while the associations between the difficulty the farmer would experience in finding an alternative seed supplier if the relationship was terminated were not significant, to a varying extent, each of the four power item measures were significant and negative as hypothesized.

Since different aspects of the dependence construct (the use of coercive power and the availability of alternative suppliers) impacted differently upon relational satisfaction, trust and continuity, this would suggest that the dependence construct was multi-dimensional rather than unidimensional. A superior solution might be

achieved if dependence were to be broken into its two component parts: power and the availability of alternative suppliers. However, since six out of the ten dependence measures are not normally distributed, the fundamental problem still remains as to the admissibility of a final solution.

Since at best, only a mediocre model fit can be achieved, it is necessary to explore the various factors that may have led to the results achieved. In the following chapter, the extent to which the various item measures used may be universally applied will be examined and the association between trust and satisfaction examined in greater detail.

Chapter Ten

DISCUSSION[6]

10.1 Chapter outline

Having presented and tested an alternative model of long-term buyer-seller relationships in the seed potato market in the Cordillera, two issues emerge which have both practical and theoretical implications.

Firstly, since most of the item measures were developed from the theory of buyer-seller relationships in the industrialised world, their application to the study of relationships in the transitional economies must be examined.

Secondly, although there is some evidence to support the finding that trust is an antecedent to satisfaction (Anderson and Narus 1990; Ganesan 1994), in developing countries, the significance of trust in business-to-business relationships might be better explained by including dimensions such as institutional trust (Zucker 1986), system trust (Luhmann 1979) and social capital (Fukuyama 1995), which in the context of the industrialised nations, are generally taken for granted.

---

[6] This section draws extensively upon Batt, Peter J. (2003a), Examining the performance of the supply chain for potatoes in the Red River Delta using a pluralistic approach, *Supply Chain Management: an International Journal* (in press); Batt, Peter J. and Nyoman Parining (2002), Trust building behaviour within the Balinese fresh produce industry, in Batt, Peter J. (ed), *Culture and Collaboration in Distribution Networks. Proceedings of the inaugural meeting of the IMP Group in Asia.* Curtin University [cd]; Batt, Peter. J. (2001d), Relational quality: further evidence of a single higher order construct in an industrial market, in *Interactions, Relationships and Networks: Strategic Dimensions. Proceedings 17th Annual IMP Conference,* Norwegian Institute of Management (BI) [cd]; Batt, Peter J. and Helen Wilson (2001), Exploring the nature of long-term buyer-seller relationships in the Western Australian wine industry, *Australia New Zealand Wine Industry Journal,* Vol 16 (6), 87-96.

10.2 Employing appropriate item measures

Although the concept of relationship marketing has permeated mainstream marketing literature for almost three decades, it seems that few academics have sought to test the relationship marketing constructs in diverse national settings. This is regrettable, as differences in economic, competitive and political variables and cross-national differences in culture, management practice and management style, are expected to exert a significant impact on the key relationship marketing variables (Samiee and Walters 2003).

While Mavondo and Rodrigo (2001) indicate that it is common practice in the relationship literature for researchers to investigate international business relationships through the direct replication of Western constructs, in widely diverse cultures such an approach should be rejected on the grounds that the various measures will fail to adequately capture the true essence of the constructs.

Singh and Sirdeshmukh (2000) note that by defining both trust and satisfaction in global terms, significant conceptual problems can arise, as different respondents may use different attributes to evaluate both trust and satisfaction. However, they caution against developing different definitions for every situation as the constructs may then contain so many different attributes that they become cumbersome. Johnson *et al.* (2002) describe how the proliferation of aggregate measures of customer satisfaction has made it difficult to compare systematic differences in satisfaction across countries where different methods and measures are employed.

On a methodological note, Kumar *et al.* (1999) question whether it is appropriate to administer the same scales to participants in other countries. Low education and literacy levels may influence the response formats to the scales employed. Moreover, the culture in a country can also affect the responses and introduce some cultural bias.

Without denying that cultural differences may have a significant impact on the measures of long-term business-to-business relationships from one country to another, significant differences may also exist across industries and even within industries. Anderson and Narus (1990) demonstrate how the relationship between manufacturers and distributors differs, depending upon whether the relationship is viewed from the manufacturers perspective or the distributors perspective. Samiee and Walters (2003) observe significant differences in the nature of up-stream and down-stream relationships with regard to both satisfaction and power-dependence. Frazier *et al.* (1989) and Kumar *et al.* (1995) conclude that larger, more powerful firms are able to manage their relationship with smaller firms in order to achieve desired goals. File *et al.* (1994) observe significant differences in the nature of the industrial purchasing process between large corporate organisations and small family firms. Even within the firm itself, since most relationship studies have been undertaken within large firms and by necessity have involved multiple respondents, significant differences in the nature of the relationships between firms have been observed depending upon the position the individual occupies within the focal firm (Storer *et al.* 2002).

In this study, it was evident from the results of the exploratory factor analysis and from the exclusion of over 60% of the variables (either because of cross-loading or poor reliability) that the various relational measures employed have failed to adequately capture the true nature of the relationships that exist between potato farmers in the Cordillera and their preferred seed suppliers.

Ordinarily, before embarking upon any major research study to explore the nature of long-term buyer-seller relationships in a foreign country, exploratory research should be conducted with potential respondents. Through focus groups, the composition of the various constructs may be explored, not only by applying existing measures, but more importantly through in-depth enquiry, to identify any underlying dimensions that the existing measures fail to encapsulate.

In this instance, this most rudimentary process was not undertaken. Some time before the process of data collection began, the questionnaire was sent to the Philippines and proof read by two academics at Benguet State University who had previously been involved in an analysis of the marketing system for potatoes in the Cordillera. In their opinion, no amendments to the questionnaire were required.

As the Philippines was once a US colony, English is widely spoken. Furthermore, since the conclusion of World War Two, the Philippines have adopted many aspects of US culture, thus reducing the cultural distance. Therefore, few problems were expected to emerge both in the translation and in the respondent's ability to comprehend the questions asked of them. On the advice of the academics at Benguet State University, the questionnaire was not translated, for it was their belief that the majority of potential respondents would have no difficulty in responding to the various questions asked of them.

However, there is very little empirical evidence to demonstrate the extent to which the various relationship measures developed in the industrialised countries may or may not be applied in the developing countries. Regrettably, in this study, the ability to make direct comparisons with many of the existing measures was confounded by the introduction of several new potential measures of satisfaction and power-dependence.

To address this problem, the results of this thesis are compared with the results from four other exploratory studies (in which the author was directly involved) into the nature of business-to-business relationships in agribusiness that have used the same measures of satisfaction, trust and dependence. With two of these studies drawn from research in Australia (the fresh fruit and vegetable industry and the wine industry), one from Indonesia (the fresh vegetable industry) and one from Vietnam (the potato industry), the extent to which the various item measures may or may not be cross-culturally applied within agribusiness will be investigated.

While a summary of the various papers may be found in Appendix 4, the full papers are contained within the attached cd. These papers provide details of the methods of data collection, sampling and data analysis.

10.2.1 Satisfaction

As described earlier in the Methodology (Chapter Five), satisfaction is most often measured using a rating scale anchored at one end by satisfaction and at the other by dissatisfaction (Crosby *et al.* 1990; Dorsch *et al.* 1998; Frazier *et al.* 1989; Ganesan 1994). Various other measures of satisfaction (used in conjunction with the satisfaction-dissatisfaction scale) include rating scales anchored by pleased-displeased (Crosby *et al.* 1990; Dorsch *et al.* 1998; Ganesan 1994), favourable-unfavourable (Crosby *et al.* 1990; Dorsch *et al.* 1998), happy-sad (Ganesan 1994), and contented-disgusted (Ganesan 1994). However, while these measures may produce highly reliable scales, reliability is no guarantee of either the veracity or unidimensionality of the construct (Gerbing and Anderson 1988).

Babin and Griffin (1998) contend that many of these measures represent the thoughts that cause satisfaction, more than they indicate satisfaction itself. Selnes (1998) argues that satisfaction is a unidimensional construct and as such, is best measured by a single item measure. Drawing a parallel with trust, Selnes argues that the various item measures used to evaluate trust are in fact sources or antecedents of trust and are not therefore part of the construct. However, Johnson and Fornell (1991) state quite categorically that satisfaction is not directly measurable. Satisfaction is a latent construct, measured only indirectly through a number of proxy or indicator variables rather than one observable variable. Furthermore, Geyskens *et al.* (1999) argue that satisfaction is comprised not of one but two quite distinct dimensions: economic satisfaction and social satisfaction.

Quite deliberately in this research, given the inability of the existing measures of relational satisfaction to identify which attributes contribute to satisfaction (or dissatisfaction), a conscious decision was made to utilise a multiple number of

item measures. Since the use of multiple item scales for trust is widely accepted (Ganesan 1994; Morgan and Hunt 1994; Doney and Cannon 1997), there is no reason to presuppose why satisfaction should not also be measured by multiple indicator variables.

Ruekert and Churchill (1984) contend that despite the importance of satisfaction in exchange relationships, it remains a primitive construct. Tikkanen and Alajoutsijarvi (2002) argue how most existing approaches to the assessment and measurement of customer satisfaction are too simplistic and mechanistic to effectively tackle the complexity of the construct. While there is broad support for the concept that satisfaction is derived from the extent to which performance exceeds the customer's expectations (Oliver 1980), drawing upon the concepts proposed by Hakansson and Snehota (1995), Tikkanen and Alajoutsijarvi (2002) describe the need for measures of relational satisfaction to capture various elements of adaptations, cooperation and conflict resolution. Furthermore, adopting Geyskens *et al.* (1999) concept of economic and social satisfaction, measures should capture both the economic rewards and the costs associated with the exchange.

Ravald and Gronroos (1996) have described how firms seek to improve customer satisfaction by increasing the quality of the core product and the supporting services. However, few of the widely accepted quality models include any explicit measure of the prices or costs in the customer's judgement of quality. If customer satisfaction depends on value, then it must also depend upon the total costs. Economic performance can be viewed as the key reward and price as the key sacrifice (Voss *et al.* 1998). However, equally important is the manner in which the rewards obtained from the relationship are shared equitably between the exchange partners. Both Frazier (1983) and Anderson and Narus (1990) suggest that satisfaction with past outcomes indicates equity in the exchange.

To evaluate economic satisfaction, Geyskens and Steenkamp (2000) use a number of measures that relate satisfaction to various economic indicators including

profitability, sales volume, cost effectiveness and productivity. However, Geyskens *et al.* (1999) note that the proportion of economic items included in the satisfaction scale can lead to varying results. Conceptually, the extent to which a satisfaction scale captures the economic versus social aspects of the exchange will have an impact, both on the antecedents that influence satisfaction as well as the consequences promoted by satisfaction. Furthermore, they note that some aspects of social satisfaction have the potential to overlap with accepted measures of both trust and commitment.

While Wilson and Jantriana (1993) consider that an assessment of relationship value should begin with an examination of the economic value, Ravald and Gronroos (1996) report that customer-perceived value is highly situation specific. Furthermore, while economic benefits may enhance customer satisfaction for each exchange episode, it is more likely that the social benefits of the exchange are more important for the maintenance of long-term relationships. As a result, in comparing the results of this thesis with the other four independent studies, only the social satisfaction measures are used.

Somewhat contrary to expectations, respondents in the Philippines, Indonesia and Vietnam were no less satisfied with the social outcomes of the exchange than respondents in Australia (Table 10.1).

Since it is often assumed that small farmers in developing countries are subject to exploitation by various market intermediaries (Lele 1981; Harris-White 1995; Mendoza and Rosegrant 1995; Pomeroy and Trinidad 1995), it was expected that respondents in the developing countries would be significantly less satisfied with the outcomes of their exchange relationships. When farmers do not receive the financial rewards they anticipate, their preferred trading partner will be perceived as having failed to meet their expectations and when exploitation is detected, to have treated them unfairly and inequitably.

Table 10.1. Scaled means of relational satisfaction measures in cross-country comparisons.

Item	South East Asia			Australia	
	P	I	V	GG	FFV
Good cooperation	5.13	5.28	5.64	4.77	5.14
Quick to handle complaints	5.11	4.48	5.22	3.97	5.06
Fair and equitable	5.00	5.17	5.49	4.54	5.05
Meets expectations	4.66	4.72	5.55	4.54	4.81
Adequately rewarded	3.74	4.96	5.44	4.54	4.62
Much conflict [R]	5.39	4.22	4.91	4.61	5.79
Mean	4.83	5.07	5.37	4.55	5.07

where P is the Philippines
I is Indonesia
V is Vietnam
GG is grape growers
FFV is fresh fruit and vegetable growers

Since both the Philippines and Indonesian data sources used a seven point scale, mean responses have been adjusted to correspond to the six point scales used in the three other studies.

However, there was no evidence to suggest that farmers in the transitional economies felt they had been inadequately rewarded nor any evidence to suggest that preferred trading partners had not adequately met their expectations. Preferred trading partners not only treated them fairly and equitably but were quick to handle the farmer's complaints and there was minimal evidence of any significant conflict in the relationship that might suggest farmers had been exploited. In general, respondents in the transitional economies indicated higher levels of cooperation with preferred trading partners than those seen in Australia.

While locational factors may potentially limit the number of intermediaries available to transact with primary producers (Pomeroy and Trinidad 1995), respondents in the transitional economies and fresh fruit and vegetable producers in Australia indicated that they could readily chose an alternative exchange partner. Presumably, since there are a greater number of potential exchange partners, farmers will choose that exchange partner who provides the best offer.

Johnson, Herrmann and Gustafsson (2002) indicate that satisfaction is generally higher where there is greater competition. The more limited the competition, the less incentive there is for suppliers to meet the needs of different customers. Johnson and Fornell (1991) indicate that satisfaction will also be low when alternative suppliers make relatively homogeneous offers.

However, satisfaction will increase by a greater magnitude when the products or services offered reduce losses more than when those same products and services increase gains (Ravald and Gronroos 1996). Monroe (1991) claims that a customer will value a reduction in costs more than a corresponding increase in benefits. From the perspective of a Filipino potato farmer, purchasing poor quality seed will have a much greater impact on the productivity of the crop than purchasing superior quality seed. For the farmers in Indonesia, Vietnam and the fresh fruit and vegetable growers in Australia, selecting a poor exchange partner will have a significant negative impact on the prices they receive from traders and indeed, while satisfaction with the exchange will decline, inadvertently selecting an untrustworthy trader may result in non payment and the complete loss of income from the produce received by that trader.

Since satisfaction is fundamentally measured by the extent to which the customer's expectations have been fulfilled, even although Filipino potato farmers may be dissatisfied with the quality of the seed generally available, over time they will learn to lower their expectations to reduce outcome uncertainty. Johnson and Fornell (1991) describe how satisfaction increases with experience. For customers with extensive experience, expectations and performance perceptions will draw closer together, thereby reducing the gap.

10.2.2 Trust [7]

Trust is a concept that means many different things to many different people. However, most concepts of personal trust share three common elements: (1) some degree of interdependence between the trustee and trustor; (2) trust provides a means of coping with uncertainty in the exchange; and (3) trust is a belief or an expectation that the vulnerability resulting from the acceptance of risk will not be taken advantage of by the other party (Lane 2000).

Trust may be value-based or emotion-based, calculative, or based on the qualities one expects a trusted person to possess (Lane 2000). Zucker (1986) describes trust between organisations in the context of process-based trust, characteristics-based and institutional-based trust. Process-based trust is derived from a social system of mutual obligations, where each partner has clear expectations of the other's behaviour. Characteristics-based trust is tied to specific individuals, where various demographic characteristics serve as indicators of membership to a common cultural system with shared expectations. Institutional-based trust rests upon membership in a subculture within which clearly delineated expectations are held and from various intermediary mechanisms that the trustee undertakes to protect the interest of both partners.

Platteau (1994) conceptualises trust at two levels: limited group morality and generalised morality. Limited group morality is restricted to those people with whom the actor has close identification, while generalised morality is applicable to society in general. It is a society's predisposition towards generalised forms of normality that is essential for the development of trust as it leads to improved communication channels and social cooperation.

Humphrey and Schmitz (1998) suggest that trust operates at two levels: in the ordering of the relationships required for basic market transactions (minimal trust)

[7] In addition to the papers cited earlier, this section draws upon Batt, Peter J. (2003), Building trust between growers and market agents, *Supply Chain Management: an International Journal,* Vol 8 (1), 65-78; Batt, Peter J. (2001e), The Universality of Trust? in Chetty, S. and B. Collins (ed), *Proceedings Australia New Zealand Marketing Academy. Bridging Marketing Theory and Practice,* Massey University, Auckland, New Zealand. [cd]

and in the relationships that sustain the cooperation seen in industrial supply chains and clusters (extended trust). Particularly in the developing world, where institutional mechanisms for redress are lacking and actively engaging in opportunistic behaviour is often rewarded, the benefits of extended trust become obvious when unanticipated contingencies are dealt with through cooperation. The incentive to cooperate is greatest when firms face challenges they cannot easily address on their own.

In long-term buyer-seller relationships, Sako (1992) finds it necessary to differentiate between contractual trust, competence trust and goodwill trust. Contractual trust rests upon the moral norm of honesty and keeping promises. Competence trust is based on the expectation that the trading partner will perform its role competently. Goodwill trust is described as the willingness of the exchange partner to do more than expected. Someone who is worthy of goodwill trust is dependable and can be granted some discretion, for they can be trusted to take initiatives while refraining from taking unfair advantage.

Handfield and Betchel (2002) describe how trust is a function of sustained reliable performance. However, trust is not a necessary ingredient for exchange, just as the presence of distrust does not, in and of itself, preclude purchase. Situational and contextual factors will determine the importance of trust in the transaction. Typically, trust becomes important when the transaction involves a high degree of performance ambiguity and where significant consequences may arise from the use or application of the product (Singh and Sirdeshmukh 2000). Trust will become all the more important when intangible assets are transferred between the parties (Murphy 2002).

In the absence of any certified seed system, Filipino potato farmers are generally unable to ascertain the quality of the seed they have purchased until some weeks after planting and it is only at harvest, 90 to 120 days later, that the farmer is finally able to evaluate the productivity of the seed. Since many other factors may intervene and potentially influence both the emergence of the seed and the

subsequent productivity of the crop, seed suppliers have an opportunity to cheat. Furthermore, in making the decision to purchase seed, farmers expose not only their business but also themselves and their immediate family to potential loss. To guard against this, potato farmers will actively seek, through the words and actions of other people (and organisations), those suppliers who they perceive to be most trustworthy. But in who and or what does the farmer trust?

Plank *et al.* (1999) contest that while trust is a global belief on the part of a buyer that their exchange partner will fulfil their obligations, trust is comprised of three individual components: product trust, sales-person trust and company trust. Anderson and Narus (1990), Doney and Cannon (1997) and Smeltzer (1997) find it necessary to differentiate between trust in an individual and trust in an organisation. However, since both inter-personal trust and inter-organisational trust are based upon the outcome of successful exchange experiences with a partner (Sydow 2000), it can become difficult to differentiate between personal trust and organisational trust. Because trust is difficult to define, it is difficult to measure, thus the various measures used to evaluate trust may not necessarily capture all of the facets (Smeltzer 1997).

Furthermore, trust may vary not only between individuals and organisations, but also between nationalities (Conway and Swift 2000). While it is much easier to trust someone if one can relate to them, differences in culture, accepted business practice, the economic environment, legal system and communications infrastructure will make the development of trust in international markets a most challenging task (Skarmeas and Katsikeas 2001).

Aulakh, Kotabe and Sahay (1996) describe how the role of trust in inter-organisational partnerships and its underlying dynamics may vary according to the internal organisational culture of the partner as well as the broader cultural environment. Smeltzer (1997) considers how trust is influenced by the length of the relationship, the dynamics of the industry, the people involved and the number of times and extent to which trust has been tested in the past. People will generally

trust one another until such time as the exchange partner takes various actions to destroy trust. However, only one instance of opportunistic trading may be enough to destroy trust. Trust is therefore a highly dynamic variable, contingent not only upon the stage of development of the relationship (Dwyer *et al.* 1987; Lane 2000), but the continuous reassessment of an actor's performance to build and maintain trust (Ford 1980). Trust evolves over time, yet trust will grow and wane in business-to-business relationships much as it does in interpersonal relationships (Smeltzer 1997).

To understand trust, Lyon (2000) believes that it is necessary to understand how markets operate in different countries and to be sensitive to local path dependencies, rather than to assume there are universal market forces or conditions that can be transplanted everywhere. Similarly, Moore (1999) suggests that it is dangerous to conflate trust over a wide range of social domains and to assume that one is describing an equivalent phenomenon in all contexts. Trust is not a generic phenomenon nor is it similar in all social domains. The concept of trust is both emotive and of different emotional significance in different cultures.

Especially in the developing world, where there is imperfect information and the lack of any effective legal mechanism for handling disputes, trust will rely to a much greater extent upon reputations, sanctions and moral norms, where the most commonly reported reason for trusting someone is the result of a long-standing relationship and personal friendship (Platteau 1994; Fukuyama 1995; Lyon 2000).

In a market where information about a firm or an individual's trustworthiness is shared among other firms only by personal recommendation, reputation is a form of social collateral that can guarantee contract performance without prior acquaintance (Fafchamps 1996). Concern for ones reputation may be sufficient to ensure compliance and to enable firms to offer credit or take large orders without knowing each other personally.

Herbig and Milewicz (1995) view reputation as a customer's estimation of the consistency over time of an attribute, based on an evaluation of their exchange partner's willingness and ability to perform an activity repeatedly in a similar fashion. Similarly, Moorman, Zaltman and Deshpande (1992) regard reputation as an indicator of reliability. Derived primarily from personal experience, perceptions of past performance may also be drawn from the various signalling behaviours the partner undertakes to both develop and maintain its reputation (Fombrun and Shanley 1990). Reputation thus creates expectations, not only about the key attributes of the exchange partner, but also about how the partner will behave in the future.

With the exception of reputation, very few of these aspects can be found in the various measures of trust developed in the relationship marketing literature. Even though numerous measures of trust have been developed and validated in the industrialised world, few studies have attempted to utilise these measures across countries and across cultures. Sako (2000) compares trust across business relationships in the US, Japan, the UK, Germany and Europe, noting significant differences for each of the trust dimensions (contractual, competence and goodwill), equity and opportunism.

Using eight item measures developed by Doney and Cannon (1997), the extent to which the trust measures can be universally applied across a number of South East Asian countries and Australia was explored in each of the parallel studies.

It was immediately apparent that trust was more important in exchange relationships in the developing countries (Table 10.2). Respondents in the Philippines, Indonesia and Vietnam indicated higher levels of trust in their preferred trading partner than respondents in Australia. Respondents in the transitional economies had greater confidence in their preferred trading partner and were more likely to believe the information provided by their preferred trading partner. In the transitional economies, preferred trading partners were more likely to keep their promises and invariably had a better reputation.

Table 10.2. Scaled means of trust measures in cross-country comparisons.

Item	South East Asia			Australia	
	P	I	V	GG	FFV
Trust partner	5.29	5.28	5.36	4.69	4.79
Has necessary expertise	5.25	5.16			5.60
Have confidence	5.12	5.29	5.58	4.56	5.03
Good reputation	5.08	5.54	5.46	4.92	5.03
Believe information	4.92	4.81	5.05	4.69	4.78
Keeps promises	4.78	5.09	5.54	4.54	4.55
Considers my best interests	4.65	4.34	3.81	3.92	4.38
Not always sincere [R]	4.95	4.27	5.53	4.30	4.87
Mean	5.01	5.13	5.25	4.53	4.68

where P is the Philippines
I is Indonesia
V is Vietnam
GG is grape growers
FFV is fresh fruit and vegetable growers

Since both the Philippines and Indonesian data sources used a seven point scale, mean responses have been adjusted to correspond to the six point scales used in the three other studies.

This result was not expected. In discussing the results of the World Values Survey, Moore (1999) contends that average levels of trust are higher in the world's better governed and wealthier societies. Invariably, these societies are characterised by the free flow of information and more effective legal and judicial institutions. However, Bachmann (2000) reports that the social norm to trust exchange partners is considerably stronger in Asia than in Europe or North America. Lyon (2000) reports that trust is more important in facilitating exchange in the developing countries. In Ghana, since most small farmers have limited access to legal recourse, they must rely to a much greater extent upon trust as the principal mechanism of market governance. However, while Lyon believes that trust comes from the generalised norms of morality (reciprocity); the various sources of information the farmer uses to evaluate a potential partner's reputation; and various social sanctions that include the loss of benefits, damage to reputations and social pressure from the community, in all five studies the only dimension for which some empirical measure was obtained was reputation.

While Ganesan (1994) differentiates between credibility and benevolence, Doney and Cannon (1997) found that they could not discriminate between benevolence and credibility and Geyskens *et al.* (1998) debated whether the two dimensions could be measured separately or were best applied as a single global measure. To test the multidimensionality of the trust construct, principal component analysis was employed. An array of solutions across the five agribusiness sectors emerged (Table 10.3).

Table 10.3. Testing the universality of the trust construct.

Item	South East Asia						
	Philippines		Indonesia			Vietnam	
Have confidence	.863		.828			.798	
Has necessary expertise	.736				.937		
Believe information	.720			.649		.855	
Good reputation	.678		.750			.563	
Considers my best interests	.572			.809			.956
Not always sincere		.948		*		.787	
Trust partner	*	*	.760			*	*
Keeps promises	*	*	.759			.856	
Percent variance	50.6	19.9	30.4	19.9	13.9	43.2	18.5
Cumulative variance	50.6	70.5	30.4	50.3	64.2	43.2	61.7
Cronbach's alpha	.766	NA	.793	.501	NA	.846	NA

Item	Australia	
	GG	FFV
Have confidence	.873	.899
Has necessary expertise		.746
Believe information	.808	.847
Good reputation	.872	.890
Considers my best interests	.859	.857
Not always sincere	*	*
Trust partner	.904	.888
Keeps promises	*	.725
Percent variance	65.9	66.5
Cronbach's alpha	.896	.931

where GG is grape growers
FFV is fresh fruit and vegetable growers
* item has been deleted

In both the Philippines and Vietnam, a two-factor solution was extracted, but only three of the item measures (confidence, the belief in the information provided and reputation) were found to load onto the same factor. In Indonesia, a three-factor solution emerged which collectively explained 64% of the variance. However, with an alpha coefficient of just 0.5, the second factor was found to be unreliable and only two of the item measures (confidence and reputation) were shared in common with the results from the Philippines and Vietnam.

For the two Australian studies, a single factor was extracted in both cases, with five of the item measures (confidence, reputation, trust, considers best interests and belief in the information provided) appearing in each construct. Furthermore, the reliability of both constructs (.89 and .93 respectively) were observed to be markedly higher than those obtained from the South East Asian studies, providing some evidence that trust, as a construct, has not yet been adequately operationalised for application within the transitional economies.

10.2.3 Power-dependence

Contrary to expectations, the power-dependence measures also produced a result that differed significantly from that which was expected. Although Lele (1981), Mendoza and Rosegrant (1995) and Pomeroy and Trinidad (1995) anticipated that farmers in the transitional economies would be more dependent upon their preferred trading partner, there was little evidence to support this (Table 10.4).

Furthermore, contrary to the literature reported by Crissman (1989), Gayao *et al.* (1997) and Tagarino *et al.* (1998), potato farmers in the Cordillera were not found to be dependent upon their preferred seed supplier nor were they subjected to any deliberate or obvious use of coercive power. While the shortage of seed at planting time was believed to be one of the major constraints limiting potato production in the Cordillera (Crissman 1987), most farmers reported that they could readily find an alternative seed supplier

Table 10.4. Scaled means of power-dependence measures in cross-country comparisons.

Item	South East Asia			Australia	
	P	I	V	GG	FFV
Free to choose another	5.49	4.83	5.71	4.44	6.52
Has best offer (Calt)	4.91	5.26	5.31	4.10	
Become more dependent	3.41	2.57	2.07	2.87	3.11
Must adhere to demands	1.12	2.48	2.78	2.64	2.38
Controls all the information	1.09	2.61	2.21	2.54	3.49
Has all the power	1.06	3.11	2.28	3.05	2.88
Mean	2.83	3.64	3.38	3.27	3.68

where P is the Philippines
I is Indonesia
V is Vietnam
GG is grape growers
FFV is fresh fruit and vegetable growers

Since both the Philippines and Indonesian data sources used a seven point scale, mean responses have been adjusted to correspond to the six point scales used in the three other studies.

Nevertheless, because of the adverse impact poor quality seed will have on the productivity of the crop, farmers will aggressively search out and locate those seed suppliers who provide better quality seed (Crissman 1989). In the context of the Filipino seed potato industry, the construct C_{alt} (comparison with the best alternative) (Anderson and Narus 1990) is highly relevant, for most potato farmers in the Cordillera indicate that their preferred seed supplier provided the best quality seed. Thus, to some extent, a Filipino potato farmer may become dependent upon their preferred seed supplier.

What was quite unexpected was the extent to which farmers in both Indonesia and Vietnam were also found to be less dependent on their preferred trading partner. It is widely acknowledged that in most developing countries the many small farmers are subject to exploitation by various market intermediaries (Lele 1981). In most developing countries, the agricultural marketing system is characterised by a highly atomistic production side (where there are many small, widely dispersed farmers growing perishable crops) and an oligopolistic marketing system (where there are only a few traders)(Mendoza and Rosegrant 1995). Marketing costs are

high because of inefficient transport systems, inadequate cool storage capacity and significant variations in product form, variety and quality (Harris-White 1995). The supply chain itself is often long and protracted, involving a large number of market intermediaries (Lele 1981). Furthermore, information and locational factors may potentially limit the number of intermediaries available to transact with primary producers (Pomeroy and Trinidad 1995). In other instances, various credit arrangements may lock farmers into long-term business-to-business relationships where the farmer is, to varying degrees, more or less dependent upon the market intermediary (Mendoza and Rosegrant 1995).

From observing the results obtained from both grape growers and fresh fruit and vegetable producers, it was apparent that most farmers in Australia were not subject to the exercise of coercive power. However, with both the number of grape growers and grape production rapidly increasing in Australia, wineries are able to select those grape growers who produce better quality grapes. Since the quality of the wines produced is somewhat dependent upon the quality of the fruit purchased, many wineries have entered into long-term contracts with preferred grape growers. Hence, to some extent, grape growers may become locked into long-term agreements and as a result, are less able to choose an alternative exchange partner. Although grape growers often receive significant price premiums for producing quality fruit, since prices are ultimately determined by supply and demand, many grape growers may perceive that they are not getting the best returns from their preferred customers (Batt and Wilson 2001).

Perceptions of power may partly explain the lower than anticipated levels of dependence observed. Power is a function of an actor's perception of their respective partner's power base (Gaski 1984). The more power an actor is perceived to have, the less often that power will need to be used. While the power to coordinate is the prerogative of the dominant firm, the restraint of power is one of the social norms of governance (Achrol 1997). Macneil (1980) observes that the more relational the exchange becomes, the less likely the parties will need to exercise coercive power. Furthermore, the use of various coercive powers to

cajole and coerce cooperation is not conducive to the evolution of cooperative long-term relationships (Achrol 1997). The frequent use of threats and coercion will lessen the desire to cooperate and increase channel conflict (Frazier and Summers 1984; Frazier *et al.* 1989).

Channel conflict is inevitable due to the functional interdependence that arises between channel members (Gaski 1984). However, the kind of power that is most compatible in long-term relationships is that derived from expert, reputational or referent power (Achrol 1997). While expert power may be lost once it is expended, expertise is something that has to be constantly regenerated, promoted and communicated. Reputational or referent power is partly derived from the social and public images that the firm endeavours to portray. That which is the most influential is the ability of the firm to create a sense of belonging and security. Hence it is not where the power resides, but rather, how it is restrained.

While the use and restraint of power is central to the concept of power-dependence, so also are the three situations under which a firm can become dependent: (1) when the product is highly valued; (2) when the preferred supplier has the best offer; and (3) when there are fewer alternative sources of exchange (Heide and John 1988). While a single power-dependence construct was used in the analysis (as a result of principal component analysis), evidence was presented in Chapter Nine to suggest that the construct may be multidimensional. As there was a significant and positive association between satisfaction and the availability of alternatives, but no significant association between satisfaction and power, this result would suggest the presence of at least two independent constructs. Further support for the multidimensionality of the power-dependence construct was provided from the analysis of the association between trust and commitment and the availability of alternatives (not significant) and power (significant and negative as hypothesised).

The concept of multidimensionality was explored in all five studies by analysing the power-dependence measures with principal component analysis. Furthermore,

by comparing and contrasting the results obtained from the three developing countries (Indonesia, the Philippines and Vietnam) and Australia, some indication of the extent to which the selected power-dependence measures could be universally applied was ascertained.

From the Filipino data set, principal component analysis produced three factors that collectively explained 80% of the variance (Table 10.5).

Table 10.5. Testing the universality of the power-dependence construct.

Item	South East Asia						
	Philippines			Indonesia		Vietnam	
Has all the power	.918			.696		.768	
Controls all the information	.912			.719		.893	
Must adhere to demands	.870			.836			.877
Has best offer (Calt)		.822			.787	-.672	
Free to choose another		-.755			.706	-.658	
Become more dependent			.976	.815			
Percent variance	43.6	19.1	17.3	38.1	19.1	44.1	19.0
Cumulative variance	43.6	62.7	80.0	38.1	57.2	44.1	63.1
Cronbach's alpha	.897	.454	NA	.775	.277	.738	NA

Item	Australia		
	GG		FFV
Has all the power	.702*	-.527*	.886
Controls all the information	.878		.818
Must adhere to demands	.895		.835
Has best offer (Calt)		.942	
Free to choose another	-.694*		
Become more dependent	.777		.604*
Percent variance	48.4	20.4	53.5
Cumulative variance	48.4	68.8	-
Cronbach's alpha	.916	NA	.842

where GG is grape growers
FFV is fresh fruit and vegetable growers
* item has been deleted

Factor One captured the three measures of power (the seed supplier had all the power, controlled all the information and the farmer had to adhere to the seed supplier's demands).

Factor Two was found to comprise of two seemingly unrelated elements (the seed supplier makes the best offer and the farmer was free to choose another partner at any time). Therefore, it was no surprise to find that with a Cronbach's alpha coefficient of only 0.45, this construct was considered unreliable. Factor Three was a single item measure suggesting that, over time, the farmer had become more dependent upon their preferred seed supplier.

From the study in Indonesia and the two studies in Australia, these three measures of power were all found to correlate highly. In two instances, a fourth related measure was found to correlate with power, indicating how, over time, the farmers had become more dependent.

In Vietnam, while two of the power measures were found to correlate with C_{alt} and the availability of alternative trading partners, both C_{alt} and the availability of alternatives were negative, indicating that they were diametrically opposed. In both the Philippines and Indonesia, while C_{alt} and the availability of alternatives were both found to correlate in the one principal component, since both were rejected as being unreliable, this would suggest that both measures probably existed as independent variables. In the Western Australian wine industry, C_{alt} was indeed found to exist as a separate construct.

Although all studies are exploratory, there is sufficient evidence to suggest that power and dependence are quite separate constructs. However, whether it is possible to separate the availability of alternatives and C_{alt} into independent dimensions cannot be ascertained from the current analysis.

10.2.4 Results of combined analysis

While satisfaction, trust and power-dependence have been evaluated separately there is a strong possibility that all three dimensions may share some elements in common. Geyskens *et al.* (1999) have predicted that the measures of social satisfaction may overlap with trust. Furthermore, since there is a significant

negative association between power-dependence and trust, there is also a strong possibility that some elements of these dimensions will be shared in common.

To test the robustness of the constructs, all of the item measures used to evaluate the three constructs (satisfaction, trust and power-dependence) were analysed together using principal component analysis.

From the Filipino data set, five factors were extracted that collectively explained 68% of the variance (Table 10.6).

Table 10.6. Evaluating satisfaction, trust and power-dependence in the Philippines.

Item	Factor loadings				
	1	2	3	4	5
Supplier controls all information	.889				
Supplier has all the power	.889				
Must adhere to supplier demands	.838				
Supplier not always sincere	.644				
Adequately rewarded by supplier	.633				
Supplier always keeps promises		.881			
Believe information from supplier		.864			
Supplier considers my best interests		.641			
Good cooperation with supplier			.805		
Supplier meets expectations			.768		
Can choose another supplier at any time				.794	
Trust preferred supplier				.757	
More dependent on supplier					.823
Quick to handle complaints					.632
Eigenvalue	3.53	2.46	1.37	1.24	1.01
Percent variance	25.23	17.57	9.77	8.89	7.19
Cumulative variance	25.23	42.80	52.57	61.46	68.65
Cronbach's alpha	.855	.737	.574	.494	.320

Factor One (restraint of power) comprised five item measures. The first three variables were the same three variables associated with the power dimension (the seed supplier had all the power, controlled all the information and the farmer had to adhere to the seed suppliers demands).

While each of these variables had factor loadings exceeding 0.8, they were found to correlate with one measure of trust (the seed supplier is not always sincere) and one measure of satisfaction (the farmer feels adequately rewarded). With a Cronbach's alpha coefficient of 0.855, the construct was considered sufficiently robust. Since the preferred seed supplier seldom used coercive power to influence the farmer and was generally sincere towards the farmer, most farmers felt adequately rewarded. Hence the construct demonstrated the restraint of power rather than its use.

Factor Two (trust) was found on this occasion to be comprised of three variables. The first two variables (keeps promises and belief in the information provided) were the same two variables used earlier to test the proposed model. The third variable (considers my best interests) was drawn from the trust measures proposed by Doney and Cannon (1997).

Factor Three (satisfaction) was comprised of two variables (cooperation and meeting expectations). However, with a Cronbach's alpha coefficient of just 0.574, the construct would ordinarily be considered unreliable except for exploratory purposes. For the remaining two constructs, as the Cronbach's alpha coefficients were below 0.5, both were rejected.

From the Indonesian data set, a six factor solution was extracted that explained 68% of the variance (Table 10.7). Factor One (trust) comprised three item measures (trust, confidence and keeping promises). This construct was also similar to that which was extracted during the analysis of the trust measures alone, although on that occasion, reputation provided an additional measure. With a Cronbach's alpha coefficient of 0.77, this construct was considered reliable

Factor Two (independence) comprised two item measures (become more dependent over time and must adhere to traders demands). However, since most farmers disagreed with both statements, it was evident that vegetable farmers in Indonesia were free to make the majority of their own marketing decisions.

Table 10.7. Evaluating satisfaction, trust and power-dependence in Indonesia.

Item	Factor loadings					
	1	2	3	4	5	6
Have confidence in trader	.910					
Trust preferred trader	.778					
Trader always keeps promises	.707					
More dependent upon trader		.862				
Must adhere to traders demands		.830				
Believe information from trader			.785			
Trader considers my best interests			.718			
Trader has all the power			.615			
Trader quick to handle complaints				.855		
Traders treats me fairly and equitably				.809		
Much conflict with trader					-.643	
Trader not always sincere					-.612	
Trader meets expectations					.577	
Good cooperation with trader					.572	
Trader has necessary expertise						.834
Adequately rewarded by trader						.596
Eigenvalue	3.59	2.25	1.50	1.27	1.14	1.07
Percent variance	22.4	14.1	9.4	7.9	7.1	6.7
Cumulative variance	22.4	36.5	45.9	53.8	60.9	67.6
Cronbach's alpha	.770	.769	.613	.705	.591	.374

Factor Three was a second trust dimension, although it contained one variable from power-dependence (preferred trader has all the power). Since most farmers indicated that traders did not have all the power, the traders inability to coerce or the making of a conscious decision not to coerce farmers into making decisions they might not have otherwise undertaken could be construed as facilitating trust (Madhok 1995; Andaleeb 1996; Brenkert 2000). However, neither of the trust constructs could be adequately described by the two trust dimensions proposed by Ganesan (1994) nor did they resemble any of the three dimensions of trust proposed by Sako (1992).

Factor Four comprised two variables (trader quick to handle complaints and trader treats me fairly and equitably). Since both variables could potentially relate to the farmer's economic satisfaction with the exchange, the construct was so named.

However, while Factor Five was also a measure of satisfaction (although it did contain one trust measure), this second factor captured the social satisfaction inherent in the exchange. In such exchange relationships, there was minimal conflict between the farmer and their preferred trading partner. In the absence of conflict, there was good cooperation between the exchange partners, with the traders often meeting the farmer's expectations. On most occasions, the trader treated the farmer with sincerity. As the reliability coefficient was just below 0.6, the construct was admissible for an exploratory study. With a reliability coefficient of only 0.37, Factor Six was rejected.

From the Vietnamese data, another six-factor solution was extracted, which collectively explained over 73% of the variance. In this instance, since the reliability coefficients for all four multiple item constructs exceeded 0.70, all were considered sufficiently robust (Table 10.8).

Table 10.8. Evaluating satisfaction, trust and power-dependence in Vietnam.

Item	Factor loadings					
	1	2	3	4	5	6
Best offer	.783					
Meets expectations	.769					
Easy to contact	.768					
Keeps me informed on prices	.765					
Always keeps promises	.750					
Prefer to transact with locals	.734					
Good cooperation	.730					
Have confidence in trader		.748				
Less risky		.736				
Always honest		.643				
Free to choose another at any time		.587				
Always considers my best interests			-.904			
Must adhere to traders demands			.823			
Often acts opportunistically				.864		
Much conflict				.819		
More dependent on trader					.800	
Identify more suitable varieties						.913
Eigenvalue	4.61	2.59	1.77	1.70	1.34	1.22
Percent variance	25.6	14.4	9.8	9.4	7.5	6.8
Cumulative variance	25.6	40.0	49.8	59.2	66.7	73.5
Cronbach's alpha	.874	.754	.717	.756	NA	NA

Factor One (relational satisfaction) was comprised of seven item measures. While only two of these measures came from the proposed measures of satisfaction (trader meets expectations and good cooperation), it was clear that the presence of the other measures could also contribute to the farmer's economic (makes the best offer, keeps me informed on prices) and social satisfaction (trader always keeps promises).

The desire to transact with local traders and the ease with which the trader could be contacted were also believed to contribute to satisfaction. Lyon (2000) indicates how in Ghana, vegetable producers prefer to transact with local traders, because, in the event of non payment, they know where to find the trader. Having a close long-term relationship with a preferred trading partner may also prove reassuring, reducing the risk of being exposed to any opportunistic trading practices and of providing greater assurances of receiving a fair and equitable return.

Factor Two (trust) contained two of the trust measures (confidence in preferred trader and preferred trader is always honest). Since trust is widely conceptualised as a risk reduction strategy (Hawes *et al.* 1989; Fafchamps 1996; Humphrey 2000; Humphrey and Schmitz 1998; Lane 2000; Lyon 2000), it seems appropriate that the item measure that sought to evaluate the extent to which the relationship reduced risk was included in the trust construct. Similarly, since the freedom to choose an alternative exchange partner may indicate low dependence and therefore reduce the likelihood of exposure to coercive influence strategies, it was also not unexpected to find this measure contained within trust.

Developing this construct further, Lane (2000) describes calculative trust as being based upon expectations about another. Madhok (1995) describes trust as being based on a set of mutual expectations regarding each other's behaviour and each actor's fulfilment of their perceived obligations. However, trust does not mean the naïve belief in the honesty of another actor, but rather the probability of violating an implicit or explicit agreement. Trust is the perceived likelihood that the

exchange partner will behave in a self-interested manner. Since trust is primarily a decision under risk (Luhmann 1979), an actor can weigh the costs and benefits of a certain course of action. In utilitarian terms, an actor will choose that course of action most likely to gain maximum utility.

Factor Three contained one trust measure (always considers my best interest) and one measure from power-dependence (the extent to which the farmer was forced to adhere to the traders demands). Since the trust measure was negative, this construct was labelled coercive power, indicative of the extent to which the preferred trading partner forced the farmer to comply with their demands.

Factor Four (economic dissatisfaction) was a measure of the dissatisfaction present in the relationship as a result of the preferred trading partner sometimes acting opportunistically. Since opportunistic behaviour is most often undertaken because one party finds it advantageous to maximise their own gains at the expense of their exchange partner (Gundlach *et al.* 1995), conflict will inevitably result. Since most conflict occurs in relationships over economic issues (Geyskens *et al.* 1999), farmers will be dissatisfied whenever they learn that their preferred trading partner has acted opportunistically. Factors Five and Six were both single item measures.

Exploring the results of principal component analysis for the first of the Australian studies produced a remarkably different solution. For the grape growers, a simple two-factor solution was extracted which explained over 74% of the variance (Table 10.9). Factor One (relational quality) was found to contain three measures of satisfaction (treats me fairly and equitably, meets my expectations and good cooperation) and five measures of trust (I trust my preferred trading partner, preferred trading partner keeps promises, have confidence in preferred trading partner, believe information provided by preferred trading partner and preferred trading partner always considers my best interests). With a Cronbach's alpha coefficient of 0.946 this construct was considered extremely robust.

Table 10.9. Evaluating satisfaction, trust and power-dependence among Western Australian wine grape growers.

	Factor loadings	
	1	2
Preferred customer treats me fairly and equitably	.920	
Trust preferred customer	.905	
Preferred customer often meets my expectations	.903	
Preferred customer always keeps promises	.886	
Have confidence in preferred customer	.878	
Good cooperation with preferred customer	.834	
Believe information from preferred customer	.819	
Preferred customer considers my best interests	.742	
Must adhere to preferred customer's demands		.879
Preferred customers controls all information		.822
Become more dependent on preferred customer		.795
Eigenvalue	6.10	2.07
Percent variance	55.44	18.84
Cumulative variance	55.44	74.28
Cronbach's alpha	.946	.784

Support for this combined construct is provided by Crosby *et al.* (1990) and Leuthesser (1997) who model relational quality as a composite measure derived from both satisfaction and trust. However, Dorsch *et al.* (1998) describe relational quality as a higher-order construct containing dimensions of satisfaction, trust and commitment, while Kumar *et al.* (1995) conceptualise relational quality as being comprised primarily of trust and commitment.

Furthermore, in the context of long-term business-to-business relationships, both satisfaction and trust are cumulative experiences. Cumulative satisfaction is based on the total purchase and consumption experience over time (Fornell 1992). Cumulative satisfaction is best described as a process that extends across the entire consumption period (Fournier and Mick 1999). Trust is also a cumulative experience, arising from repeated interactions that, over time, enable an actor to predict or to forecast how their partner will behave (Doney and Cannon 1997). Geyskens *et al.* (1999) report that trust is rather strongly correlated with social satisfaction, conflict and commitment, so much so, that mean correlations among social satisfaction, trust and commitment vary between 0.51 and 0.76 and may share between 23 - 59% of their variance in common.

However, if social satisfaction and trust are essentially the same construct, each would exhibit an identical pattern of relationships with various antecedents and consequences (Geyskens *et al.* 1999). Such, however, was not the case, thereby suggesting that both satisfaction and trust exist as separate but inter-related constructs.

Factor Two (power-dependence) contained three items: two from power (must adhere to wineries demands and preferred customer controls all the information) and one from dependence (become more dependent over time). With a reliability coefficient exceeding 0.78, this construct was also very robust.

Exploring the relationship between Western Australia fresh fruit and vegetable growers and their preferred market agents produced a similar result to that achieved in the WA wine industry. While a three-factor solution was extracted that explained 66% of the variance, the relational quality construct again dominated the solution, explaining 47% of the variance (Table 10.10).

In this instance, Factor One (relational quality) was comprised of five satisfaction measures (preferred market agent treats me fairly and equitably, adequately rewarded, meets expectations, good cooperation and quick to handle complaints) and six trust measures (trust preferred market agent, have confidence in market agent, market agent has the necessary expertise, believe market agent, market agents always keeps promises and always considers my best interests).

Factor Two (market power) comprised three measures from power-dependence (must adhere to market agents demand, market agent has all the power and controls all the information). With a reliability coefficient exceeding 0.84 this construct was very robust.

The final factor was comprised of a single item that indicated the extent to which the farmer could choose an alternative market agent at any time.

Table 10.10. Evaluating satisfaction, trust and power-dependence among Western Australian fresh fruit and vegetable growers.

	Factor loadings		
	1	2	3
Trader treats me fairly and equitably	.887		
Adequately rewarded by trader	.873		
Have confidence in preferred trader	.863		
Trader meets expectations	.841		
Trust most preferred trader	.824		
Trader always considers my best interests	.818		
Believe the information from trader	.809		
Good cooperation with trader	.801		
Trader always keeps promises	.730		
Trader quick to handle complaints	.723		
Trader has the necessary expertise	.711		
Must adhere to trader's demands		.827	
Trader has all the power		.811	
Trader controls all the information		.759	
Free to choose another trader at any time			.819
Eigenvalue	8.53	2.29	1.11
Percent variance	47.37	12.74	6.17
Cumulative variance	47.37	60.11	66.28
Cronbach's alpha	.952	.842	NA

From these various analyses, two major conclusions can be reached. In the first instance, as predicted by Geyskens *et al.* (1999), there is much in common between social satisfaction and trust. For the two studies undertaken in Australia, a very strong and relatively consistent single factor (relational quality) emerged that collectively explained between 47 - 55% of the variance. Capturing most of the measures of social satisfaction and trust, the emergence of this single construct suggests that it will prove very difficult to develop measures to adequately differentiate between social satisfaction and trust since both constructs effectively tap into the same underlying dimensions.

In the second instance, it would appear that the various measures of social satisfaction, trust and power-dependence, developed in the context of enduring long-term buyer-seller relationships in the industrialised world, cannot be readily transferred to the transitional economies. Not only were three very different results obtained but there was minimal evidence of any consistent and reliable

constructs emerging that might indicate functional equivalence. Each country has its own unique culture and mix of environmental factors that will influence the nature of long-term buyer-seller relationships. However, to varying degrees, in the absence of a well developed legal system, personal trust will assume much greater importance in the transitional economies. Furthermore, since the majority of enterprises studied were small family firms, it will prove exceedingly difficult to differentiate between trust in an individual and trust in an organisation.

10.3 Trust: a pre-requisite for exchange?

In the development of long-term buyer-seller relationships, it is widely accepted that satisfaction with the outcomes of previous exchange experiences leads to trust (Ford 1980; Ganesan 1994; Geyskens *et al.* 1999; Morgan and Hunt 1994; Wilson 1995). However, there is increasing evidence to suggest that trust is a prerequisite that facilitates exchange (Bjorkman and Kock 1995; Brenkert 2000; Hardy, Phillips and Lawrence 2000; Humphrey and Schmitz 1998; Mackenzie and Hardy 1996; Moore 1999; Zucker 1986) and depending upon the outcomes of the transaction, trust may lead to satisfaction (Andaleeb 1996; Anderson and Narus 1990; Dwyer *et al.* 1987; Singh and Sirdeshmukh 2000).

Luo (2002) describes how trust between organisations is an important independent variable of joint performance because of enhanced cooperation, transaction cost savings, improved capability and greater flexibility. However, trust may also be a dependent variable influenced by institutional arrangements, organisational and individual factors and indeed, even a moderating variable in shaping causal relationships in organisational behaviour and social psychology. Trust is a multidimensional construct containing both cognitive and affective elements and both micro (interpersonal) and macro (interorganisational) elements

10.3.1 The re-emergence of social capital

Humphrey (2000) describes how, under perfect competition, economic exchange seldom involves risk. Actors assume that contracts will be honoured and risk will

be eliminated by the assumptions of candid rationality and perfect information. However, when these assumptions are relaxed, an actor is exposed to risk. If these risks cannot be controlled, they may be too great for the transaction to occur. If, on the other hand, the partner can be trusted, exchange will be facilitated.

Trust has been acknowledged in economic and organisational theory as the most efficient mechanism for governing transactions (Ouchi 1980). As the number and frequency of exchange increases, so does the importance of reliable modes of trust (Zucker 1986). Zucker describes how institutional trust is a vital precondition in the development of complex economic systems. Institutional trust is tied to formal social structures that generalise beyond a given transaction and beyond specific exchange partners. These institutional structures may be either person specific or firm specific, or based on intermediary mechanisms. The person specific or firm specific type rests upon membership within a subculture where very specific expectations are held. Intermediary mechanisms rest on the legitimate concern that a transaction may not be completed or fail to produce the expected return without the intervention of some third party such as an insurance agent, or a legal or statutory institution that protects the interests of all parties in the exchange.

Luhmann (1979) develops his concept of system trust on the basis that each person trusts on the assumption that others trust. System trust, derived from the confidence in the authority, reliability and/or legitimacy of political power, money and the legal system, accumulates from continuous positive experiences within the system. Brenkert (2000) suggests that without some minimum level of basic trust between buyers and seller, business transactions will prove impossible. Basic trust within the market assumes that all participants will transact using recognised, generally acceptable rules, customs or standards. Sako (1982) describes how competence trust is an essential prerequisite before contemplating any long-term relationship. Competence trust may be attained either by purchasing existing competencies or by investing to create them. However, the option to invest will be exercised only if the returns from such investments can be guaranteed through the creation of goodwill trust. Contractual trust rests on the moral norm of honesty

and keeping promises that is inculcated in people through socialisation and education. This is the minimal amount of trust that must exist for any civil society to function. Underpinning contractual trust are the social bonds, personal networks and embedded social relationships that enable exchange to take place without prior agreement on all terms and conditions.

Granovetter (1985) considers trust to be based primarily in the social system, where individuals find themselves capable of trusting because of the social norms and networks within which their actions are embedded. Common values and norms of obligation will develop in long-term relationships where trust is present. Bradach and Eccles (1989) see norms of obligation as one of the basis of trust within and between organisations. Common values and norms based on kinship, familiarity, religion, ethnic status or family background will assure solidarity between exchange partners within the network (Zucker 1986). Those who flaunt the rules will be ostracised socially and punished economically (Humphrey and Schmitz 1998).

In Ghana, Lyon (2000) reports how trust derived through a common individual, intermediary or guarantor, family linkages and long-term friends, a common ethnic background, attendance at the same church, or the individual's position within the community, is mandatory before traders will enter into any exchange transaction requiring credit. In China, Bjorkman and Kock (1995) describe how trust and the formation of social relationships is a prerequisite for business transactions. Child (2000) describes how trust-based relationships within defined family groups protects against opportunism and the low levels of trust that prevail within Chinese society.

For Fukuyama (1995), trust is an "expectation that arises within a community of regular, honest and cooperative behaviour based on commonly shared norms on the part of other members of the community" (p 26). The prevalence of trust within society results in social capital; a construct that Fukuyama uses to describe

the extent to which trust permeates an entire society, rather than being confined to a family, a clan or close friends (Lane 2000).

Defined by Putnam (1995)(cited in Nahapiet and Ghoshal 1998) as the "features of social organisation such as networks, norms and trust that facilitate coordination and cooperation for mutual benefit", social capital provides a valuable resource for the conduct of social exchange. With the majority of the social capital embedded within networks of mutual acquaintance and recognition, social capital resides and is reinforced by the pattern of linkages and the relationships that are built within the network.

Trust and trustworthiness are central to the concept of social capital (Fukuyama 1995). People who know and trust one another are more likely to cooperate and to find solutions to problems that are mutually acceptable to everyone. Social capital facilitates cooperative behaviour and the transfer of information and resources (Sharp and Smith 2003). Social capital makes it possible to achieve desired outcomes that would be impossible without it or could only be achieved at considerable cost. In a sense, social capital facilitates the governance of economic exchange (Annen 2003), reducing the potential for opportunism and the need for costly monitoring processes (Nahapiet and Ghoshal 1998).

From this discussion, there is clear evidence to suggest that trust is a prerequisite for economic exchange. However, within the industrialised countries, trust is so closely related to the basic norms of behaviour and social customs that most actors take it for granted until it is violated (Garfinkel 1967:cited in Zucker 1986). It's only when research moves towards the study of relationships in the transitional economies that the scarcity or absence of institutional trust re-emerges. Humphrey and Schmitz (1998) suggest that the lack of institutional trust in the developing countries is the major obstacle to the establishment of a more effective market economy. Trust is therefore a vital precondition in the development of efficient economic exchange.

10.3.2 Trust leads to satisfaction

If trust is a precondition for exchange, then trust will lead to satisfaction. Within business-to-business relationships, Dwyer *et al.* (1987) describe how relationships evolve through five general phases. After several exploratory transactions, expected patterns of behaviour and standards of conduct begin to emerge in the relationship. These experiences create expectations, not only with regard to the supplier's ability to deliver desired products in the desired manner (de Ruyter *et al.* 2001), but also that suppliers will act in a manner that is responsible, with integrity and without injury to the focal firm (Selnes 1998; Singh and Sirdeshmukh 2000).

Since there is some degree of risk and uncertainty in most transactions, trust is an expectation that the vulnerability that arises from the acceptance of risk will not be taken advantage of by the exchange partner (Lane 2000). With trust, expectations can be reliably predicted which will result in the focal firm feeling not only more secure in its relationship (Andaleeb 1996; Geyskens *et al.* 1998: Selnes 1998), but if expectations are fulfilled, the focal firm will feel more satisfied with its exchange partner (Oliver 1980; Yi 1990; Fornell 1992).

Achrol (1997) considers trust to be the critical determinant of many factors related to a firm's performance including the more open exchange of relevant ideas and emotions, greater clarification of goals and problems, more extensive search for alternative courses of action and greater satisfaction with efforts. Dwyer *et al.* (1987) describe how when trust is present, exchange partners are more willing to cooperate and to find mutually acceptable ways to resolve conflict. Once trust is established, firms learn that coordinated joint efforts will lead to outcomes that exceed those the firm would achieve if it acted solely in its own best interests (Anderson and Narus 1990).

While Anderson and Narus (1990) suggest that cooperation leads to trust which leads to satisfaction, trust will lead to a greater willingness to cooperate in the future. In turn, that will generate more trust in the future and so forth. MacKenzie

and Hardy (1996) propose that trusting behaviour must come before a buyer enters into an exchange relationship, but trust itself will emerge after the completion of the exchange and will continue to build over successive transactions.

Singh and Sirdeshmukh (2000) demonstrate how trust will have a direct positive influence of post-purchase satisfaction. While trust is not a necessary ingredient for consummating an exchange, just as the presence of distrust does not, in and of itself preclude exchange (Mayer, Davis and Schoorman 1995), trust will become important in those transactions where there is a high level of performance ambiguity and significant consequentiality associated with the exchange. Singh and Sirdeshmukh propose that the competence dimension of trust will influence pre-performance expectations, especially where the buyer can be reasonably confident that the supplier will fulfil their promises. When a buyer perceives that the service provider has high competence trust, it is consistent to hold high performance expectations in subsequent exchange episodes.

However, Singh and Sirdeshmukh (2000) are quick to note that satisfactory exchange experiences will also reinforce trust. When buyers judge the performance to be of a high quality and/or to have exceeded their initial expectations, and if this result can be attributed to the supplier's ability, the buyer's competence trust in the supplier will increase. This can be particularly important, for a buyer who has a high level of pre-trust is unlikely to be perturbed by a single negative exchange experience. High levels of trust will reduce the negative consequences associated with a single negative exchange episode.

While there is some empirical support for the pathway from trust to satisfaction, Anderson and Narus (1990) raise a methodological issue, which may in part explain the departure from the widely accepted satisfaction to trust pathway. When respondents were asked about their perceptions of satisfaction and trust with their preferred seed supplier, informants gave a present state report; that is, they answered how much they were satisfied and how much they trusted their

preferred seed supplier at a particular point in time. Trust is however, an expectation about the future. To trust is to rely upon honesty and benevolence in the future in an uncertain environment (Medlin and Quester 2002). Conversely, satisfaction in buyer-seller relationships has been traditionally evaluated from the perspective of a transaction that is conceptually rooted in the past (Oliver 1980). Hence it is entirely logical that satisfaction will lead to trust.

More recently, Fornell (1992), Anderson *et al.* (1994), Fournier and Mick (1999) and Tikkanen *et al.* (2000) have posited that satisfaction in long-term relationships is a cumulative dynamic process. As a result, satisfaction depends not only upon whether the current product meets the customer's needs (transaction specific), but also that the product will meet the customers anticipated needs in the future. Hence, whereas transaction specific satisfaction is rooted in the past, cumulative satisfaction is rooted in the future. Departing from the generally accepted measures of satisfaction and placing both satisfaction and trust in the same time dimension may explain the high degree of correlation between satisfaction and trust and thus the emergence of the relational quality construct.

Where the product is intangible, such as seed potatoes, and the farmer's decision to purchase seed from a particular supplier has been based either upon a satisfactory prior experience with that supplier or the reputation that the preferred seed supplier has established in the market (trust), in either instance, both variables are rooted in the past, yet the extent to which the seed meets the farmer's expectations (satisfaction) can only be evaluated in the future. Trust therefore can lead to satisfaction, and as proposed by Anderson and Narus (1990), MacKenzie and Hardy (1996) and Singh and Sirdeshmukh (2000), a satisfactory transaction will probably result in greater trust in the preferred exchange partner.

10.4 Chapter summary

From this discussion, it would appear that any attempt to improve the measures of relational satisfaction by introducing elements of economic and social satisfaction

may result in a high degree of correlation between social satisfaction and trust. Indeed, Geyskens *et al.* (1999) predicted that including measures of social satisfaction would result in a significant overlap with trust. For example, both equity and the extent to which expectations are fulfilled are dimensions that could be accommodated equally well within satisfaction or trust, lending support for a composite measure of relational quality as described by Crosby *et al.* (1990) and Leuthesser (1997). While acknowledging that trust and satisfaction are the two key concepts in relationship marketing, Selnes (1998) indicates that both concepts are similar in the sense that they represent some overall evaluation, feeling or attitude towards an exchange partner.

It is also apparent that the existing measures of trust developed in the context of long-term relationships in the industrial countries fail to adequately capture the true nature of trust in relational exchange in the transitional economies. Trust between and within organisations must be viewed not only at the interpersonal and interorganisational level, but also at the systemic level, where variables such as institutional trust (Zucker 1986), system trust (Luhmann 1979) or social capital (Fukuyama 1995) are included. Any measures that fail to go beyond interpersonal trust and interorganisational trust will fail to adequately demonstrate how trust can be built and maintained within the transitional economies.

Chapter Eleven

CONCLUSIONS AND IMPLICATIONS

11.1 Chapter outline

In this final chapter, the aims and objectives established in Chapter One will be revisited and addressed. This thesis sought to identify: (1) the factors that impacted upon a Filipino potato farmer's decision to purchase seed; (2) the criteria Filipino potato farmer's used in choosing between alternative seed suppliers; and (3) the nature of the long-term relationships that existed between potato farmers and their preferred seed suppliers. Using scales developed and tested in the industrialised nations and scales developed specifically for this thesis and subsequently used in a number of other independent studies conducted by the author, a number of conclusions are made that have both theoretical and commercial implications. However, it should be noted that this is one of only a few studies worldwide to have employed the relationship-marketing paradigm in agribusiness and is perhaps the first to attempt to examine empirically the impact of trust, satisfaction, commitment, power-dependence and the willingness to make relationship-specific investments between potato farmers and seed suppliers in a transitional economy. As a result and with due regard to the various problems associated with the non-normality of the data, any conclusions reached must be treated with some caution.

11.2 Factors influencing the decision to purchase seed

In making their decision to purchase seed and indeed to grow potatoes, most farmers in the Cordillera were highly cognisant of the various risks associated with the purchase of seed, the external environment and the potential impact failure of the potato crop could exert on the farm household. While not all of these risks are controllable, most are manageable, for if the potential risk is assumed to be too great, the farmer can chose not to grow potatoes.

In the Cordillera, a potato farmer's decision to purchase seed was found to be influenced by six primary components: (1) the magnitude of the investment; (2) the desire to retain some proportion of the harvest as seed to plant another crop; (3) the availability of complementary farm inputs; (4) the farmer's attitude to risk; (5) the productivity of the seed; and, (6) the variety. Collectively, each of these components represented a potential economic risk that an astute farmer will endeavour to minimise.

With most potato farmers (88%) in the Cordillera planting between 0.1-0.25 ha of potatoes for the main crop at a rate of 1.8-2.0 tonnes per ha, the average farmer will require between 180-500 kg of seed. With 75% of farmers paying between Ps 13-15 per kg to purchase seed, the decision to purchase seed will require a cash investment of between Ps 2,300 - 7,500. However, with fertilisers and chemicals exceeding 50% of production costs, the decision to grow potatoes will require a significant cash investment for a period of between 60 - 90 days.

Irrespective of whether the farmer has access to the cash or must borrow some or all of the funds required from various input suppliers or other informal sources, an investment of this magnitude will expose the farm household to significant risk. Not only is there the constant risk of loosing the entire crop should the typhoons come early, but there is also the uncertainty of price in the output market and, in the absence of any formal seed certification system, the risk of inadvertently purchasing poor quality seed that will have a significant negative impact on productivity. Since farmers may be unable to recover the costs of production, they are understandably risk averse. Both Kool (1994) and File and Prince (1996) have demonstrated that small family firms are more risk averse because of the intimate relationship between the performance of the business and household expenditure.

In order to reduce the demand on their limited cash reserves, most potato farmers in the Cordillera (98%) will endeavour to retain some proportion of their harvest to use as seed for one or more subsequent potato crops. However, in making the decision to retain a proportion of the harvest as seed, farmers must not only forgo

the opportunity to sell that seed in the market, to feed it to livestock or to eat it themselves, but there are various costs associated with providing seed storage and the losses incurred during storage from tuber rotting and infection.

In discussing the economics of potato production in the Cordillera, it was apparent that most farmers under valued the true cost of seed. While Mariano *et al.* (1991) indicated that the cost of seed approached 40% of production costs, Perez (1995a) suggested a figure of 31% and HARRDEC (1996) suggested 34%, for over 40% of farmers, seed costs were estimated to be less than 10% of production costs. Two reasons are thought to explain why this situation should be so prevalent.

In the first instance, farmers are retaining that proportion of the harvest considered too small for the fresh market. Both Gayao *et al.* (1997) have Batt (1999) have reported that traders are willing to pay significant price premiums to procure the large and extra large tubers. However, the marginal cost of retaining the smaller tubers was found to depend on the prices prevailing in the fresh market. As prices in the fresh market increased, farmers retained less of their harvest for seed. When prices in the fresh market averaged between Ps 9-10 per kg, 47% of farmers retained between 11-20% of their harvest for seed. However, at Ps 11-12 per kg, only 23% of those farmers continued to retain between 11-20% of their harvest as seed. Hence, as reported by Crissman and Hibon (1996), there is a switching price at which farmers may choose to sell all of their harvest and to purchase seed as the next planting season approaches. Because of the significant contribution potatoes make to the household income and the perceived lack of any other opportunities to derive additional income, this switching price is more likely to be governed by the returns in the fresh market than it is by the cost of replacing the seed.

In the second instance, with average yields in the Philippines reported to be only 12 tonnes per ha (Crissman 1989), in order to obtain sufficient seed to replant another crop, farmers will need to retain between 15-20% of their harvest. However, as the productivity of the seed progressively declines, due to the accumulation of disease, farmers will find it necessary to retain a greater

proportion of their harvest in order to obtain sufficient seed. As the quality of the seed progressively deteriorates, so also will the value of the seed. Seed that is already contaminated with a variety of systemic diseases will cost significantly less to replace than clean seed. While Renia (1992) indicates that the cost of imported seed may be 2.3 - 17 times the price of potatoes in the fresh market, with due regard to tuber size, most potato farmers in the Cordillera expect to pay between 1.2 - 1.5 times the price of potatoes in the fresh market to purchase seed.

Since most potato farmers (70%) in the Cordillera derive all of their income from the cultivation of arable crops and the majority of farmers (93%) derive more than 50% of their on-farm income from the cultivation of potatoes, the productivity and profitability of the potato crop will have a significant impact on household income. That factor which most farmers believed to have the most influence on the productivity and profitability of the potato crop was the selection of the most appropriate variety.

In the Cordillera, most farmers (99%) cultivate Granola. Granola is not only fast maturing (60-90 days) but it has, over time, been found to deteriorate at a significantly slower rate than most other varieties, thus indicating some resistance to infection. Granola is not only more productive, but it also produces a greater proportion of larger sized tubers than most other varieties. The tubers are well shaped and uniform with gold skin and a bright yellow flesh that not only looks appealing, but also delivers the desired eating qualities.

11.3 Factors influencing the choice of seed supplier

While most potato farmers in the Cordillera spent a considerable amount of time making the decision to purchase seed, farmers spent significantly less time choosing between alternative seed suppliers. Despite the risks involved in making a poor choice because of the intangible nature of seed quality and the large number of alternative seed suppliers, most farmers preferred to transact with those seed supplier(s) with whom they had had some favourable prior experience.

Seed is an intangible product. While some seed quality dimensions such as seed size, the purity of the seed (when mixed with varieties possessing different skin colours or flesh colours), physiologically old seed and seed that is infected with various storage rots can be ascertained from a visual inspection, for a great many other quality parameters, it is not possible to differentiate between alternative seed supplier's offers only on the basis of visual inspection. The extent to which seed is physiologically mature (and therefore capable of sprouting after planting) and free from pathogens can only be ascertained some weeks after planting and it is only at harvest, some 60-90 days later that the productivity of the seed can be accurately determined. In the absence of any certified seed system that might provide some assurance of seed quality, farmers reduce the risk by purchasing from those seed suppliers who have provided good quality seed in the past.

Since most potato farmers must enter into some credit arrangement with the seed supplier, farmers prefer to transact with those seed suppliers who offer the most competitive prices and favourable terms of repayment. Such seed suppliers are perceived to have a strong customer base and to be financially strong. This is important for in the unlikely event of crop failure, a financially strong supplier will allow the farmer to repay the loan over many years.

As most potato farmers (98%) intend to retain some proportion of the harvest to plant one or more subsequent potato crops, the ability of the seed supplier to provide seed that was substantially free of pathogens and seed of the desired size was also found to exert considerable influence on the farmers choice of seed supplier. Seed that is substantially free of pests and diseases will have a greater yield potential, not only for the current crop but, for any other potato crops which may be derived from that seed (Beukema and van der Zaag 1990). To the extent that they are able, most farmers will endeavour to purchase the best quality seed. However, good quality seed will cost more to purchase. For those farmers unable to secure a loan, to discern any tangible difference in seed quality and for those farmers who have no desire to retain any proportion of the seed for planting a subsequent potato crop, the cost of seed will remain the most important variable in

their choice of preferred seed supplier. However, where farmers intend to retain some proportion of the harvest to plant one or more subsequent crops, purchasing on price alone will inevitably result in the acquisition of inferior quality seed with a concomitant reduction in productivity.

Seed size will have a direct impact on the amount of cash farmers must outlay to purchase seed. While large seed tubers generally produces more shoots, if larger seed is used, a greater weight of seed per unit area must be planted, thereby incurring additional cost. Most potato farmers in the Cordillera (61%) sought to purchase seed between 40-50 mm (20-25 seed pieces per kg).

The final construct that was found to be most influential in the farmer's choice of seed supplier was the ability of the seed supplier to provide sufficient quantities of seed of the farmer's desired variety and to be able to respond to the farmer's immediate needs. Collectively, these variables were described as the seed supplier's functional quality. Although most farmers indicated their intention to buy seed 3-4 months before planting, there was some possibility that the preferred seed supplier may be unable to deliver because of the unprecedented demand for seed or unexpected losses incurred during seed storage. Since most farmers retain some proportion of their own harvest to use as seed for a subsequent crop, they may also find that as the planting time approaches, they have insufficient seed to plant the intended area.

Hence, those variables that were found to be most influential in the farmer's choice of seed supplier were comprised primarily of the various technical quality dimensions (seed quality), functional quality dimensions (the ability to deliver the seed in the quantities required when the farmer needed it for planting) and price. Not unexpectedly, empirical support for the importance of each of these variables can be found in the industrial purchasing literature reported by Cunningham and White (1973), Lehmann and O'Shaughnessy (1974) and Dempsey (1978).

However, in contrast to more recent literature on industrial purchasing behaviour (Leenders and Fearon 1993; Hutt and Speh 1995), the service elements of the seed supplier's offer were perceived as being relatively unimportant for all but the larger potato farmers. Since these service elements assume greater importance when alternative suppliers make relatively homogeneous offers, this would suggest that significant differences still exist between alternative seed suppliers' offer quality.

11.4 Buyer-seller relationships in the Filipino seed potato industry

In describing the range of marketing relationships, Webster (1992) describes a continuum anchored at one end by a discrete one-off transaction between two actors in a competitive market and at the other, by two fully integrated hierarchical firms. One step away from the pure transaction is a repeat transaction. The next step is a long-term relationship, followed by a cooperative buyer-seller partnership in which each actor depends upon the other (in some particular area of activity). In considering the nature of the long-term relationship between Filipino potato farmers and their preferred seed suppliers, it is highly probable that all four types of relationship can be identified.

A one-off transaction is expected to emerge where a farmer sees an opportunity to grow potatoes, either because they have the land available or output prices in the fresh market suddenly make it more attractive to grow potatoes. Such farmers are pure opportunists, perhaps acting impulsively. Since they have no desire to retain any proportion of the harvest to replant a subsequent potato crop, they will endeavour to minimise the costs of production, hence seeking to the maximum extent possible, to purchase the best quality seed for the lowest price. Such farmers are generally found at lower altitudes, where should heavy rain result in the closure of the Halsema Highway, they may be able to take advantage of the sudden increase in price. However, with the marked increase in the number of insect vectors and the higher incidence of bacterial wilt, farmers at lower altitudes are unable to retain any proportion of the seed to plant another crop.

However, for most farmers in the Cordillera, since potatoes are the major source of income for the household and there are few other crops with the same potential to maximise income, farmers will endeavour to repurchase seed from those seed suppliers who have provided good quality seed in the past. The desire to repurchase may be driven by convenience, therefore minimising the amount of time and effort needed to process information about the various alternatives, or it may be driven by the knowledge that the preferred seed supplier offers a product that is distinctly superior to that offered by alternative suppliers. Since this is, by its very nature a repeat purchase, the farmer has had some favourable prior experience and thus, if reputation has at all influenced the farmer's decision to purchase, the rudiments of trust are present.

In the transitional economies where there is imperfect information and there are few effective legal mechanisms for handling disputes, trust will greatly reduce search costs and facilitate the exchange of information on market conditions and prices, trade flows and credit (Fafchamps and Minten 1998). Sako (1982), Humphrey and Schmitz (1998) and Brenkert (2000) argue that without some minimal level of trust, exchange would prove impossible in all but the most fundamental economies.

When investments cannot be limited, information is not available and contractual arrangements are either inapplicable or unworkable, trust may be the only option (Selnes 1998). In the Cordillera, the seed potato industry satisfies two of these conditions. To grow potatoes, farmers must either use their own seed or purchase seed from other farmers. However, in the absence of any certified seed system, the farmer is unable to accurately ascertain the quality of the seed prior to planting. Hence, unlike the majority of other inputs seed is an intangible product. While the farmer's decision to purchase seed may be based on some favourable prior experience or reputation, it is only some weeks after planting and ultimately at harvest that the farmer can evaluate the productivity of the seed and their satisfaction or dissatisfaction with the purchase will emerge.

As the productivity of the seed is dependent not only on seed quality, but also upon the freedom of the soil from various pests and pathogens, the extensive use of chemicals and fertilizers and seasonal variations in temperature, rainfall and insolation, it is impossible to adequately cover all of these contingencies in any formal contract. While trust may be able to compensate for the absence of any formal agreement (Ring and van de Ven 1994) and in part, to remove much of the uncertainty associated with an intangible product, trust will become an important antecedent of relationship enhancement (Selnes 1998).

If trust is an antecedent to satisfaction, then it is satisfaction that will lead to the desire to maintain the relationship rather than trust. Liljander and Strandvik (1995) indicate that customer satisfaction is the best predictor of a customer's intention to repurchase. Satisfied customers not only stay loyal to the firm but, may also buy more and buy more often (Anderson *et al.* 1994). In the Cordillera, it was the farmer's desire to procure the best quality seed available that not only resulted in potato farmers maintaining their relationship with their preferred seed suppliers, but it also resulted in farmers becoming more dependent upon their preferred seed suppliers.

However, Gruen (1995) warns that maximising satisfaction without building trust can lead to a promiscuous relationship. In the absence of any tangible relationship-specific investments, firms will continue to transact only until that point where an alternative exchange partner presents a better deal. Furthermore, Wilson and Mummalaneni (1986) state that it is possible for an actor to be committed to a relationship even where they are unsatisfied with it. Backhaus and Buschken (1999) demonstrate how, in the presence of substantial relationship-specific investments, while short-term opportunistic behaviour may result in an unsatisfactory exchange, the respective parties maintain the relationship in the expectation of benefiting from subsequent exchange episodes. In the Cordillera, while potato farmers may be dissatisfied with the prices they receive in the output market, they will continue to maintain their relationship with those seed suppliers who offer the best quality seed and the most favourable terms of repayment.

While there is some debate in the literature as to whether a repeat purchase situation constitutes any meaningful on-going relationship, for durable consumer goods where some after sales service may be required (Webster 1992) and capital goods such as seed potatoes where the benefits are derived over a long period of time, there will be an on-going relationship either directly or indirectly with the customer. However, the relationship in whatever form it takes, may be highly adversarial and present a major source of conflict between the actors.

Webster (1992) suggests that it is not until the actors have finally entered into a formal contract that the association moves towards being a long-term relationship. However, this in itself is no guarantee that all conflict has been removed, for in the industrialised countries, it has been common practise for many years to play one supplier off against another in order to obtain the lowest possible price. Ford (1984) suggests that a long-term relationship begins to emerge when the actors begin to make tangible relationship-specific investments. This may begin initially with the exchange of commercially sensitive information leading eventually to formal investments in infrastructure, systems and product innovations and adaptations to meet a specific customer's requests.

In the Cordillera, it would seem that the respective partners have entered into a long-term relationship when the preferred seed supplier has indicated their willingness to extend credit to the farmer. At this point in the development of their relationship, trust is evidently present. Farmers must trust the seed supplier to provide good quality seed. In transferring the resultant crop to the seed supplier to market, the farmer must trust the seed supplier to treat them fairly and equitably and to return to them a fair share of the profits. In turn, the seed supplier must trust the farmer not to sell the harvest to another trader or to default on the loan. Knack and Keefer (1997) indicate how informal credit markets depend on strong interpersonal trust to facilitate investment where there is no formal system of mediation and the lack of assets (or the unwillingness to use those assets as collateral) limits access to formal bank credit. Hence, as predicted, there was a significant positive association between the willingness of the preferred seed

supplier to make relationship-specific investments and the farmers' trust in their preferred seed supplier.

Having provided the farmer with financial assistance, seed suppliers will find that they have constrained their opportunities to use coercive influence strategies. In the absence of any formal contract, should the seed supplier exercise excessive power, the farmer can readily default on the loan. Not only will the use of coercive influence strategies result in a marked reduction in the farmer's trust in the preferred seed supplier, but the use of coercive influence strategies will also lead to a significant reduction in the farmer's desire to maintain the relationship.

On a more positive note, the willingness of the preferred seed supplier to provide financial assistance, to provide seed when it is scarce and to advise the farmer of potential supply problems will result in the relationship generating greater value. As the benefits derived from the relationship increase, the farmer's satisfaction with the exchange will increase, thus resulting in a significant positive association between the seed supplier's willingness to make relationship-specific investments and the farmer's relational satisfaction. Since it is in their best financial interests, farmers will endeavour to maintain their relationship with those seed suppliers who provide the most value. Hence, there was not only a significant positive association between satisfaction and the farmer's desire to maintain their relationship but, a significant positive association between the willingness of the seed supplier to make relationship-specific investments and the farmer's desire to maintain their relationship.

11.5. Opportunities for further research

The failure of the proposed model to adequately capture and predict the nature of the long-term relationships between Filipino potato farmers and their preferred seed suppliers demands further examination. Three problems require resolution.

It was evident that respondents in the Cordillera experienced considerable difficulty in utilising a seven point scale to accurately reflect their responses to many of the various item measures. Whether it was the way in which the various questions were asked, or whether indeed the responses did accurately capture the true importance of the various items, respondents tended to group their answers at either end of the scale: a particular variable was either "very important" or "not at all important" or they either "agreed a great deal" or they "disagreed a great deal". As a result, a great many variables (35%) were not normally distributed, thus restricting the operation of several multivariate data analysis techniques.

Cultural factors could be responsible, for an analysis of the $Z_{skewness}$ coefficients for the data collected in both Indonesia (14%) and Vietnam (24%) indicated that while such problems were much less evident, they were still significantly more abundant than those observed in the WA fresh fruit and vegetable industry (8%) and the WA wine grape industry (9%).

Bulmer (1998) describes how the social survey is "quintessentially an American form of social research" (p 153). Surveys pervade western society to such an extent that they are widely accepted by the majority of the population whether as respondents, consumers or critics. However, within a transitional economy, the ability of the survey to elicit individual attitudes and values will depend not only upon how well the technique is socially accepted by potential respondents, but also the manner in which the survey is both designed and conducted. Here various issues such as functional equivalence, format and approach, and the use of standardised measures and scales, will impact upon the ability of respondents to answer.

Critical problems often emerge in the construction of standardised measures and scales in that respondents may simply not understand the questions posed of them (Bulmer 1998). Without an adequate frame of reference, respondents may experience great difficulty in adequately positioning their responses, opting instead to provide answers that they perceive will appease the enumerator or

reflect group norms rather than individual opinions and beliefs (Kuechler 1998). Mitchell (1983) reports that the use of pre-coded questions may structure the respondent's frame of reference in such a manner as to encourage them to provide answers that in normal circumstances would be beyond their abilities to formulate. Lehmann (1985) indicates how fixed response questions may limit the respondent. Especially strong feelings cannot be adequately expressed leading to truncated responses.

Conversely, relying upon the use of open-ended questions to elicit responses will most likely lead to more abstract conceptualisations and the inability to make meaningful comparisons between competing attributes (Kuechler 1998). Here, the quality of the responses depends to a much greater extent upon the respondent's glibness and interest in the topic and the ability of the enumerator to extract the information, thus making the survey more susceptible to interviewer bias (Lehmann 1985).

However, the use of a standardised interview schedule is in itself no guarantee that the results will be reliable (Bulmer 1998). Kuechler (1998) states that, "the survey method appears to be culture specific, a valuable and indispensable tool for gauging public opinion in Western societies but is inherently deficient when used in countries with other political and cultural traditions" (p 189). Cultural differences do exist between Western nations and most Asian societies that will influence the type of questions that can be asked and the manner in which they are asked. While short direct questions are common in most Western nations, these are often considered inappropriate, if not offensive, in many Asian societies.

More fundamental however, is that although the same questions may be asked across a number of cultures, the concept itself may not be equivalent. Macintyre (1973)(cited in Bulmer 1998) describes and compares how the concept of pride in Italy is vastly different from the same concept in England. Translation does not adequately compensate for the problem of context as literally equivalent words and phrases may convey quite different meanings in two different languages and

cultures (Bulmer 1998). Scheuch (1968)(cited in Kuechler 1998) raises concerns about the importance of translating cross-national surveys, arguing for functional equivalence rather than literal conversion. Kuechler (1998) describes how in testing whether functional equivalence has been achieved, simply back translating the questionnaire will not suffice. Communication with collaborators about questionnaire formulation and structure, rather than just item translation, is critically important (Bulmer 1998).

To ensure the validity of survey data, culture-specific adjustments are necessary (Kuechler 1998). Often, the analysis can be greatly enriched by incorporating non-quantitative information about cultural norms, an aspect particularly important for Asian countries. However, stretching the concept of functional equivalence to include culture may result in compromises and the production of questionable data that is not solidly grounded in empirical evidence or readily applicable across cultures. Jowell (1998) describes how it is imperative to ensure that questions have an equivalent meaning to all respondents in all countries to ensure that variations in the data are derived from differences in their answers rather than in their interpretation. Newby *et al.* (1998) finds it particularly desirable to use multiple research approaches particularly when studying phenomena that has not been previously researched.

Returning to the issue of functional equivalence, trust is a concept that means many different things to many different people (Lane 2000). In the absence of a well-developed legal system, not only is trust more important in the transitional economies, but trust is based to a much greater extent on long-term interpersonal relationships and the norms of social morality (Platteau 1994; Fukuyama 1995; Lyon 1995). In this regard, the existing measures of trust most commonly applied in the analysis of long-term buyer-seller relationships in the industrialised world (Ganesan 1994; Doney and Cannon 1997) are unlikely to adequately capture the true nature of the construct in the developing countries.

This issue might be best resolved by undertaking detailed exploratory research with a selected group of potential respondents. From an analysis of the transcript, various item measures might then be developed and tested for both their reliability and validity prior to their inclusion in a subsequent survey instrument.

However, it is not only trust that needs to be reviewed. In the context of long-term buyer-seller relationships, it is appropriate to revisit and redefine satisfaction. In the analysis of long-term buyer-seller relationships, satisfaction has been most often evaluated on the basis of the most immediate past transaction. However, it is cumulative satisfaction that motivates firms to invest in relationships, where satisfaction is derived not only from the extent to which current products and services meet customers needs, but also the anticipated quality of future products and services (Anderson *et al.* 1994). Just as trust is based upon an expectation that an exchange partner will behave in a predictable manner, cumulative satisfaction is also based upon an expectation that an exchange partner will continue to provide products and services that will perform to the standard expected.

Responding to Geyskens *et al.* (1999) and Geyskens and Steenkamp (2000) challenge to conceptualise satisfaction on two levels (economic and social), many aspects of social satisfaction have the potential and indeed many were found in this thesis to overlap with the generally accepted measures of trust. However, this should not preclude or restrict the development of more appropriate measures of relational satisfaction, for the various arguments presented by Gerbing and Anderson (1988), Johnson and Fornell (1991), Geyskens *et al.* (1999), Geyskens and Steenkamp (2000) and Tikkanen and Alajoutsijarvi (2002) have a sound theoretical foundation.

In numerous studies undertaken by the author subsequent to having completed the data analysis associated with this thesis, two additional components have been built into most other questionnaires that have greatly assisted in the analysis of both the relationship dimensions and the preferred supplier's performance.

In the first instance, it is not only important to identify what customers want, it is also important to identify the extent to which the preferred supplier is able to fulfil these needs. First proposed by Parasuraman, Zeithamal and Berry (1985) and subsequently used in the development of the SERVQUAL measures, the concept of gap analysis enables suppliers to match their performance on various selection criteria to the relative importance the buyer places on those same criteria (Lambert, Adams and Emmelhainz 1997). Competitive advantage is best gained by performing well on those attributes considered important to the buyer while over performing on unimportant criteria constitutes an inefficient use of limited resources.

While there is much debate on the various methodologies one can use to evaluate supplier performance, Ennew, Reed and Binks (1993) suggest that a comparison of the mean scores of the importance of various attributes and the supplier's perceived performance in delivering against those same attributes provides a straightforward measure of how well a particular supplier meets customers needs.

Similar insights into the nature of a customer's long-term relationship with a supplier can also be sought by investigating not only the nature of the customers relationship with their preferred supplier but also with secondary suppliers and or competitors. While asking potato farmers in the Cordillera to report only upon the nature of their relationship with their most preferred seed supplier may have created some of the problems associated with the non normality of the data, respondents in Australia, Indonesia and Vietnam were asked to report on their relationship with their most preferred trading partner. However, in each of these subsequent studies, farmers were asked to evaluate their relationship with their preferred buyer rather than their preferred supplier. The extent to which this may have influenced their responses is unknown for there is some evidence to suggest that a firm's relationships with up-stream suppliers and down-stream customers may be quite different (Samiee and Walters 2003).

11.6. Implications for Western Australian seed potato producers [8]

Although the State of Western Australia (WA) occupies more than 2.52 million square kilometres, WA is the smallest producer of potatoes in Australia. In 1999, only 2,685 hectares of potatoes were cultivated in WA (ABS 2003a). However, WA produced an average yield of 40.5 tonnes per hectare, far in excess of the Australian national average of 32.6 tonnes per hectare (ABS 2003b).

In WA, potatoes are planted from June to February (Batt 1994). However, the best climatic conditions for the growth of potatoes are found between August and December. With production occurring within a narrow coastal strip from Gingin to Manjimup and Albany, fresh potatoes are available every week of the year.

WA is unique because it is the only state in Australia still to have a statutory marketing board. Under a system of area licenses, the Potato Marketing Board of WA (PMBWA) determines on the basis of the previous season's harvest, the number of hectares required to meet the forecast consumer demand. Through a system of Delivery Intents, the PMBWA then establishes a weekly plan to supply around 1,000-1,200 tonnes of potatoes per week (Batt 1994).

Since production licenses are issued to growers specifying the area (hectares) to be planted, there is a significant financial incentive for potato growers to maximise productivity per unit area (Batt 1994). However, the two other variables that contribute to the above average yield are the strict quarantine and isolation from other potato growing areas. WA is perhaps the only potato growing area in the world to be free from the three major pests and diseases of potatoes (bacterial wilt, late blight and Potato Cyst Nematode)(Schmiediche 1995). Furthermore, since most potato growers either graze livestock or grow potatoes within an

[8] This section draws extensively from Batt, Peter J. (1997), *A Review of the Export Market for Western Australian Seed Potatoes in South East Asia,* New Industries Program, Agriculture Western Australia and Batt, Peter J. (1994), Potato Production in Western Australia in Rasco, E.T and F.B. Aromin (ed), *Proceedings of Fourth Asian Potato Association Triennial Conference,* Asian Potato Association, Vol 1, 167-171.

integrated vegetable production system, potatoes are seldom grown in the same soil more than once every three years, thereby significantly reducing the accumulation of soil borne pathogens. Near the coast, a strong south-westerly airflow from the Southern Ocean provides isolated seed production areas with a very low incidence of aphids and other insect vectors (Batt 1994).

WA currently produces around 12,000 tonnes of seed per year (Nightingale Consulting 2001). Seed is either grown under an Approved Seed Scheme on heavy peat soils subject to regular winter flooding near Albany or under a Certified Seed Scheme in south-west WA (Batt 1994). However, in both cases, seed growers import pathogen-tested minitubers (G_0) from the Eastern States, multiplying these in the field for no more than four generations. This seed is then utilised in the production of potatoes for the fresh market, for processing (as either French fries or crisps) or exported.

WA currently exports around 1,200 tonnes of seed potatoes per annum (although the official statistics indicate a much smaller amount). The largest market is to Mauritius, which purchases around 700 tonnes per annum. Other markets for WA seed potatoes include Indonesia, Thailand and Sri Lanka.

Given the increasing demand for seed in South East Asia and the inability of any of the National Seed Potato Programs to successfully establish any formal seed certification system in the region, WA is emerging as a cost effective source of high quality seed. WA is not only closer to the market than the traditional sources of seed from Europe (the Netherlands, Germany and Scotland) but WA is able to provide seed of the desired physiological age for planting in October, when seed harvested in Europe (in August) is not yet mature enough to plant. With the low incidence of disease there is also less likelihood of inadvertently importing serious plant diseases which, in the tropical highlands, given the intensity of production, have to potential to spread rapidly and both reduce the productivity per unit area and the ability of the tubers to store for any significant period of time. Furthermore, unlike the European seed producers, seed potato growers in WA

have shown a willingness to import and multiply potato varieties selected by the National Seed Potato Programs for subsequent re-export. These improved varieties are both more suited to the agro-ecological conditions experienced in each country and to the demands of the local market.

However, the seed potato industry in WA is very much in its infancy. With seed potato production currently approaching 12,000 tonnes and exports averaging just 1,200 tonnes, WA lacks the critical mass to capture the benefits derived from the economies of scale. While Australia currently exports around 10,800 tonnes of seed potatoes (Nightingale Consulting 2001), the Netherlands exports over 685,000 tonnes (NIVAA 2003) and Scotland, the world's second largest producer of seed potatoes, around 48,100 tonnes (SEERAD 2003). Isolation also comes at a cost, for it is not only more expensive to ship seed potatoes from WA but shipping is both irregular and unreliable. Furthermore, the relatively unsophisticated nature of seed potato production in WA and the predominant use of cut seed makes it difficult to cost effectively produce the large quantities of small round seed required by the export markets.

Looking specifically at the potential market for WA seed potatoes in the Cordillera, the period of greatest demand for imported seed will be associated with the planting of the main crop in January-February. At this time of the year, there is less likelihood of crop failure from both frost and typhoons and thus farmers have the best chance of recovering their initial investment. However, at this time of the year, WA will not only face intense price competition from the European seed suppliers, but most of the seed crops in WA will either still be in the ground or physiologically too young. Nevertheless, since potato production in WA is not limited by climatic constraints to the same extent as the European seed producers, on selected sites it will be possible to plant July-August and to harvest in October so that seed of the desired physiological age is available for planting.

With most potato farmers in the Cordillera (75%) paying between Ps 13-15 per kg to purchase seed, despite the proximity of WA to the market, the cost of

purchasing imported seed will remain problematic for both the Filipino potato farmers and WA seed producers. Batt (1997) estimates that WA seed producers must realise a c+f price of around AUD$800 per tonne (Ps 20 per kg) for seed exports to the Philippines to prove profitable. However, the costs at the farm level will be appreciably higher after meeting the costs of inspection, Customs clearance, storage, domestic freight costs and the importers and distributors profit margins.

Fortunately, while the larger potato farmers are both more willing and able to pay a higher price, the larger farmers indicate that they generally pay a price premium only 15-20% above that paid by the smaller farmers. Furthermore, while the larger farmers may have better access to credit, it is unlikely that they will be able to pay the full cost of the imported seed prior to harvest. While the larger farmers appear to be the most attractive end customers for WA seed, they do not, on average, purchase any more seed than the smaller farmers. While ideally, the larger farmers may purchase as much as 1 tonne, most purchase around 500 kg. Since the cost of credit is as much of a problem for the larger farmers as it is for the smaller farmers, in order to penetrate the market, WA seed suppliers will need to extend credit to a reputable local agent.

While the larger farmers may pay a higher price, they also expect a higher level of service. The larger farmers require their seed suppliers to provide them with more technical information, more market information and to be more willing to share the costs of evaluating new varieties. Although the larger potato farmers may be less risk averse, partly because they draw less of their household income from potato production and partly because they have greater market power (for they generally negotiate better prices for their fresh potato crop), until such time as they are able to verify that the higher costs associated with the purchase of seed from a new supplier or a new variety does indeed result in a significant improvement in productivity and profitability, they are unlikely to embrace the innovation to the full extent possible.

During the data collection phase, numerous on-farm demonstration plots were observed throughout the Cordillera. According to Athaide *et al.* (1996), product demonstration aims to reduce buyers perceived risk of adoption. Demonstration not only confirms that the product will deliver the desired benefits, but it also provides an opportunity to clarify the product's relative advantage and thus to convince buyers that the product is superior to that currently being used. Furthermore, providing evidence of the product's superior performance will enable sellers to articulate the product's relative advantages. By better managing buyers expectations and by being honest about the product's performance in use, sellers have an opportunity to build trust. Lamont (1993) suggests that one of the reasons for the continuing dominance of Dutch seed potato exports is the ability of the industry to produce new and improved varieties in response to changing consumer requirements in both existing and emerging markets. This is supported by numerous experimental and demonstration sites worldwide that greatly facilitate the rate of adoption.

Providing buyers with on-site technical support is the next logical step, for when technological innovations are involved, sellers often need to help buyers achieve the full benefit from the innovation (Athaide *et al.* 1996). While planting a new variety may appear to be only a minor innovation, the decision may have significant implications on the use of irrigation, fertilisers and pesticides and even influence the length of the cropping period. Failure to achieve anticipated benefits because of the inappropriate use (or lack) of complementary inputs or failure to let the crop run for its full duration will result in negative word-of-mouth and thus a significant reduction in the rate of adoption.

However, with less than 5,600 hectares of potatoes cultivated in the Cordillera and with most farmers (87%) sourcing the majority of their seed from the informal seed system, at a planting rate of 1.8-2.0 tonnes per hectare, the market is unlikely to exceed more than 1,450 tonnes per annum. Without significant financial support from the Government, it is unlikely that any one WA seed producer could cost effectively develop the seed market in the Cordillera.

Nevertheless, it should be possible through the National Seed Potato Program and selected farmers to provide training courses, to undertake cooperative research and development projects, to provide technical exchanges between growers and agronomists, and to facilitate and improve communication within the industry. By becoming an integral and accepted part of the informal seed system, providing that WA seed producers can continue to supply seed that is competitively priced, substantially free of pests and diseases, of the desired size, variety and physiological age, the farmers themselves may become the greatest advocates for WA seed.

References

Achrol, R. S., T. Reve and L. W. Stern (1983), The environment of marketing dyads: a framework for comparative analysis, *Journal of Marketing,* Vol 47 (Fall), 55-67.

Achrol, R. S. (1997), Changes in the theory of interoganisational relations in marketing: toward a network paradigm, *Journal of the Academy of Marketing Science,* Vol 25 (1), 56-71.

Altoveros, E. C. (1992), Seed management aspect: use of computer program, in Rasco and Aromin (ed), *Potato Seed Systems in Transition,* SAPPRAD, 177-195.

Andaleeb, S.S. (1996), An experimental investigation of satisfaction and commitment in marketing channels: the role of trust and dependence, *Journal of Retailing,* Vol 72 (1), 77-93.

Anderson, E.W., C. Fornell and D.R. Lehmann (1994), Customer satisfaction, market share and profitability: findings from Sweden, *Journal of Marketing,* Vol 58 (July), 53-66.

Anderson, E. and B. A. Weitz (1986), Make-or-buy decisions: vertical integration and marketing productivity, *Sloan Management Review,* Spring, 3-19.

Anderson, E., W. Chu and B. A. Weitz (1987), Industrial purchasing: an empirical exploration of the buyclass framework, *Journal of Marketing,* Vol 51 (July), 71-86.

Anderson, E. and B. A. Weitz (1989), Determinants of continuity in conventional industrial channel dyads, *Marketing Science,* Vol 8 (Fall), 310-323.

Anderson, E. and B. A. Weitz (1992), The use of pledges to build and sustain commitment in distribution channels, *Journal of Marketing Research,* Vol 29, 18-34.

Anderson, J. C. and J. A. Narus (1990), A model of distributor firm and manufacturing firm working relationships, *Journal of Marketing,* Vol 54 (1), 42-58.

Anderson, J. C. and J. A. Narus (1991), Partnering as a focused market strategy, *Californian Management Review,* Vol 33 (3), 95-113.

Anderson, J. C. and J. A. Narus (1999), *Business Marketing Management: Understanding, Creating and Delivering Value,* Prentice Hall. NJ.

Annen, K. (2003), Social capital, inclusive networks and economic performance, *Journal of Economic Behaviour and Organisation*, Vol. 50 (4), 449-463.

Arbuckle, J.L. (1997), *Amos Users' Guide,* Smallwaters Corporation.

Arndt, J. (1979), Towards a concept of domesticated markets, *Journal of Marketing,* Vol 43 (Fall), 69-75.

Aromin, F. B., E. T. Rasco, O. K. Bautista, P. Magtibay, E. J. Sana, A. A. de la Cruz, C. A. Baniqued and J. S. Mariano (1993), Evaluation of highland produced seed tubers of potato cv Berolina, in *Research Papers and Progress Reports on Development Activities July 1992-June 1993,* SAPPRAD, 376-401.

Athaide, G. A., P. W. Meyers and D. L. Wilemon (1996), Seller-buyer interactions during the commercialisation of technological process innovations, *Journal of Product Innovation Management,* Vol 13, 406-421.

Australian Bureau of Statistics (2003a), *Agriculture industry in Australia – WA State profile* [online: www.austats.gov.au]

Australian Bureau of Statistics (2003b), *Year Book Australia. 2003. Agriculture. Vegetables and Fruit* [online: www.austats.gov.au]

Aulakh, P.S., M. Kotabe and A. Sahay (1996), Trust and performance in cross-border marketing relationships: a behavioural approach, *Journal of International Business Studies,* Vol 27 (5), 1005-32.

Babin, B.J and M. Griffin (1998), The nature of satisfaction: an updated examination and analysis, *Journal of Business Research,* Vol 41, 127-136.

Bachmann, R. (2000), Conclusion: trust – conceptual aspects of a complex phenomenon, in Lane C. and R. Bachmann (ed), *Trust Within and Between Organisations*, Oxford University Press, 298-322.

Backhaus, K. and J. Buschken (1999), The paradox of unsatisfying but stable relationships – a look at German car suppliers, *Journal of Business Research,* Vol 46, 245-257.

Balaoing, V. G. and F. D. Lazo (1967), Irish potato production in the Philippines: problems and prospects, *Philippine Journal of Plant Industry,* Vol 32 (3-4), 195-216.

Batt, P. J. (1994), Potato production in Western Australia, in Rasco, E.T. and F.B. Aromin. (ed), *Proceedings of the Fourth Asian Potato Association Triennial Conference,* Asian Potato Association, 167-171.

Batt, P. J. (1997), *A Review of the Export Market for Western Australian Seed Potatoes in South East Asia,* New Industries Program, Agriculture Western Australia, October.

Batt, P. J. (1998), The demand for seed potatoes in South East Asia, *Australian Agribusiness Review* [on-line] http://www.agribusiness.asn.au

Batt, P. J. (1999), Potato production in the Philippines, www.potatocongress.org/columns/september/batt.htm [on-line]

Batt, P. J. and N. Rexha (1999), Building trust in agribusiness supply chains: a conceptual model of buyer-seller relationships in the seed potato industry in Asia, *Journal of International Food and Agribusiness Marketing,* Vol 11(1). 1-17.

Batt, P. J. (2001a), Why dissatisfied customers still desire long-term relationships, in *Interactions, Relationships and Networks: Strategic Dimensions. Proceedings 17th Annual IMP Conference.* Norwegian Institute of Management (BI) [cd].

Batt, P. J. (2001b), Variety: the key driver of demand for seed potatoes in the Philippines, *African Crop Science Journal,* Vol 9 (1). 317-329.

Batt, P. J. (2001c), Factors influencing a potato farmer's choice of seed supplier: empirical evidence from the Philippines, *Journal of International Food and Agribusiness Marketing,* Vol 12 (2). 71-91.

Batt, P. J. (2001d), Relational quality: further evidence of a single higher order construct in an industrial market, in *Interactions, Relationships and Networks: Strategic Dimensions. Proceedings 17th Annual IMP Conference,* Norwegian Institute of Management (BI) [cd]

Batt, P. J. (2001e), The universality of trust? in Chetty, S. and B. Collins (ed) *Proceedings Australia New Zealand Marketing Academy. Bridging Marketing Theory and Practice.* Massey University. Auckland. New Zealand. [cd]

Batt, P. J. and H. Wilson (2001), Exploring the nature of long-term buyer-seller relationships in the Western Australian wine industry, *Australia New Zealand Wine Industry Journal,* Vol 16 (6), 87-96.

Batt, P. J. and V. Thein (2001), Examining Asian attitudes to Australian horticultural products in Hong Kong, Malaysia and Singapore, *Proceedings 11th IAMA Annual World Food and Agribusiness Symposium.* Sydney, Australia. [on-line] www.agecon.tamu.edu/iama/symposium2001/papers.html

Batt, P. J. (2002), *Report for Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) on the market for seed potatoes, fresh potatoes and processed potato products in Vietnam,* GTZ Hanoi.

Batt, P. J. and N. Parining (2002), Trust building behaviour within the Balinese fresh produce industry, in Batt, Peter J (ed), *Culture and Collaboration in Distribution Networks. Proceedings of the inaugural meeting of the IMP Group in Asia.* Curtin University [cd]

Batt, P. J. (2003a), Examining the performance of the supply chain for potatoes in the Red River Delta using a pluralistic approach, *Supply Chain Management: an International Journal,* (in press)

Batt, P. J. (2003b), Building trust between growers and market agents, *Supply Chain Management: an International Journal*, Vol 8 (1), 65-78.

Batt, P.J. and R. Morooka (2003), Perceptual differences in offer quality between Western Australian rock lobster exporters and Japanese rock lobster importers. *Supply Chain Management; an International Journal*, (in press)

Batugal, P. A., A. A. de la Cruz and M. Castaneda (1988), Planting material management. The use of highland grown seed potatoes for lowland Philippines, *Proceedings Workshop on Tropical Agronomy of Potatoes,* CIP/APA, 124-128.

Beukema, H.P. and D.E. van der Zaag (1990), *Introduction to Potato Production,* PUDOC. Wageningen.

Beukema, H.P. (1990), A comparison of different seed potato production systems, in Rashid, M.M., M.A. Siddique and M.M. Hussain (ed), *Seed Potato in Bangladesh,* Bangladesh-Netherlands Seed Multiplication Project, 43-62.

Bennett, R. and H. Gabriel (2001), Reputation, trust and supplier commitment: the case of shipping company/seaport relations, *Journal of Business and Industrial Marketing,* Vol 16 (6), 424-438.

Bentler, P.M. and D.B. Bonett (1980), Significance tests and goodness of fit in the analysis of covariance structures, *Psychological Bulletin,* Vol 88, 588-606.

Bentler, P.M. (1990), Comparative fit indexes in structural models, *Psychological Bulletin,* Vol 107, 238-246.

Bjorkman, I. and S. Koch (1995), Social relationships and business networks: the case of Western companies in China, *International Business Review,* Vol 4 (4), 519-535.

Bos, D. (1998), *Adoption Process of a New Potato Variety. Farmer's Attitude Towards Potato Variety BSU-P03,* Unpublished MSc Thesis, University of Wageningen.

Bowen, D.E., C. Siehl and B. Schneider (1989), A framework for analysing customer service orientations in manufacturing, *Academy of Management Review,* Vol 14 (1), 75-95.

Bradach, J.L and R.G. Eccles (1989), Price, authority and trust: from ideal types to plural forms, *Annual Review of Sociology,* Vol 15, 97-118.

Brenkert, G.G. (2000), Trust, morality and international business, in Lane, C. and Bachmann, R. (ed), *Trust Within and Between Organisations,* Oxford University Press, 273-297.

Bulmer, M. (1983), Sampling, in Bulmer, M. and D.P. Warwick (ed), *Social Research in Developing Countries,* John Wiley and Sons, 91-99.

Bulmer, M. and D.P. Warwick (1983), Research strategy, in Bulmer, M. and D.P. Warwick (ed), *Social Research in Developing Countries,* John Wiley and Sons, 27-40.

Bulmer, M. (1998), Introduction. The problem of exporting social survey research, *American Behavioural Scientist,* Vol 42 (2), 153-167.

Bunn, M.D. (1993), Taxonomy of buying decision approaches, *Journal of Marketing,* Vol 57 (January), 38-56.

Byrne, B.M. (2001), *Structural equation modelling with AMOS: basic concepts, applications and programming,* Lawrence Erlbaum Associates, NJ.

Callueng, M.P., E. Sana, E.T. Valdez, A.A. de la Cruz, H.P. Reboroso and E. Chujoy (1993a), Farmers participatory evaluation of lowland potato clones, in *Research Papers and Progress Reports on Development Activities July 1992-June 1993,* SAPPRAD, 157-167.

Callueng, M.P., E. Sana, E.T. Valdez, H.P Reboroso and A.A. de la Cruz (1993b), Evaluation of potato germplasm in the lowlands of Cagayan, in *Research Papers and Progress Reports on Development Activities July 1992-June 1993,* SAPPRAD, 168-179.

Campbell, A. (1997), Buyer-seller partnerships: flip sides of the same coin? *Journal of Business and Industrial Marketing,* Vol 12 (6), 417-434.

Campbell, N.C.G. (1985), An interaction approach to organisational buying behaviour, *Journal of Business Research,* Vol 13, 35-48.

Cardozo, R.N. and J.W. Cagley (1971), Experimental study of industrial buyer behaviour, *Journal of Marketing Research,* Vol 8, 329-334.

Child, J. (2000), Trust and international strategic alliances: the case of Sino-foreign joint ventures, in Lane, C. and Bachmann, R. (ed), *Trust Within and Between Organisations,* Oxford University Press, 241-272.

Choffray, J.M. and G.L. Lilien (1980), *Market Planning for New Industrial Products,* John Wiley. NY.

Conway, T. and J.S. Swift (2000), International relationship marketing. The importance of psychic distance, *European Journal of Marketing,* Vol 34 (11/12), 1391-1413.

Crissman, C. (1987), Identifying strengths and weaknesses in seed programs, *Report of the Third Social Science Planning Conference,* CIP, 262-272.

Crissman, C. (1989), *Seed Potato Systems in the Philippines: A Case Study.* CIP.

Crissman, C. (1990), Comparing aspects of seed potato programs in Ecuador, Kenya and the Philippines, in Rashid, M.M. M.A. Siddique and M.M. Hussain (ed), *Seed Potato in Bangladesh,* Bangladesh-Netherlands Seed Multiplication Project, 63-74.

Crissman, C. and A. Hibon (1996), *Establishing Seed Potato Prices: Concepts, Procedures and Implications for Research and Training.* Social Science Department, Working Paper 1996-1, CIP, Peru.

Cronbach, L.J. (1951), Coefficient alpha and the internal structure of tests, *Psychometrica,* Vol 16, 297-334.

Crosby, L.A., K.R. Evans and D. Cowles (1990), Relationship quality in services selling: an interpersonal influence perspective, *Journal of Marketing,* Vol 54 (July), 68-81.

Cunningham, M.T. and J.G. White (1973), The determinants of choice of supplier, *European Journal of Marketing,* Vol 7 (Winter), 189-202.

Cunningham, M.T. and E. Homse (1982), An interaction approach to marketing and purchasing strategy, in Hakansson, H. (ed), *International Marketing and Purchasing of Industrial Goods. An Interaction Approach,* IMP Project Group, Wiley, 323-328.

Cunningham, M.T. and P.W. Turnbull (1982), Inter-organisational personal contact patterns, in Hakansson, H. (ed), *International Marketing and Purchasing of Industrial Goods. An Interaction Approach,* IMP Project Group, Wiley, 304-315.

de Ruyter, K., L. Moorman and J. Lemmink (2001), Antecedents of commitment and trust in customer-supplier relationships in high technology markets, *Industrial Marketing Management,* Vol 30, 271-286.

Della Vedova, O. and S. Brieva (1995), Socio economic methods for the study of input markets: seed potatoes in Argentina, in Scott. G. J. (ed), *Prices, Products and People. Analysing Agricultural Markets in Developing Countries,* CIP. Lynne Rienner. London, 239-254.

Demagante, A.L., P. van der Zaag and C. Boucaron (1986), *Cutting Potato Seed Tubers: A Means to Reduce Cost for Lowland Potato Production,* CIP Region VII, Working Paper 86/2.

Dempsey, W.A. (1978), Vendor selection and the buying process, *Industrial Marketing Management,* Vol 7, 257-267.

Department of Agriculture (1998), *Selected Statistics in Agriculture. High Value Commercial crop. Root Crops. Irish potato.*

Doney, P.M. and J.P. Cannon (1997), An examination of the nature of trust in buyer-seller relationships, *Journal of Marketing,* Vol 61 (April), 35-51.

Dorsch, M.J., S.R. Swanson and S.W. Kelly (1998), The role of relationship quality in the stratification of vendors as perceived by customers, *Journal of the Academy of Marketing Science,* Vol 26 (2), 128-142.

Dwyer, F.R., P.H. Schurr and S. Oh (1987), Developing buyer-seller relationships, *Journal of Marketing,* Vol 51 (April), 11-27.

Dyer, J.H. and W. G. Ouchi (1993), Japanese-style partnerships: giving companies a competitive edge, *Sloan Management Review,* Fall, 51-63.

Easton, G. and L. Araujo (1994), Market exchange, social structures and time, *European Journal of Marketing,* Vol 28 (3), 72-84.

Ellram, L.M. (1990), The supplier selection decision in strategic partnerships, *International Journal of Purchasing and Materials Management,* Fall, 8-14.

Ellram, L.M. (1991), A managerial guideline for the development and implementation of purchasing partnerships, *International Journal of Purchasing and Materials Management,* Summer, 2-7.

Emerson, C.J. and C.M. Grimm (1999), Buyer-seller customer satisfaction: the influence of the environment and customer service, *Journal of Business and Industrial Marketing,* Vol 14 (5/6), 403-415.

Ennew, C.T., G.V. Reed and M.R. Binks (1993), Importance-performance analysis and the measurement of service quality, *European Journal of Marketing,* Vol 27 (2), 59-70.

Evans, J.R and R.L. Laskin (1994), The relationship marketing process: a conceptualisation and application, *Industrial Marketing Management,* Vol 23, 439-452.

Fafchamps, M. (1996), The enforcement of commercial contracts in Ghana, *World Development,* Vol 24 (3), 427-448.

Fafchamps, M. and B. Minten (1998), *Relationships and Trade in Madagascar*, MSSD Discussion Paper No. 24, International Food Policy Research Institute.

Feder, G., R.E. Just and D. Zilberman (1985), Adoption of agricultural innovations in developing countries: a survey, *Economic Development and Cultural Change,* Vol 33, 255-298.

Feigenbaum, A.V. (1991), *Total Quality Control,* Third Ed., McGraw Hill.

File, M.A., J.L. Mack and R.A. Prince (1994), Marketing to the family firm. A new consideration for business-to-business marketers, *Journal of Business and Industrial Marketing,* Vol 9 (3), 64-72.

File, K.M and R.A. Prince (1996), A psychographic segmentation of industrial family businesses, *Industrial Marketing Management,* Vol 25, 223-234.

Fombrun, C. and M. Shanley (1990), What's in a name? Reputation building and corporate strategy, *Academy of Management Journal,* Vol 33 (2), 233-258.

Ford, D. (1980), The development of buyer-seller relationships in industrial markets, *European Journal of Marketing,* Vol 14 (5/6), 339-353.

Ford, D. (1982), Development of buyer-seller relationships in industrial markets, in Hakansson, H. (ed), *International Marketing and Purchasing of Industrial Goods. An Interaction Approach.* IMP Project Group, Wiley, 288-303.

Ford, D. (1984), Buyer/seller relationships in international industrial markets, *Industrial Marketing Management,* Vol 13, 101-112.

Ford, D., R. McDowell and C. Tomkins (1996), Relationship strategy, investments and decision making, in Iacobucci, D. (ed), *Networks in Marketing.* Sage Publications, 144-176.

Fornell, C. (1992), A national customer satisfaction barometer: the Swedish experience, *Journal of Marketing,* Vol 55 (January), 1-21.

Fornell, C., M.D. Johnston, E.W. Anderson, J. Cha and B.E. Bryant (1996), The American customer satisfaction index: nature, purpose and findings, *Journal of Marketing,* Vol 60 (October), 7-18.

Fournier, S. and D.G. Mick (1999), Rediscovering satisfaction, *Journal of Marketing,* Vol 63 (October), 5-23.

Frazier, G.L. (1983), Interorganisational exchange behaviour in marketing channels: a broadened perspective, *Journal of Marketing,* Vol 47 (Fall), 68-78.

Frazier, G.L and J.O. Summers (1984), Interfirm influence strategies and their application within distribution channels, *Journal of Marketing,* Vol 48 (Summer), 43-55.

Frazier, G.L. and J.O. Summers (1986), Perceptions of interfirm power and its use within a franchise channel of distribution, *Journal of Marketing Research,* Vol 23 (May), 169-176.

Frazier, G.L., J.D. Gill and S.H. Kale (1989), Dealer dependence levels and reciprocal actions in a channel of distribution in a developing country, *Journal of Marketing,* Vol 53 (January), 50-69.

Fukuyama, F. (1995), *Trust: The Social Virtues and the Creation of Prosperity,* Hamish Hamilton, London.

Ganesan, S. (1994), Determinants of long-term orientation in buyer-seller relationships, *Journal of Marketing,* Vol 58 (April), 1-19.

Gaski, J.F. (1984), The theory of power and conflict in channels of distribution, *Journal of Marketing,* Vol 48 (Summer), 9-29.

Gayao, B.T. and J.M. Sim (not dated), *Potato Investment Profile in the Cordilleras* Benguet State University.

Gayao, B.T., A.T. Botangen, J. Dati, H. L. Quindara, D.T. Meldoz and J.V. Sim (1997), *Farm-level Assessment of Potato Production, Marketing and Utilisation in the Highlands of Northern Philippines,* Northern Philippines Root Crops Research and Training Center, Benguet State University.

Gerbing, D.A. and J.C. Anderson (1988), An updated paradigm for scale development incorporating unidimensionality and its assessment, *Journal of Marketing Research,* Vol 25 (May), 186-192.

Geyskens, I., J.B. Steenkamp, L.K. Scheer and N. Kumar (1996), The effects of trust and interdependence on relationship commitment: a transatlantic study, *International Journal of Research in Marketing,* Vol 51, 303-318.

Geyskens, I., J.B. Steenkamp and N. Kumar (1998), Generalisations about trust in marketing channel relationships using meta-analysis, *International Journal of Research in Marketing,* Vol 15 (3), 223-248.

Geyskens, I., J.B. Steenkamp and N. Kumar (1999), A meta-analysis of satisfaction in marketing channel relationships, *Journal of Marketing Research,* Vol 36 (May), 223-238.

Geyskens, I. and J.B. Steenkamp (2002), Economic and social satisfaction: measurement and relevance to marketing channel relationships, *Journal of Retailing,* Vol 76 (1), 11-32.

Granovetter, M. (1985), Economic action and social structure: a theory of embeddedness, *American Journal of Sociology,* Vol 91, 481-510.

Gronroos, C. (1990), *Service management and marketing: managing moments of truth in service competition,* Lexington Books, MA.

Gronroos, C. (1995), *From Marketing Mix to Relationship Marketing: Towards a Paradigm Shift in Marketing.* http//www.mcb.co.uk [on-line].

Gronroos, C. (1999), Relationship marketing: challenges for the organisation, *Journal of Business Research,* Vol 46, 327-335.

Gundlach, G.T., R.S. Achrol and J.T. Mentzer (1995), The structure of commitment in exchange, *Journal of Marketing,* Vol 59 (January), 78-92.

Hair, J. F. Jnr., R.E. Anderson, R.L. Tatham and W.C. Black (1998), *Multivariate Data Analysis,* Fifth ed, Prentice Hall International, NJ.

Hakansson, H. and B. Wootz (1975), Supplier selection in an international environment - an experimental study, *Journal of Marketing Research,* Vol 12 (February), 46-51.

Hakansson, H., J. Johanson and B. Wootz (1977), Influence tactics in buyer-seller processes, *Industrial Marketing Management,* Vol 5, 319-332.

Hakansson, H. and B. Wootz (1979), A framework of industrial buying and selling, *Industrial Marketing Management,* Vol 8, 28-39.

Hakansson, H. (ed) (1982), *International Marketing and Purchasing of Industrial Goods: An Interaction Approach,* IMP Project Group, John Wiley and Sons.

Hakansson, H. and I. Snehota (1995), *Developing Relationships in Business Networks,* International Thomson Business Press, London.

Hakansson, H and D.D. Sharma (1996), Strategic alliances in a network perspective, in Iacobucci, D. (ed), *Networks in Marketing,* Sage Publications, 108-124.

Hallen, L., J. Johanson and N. Seyed-Mohamed (1991), Interfirm adaptation in business relationships, *Journal of Marketing.* Vol 55 (April), 29-37.

Halstead, D. (1999), The use of comparison standards in customer satisfaction research and management: a review and proposed typology, *Journal of Marketing Theory and Practice,* Vol 7 (3), 13-26.

Han, S.L., D.T. Wilson and S.P. Dant (1993), Buyer-supplier relationships today, *Industrial Marketing Management,* Vol 22, 331-338.

Handfield, R.B. and C. Betchel (2002), The role of trust and relationship structure in improving supply chain responsiveness, *Industrial Marketing Management,* Vol 31, 367-382.

Hardy, C.N., N. Phillips and T. Lawrence (2000), Distinguishing trust and power in interorganisational relations: forms and facades of trust, in Lane, C. and Bachmann, R. (ed), *Trust Within and Between Organisations,* Oxford University Press, 64-87.

Harris-White, B. (1995), Efficiency and complexity: distributive margins and the profits of market enterprise, in Scott, G. J. (ed), *Prices, Products and People. Analysing Agricultural Markets in Developing Countries*, Lynne Rienner, Boulder, 301-324

Haverkort, A.J. (1986), Forecasting national production improvement with the aid of a simulation model after the introduction of a seed potato production system in Central Africa, *Potato Research,* Vol 29 (1), 119-130.

Hawes, J.M., K.E. Mast and J.E. Swan (1989), Trust earning perceptions of sellers and buyers, *Journal of Personal Selling and Sales Management,* Vol 9 (Spring), 1-8.

Heide, J.B. and G. John (1988), The role of dependence balancing in safe-guarding transaction-specific assets in conventional channels, *Journal of Marketing,* Vol 52 (January), 20-35.

Heide, J.B. and G. John (1990), Alliances in industrial purchasing: the determinants of joint action in buyer-seller relationships, *Journal of Marketing Research,* Vol 27 (February), 24-36.

Heide, J.B. (1994), Interorganisational governance in marketing channels, *Journal of Marketing,* Vol 58 (January), 71-85.

Herbig, P and J. Milewicz (1995), To be or not to be...credible that is: A model of reputation and credibility among competing firms, *Marketing Intelligence and Planning,* Vol 13 (6), 24-33.

Higginbottom, D. (1996), *A Case Study: Seed Potatoes to Indonesia,* Australia-Indonesia Working Group on Agricultural and Food Cooperation, Darwin, June.

Highland Agriculture and Resources Research and Development Consortium (1996), *Highland Potato Technoguide,* Benguet State University, La Trinidad.

Hirakubo, N and M. Kublin (1998), The relative importance of supplier selection criteria: the case of electronic components procurement in Japan, *International Journal of Purchasing and Materials Management,* Spring, 19-24.

Horton, D. (1987), *Potatoes. Production, Marketing and Programs for Developing Countries,* Westview Press.

Huda, Md. Nazmul (1990), Seed potato marketing in Bangladesh, in Rashid, M.M., M.A. Siddique and M.M. Hussain (ed), *Seed Potato in Bangladesh,* Bangladesh-Netherlands Seed Multiplication Project, 219-231.

Humphrey, J. and H. Schmitz (1998), Trust and inter-firm relations in developing and transitional economies, *Journal of Development Studies*, Vol 34 (4), 1-17.

Humphrey, J. (2000), Trust and the transformation of supplier relations in Indian industry, in Lane, C. and Bachmann, R. (ed), *Trust Within and Between Organisations,* Oxford University Press, 214-240.

Hutt, M.D. and T.W. Speh (1995), *Business Marketing Management. A Strategic View of Industrial and Organisational Markets,* Fifth Ed, Dryden Press.

Jackson, B. B. (1985), Build customer relations that last, *Harvard Business Review,* November-December, 120-128.

Jayasinghe, U., J. Brons, P. Dalang, Z. Ganga, B. Gayao, M.U. Jonny and J. Perez (1997), *The Informal Seed System as a Means of Seed Production and Diffusion of New Potato Varieties in the Mountain Province of The Philippines,* CIP, La Trinidad, March.

Johnson, M.D. and C. Fornell (1991), A framework for comparing customer satisfaction across individuals and product categories, *Journal of Economic Psychology,* Vol 12, 267-286.

Johnson, M.D., A. Herrmann and A. Gustafsson (2002), Comparing customer satisfaction across industries and countries, *Journal of Economic Psychology,* Vol 23, 749-769.

Jowell, R. (1998), How comparative is comparative research, *American Behavioural Scientist.* Vol 42 (2). 168-177.

Kalwani, M.U. and N. Narayandas (1995), Long-term manufacturer-supplier relationships: do they pay off for supplier firms? *Journal of Marketing,* Vol 59 (January), 1-16.

Kloos, J.P. and P. van der Zaag (1988), Adoption of innovative seed technologies for non traditional seed potato areas, *Proceedings Symposium on Improved Potato Planting Material,* CIP/APA, 36-40.

Knack, S. and P. Keefer (1997), Does social capital have an economic pay-off? A cross country investigation, *Quarterly Journal of Economics,* November, 1251-1288.

Kool, M. (1994), *Buying Behaviour of Farmers,* Wageningen Pers, Wageningen.

Kool, M., M.T.G. Meulenberg and D. Broens (1997), Extensiveness of farmers buying processes, *Agribusiness,* Vol 13 (3), 301-318.

Kotler, P. and G. Armstrong (1999), *Principles of Marketing.* International Edition, 8th Edition, Prentice Hall.

Krapfel, R.E., D. Salmond and R. Spekman (1991), A strategic approach to managing buyer-seller relationships, *European Journal of Marketing,* Vol 25 (9), 22-37.

Kuechler, M. (1998), Survey method: an indispensable tool for social science research everywhere? *American Behavioural Scientist,*Vol 42 (2), 178-193.

Kumar, N., L.K. Scheer and J.B. Steenkamp (1995), The effects of supplier fairness on vulnerable resellers, *Journal of Marketing Research,* Vol 32 (February), 54-65.

Kumar, N. (1996), The power of trust in manufacturer-retailer relationships, *Harvard Business Review,* November-December, 92-106.

Kumar, V., D.A. Aaker and G.S. Day (1999), *Essentials of Marketing Research,* John Wiley and Sons.

Lambert, D.M., R.J. Adams and M.A. Emmelhainz (1997), Supplier selection criteria in the healthcare industry: a comparison of importance and performance, *International Journal of Purchasing and Materials Management,* Winter, 16-22.

Lamont, J.T.J. (1993), Export success determinants in the new product development process for exported agricultural products: evidence from the Dutch seed potato industry, *Agricultural Systems,* Vol 41, 455-474

Landeros, R. and R.M. Monczka (1989), Cooperative buyer/seller relationships and a firm's competitive posture, *Journal of Purchasing and Materials Management,* Fall, 9-18.

Lane, C. (2000), Introduction: theories and issues in the study of trust, in Lane, C and Bachmann, R. (ed), *Trust Within and Between Organisations,* Oxford University Press, 1-30.

Leedy, P.D. (1997), *Practical Research Planning and Design,* Sixth ed, Merrill Prentice Hall.

Leenders, M.R. and H.E. Fearon (1993), *Purchasing and Materials Management,* Tenth ed, Irwin.

Lehmann, D.R. and J. O'Shaughnessy (1974), Difference in attribute importance for different industrial products, *Journal of Marketing,* Vol 38 (April), 36-42.

Lehmann, D.R. (1985), *Market Research and Analysis,* Second ed. Irwin.

Lele, U. (1981), Cooperatives and the poor: a comparative perspective, *World Development*, Vol 9, 55-72.

Leuthesser, L. (1997), Supplier relational behaviour: an empirical assessment, *Journal of Marketing Management,* Vol 26, 245-254.

Lilien, G.L., P. Kotler and K.S. Moorthy (1992), *Marketing Models,* Prentice Hall

Liljander, V. and T. Strandvik (1995), The nature of customer relationships in services, *Advances in Services Marketing and Management,* Vol 4, 141-167.

Lohtia, R. and R.E. Krapfel (1994), The impact of transaction-specific investments on buyer-seller relationships, *Journal of Business and Industrial Marketing,* Vol 9 (1), 6-16.

Low, B.K.H. (1996), Long-term relationship in industrial marketing. Reality or rhetoric? *Industrial Marketing Management,* Vol 25, 23-35.

Luhmann, N. (1979), *Trust and Power,* Chichester, Wiley.

Luo, Y. (2002), Building trust in cross-cultural collaborations: towards a contingency perspective, *Journal of Management,* Vol 28 (5), 669-694.

Lyon, F. (2000), Trust, networks and norms: the creation of social capital in agricultural economies in Ghana, *World Development,* Vol 28 (4), 663-681.

McCutcheon, D. and F.I. Stuart (2000), Issues in the choice of supplier alliance partners, *Journal of Operations Management.* Vol 18, 279-301.

Macintyre, A. (1973), Is a science of comparative politics possible? in Ryan, A. (ed) *The philosophy of social explanation.* Oxford University Press. 171-188.

Mackenzie, H.F and K.G. Hardy (1996), Manage your offering or manage your relationship? *Journal of Business and Industrial Marketing.* Vol 11 (6), 20-37.

Macneil, I.R. (1980), *The New Social Contract: An Inquiry into Modern Contractual Relations,* Yale University Press, New Haven, CT.

McQuiston, D.H. (1989), Novelty, complexity and importance as causal determinants of industrial buyer behaviour, *Journal of Marketing,* Vol 53 (2), 66-79.

Madhok, A. (1995), Revisiting multinational firm's tolerance for joint ventures: A trust-based approach, *Journal of International Business Studies,* Vol 26 (1), 117-137.

Mariano, J.S, V.E. Demonteverde, J. Perez and P. van der Zaag (1991), Viruses: have we exaggerated their significance? in *Proceedings Symposium on the Role of Novel and Traditional Seed Potato Production Techniques in Asia,* Asian Potato Association, 32-40.

Marsh, H.W., J.R. Balla and R.P. McDonald (1988), Goodness-of-fit indexes in confirmatory factor analysis: the effects of sample size, *Psychological Bulletin,* Vol 103, 391-410.

Mavondo, F. and E.M. Rodrigo (2001), The effect of relationship dimensions on interpersonal and interorganisational commitment in organisations conducting business between Australia and China, *Journal of Business Research,* Vol 52 (2), 111-121.

Mayer, R.C., Davis, J.H and Schoorman, F.D. (1995), An integrative model of organisational trust, *Academy of Management Review,* Vol 20 (3), 709-734.

Medlin, C and P. Quester (2002) Inter-firm trust: two theoretical dimensions versus a global measure, in Batt, Peter J. (ed), *Culture and Collaboration in Distribution Networks. Proceedings of the inaugural meeting of the IMP Group in Asia* Curtin University of Technology [cd]

Mendoza, M.S. ands M.W. Rosegrant (1995), Pricing conduct of spatially differentiated markets, in Scott, G. J. (ed), *Prices, Products and People. Analysing Agricultural Markets in Developing Countries*, Lynne Rienner, Boulder, 343-360.

Merrilees, B. and D. Miller (1999), Direct selling in the West and the East: the relative roles of product and relationship (guanxi) drivers, *Journal of Business Research,* Vol 45 (3), 267-273.

Mitchell, R.E. (1983), Survey materials collected in the developing countries: sampling, measurement and interviewing obstacles to intranational and international comparisons, in Bulmer, M. and D.P. Warwick (ed), *Social Research in Developing Countries.* John Wiley and Sons. 219-239.

Monares, A. (1979), *Agro-Economic Evaluation of Highland Seed in the Canete Valley, Peru,* Social Science Unit, Working Paper 1979-3, CIP.

Monares, A. (1981), *The Potato Seed System in the Andean Region: The Case of Peru,* Unpublished PhD thesis, Cornell University.

Monczka, R., R. Trent and R. Handfield (1998), *Purchasing and supply chain management,* South-Western College Publishing, CT.

Monroe, K.B. (1991), *Pricing – Making profitable decisions*, McGraw-Hill, NY.

Moore, M. (1999), Truth, trust and market transactions: what do we know? *Journal of Development Studies,* Vol 36 (1), 74-88.

Moorman, C., G. Zaltman and R. Deshpande (1992), Relationships between providers and users of market research: the dynamics of trust within and between organizations, *Journal of Marketing Research,* Vol 29 (3), 314-28.

Moorman, C., R. Deshpande and G. Zaltman (1993), Factors affecting trust in market research relationships, *Journal of Marketing,* Vol 57 (January), 81-101.

Morgan, R.M. and S.D. Hunt (1994), The commitment-trust theory of relationship marketing, *Journal of Marketing,* Vol 58 (July), 20-38.

Moriarty, R.T and R.E. Spekman (1984), An empirical investigation of the information sources used during the industrial buying process, *Journal of Marketing Research,* Vol 21 (May), 137-147.

Morris, M.H., J. Brunyee and M. Page (1998), Relationship marketing in practice. Myths and reality, *Industrial Marketing Management,* Vol 27, 359-371.

Murphy, J.T. (2002), "Networks, trust and innovation in Tanzania's manufacturing sector", *World Development,* Vol. 30 (4), 591-619.

Nahapiet, J. and Ghoshal, S. (1998), Social capital, intellectual capital and the organisational advantage, *Academy of Management Review,* Vol. 23 (2), 242-266.

Newby, M., S. Amin, I. Diamond and R. T. Naved (1998), Survey experience among women in Bangladesh, *American Behavioural Scientist*, Vol 42 (2), 252-266.

Nightingale Consulting (2001), *Exploiting the South East Asian Seed Potato Market.* April.

Nishiguchi, T. and J. Brookfield (1997), The evolution of Japanese subcontracting, *Sloan Management Review,* Fall, 89-101.

NIVAA (2003), *Facts and figures 2001* [on line: www.nivaa.nl]

Noordewier, T.G., G. John and J.R. Nevin (1990), Performance outcomes of purchasing arrangements in industrial buyer-vendor relationships, *Journal of Marketing,* Vol 54 (October), 80-93.

Nunnally, J.C. (1978), *Psychometric Theory,* Second ed, McGraw Hill. NY.

Oliver, C. (1990), Determinants of interorganisational relationships: integration and future directions, *Academy of Management Review,* Vol 15 (2), 241-265.

Oliver, R.L. (1980), A cognitive model of the antecedents and consequences of satisfaction decisions, *Journal of Marketing Research,* Vol 17 (November), 460-469.

Oliver, R.L. (1997), *Satisfaction: A Behavioural Perspective on the Consumer,* McGraw-Hill. NY.

Ouchi, W.G. (1980), Markets, bureaucracies and clans, *Administrative Science Quarterly*, Vol 25, 129-141.

Parasuraman, A., V.A. Zeithamal and L.L. Berry. 1985. A conceptual model of service quality and its implications for future research, *Journal of Marketing*, Vol 49 (Fall), 41-50.

Parasuraman, A. (1998), Customer service in business-to-business markets: an agenda for research, *Journal of Business and Industrial Marketing,* Vol 13 (4/5), 309-321.

Parkhe, A. (1993), Strategic alliance structuring: a game theoretic and transaction cost examination of interfirm cooperation, *Academy of Management Journal,* Vol 36 (4), 794-829.

Perez, J.C. (1995a), Potato production in the Philippines, in Batt, Peter J. (ed), *Proceedings of an Industry Workshop. An Emerging Opportunity; The Export of Tropical Seed Potatoes to Asia,* Curtin University.

Perez, J.C. (1995b), Seed potato production in the Philippines, in Batt, Peter J. (ed), *Proceedings of an Industry Workshop. An Emerging Opportunity; The Export of Tropical Seed Potatoes to Asia,* Curtin University.

Pfeffer, J. and G.R. Salancik (1978), *The External Control of Organisations: A Resource-Dependence Perspective,* Harper and Row, NY.

Plank, R.E., D.A. Reid and E.B. Pullins (1999), Perceived trust in business-to-business sales: a new measure, *Journal of Personal Selling and Sales Management*, Vol 14 (3). 61-71.

Platteau, J.P. (1994), Behind the market stage where real societies exist – Part II: the role of moral norms, *Journal of Development Studies,* Vol 30 (3), 753-817.

Poats, S.V. (1984), Potato consumption habits in seven developing countries, *EAPR Abstracts of Conference Papers,* 5-6.

Pomeroy, R.S. and A.C. Trinidad (1995), Industrial organisation and market analysis: fish marketing, in Scott, G. J. (ed), *Prices, Products and People. Analysing Agricultural Markets in Developing Countries*, Lynne Rienner, Boulder, 217-238.

Putnam, R.D. (1995), Bowling alone: America's declining social capital, *Journal of Democracy*, Vol. 6, 65-78.

Puto, C.P., W.E. Patton III and R.H. King (1985), Risk handling strategies in industrial vendor selection decisions, *Journal of Marketing,* Vol 49 (Winter), 89-98.

Raghubanshi, C.S. and R.N. Tewari (1983), *Marketing of Himachal's Seed Potato (A Study in Minimizing Transportation Cost and in Augmenting Farmer's Share),* Agro-Economic Research Unit, Himachal Pradesh University.

Rasco, E.T. (1994), *Coordinators Report. July 1993 - June 1994,* SAPPRAD.

Rasco, E.T. and F.B. Aromin (1994), The Potato in its third frontier, in Rasco, E.T. and F.B. Aromin (ed), *Proceedings of the Fourth Asian Potato Association Triennial Conference.* Asian Potato Association, 1-24.

Ravald, A. and C. Gronroos (1996), The value concept and relationship marketing, *European Journal of Marketing,* Vol 30 (2), 19-30.

Renia, H. M. (1992), *International Trade of Potatoes. The Dutch Performance 1970-1990 with Special Reference to the Developing World,* University of Wageningen.

Ring, P.S. and A.H. van de Ven (1994), Developmental processes of cooperative interorganisational relationships, *Academy of Management Review,* Vol 19 (1), 90-118.

Robinson, P.J., C.W. Faris and Y. Wind (1967), *Industrial Buying and Creative Marketing,* Allyn and Bacon. Boston.

Ruekert, R.W. and G.A. Churchill (1984), Reliability and validity of alternate measures of channel member satisfaction, *Journal of Marketing Research,* Vol 21 (May), 226-233.

Sako, M. (1992), *Prices, quality and trust: interfirm relations in Britain and Japan,* Cambridge University Press.

Sako, M (2000), Does trust improve business performance, in Lane, C and Bachmann, R. (ed), *Trust Within and Between Organisations,* Oxford University Press, 88-117.

Samiee, S and P.G. P. Walters (2003), Relationship marketing in an international context: a literature review, *International Business Review*, (in press).

Sana, E.J., M.P. Callueng, E.T. Valdez, A.A. de la Cruz, H.P. Reboroso and F.B. Aromin (1993), In search of a sustainable potato seed system for the lowlands of Cagayan, in *Research Papers and Progress Reports on Development Activities July 1992-June 1993,* SAPPRAD, 139-156.

Scheuch, E.K. (1968), The cross-cultural use of sample surveys: problem of comparability, in Rokkan, S. (ed), *Comparative Research Across Nations and Cultures.* Mouton, Paris. 176-209.

Schmiediche, P. (1995), The production of seed potatoes in South East Asia, in Batt, Peter J. (ed), *Proceedings of an Industry Workshop. An Emerging Opportunity; The Export of Tropical Seed Potatoes to Asia,* Curtin University.

Scott, G.J. (1994), The emerging world market for potatoes and potato products with particular reference to developing countries, *Economie and Gestion, Agro Alimentaire,* Vol 30, 19-27.

SEERAD (2003), *Potato exports* [online: www.scotland.gov.uk/agri]

Selnes, F. (1998), Antecedents and consequences of trust and satisfaction in buyer-seller relationship, *European Journal of Marketing,* Vol 32 (3/4), 305-322.

Shapiro, B.P. and T.V. Bonoma (1984), How to segment industrial markets, *Harvard Business Review,* Vol 62 (May-June), 104-110.

Sharp, J.S. and Smith, M.B. (2003), Social capital and farming at the rural-urban interface: the importance of non-farmer and farmer relations, *Agricultural Systems,* Vol.6 (3), 913-927.

Sheth, J.N. (1973), A model of industrial buyer behaviour, *Journal of Marketing,* Vol 37 (October), 50-56.

Sheth, J.N. and A. Sharma (1997), Supplier relationships. Emerging issues and challenges, *Industrial Marketing Management,* Vol 26, 91-100.

Sim, J.M., B.T. Gayao, D.T. Meldoz, J. G. Dati, A.T. Botagen, H.L. Quindara and E.T. Botagen (1997), *Marketing System of Potatoes Produced in Benguet and Mountain Provinces,* Northern Philippines Root Crops Research and Training Centre.

Simpson, P.M., J.A. Siguaw and S.C. White (2002), Measuring the performance of suppliers: an analysis of evaluation processes, *Journal of Supply Chain Management,* Winter, 29-41.

Singh, J. and D. Sirdeshmukh (2000), Agency and trust mechanisms in consumer satisfaction and loyalty judgements, *Journal of the Academy of Marketing Science,* Vol 28 (1), 150-167.

Skarmeas, D.A. and C. S. Katsikeas (2001), Drivers of superior importer performance in cross-cultural supplier–reseller relationships, *Industrial Marketing Management,* Vol 30 (2), 227-241.

Smeltzer, L.R. (1997), The meaning and origin of trust in buyer-seller relationships, *International Journal of Purchasing and Materials Management*, Winter, 40-48.

Spekman, R.E. and K.S. Celly (1995), Towards an understanding of the antecedents of strategic alliances, in Moller, K and D. Wilson (ed), *Business Marketing: An Interaction and Network Perspective,* Kluwer Academic Publishers, 157-191.

Spreng, R.A., S.B. Mackenzie and R. W. Olshavsky (1996), A re-examination of the determinants of consumer satisfaction, *Journal of Marketing,* Vol 60 (July), 15-32.

Storer, C.E., G. Soutar, M. Darrington and M.F. Rola-Rubzen (2002), Buyer-seller relections on interorganisational information systems: implications for chain data collection methods, *Chain and Network Science*, 117-133.

Swan, J.E. and L.J. Combs (1976), Product performance and customer satisfaction: a new concept, *Journal of Marketing,* Vol 40, 25-33.

Swan, J.E., I.F. Trawick and D.W. Silva (1985), How industrial salespeople gain customer trust, *Industrial Marketing Management,* Vol 14 (August), 203-211.

Sydow, J. (2000), Understanding the constitution of interorganisational trust, in Lane, C and Bachmann, R. (ed), *Trust Within and Between Organisations,* Oxford University Press, 31-63.

Tagarino, D.D., E.B. Cungihan and J.B. Paday-os (1998), *Analysis of the Credit Market for Potato Production and Marketing in the Cordillera Administrative Region,* HARRDEC.

Thorelli, H.B. (1986), Networks: between markets and hierarchies, *Strategic Management Journal,* Vol 7 (1), 37-51.

Tikkanen, H., K. Alajoutsijarvi and J. Tahtinen (2000), The concept of satisfaction in industrial markets: a contextual perspective and a case study from the software industry, *Industrial Marketing Management,* Vol 29, 373-386.

Tikkanen, H. and K. Alajoutsijarvi (2002), Customer satisfaction in industrial markets: opening up the concept, *Journal of Business and Industrial Marketing,* Vol 17 (1), 25-42.

Tse, D.K. and P.C. Wilton (1988), Models of consumer satisfaction formation: an extension, *Journal of Marketing Research,* Vol 25 (Fall), 335-345.

Turnbull, P.W. and D.T. Wilson (1989), Developing and protecting profitable customer relationships, *Industrial Marketing Management,* Vol 18, 233-238.

van der Zaag, D.E. and D. Horton (1983), Potato production and utilization in world perspective with special reference to the tropics and subtropics, *Potato Research,* Vol 26, 323-362.

van der Zaag, D.E. (1986), The potential demand for seed potatoes: a world perspective, *Potato Research,* Vol 29 (4), 541-548.

van der Zaag, D.E. (1987), Growing seed potatoes, in de Bokx, J.A. and J.P.H. van der Want (ed), *Viruses of Potatoes and Seed Potato Production,* PUDOC, Wageningen, 176-203.

van der Zaag, D.E. (1990a), Recent trends in development, production and utilization of the potato crop in the world, *Asian Potato Journal,* Vol 1 (1), 1-11.

van der Zaag, D.E. (1990b), Research and developments in seed potato production systems and its implications in Bangladesh, in Rashid, M.M., M.A. Siddique and M.M. Hussain (ed), *Seed Potato in Bangladesh,* Bangladesh-Netherlands Seed Multiplication Project, 90-99.

van der Zaag, P. (1991), A critical overview of seed production systems in Asia, *Proceedings Symposium on the Role of Novel and Traditional Seed Potato Production Techniques in Asia,* Asian Potato Association, 1-3.

van der Zaag, P. (1992), The potato in Asia: looking back and looking ahead, *Asian Potato Journal,* Vol 3, 1-5.

Villamayor, F.G. (1984), *Growth and yield of potatoes (Solanum tuberosum) in the lowlands of The Philippines,* Unpublished PhD thesis, University of Guelph.

Voss, G.B., A. Parasuraman and D. Grewal (1998), The roles of price, performance and expectations in determining satisfaction in service exchanges, *Journal of Marketing.* Vol 62 (October), 46-61.

Vrolijk, B. (1994), *Asian Potato Trade. Economic Analysis of the International Trade in Potatoes and Potato Products to, from and within Asia,* University of Wageningen.

Ward, M. (1983), Missing the point: sampling methods and types of error in third world surveys in identifying poverty issues, in Bulmer, M. and D.P. Warwick (ed), *Social Research in Developing Countries*, John Wiley and Sons. 125-142.

Webster, F.E and Y. Wind (1972), A general model for understanding organisational buying behaviour, *Journal of Marketing,* Vol 36 (April), 12-19.

Webster, F.E. (1992), The changing role of marketing in the corporation, *Journal of Marketing,* Vol 56 (October), 1-17.

Wetzels, M., K. de Ruyter and M. van Birgelen (1998), Marketing service relationships: the role of commitment, *Journal of Business and Industrial Marketing,* Vol 13 (4/5), 406-423.

Williamson, O.E. (1985), *The Economic Institutions of Capitalism,* The Free Press. NY.

Wilson, D.T and V. Mummalaneni (1986), Bonding and commitment in buyer-seller relationships: a preliminary conceptualisation, *Industrial Marketing Management*, Vol 1 (3), 44-58.

Wilson, D.T. and S.A. Jantrania (1993), Measuring value in relationship development, *Proceedings of the 9th IMP Conference, Bath.*

Wilson, D.T. (1995), An integrated model of buyer-seller relationships, *Journal of Academy of Marketing Science,* Vol 23 (4), 335-345.

Wilson, E.J. (1994), The relative importance of supplier selection criteria: a review and update, *International Journal of Purchasing and Materials Management,* Summer, 35-41.

Wind, Y. (1970), Industrial source loyalty, *Journal of Marketing Research,* Vol 7 (November), 450-457.

Wind, Y. and R.N. Cardozo (1974), Industrial market segmentation, *Industrial Marketing Management,* Vol 3 (March), 155.

Woodruff, R.B. (1997), Customer value: the next source for competitive advantage, *Journal of the Academy of Marketing Science,* Vol 25 (2), 139-153.

Wooster, P. and K. Faroog (1994), Potato seed supply and production in Pakistan, in *Potato Seed Systems. Bhutan, Nepal, Pakistan,* Pak-Swiss Potato Development Project (PSPDP), Islamabad, Pakistan, 15-24.

Yi, Y. (1990), A critical review of consumer satisfaction, in Zeithaml, V.A (ed). *Review of Marketing. 1990,* American Marketing Association. Chicago. 68-123.

Zucker, L.G. (1986), Production of trust: institutional sources of economic structure, 1840-1920, *Research in Organisational Behaviour,* Vol 8, 53-111.

Appendix 1.

Questionnaire

Survey Instrument

1. Province in which farm is located .....

2. Area of the farm .....

   Proportion of land freehold .....
   leased .....
   Government .....

3. Area of farm cropped in potatoes .....

   First crop .....
   Second crop .....
   Third crop .....

4. Planting times (month); First crop .....
   Second crop .....
   Third crop .....

5. Harvest times (month); First crop .....
   Second crop .....
   Third crop .....

6. How many times are potatoes grown in same ground per year .....

7. On average, how many years elapse between when you first grew potatoes on a piece of land and when you last grew potatoes on that same piece of land .....

8. Do you irrigate your potato crop? Yes
   No

9. What is the most significant cost of production .....

10. Assuming that it cost $US2,000 per ha to cultivate potatoes, what proportion of your costs of production are;

    seed .....
    fertiliser .....
    chemicals .....
    irrigation .....
    labour .....
    mechanisation .....

    TOTAL 2,000

11. Dealing specifically with your FIRST crop of potatoes

    What proportion of your FIRST potato crop is grown from;

    tps .....
    cuttings .....
    seed tubers .....

12. Ideally, what is the preferred seed size .....

13. What seed size is actually planted .....

14. Ideally, what is the seed rate per ha .....

15. At what rate per ha is seed actually planted .....

16. What proportion of the seed planted is;

    growers own seed .....
    a gift from other farmers .....
    purchased from seed growers .....
        other farmers .....
        open market .....
        farmer cooperative .....
        seed merchants .....
        Government seed programs .....
        overseas seed suppliers .....

17. What is the cost of that seed per kg purchased from;

    seed growers .....
    other farmers .....
    open market .....
    farmer cooperative .....
    seed merchants .....
    Government seed programs .....
    overseas seed suppliers .....

18. What proportion of your FIRST potato crop is;

    sold to local village market .....
    sold to other village markets .....
    sold to traders/wholesalers .....
    sold direct to processors .....
    retained for your own consumption .....
    retained for stock food .....
    retained for seed .....
    given away to other farmers/family .....

19. What is the average price per kg for the potatoes you sell from your FIRST crop to;

    the local village market .....
    other village markets .....
    traders/wholesalers .....
    direct to processors .....

20. What is your capacity on-farm to store tubers .....

21. Dealing specifically with your SECOND crop of potatoes

    What proportion of your SECOND potato crop is grown from;

    tps .....
    cuttings .....
    seed tubers .....

22. Ideally, what is the seed rate per ha .....

23. At what rate per ha is seed actually planted .....

24. What proportion of the seed planted is;

    growers own seed .....
    a gift from other farmers .....
    purchased from seed growers .....
        other farmers .....
        open market .....
        farmer cooperative .....
        seed merchants .....
        Government seed programs .....
        overseas seed suppliers .....

25. What is the cost of that seed per kg purchased from;

    seed growers .....
    other farmers .....
    open market .....
    farmer cooperative .....
    seed merchants .....
    Government seed programs .....
    overseas seed suppliers .....

26. What proportion of your SECOND potato crop is;

sold to local village market .....
sold to other village markets .....
sold to traders/wholesalers .....
sold direct to processors .....
retained for your own consumption .....
retained for stock food .....
retained for seed .....
given away to other farmers/family. .....

27. What is the average price per kg for the potatoes you sell from your SECOND crop to;

the local village market .....
other village markets .....
traders/wholesalers .....
direct to processors .....

28. Dealing specifically with your THIRD crop of potatoes
What proportion of your THIRD potato crop is grown from;

tps .....
cuttings .....
seed tubers .....

29. Ideally, what is the seed rate per ha .....

30. At what rate per ha is seed actually planted .....

31. What proportion of the seed planted is;

growers own seed .....
a gift from other farmers .....
purchased from seed growers .....
other farmers .....
open market .....
farmer cooperative .....
seed merchants .....
Government seed programs .....
overseas seed suppliers .....

32. What is the cost of that seed per kg purchased from;

seed growers .....
other farmers .....
open market .....
farmer cooperative .....
seed merchants .....
Government seed programs .....
overseas seed suppliers .....

33. What proportion of your THIRD potato crop is;

sold to local village market .....
sold to other village markets .....
sold to traders/wholesalers .....
sold direct to processors .....
retained for your own consumption .....
retained for stock food .....
retained for seed .....
given away to other farmers/family..... .....

34. What is the average price per kg for the potatoes you sell from your THIRD crop to;

the local village market .....
other village markets .....
traders/wholesalers .....
direct to processors .....

35. Ideally, how much seed do you purchase per year .....

36. How much seed is actually purchased per year .....

37. Ideally, what proportion of seed is renewed per year .....

38. What proportion of seed is actually renewed per year .....

39. For how many crops do you retain your own seed .....

40. Do you;

	Never	Sometimes	Always
regularly purchase certified seed	1	2	3
purchase seed from known suppliers	1	2	3
rogue the crop (negatively select	1	2	3
choose disease free land to grow potatoes	1	2	3
practice crop rotation	1	2	3
regularly apply pesticides	1	2	3
grow seed crops in isolation from other potato crops	1	2	3
positively select	1	2	3
grade seed before storage	1	2	3
chemically treat seed before storage	1	2	3
test seed for latent diseases	1	2	3

41. How soon before planting do you place your order for seed with your preferred seed supplier .....

42. How much time do you spend making your decision;

	Not a lot of time						A great deal of time
to purchase seed	1	2	3	4	5	6	7
which variety to grow	1	2	3	4	5	6	7
from which supplier to purchase seed	1	2	3	4	5	6	7
from which supplier to purchase fertilizers and chemicals	1	2	3	4	5	6	7
to whom you would sell the fresh potato crop	1	2	3	4	5	6	7

43. What are the most important factors that influence your decision to purchase seed potatoes .....
.....
.....
.....
.....

44. Please indicate how important each of the following factors were to you in making your decision to purchase seed. Please circle the appropriate response where 1 is "not at all important" and 7 is "very important"

availability of seed at planting time	1	2	3	4	5	6	7
total quantity of seed required	1	2	3	4	5	6	7
freedom from disease	1	2	3	4	5	6	7
seed purity	1	2	3	4	5	6	7
variety	1	2	3	4	5	6	7
seed size	1	2	3	4	5	6	7
farmers attitude to risk	1	2	3	4	5	6	7
previous purchase of seed	1	2	3	4	5	6	7
uncertainty of price in ware market	1	2	3	4	5	6	7
seasonal variations	1	2	3	4	5	6	7
anticipated profitability	1	2	3	4	5	6	7
expected yield of seed potatoes	1	2	3	4	5	6	7
anticipated future yields of potatoes	1	2	3	4	5	6	7
expected yield of ware potatoes	1	2	3	4	5	6	7
relative price between seed/ware potatoes	1	2	3	4	5	6	7
market price for ware potatoes	1	2	3	4	5	6	7
rate of degeneration	1	2	3	4	5	6	7
anticipated losses in storing own seed	1	2	3	4	5	6	7
physiological age of the seed	1	2	3	4	5	6	7
availability of farm labour	1	2	3	4	5	6	7
proximity to seed supplier	1	2	3	4	5	6	7
availability of irrigation	1	2	3	4	5	6	7
availability of other farm inputs	1	2	3	4	5	6	7
availability of credit	1	2	3	4	5	6	7
cost of credit	1	2	3	4	5	6	7
cost of retaining your own seed	1	2	3	4	5	6	7
availability of cash to purchase seed	1	2	3	4	5	6	7
pathogen tested (certified) seed	1	2	3	4	5	6	7
seed is imported	1	2	3	4	5	6	7
know origin of the seed	1	2	3	4	5	6	7
high cost of certified seed	1	2	3	4	5	6	7
high cost of seed	1	2	3	4	5	6	7
yield difference between new seed/own seed	1	2	3	4	5	6	7
seed rate per unit area	1	2	3	4	5	6	7

45. What are your most preferred varieties .....

46. Which varieties are grown for the

ware market .....
processing .....

47. What variety is grown for the

first crop .....
second crop .....
third crop .....

48. In selecting a variety to grow, how important were each of the following variables. Please circle the appropriate response where 1 is "not at all important" and 7 is "very important"

availability of seed at planting time	1	2	3	4	5	6	7
high cost of seed	1	2	3	4	5	6	7
seed rate per unit area	1	2	3	4	5	6	7
price of potatoes in the ware market	1	2	3	4	5	6	7
productivity per hectare	1	2	3	4	5	6	7
variety traditionally grown	1	2	3	4	5	6	7
tuber shape	1	2	3	4	5	6	7
tuber size	1	2	3	4	5	6	7
flesh colour	1	2	3	4	5	6	7
skin colour	1	2	3	4	5	6	7
storage characteristics	1	2	3	4	5	6	7
fast maturing	1	2	3	4	5	6	7
resistance to disease	1	2	3	4	5	6	7
eating characteristics	1	2	3	4	5	6	7
processing qualities	1	2	3	4	5	6	7
suitability to growing environment	1	2	3	4	5	6	7
vigorous growth	1	2	3	4	5	6	7
drought tolerance	1	2	3	4	5	6	7
heat tolerance	1	2	3	4	5	6	7
new variety	1	2	3	4	5	6	7

49. Do you use cut seed Yes No

.

50. Why do you use cut seed .....
.....

51. To what extent does the use of cut seed influence yields .....
.....

52. What problems have you experienced with the use of cut seed .....
.....
.....

53. What were the most important factors you considered when choosing between alternative seed suppliers .....
.....
.....

54. Please indicate how important each of the following factors were to you in choosing between alternative seed suppliers. Please circle the appropriate answer where 1 is "not at all important" and 7 is " very important"

I choose a supplier who is able to provide seed							
of the desired variety	1	2	3	4	5	6	7
in the quantities required	1	2	3	4	5	6	7
of the desired physiological age	1	2	3	4	5	6	7
that is pure (not mixed varieties)	1	2	3	4	5	6	7
of the desired size	1	2	3	4	5	6	7
that is free of pests and disease	1	2	3	4	5	6	7
that is certified	1	2	3	4	5	6	7
provide seed that substantially improves yield	1	2	3	4	5	6	7
I choose a supplier who is able to provide seed							
from recognised seed growing areas	1	2	3	4	5	6	7
from other countries (imported)	1	2	3	4	5	6	7
I choose a supplier who							
is able to deliver seed at planting time	1	2	3	4	5	6	7
is willing to meet my immediate needs	1	2	3	4	5	6	7
can deliver seed to my farm	1	2	3	4	5	6	7
is close to my farm	1	2	3	4	5	6	7
has a good reputation	1	2	3	4	5	6	7
has a strong customer base	1	2	3	4	5	6	7
is financially strong	1	2	3	4	5	6	7
I choose a supplier who is able to							
provide seed that is competitively priced	1	2	3	4	5	6	7
offer credit	1	2	3	4	5	6	7
offer favourable terms of repayment	1	2	3	4	5	6	7
I choose a supplier who							
is able to supply other farm inputs	1	2	3	4	5	6	7
is technically capable	1	2	3	4	5	6	7
is technically competent	1	2	3	4	5	6	7
offers continuous product support	1	2	3	4	5	6	7
offers to provide technical information	1	2	3	4	5	6	7
offers to provide training programs	1	2	3	4	5	6	7
is capable of introducing new varieties	1	2	3	4	5	6	7
is in frequent communication with me	1	2	3	4	5	6	7
is willing to provide market information	1	2	3	4	5	6	7
enables me to visit their facility	1	2	3	4	5	6	7
frequently visits my farm	1	2	3	4	5	6	7
buys my ware potato crop	1	2	3	4	5	6	7
shares the risk of growing potatoes	1	2	3	4	5	6	7

55. How would you describe your relationship with your most preferred seed supplier?

.....

.....

.....

56. The first series of questions seeks to determine how satisfied you are in your relationship with your most preferred seed supplier. To what extent do you agree with EACH of the following statements. Please circle the most appropriate response where 1 is "I disagree a lot" and 7 is "I agree a lot".

Economic satisfaction							
It is more cost effective for me to rely on my existing supplier rather than to search for alternative suppliers	1	2	3	4	5	6	7
Dealing with my current supplier is less risky	1	2	3	4	5	6	7
Seed from my preferred seed supplier is consistently good	1	2	3	4	5	6	7
The seed I obtain from my supplier substantially improves the productivity of my potato crop	1	2	3	4	5	6	7
My existing seed supplier provides the best seed	1	2	3	4	5	6	7
My seed supplier purchases my fresh potatoes at a mutually agreed price	1	2	3	4	5	6	7
Social satisfaction							
My seed supplier often meets my expectations	1	2	3	4	5	6	7
There is good cooperation between my seed supplier and myself	1	2	3	4	5	6	7
There is much conflict between my seed supplier and myself.	1	2	3	4	5	6	7
My supplier is quick to handle complaints	1	2	3	4	5	6	7
My supplier treats me fairly and equitably	1	2	3	4	5	6	7
I feel I am adequately rewarded by my seed supplier	1	2	3	4	5	6	7

57. Trust between seed suppliers and potato farmers is essential for any long-term relationship to develop. To what extent do you agree with EACH of the following statements. Please circle the most appropriate response where 1 is "I disagree a lot" and 7 is "I agree a lot".

I trust my most preferred seed supplier	1	2	3	4	5	6	7
I have confidence in my seed supplier	1	2	3	4	5	6	7
I believe that my supplier has the necessary expertise to provide good quality seed	1	2	3	4	5	6	7
My supplier always considers my best interests	1	2	3	4	5	6	7
My seed supplier is not always sincere	1	2	3	4	5	6	7
My seed supplier always keeps his promises	1	2	3	4	5	6	7
I belief in the information provided by my seed supplier	1	2	3	4	5	6	7
My preferred seed supplier has a good reputation	1	2	3	4	5	6	7

58. Relationships are held together because both parties are committed to the relationship. To what extent do you agree with EACH of the following statements. Please circle the most appropriate response where 1 is "I disagree a lot" and 7 is "I agree a lot".

I expect to continue to interact with my supplier in the future	1	2	3	4	5	6	7
I expect my relationship with my seed supplier to continue	1	2	3	4	5	6	7

59. As relationships develop between seed suppliers and farmers, both parties may make adaptations to each others needs. Such may result in the willingness of the preferred seed supplier to make various relationship specific investments to help the farmer grow potatoes or through improved communication, to provide better technical and or market information To what extent do you agree with EACH of the following statements. Please circle the most appropriate response where 1 is "I disagree a lot" and 7 is "I agree a lot".

My seed supplier provides all the inputs for my potato crop	1	2	3	4	5	6	7
My preferred seed supplier provides financial assistance during difficult times	1	2	3	4	5	6	7
When seed is scarce, my supplier does everything possible to satisfy my needs	1	2	3	4	5	6	7
My preferred seed supplier is willing to share the risk of crop failure	1	2	3	4	5	6	7
My supplier seems willing to help me grow potatoes	1	2	3	4	5	6	7
My supplier keeps me well informed on technical matters	1	2	3	4	5	6	7
My supplier keeps me well informed on prices in the fresh potato market	1	2	3	4	5	6	7
My seed supplier often advises me of potential supply problems	1	2	3	4	5	6	7
My supplier willingly adapts his product offer to meet my needs	1	2	3	4	5	6	7
My supplier frequently asks me how he might improve the level of product quality and service	1	2	3	4	5	6	7
My seed supplier is willing to share the cost of evaluating new varieties	1	2	3	4	5	6	7
My seed supplier spends time with me to ensure I know what to expect from the seed I have purchased	1	2	3	4	5	6	7

60. Often, the relationship formed between seed suppliers and potato farmers is based on the knowledge that there are few alternative seed suppliers who are able to provide the seed required. Under such situations, farmers may become dependent upon their supplier. To what extent do you agree with EACH of the following statements. Please circle the most appropriate response where 1 is "I disagree a lot" and 7 is "I agree a lot".

I am more dependent upon my preferred seed supplier than they are upon me	1	2	3	4	5	6	7
If my relationship was suddenly terminated I would have great difficulty in finding an alternative supplier	1	2	3	4	5	6	7
I have no choice other than to adhere to my preferred seed suppliers demands	1	2	3	4	5	6	7
My preferred seed supplier controls all the information in our relationship	1	2	3	4	5	6	7
My preferred seed supplier has all the power in our relationship	1	2	3	4	5	6	7
My preferred seed supplier determines what I grow, when I plant and when I harvest	1	2	3	4	5	6	7
I am free to choose another supplier at any time	1	2	3	4	5	6	7
I source seeds from a number of suppliers	1	2	3	4	5	6	7
My current supplier has the best seed offer relative to the alternatives	1	2	3	4	5	6	7
My preferred seed supplier sometimes acts opportunistically	1	2	3	4	5	6	7

61. How many people are there in your immediate household .....

62. How many family members work on the farm .....

63. What is the highest level of education you have achieved .....

64. For how many years have you been growing potatoes .....

65. What proportion of your TOTAL household income is derived from the sale of
    agricultural products .....
    off-farm sources .....
    potatoes .....

66. Marital state .....

67. Farmers age .....

Appendix 2

Encoding form

FILIPINO SEED POTATO SURVEY: ENCODING FORM

1.	Respondent	(1-3)
2.	Record number	(4)
3.	Village	(5-6)
4.	Area of the farm (m^2)	(7-11)
5.	Land ownership	(12)
6.	Area cropped in potatoes (m^2)	(13-17)
7.	First crop; planting time (month)	(18-19)
	harvest time	(20-21)
8.	Second crop; planting time (month)	(22-23)
	harvest time	(24-25)
9.	Third crop; planting time (month)	(26-27)
	harvest time	(28-29)
10.	Times potatoes grown in same ground	(30)
11.	Length of rotation	(31)
12.	Irrigation	(32)
13.	Seed cost	(33-34)
	Fertiliser cost	(35-36)
	Chemical cost	(37-38)
	Irrigation	(39-40)
	Labour	(41-42)
	Mechanisation	(43-44)
14.	FIRST crop; stem cuttings (%)	(45-47)
	tubers (%)	(48-50)
	ideal seed size	(51)
	actual seed size	(52)
	ideal seed rate (kg per ha)	(53-56)
	actual seed rate (kg per ha)	(57-60)
	proportion of growers own seed (%)	(61-63)
	gift (%)	(64-65)
	seed growers (%)	(66-68)
	other farmers (%)	(69-71)
	open market (%)	(72-73)
	farmer cooperative (%)	(74-75)
	seed merchants (%)	(76-77)
	government seed program (%)	(78-79)
	overseas seed suppliers (%)	(80-81)
	cost of seed from seed growers (Ps/kg)	(82-83)
	other farmers	(84-85)
	farmer coop	(86-87)
	seed merchant	(88-89)
	Government programs	(90-91)
	Overseas suppliers	(92-93)
	open market	(94-95)

1.	Respondent	(1-3)
2.	Record number	(4)
3.	FIRST crop sold to village market (%)	(5-7)
	other village markets	(8-9)

processors	(10-11)	
retained for seed	(12-13)	
consumption	(14-15)	
traders/wholesalers	(16-18)	
gift	(19-20)	
average price local market (Ps/kg)	(21-22)	
other villages	(23-24)	
traders	(25-26)	
processors	(27-28)	
4. SECOND crop; stem cuttings (%)	(29-31)	
tubers (%)	(32-34)	
ideal seed size	(35)	
actual seed size	(36)	
ideal seed rate (kg per ha)	(37-40)	
actual seed rate (kg per ha)	(41-44)	
proportion of growers own seed (%)	(45-47)	
gift (%)	(48-49)	
seed growers (%)	(50-52)	
other farmers (%)	(53-55)	
open market (%)	(56-57)	
farmer cooperative (%)	(58-59)	
seed merchants (%)	(60-61)	
government seed program (%)	(62-63)	
overseas seed suppliers (%)	(64-65)	
cost of seed from seed growers (Ps/kg)	(66-67)	
other farmers	(68-69)	
farmer coop	(70-71)	
seed merchant	(72-73)	
government programs	(74-75)	
overseas suppliers	(76-77)	
open market	(78-79)	
crop sold to village market (%)	(80-82)	
other village markets	(83-84)	
processors	(85-86)	
retained for seed	(87-88)	
consumption	(89-90)	
traders/wholesalers	(91-93)	
gift	(94-95)	
average price local market (Ps/kg)	(96-97)	
other villages	(98-99)	
traders	(100-101)	
Processors	(102-103)	

1. Respondent	(1-3)	
2. Record number	(4)	
3. THIRD crop; stem cuttings (%)	(5-7)	
tubers (%)	(8-10)	
ideal seed size	(11)	
actual seed size	(12)	
ideal seed rate (kg per ha)	(13-16)	

actual seed rate (kg per ha)	(17-20)	
proportion of growers own seed (%)	(21-23)	
gift (%)	(24-25)	
seed growers (%)	(26-28)	
other farmers (%)	(29-31)	
open market (%)	(32-33)	
farmer cooperative (%)	(34-35)	
seed merchants (%)	(36-37)	
government seed program (%)	(38-39)	
overseas seed suppliers (%)	(40-41)	
cost of seed from seed growers (Ps/kg)	(42-43)	
other farmers	(44-45)	
farmer coop	(46-47)	
seed merchant	(48-49)	
government programs	(50-51)	
overseas suppliers	(52-53)	
open market	(54-55)	
crop sold to village market (%)	(56-58)	
other village markets	(59-60)	
processors	(61-62)	
retained for seed	(63-64)	
consumption	(65-66)	
traders/wholesalers	(67-69)	
gift	(70-71)	
average price local market (Ps/kg)	(72-73)	
other villages	(74-75)	
traders	(76-77)	
processors	(78-79)	
4. On-farm capacity to store tubers (kg)	(80-84)	
5. Seed purchased per year (ideal)(kg)	(85-89)	
6. Seed purchased per year (actual)(kg)	(90-94)	
7. Percentage of seed renewed per year (ideal)	(95-97)	
8. Percentage of seed renewed per year (actual)	(98-100)	
9. Number of crops for which seed is retained	(101)	

1. Respondent	(1-3)	
2. Record number	(4)	
3. Regularly purchase certified seed	(5)	
purchase from known suppliers	(6)	
rogue the crop	(7)	
positively select	(8)	
choose disease free land	(9)	
practice crop rotation	(10)	
apply pesticides	(11)	
grow in isolation	(12)	
grade before storage	(13)	
treat before storage	(14)	
test for latent diseases	(15)	
4. Importance of seed at planting time	(16)	
quantity required	(17)	

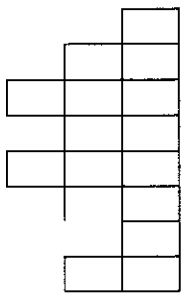
	seed rate	(18)
	yield difference	(19)
	high cost	(20)
	cost of uncertified seed	(21)
	origin of the seed	(22)
	imported	(23)
	pathogen tested	(24)
	availability of cash	(25)
	cost of retaining seed	(26)
	cost of credit	(27)
	availability of credit	(28)
	availability of other farm inputs	(29)
	irrigation	(30)
	farm labour	(31)
	proximity to seed supplier	(32)
	physiological age of seed	(33)
	losses in storage	(34)
	rate of degeneration	(35)
	market price	(36)
	relative price difference	(37)
	expected yield	(38)
	anticipated future yields	(39)
	yield of seed	(40)
	profitability	(41)
	guaranteed buy-back	(42)
	seasonal variations	(43)
	uncertainty of price	(44)
	farmers attitude to risk	(45)
	previous purchase	(46)
	seed size	(47)
	variety	(48)
	seed purity	(49)
	freedom from disease	(50)
5. Preferred variety		(51-52)
6. Ware market varieties		(53-54)
		(55-56)
7. Processing varieties		(57-58)
		(59-60)
8. Main variety grown for	first crop	(61-62)
	second crop	(63-64)
	third crop	(65-66)
9. Importance of	availability at planting time	(67)
	cost of seed	(68)
	seed rate	(69)
	price in the ware market	(70)
	productivity per ha	(71)
	traditionally grown	(72)
	tuber shape	(73)
	tuber size	(74)
	flesh colour	(75)
	skin colour	(76)

storage characteristics	(77)	
fast maturing	(78)	
resistance to disease	(79)	
eating quality	(80)	
processing quality	(81)	
suitability	(82)	
vigorous growth	(83)	
drought tolerance	(84)	
heat tolerance	(85)	
new variety	(86)	
10. Use of cut seed	(87)	
11. Why use cut seed	(88)	
12. Problems with use of cut seed	(89)	
13. Choose seed supplier	(90-91)	
	(92-93)	
	(94-95)	
14. Desired variety	(96)	
Quantities required	(97)	
Physiological age	(98)	
Pure	(99)	
Size	(100)	
Free from pests and disease	(101)	
Certified	(102)	
Improves yield	(103)	
From recognised seed area	(104)	
Imported	(105)	
Deliver at planting time	(106)	
Meet immediate needs	(107)	
Deliver to farm	(108)	
Close to my farm	(109)	
Good reputation	(110)	
Strong customer base	(111)	
Financially strong	(112)	
Competitive pricing	(113)	
Offer credit	(114)	
Offer favourable terms of repayment	(115)	

1. Respondent	(1-3)	
2. Record number	(4)	
3. Other farm inputs	(5)	
Technically capable	(6)	
Technically competent	(7)	
Continuous product support	(8)	
Provides technical information	(9)	
Provides training programs	(10)	
Introduces new varieties	(11)	
Frequent communication	(12)	
Market information	(13)	
Visit facility	(14)	
Visits farm	(15)	

	Buys ware crop	(16)	
	Shares the risk of growing	(17)	
4.	Nature of relationship with supplier	(18)	
5.	More cost effective	(19)	
	Less risky	(20)	
	Consistently good	(21)	
	Improves productivity	(22)	
	Provides best seed	(23)	
	Mutually agreed price	(24)	
	Meets expectations	(25)	
	Good cooperation	(26)	
	Conflict	(27)	
	Quick to handle complaints	(28)	
	Fair and equitable	(29)	
	Adequate reward	(30)	
6.	Trust	(31)	
	Confidence	(32)	
	Expertise	(33)	
	Considers my best interests	(34	
	Not always sincere	(35)	
	Always keeps promises	(36)	
	Believe information	(37)	
	Good reputation	(38)	
7.	Will continue to interact	(39)	
	Expect to continue	(40)	
8.	All inputs	(41)	
	Financial assistance	(42)	
	Seed is scarce	(43)	
	Share risks	(44)	
	Help grow	(45)	
	Technical matters	(46)	
	Prices	(47)	
	Supply problems	(48)	
	Adapt	(49)	
	Service	(50)	
	Varieties	(51)	
	Expect	(52)	
9.	More dependent	(53)	
	Difficulty	(54)	
	Must adhere	(55)	
	Controls information	(56)	
	All power	(57)	
	Plant and harvest	(58)	
	Free to choose	(59)	
	Many suppliers	(60)	
	Best offer	(61)	
	Opportunism	(62)	
10.	People in household	(63-64)	
11.	Family working on farm	(65)	

12.	Education	(66)
13.	Years growing potatoes	(67-68)
14.	Income derived from agriculture	(69-71)
	Income from off farm	(72-73)
	Income from potatoes	(74-76)
	Income from other crops	(77-78)
15.	Married	(79)
16.	Farmers age	(80-81)



Appendix 3

Demographic data and tables

Table 1. District in which Potato Farmers Resided.

District	Frequency	Percent
Buguias	107	45.5
Atok	71	30.2
Mankayan	26	11.1
Bakun	17	7.2
Kibungan	14	6.0
N	235	100.0

Table 2. Total Area of the Farm (square metres).

Area (m^2)	Frequency	Percent
500	1	0.4
1,000	3	1.3
1,500	5	2.1
2,000	3	1.3
2,500	45	19.1
3,000	31	13.2
3,500	4	1.7
4,000	27	11.5
5,000	50	21.3
6,000	11	4.7
7,000	3	1.3
7,500	6	2.6
8,000	1	0.4
8,500	1	0.4
10,000	24	10.2
12,000	1	0.4
15,000	5	2.1
20,000	11	4.7
30,000	1	0.4
50,000	1	0.4
80,000	1	0.4
N	235	100.0
Mean 6170.2		
SD 7237.3		

Table 3. Land Occupancy.

Land Occupancy	Frequency	Percent
Freehold	227	97.4
Leased	4	1.7
Government	2	0.9
N	233	100.0

Table 4. Total Area of the Farm Cropped in Potatoes (square metres).

Area (m^2)	Frequency	Percent
500	1	0.4
750	1	0.4
1,000	35	15.0
1,500	41	17.5
2,000	41	17.5
2,500	45	19.2
3,000	22	9.4
4,000	3	1.3
5,000	23	9.8
5,500	1	0.4
6,000	1	0.4
7,000	1	0.4
7,500	1	0.4
10,000	13	5.6
12,000	1	0.4
20,000	1	0.4
25,000	1	0.4
40,000	1	0.4
50,000	1	0.4
N	234	100.0
Mean 3368.6		
SD 4849.5		

Table 5. Number of Years Farmer's have been Growing Potatoes.

Number of years	Frequency	Percent
Less than 1 year	0	0
2-5 years	14	6.0
6-10 years	84	35.7
11-15 years	55	23.4
16-20 years	65	27.7
21 or more years	17	7.2
N	235	100.0

Table 6. Number of People in Farm Household.

Number of people	Frequency	Percent
1	9	4.0
2	14	6.3
3	38	17.0
4	76	33.9
5	30	13.4
6	45	20.1
7	7	3.1
8 and more	5	2.2
N	224	100.0

Table 7. Number of People in the Farm Household Working on the Farm.

Number of people	Frequency	Percent
1	164	70.7
2	58	25.0
3	6	2.6
4	3	1.3
5	1	0.4
N	232	100.0

Table 8. Farmers Age.

Age	Frequency	Percent
Younger than 25 years	1	0.9
26-30	10	9.3
31-35	15	13.9
36-40	31	28.7
41-45	17	15.7
46-50	23	21.3
51-55	8	7.4
Older than 56 years	3	2.8
N	108	100.0

Table 9. Formal Level of Education Attained by Farmers.

Education	Frequency	Percent
No secondary education	86	43.9
Completed secondary	94	48.0
Attended college	5	2.6
College graduate	11	5.6
N	196	100.0

Table 10. Planting and Harvest Dates for the Main Potato Crop.

Month	Planting time		Harvest time	
	Frequency	Percent	Frequency	Percent
January	7	3.6		
February	18	9.3		
March	101	52.3	1	0.5
April	49	25.4	7	3.6
May	18	9.3	13	6.7
June			78	40.2
July			56	29.0
August			38	19.7
September				
October				
November				
December				
N	193	100.0	193	100.0

Table 11. Planting and Harvest Dates for the Second Potato Crop.

Month	Planting time		Harvest time	
	Frequency	Percent	Frequency	Percent
January			47	43.1
February			16	14.7
March			7	6.4
April			1	0.9
May				
June				
July	4	3.7		
August	13	11.9		
September	28	25.7		
October	41	37.6	3	2.8
November	20	18.3	12	11.0
December	3	2.8	23	21.1
N	109	100.0	109	100.0

Table 12. Average Length of Rotation between Potato Crops.

Length of rotation	Frequency	Percent
Less than 3 months	11	4.7
3-4 months	3	1.3
5-6 months	17	7.3
7-8 months	27	11.6
9-10 months	25	10.7
11-12 months	147	63.1
More than 12 months	3	1.3
N	233	100.0

Table 13. On-farm Seed Storage Capacity.

Seed storage capacity	Frequency	Percent
Less than 500 kg	47	20.7
600-1,000	77	33.9
1,100-1,500	16	7.1
1,600-2,000	13	5.7
2,100-3,000	12	5.3
3,100-4,000	5	2.2
4,100-5,000	15	6.6
5,100-6,000	6	2.6
6,100-7,000	2	0.9
7,100-8,000	3	1.3
9,100-10,000	14	6.2
10,100-20,000	8	3.5
20,100-30,000	7	3.1
30,100-40,000	2	0.9
N	227	100.0

Table 14. The Proportion of the Farmer's Income Derived from the Cultivation of Farm Products, Off-farm Sources, Potatoes and Other Crops.

Frequency												
	Percent of income											N
	0	10	20	30	40	50	60	70	80	90	100	
Farm products		1	2			3	1	3	15	44	164	233
Off-farm	163	44	17	1	1	4			2	1		233
Potatoes			3	1	9	217	2				1	233
Other crops	2				2	217	9	1	2			233

Percent												
	Percent of income											N
	0	10	20	30	40	50	60	70	80	90	100	
Farm products		0.4	0.9			1.3	0.4	1.3	6.0	18.9	70.4	100.0
Off-farm	70.0	18.9	7.3	0.4	0.4	1.7			0.9	0.4		100.0
Potatoes			1.3	0.4	3.9	93.1	0.9				0.4	100.0
Other crops	0.9				0.9	93.1	3.9	0.4	0.9			100.0

Table 15. The Cost of Potato Production in the Cordillera.

Frequency												
	Percent of costs											N
	0	< 5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Seed	8	30	51	33	38	34	10	4	6	2	6	222
Fertilisers	1		3	15	56	100	52	7				234
Chemicals			2	6	9	41	58	87	22	4	5	234
Irrigation		78	67	57	8	1					1	212
Labour	1	13	38	47	80	24	23	3	3		1	233
Mechanisation	3	4	2	1				1				11

Percent												
	Percent of costs											N
	0	< 5	6-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50	
Seed	3.6	13.5	23.0	14.9	17.1	15.3	4.5	1.8	2.7	0.9	2.7	100.0
Fertilisers	0.4		1.3	6.4	23.9	42.7	22.3	3.0				100.0
Chemical			0.9	2.6	3.8	17.5	24.8	37.2	9.4	1.7	2.1	100.0
Irrigation		36.8	31.6	26.9	3.9	0.4					0.4	100.0
Labour	0.4	5.6	16.3	20.2	34.3	10.3	9.9	1.3	1.3		0.4	100.0
Mechanisation	27.2	36.4	18.2	9.1				9.1				100.0

Table 16. Means by which Farmers Disposed of First Potato Crop in the Cordillera.

Frequency												
	Percent of the crop disposed of											N
	0	10	20	30	40	50	60	70	80	90	100	
Local village market		2									3	5
Other village markets		1										1
Processors							1					1
Retained for seed		44	86	15								145
Retained for own consumption		9	1	1					2			13
Sold to traders		2	1					1	57	76	48	185
Gift		4								1		5

Percent												
	Percent of the crop disposed of											N
	0	10	20	30	40	50	60	70	80	90	100	
Local village market		40									60	100.0
Other village markets		100										100.0
Processors							100					100.0
Retained for seed		30.3	59.3	10.4								100.0
Retained for own consumption		69.2	7.7	7.7					15.4			100.0
Sold to traders		1.1	0.5					0.5	30.8	41.1	26.0	100.0
Gift		80.0								20.0		100.0

Table 17. Prices Farmers Received for the First Potato Crop in the Cordillera.

Frequency												
	Peso per kg											N
	< 8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	> 27	
Local village market		1										1
Other village markets												
Processors	2				1							3
Traders	7	91	28	9	20	11	7	3		3	2	181

Percent												
	Peso per kg											N
	< 8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	> 27	
Local village market		100										100.0
Other village markets												100.0
Processors	66.7				33.3							
Traders	4.0	50.3	15.4	5.0	11.0	6.1	3.9	1.7		1.7	1.1	100.0

Table 18. Means by which Farmers Disposed of Second Potato Crop.

Frequency												
	Percent of the crop disposed of											N
	0	10	20	30	40	50	60	70	80	90	100	
Local village market												
Other village markets			1									1
Processors								1				1
Retained for seed		21	49	12								82
Retained for own consumption		8	1							2		11
Sold to traders								3	41	41	19	104
Gift		1								1		2

Percent												
	Percent of the crop disposed of											N
	0	10	20	30	40	50	60	70	80	90	100	
Local village market												
Other village markets			100									100.0
Processors								100				100.0
Retained for seed		25.6	59.8	14.6								100.0
Retained for own consumption		72.7	9.1							18.2		100.0
Sold to traders								2.9	39.4	39.4	18.3	100.0
Gift		50.0								50.0		100.0

Table 19. Prices Farmers Received for the Second Potato Crop in the Cordillera.

Frequency												
	Peso per kg											N
	< 8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	> 27	
Local village market												
Other village markets		1										
Processors					1							
Traders	1	22	14	11	10	6	10	7	5	13	9	

Percent												
	Peso per kg											N
	< 8	9-10	11-12	13-14	15-16	17-18	19-20	21-22	23-24	25-26	> 27	
Local village market												
Other village markets		100										100.0
Processors					100.0							100.0
Traders	0.9	20.4	13.0	10.2	9.3	5.5	9.3	6.5	4.6	12.0	8.3	100.0

Appendix 4

Abstracts of refereed conference and journal papers utilised in the thesis

Full papers are provided in the attached cd

The Demand for Seed Potatoes in South East Asia[9]

Introduction

Over the last five years, it is apparent that the potential to export Australian seed potatoes to markets in South East Asia has received considerable attention from both Government and the private sector. No fewer than four DPIE Agribusiness Programs have been dedicated to expanding the market and improving the performance of Australian seed potato exports. A recent seed potato industry workshop sponsored by the HRDC (1996), has established research and development priorities for both the domestic and export industry, with several research projects already underway to address some of the impediments raised.

In the private sector, a network of seed potato growers from Riana, Crookwell, Ballarat and Thorpdale have entered into a cooperative research program to evaluate the performance of 13 varieties of Australian seed potatoes in four locations in West and Central Java (Higginbottom, 1996). In WA, a cooperative project between Western Potatoes, Curtin University, the International Potato Centre (CIP) and the National Potato Programs in Vietnam and the Philippines seeks to investigate opportunities for cultivating tropical potatoes in WA and the subsequent re-export of seed to South East Asia (Batt,1994a). Dowling (1995), reports on the progress Technico are making towards developing the market for in-vitro produced micro-tubers.

While few people doubt the long term potential of the market, there is some speculation as to just how big the market in South East Asia is for Australian seed potatoes. Estimates of the potential demand range from 120,000 tonnes (van der Zaag, 1986) to 150,000 tonnes per annum (Schmiediche, 1995). However, in all probability, there will be a significant difference between the potential seed demand and the effective seed demand (Crissman, 1989).

While this paper will attempt to quantify the size of the market for seed potatoes in South East Asia and to identify some of the factors which may influence the demand for Australian seed potatoes, it does not consider the various marketing strategies which may be employed by exporting firms to significantly influence the rate of adoption or the demand for seed potatoes in the market.

---

[9] Batt, Peter J. (1998), The Demand for Seed Potatoes in South East Asia, *Australian Agribusiness Review* [on-line: www.agrifood.info]

Potato Production in the Philippines[10]

Introduction

In the Philippines, the potato is a high priority crop because of its high potential yield and nutritional quality. The potato has been selected by the Government as one of three national priority crops for commercial development.

Presumably potatoes were first introduced by the Spanish during the Spanish galleon trade between Acapulco and Manila. Initial studies report the discovery of certain fine tubered, runner-type potatoes, resembling the indigenous varieties found in South America, being cultivated by the natives in Baguio and Mountain Province. Potatoes however are not a regular part of the diet in the Philippines. Rice continues to be the staple food and potatoes are purchased primarily as a luxury vegetable or a snack food.

Potatoes are mainly cultivated in the high and mid elevation areas of Benguet and Mountain Province in Northern Luzon (the Cordillera), where currently some 5,000 hectares are devoted to potato production. While the proportion of the potato crop grown in the region is declining, this is not due to any reduction in the area planted, but rather to the expansion of potato cultivation into other suitable highland regions in Northern and Southern Mindanao, the Central Visayas and to the lowland regions of Ilocos Norte and the Cagayan Valley.

Potato production in the Cordillera is severely constrained by the lack of suitable land for expansion. It is estimated that the maximum amount of land available in Benguet and Mountain Province is 6,000 hectares. Expansion means moving to steeper slopes and to less accessible areas, increasing the risk of erosion and increasing the costs of transportation. Because of land limitations, few potato growers adhere to recommended crop rotations, relying instead on greater quantities of purchased inputs (fertilisers and pesticides) to intensify production and to control the increasing incidence of bacterial wilt and late blight. However, productivity is also constrained by inappropriate varieties, especially for processing; the high cost of planting material; inefficient farm practices; and poor infrastructure, especially transport, which increases production and marketing costs. In order to meet the increasing demand in the market, especially for processed potato products, potato cultivation in non-traditional areas is expanding. It is estimated that the potential areas include some 8,000-12,000 hectares in the highlands of Northern Mindanao, specifically Bukidnon, and a further 15,000 hectares in Southern Mindanao. In addition, some 5,000-6,000 hectares are potentially available in the tropical lowlands of Ilocos Norte and the Cagayan valley.

---

[10] Batt, Peter J. (1999), The Potato Industry in the Philippines, *Global Potato News,* September. [on-line] www.potatocongress.org/columns/batt.htm.

Building Trust in Agribusiness Supply Chains A Conceptual Model of Buyer-Seller Relationships in the Seed Potato Industry in Asia[11]

Executive summary

Greater numbers of organisational buyers and sellers are moving away from the traditional adversarial approach to purchasing towards the development of closer, more cooperative, buyer-seller relationships. Building on the extent literature of buyer-seller relationships, this paper establishes a conceptual model that describes the relationship building process in the Filipino seed potato industry, starting from the seed suppliers product offer, relationship building inputs, farmer's relationship satisfaction, trust and commitment. Arising from the development of a satisfactory relationship, the focal seed supplier is expected to enjoy a greater share of the farmer's patronage. The relationship building variables are examined in relation to the situational factors (uncertainty, prior purchase, dependency and the availability of alternative suppliers).

Key words; buyer-seller relationships, commitment, seed potatoes, trust

Abstract

In the absence of a certified seed system, potato farmers in Asia must purchase replacement seed tubers from an informal seed system. With no third party assurance that the seed tubers purchased are of good quality, the farmer's decision to purchase seed may be influenced by the long-standing relationships that have been established between buyers and sellers. Trust is the critical determinant of a good buyer-seller relationship. Through maintaining communication and the making of various relationship specific investments, a conceptual model is proposed which suggests that seed suppliers may engage in trust building behaviour that should result in the preferred seed supplier enjoying a greater share of the farmer's patronage.

[11] Batt, Peter J. and Nexhmi Rexha (1999), Building Trust in Agribusiness Supply Chains: A Conceptual Model of Buyer-Seller Relationships in the Seed Potato Industry in Asia, *Journal of International Food and Agribusiness Marketing*, Vol 11(1), 1-17.

Why dissatisfied customers still desire long-term relationships[12].

Abstract

A model of long-term relationships between potato farmers and their seed suppliers in the highlands of the Northern Philippines reveals that while farmers are generally dissatisfied with the nature of their relationship with their most preferred seed supplier, they nevertheless seek to maintain that relationship. The desire to maintain the relationship is derived directly from the seed supplier's offer quality and the various commitments the preferred seed supplier makes to share the risks of growing potatoes in a highly unpredictable environment. The farmer's dissatisfaction is derived primarily from the seed supplier's inability to deliver good quality seed cost effectively and to adequately reward the farmer for their efforts in growing and harvesting the potato crop.

[12] Batt, Peter J. (2001), Why dissatisfied customers still desire long-term relationships. Interactions, Relationships and Networks: Strategic Dimensions, in *Proceedings 17th Annual IMP Conference*, Norwegian Institute of Management (BI). www.bi.no/imp2001/papers.

Variety. The key driver of demand for seed potatoes in the Philippines[13].

Abstract

With the agro-ecological conditions in the Philippines being vastly different from the temperate growing conditions under which the majority of the world's potato varieties have been selected, a farmer's choice of variety will have a profound impact on the productivity and profitability of the crop. Variety was found to be the most important factor influencing a Filipino potato farmer's decision to purchase seed. The physical characteristics of the tuber (tuber size, shape, skin colour and flesh colour) were found to be the most important factor influencing the farmer's choice of variety. Suitability to the environment was the second most important factor, indicating that farmer's are constantly searching for new, better adapted varieties which will perform better in the field. However, despite the expansion in both the fast food industry and the snack food market, the suitability of the variety for processing was surprisingly the least important factor in the farmer's choice of variety.

Key words: environmental adaptability, physical characteristics, varietal choice, *Solanum tuberosum*

Resume

Les conditions agro-écologiques dans Les Phillipines étant grandement différentes des conditions de températures grandissantes dans lesquelles la majorité du monde de la variété de la pomme de terre a été selectionnée, la variété de choix du cultivateur aura un profond impact sur la productivité and la rentabilité de la culture. Variété a été prouvée le plus important facteur influençant la decision du cultivateur Phillipien d'acheter les graines. Les charactéristiques physiques du tuber (sa taille, sa forme, la couleur de sa peau et la couleur de sa chair) étaient les plus important facteurs influençant la variété du choix du cultivateur. Un environment approprié était le deuxiéme facteur le plus important, indiquant que les fermiers recherchaient constamment de nouvelles variétés mieux adaptées. Cependant, malgré l'accroissement dans l'industrie de la restauration et le marché du casse-croût, la variété appropriée pour le traitement étaient étonnament le dernier important facteur dans la variété de choix du cultivateur.

Mots Clés: *L'environment adaptable, characteristiques physiques, variété de choix,* solanum tuberosum

[13] Batt, P. J. (2001), Variety: The key driver of demand for seed potatoes in The Philippines, *African Crop Science Journal,* Vol 9 (1), 317-329.

Factors Influencing a Potato Farmer's Choice of Seed Supplier: Empirical Evidence from The Philippines[14].

Executive Summary

As a production input, the demand for seed potatoes is derived from the demand for fresh and processed potatoes. However, in the absence of a formal seed certification system, a Filipino potato farmer's decision to purchase seed tubers will evoke considerable risk. When a farmer perceives that the decision to purchase is important and where the consequences of making a poor decision are likely to have an adverse long-term impact on the operation of the farm, farmers may attempt to reduce the risk of purchasing by splitting orders between several alternative suppliers, to purchase from well known reputable suppliers, or to purchase from those suppliers with whom they have dealt in the past. Empirical evidence collected from comprehensive personal interviews with potato farmers in The Philippines suggests that the seed supplier's reputation is the most important factor influencing a potato farmer's choice of seed supplier. The seed supplier's reputation is a measure not only of the seed supplier's credibility (customer base and financial strength), but also a measure of the extent to which the seed supplier is able to satisfy the farmer's demand for seed which is competitively priced and of the desired physiological age. Because of the long-term impact seed quality has, not only on the current crop, but on the productivity of any future crops derived from that seed, seed quality is evaluated by two variables including freedom from pests and diseases and seed size. Since these two factors were considered important by all potato farmers, in choosing between alternative seed suppliers, the seed supplier's offer quality, the level of technical support and the extent to which the seed supplier facilitated communication between the parties, became the key determinants. Cluster analysis revealed three quite distinct clusters of farmers, differing in the extent to which they favored different components of the seed supplier's offer, the area of potatoes cultivated, the number of crops for which they retained the seed and the level of education the farmer had attained. Contrary to expectations, the more educated farmers were more demanding of advice and technical support. Since this group of farmers were considered more likely to appreciate superior quality seed and be prepared to pay for it, they were considered the most likely target market for imported seed.

Key words: seed, potatoes, supplier selection criteria, The Philippines.

[14] Batt, Peter J. (2001), Factors Influencing a Potato Farmer's Choice of Seed Supplier: Empirical Evidence from The Philippines, *Journal of International Food and Agribusiness Marketing,* Vol 12 (2), 71-91.

Examining the performance of the supply chain for potatoes in the Red River Delta using a pluralistic approach[15]

Abstract

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

[15] Batt, Peter J. (2003), Examining the performance of the supply chain for potatoes in the Red River Delta using a pluralistic approach, *Supply Chain Management: and International Journal* [in press].

Trust building behaviour within the Balinese fresh produce industry[16].

Abstract

Regression analysis confirms that relational satisfaction communication and the availability of alternatives have a significant positive relationship on the development of trust between vegetable farmers and traders in Bali. While no relationship between power/dependence and a strong personal relationship was found to influence trust, the making of relational investments by traders had a significant negative relationship on trust, suggesting that such investments provide farmers with few tangible benefits.

[16] Batt, Peter J. and Nyoman Parining (2002), Trust building behaviour within the Balinese fresh produce industry in Batt, Peter J. (ed), Culture and Collaboration in Distribution Networks. Proceedings of the inaugural meeting of the IMP Group in Asia, December 11-13. Perth, WA. Curtin University.

Relational quality: further evidence of a single higher order construct in an industrial market[17].

Abstract

While there is some evidence for a single, higher order construct which captures satisfaction and trust, evidence of its existence in industrial markets remains scant and inconclusive. However, in the context of small, family owned businesses, where consumer behaviour and industrial purchasing behaviour overlap, a single construct may be a better predictor of a market intermediary's relational building activities. Two rival models are compared which, given the high degree of correlation between satisfaction and trust, support the existence of a single satisfaction/trust construct.

[17] Batt, Peter. J. (2001), Relational quality: further evidence of a single higher order construct in an industrial market, in *Interactions, Relationships and Networks: Strategic Dimensions. Proceedings 17th Annual IMP Conference,* Norwegian Institute of Management (BI) [cd]

Exploring the nature of long-term buyer-seller relationships in the Western Australian wine industry[18]

Abstract

The nature of the relationship between wineries and wine grape growers is largely one of interdependence; to produce good quality wines, wineries need a reliable supply of good quality grapes. Both the wineries and grape growers report a high degree of trust, satisfaction and commitment in their relationship with their most preferred trading partner. While the wineries exercise the majority of power in the relationship, when accompanied by constant communication that seeks to improve wine quality and to coordinate harvest dates, grape growers are not subjected to any coercive influence strategies that might otherwise undermine the relationship.

[18] Batt, Peter J. and Helen Wilson (2001), Exploring the nature of long-term buyer-seller relationships in the Western Australian wine industry, *Australia New Zealand Wine Industry Journal*, Vol 16 (6), 87-96.

Building trust between growers and market agents[19]

Abstract

In the absence of the auction as the principal mechanism for setting price in the Perth fresh fruit and vegetable market, there is a great deal of distrust between growers and the market agents who receive and distribute their produce. While most growers generally transact with more than one market agent, satisfaction with the exchange builds trust. Trust is facilitated where the grower and the market agent share similar goals. To reinforce trust, growers prefer to transact with those market agents who are prepared to invest in their relationship with the grower. Conversely, the market agents propensity to act opportunistically, to exercise power and to withhold information from the grower will have a significant negative impact on the trust that develops between growers and market agents.

Key words: trust, relationships, fresh produce

[19] Batt, Peter J. (2003), Building trust between growers and market agents, *Supply Chain Management: an International Journal,* Vol 8 (1), 65-78.

The Universality of Trust?[20]

Abstract

Empirical evidence is presented which suggests that trust is more important in facilitating exchange in transitional economies than industrial economies. Furthermore, the various item measures that have been employed to evaluate trust in Europe, North America, Australia and Japan, fail to accurately describe the construct among small farmers in a developing country. While further studies are necessary to develop a more robust measure of trust, in the context of small business, trust between organisations and individual's is difficult differentiate.

[20] Batt, Peter J. (2001), The Universality of Trust? in Chetty, S. and B. Collins (ed), *Proceedings Australia New Zealand Marketing Academy. Bridging Marketing Theory and Practice,* Massey University, Auckland, New Zealand.

A Review of the Export Market for Western Australian Seed Potatoes in South East Asia[21]

Executive Summary

1. the demand for seed potatoes in South East Asia is rapidly expanding. Greater areas of potatoes are being cultivated in an effort to satisfy the increasing demand for fresh potatoes and processed potato products.

2. the major production constraint is the lack of sufficient quantities of high quality seed of the desired varieties and physiological age at planting time.

   The average yield achieved for potatoes cultivated in South East Asia (13.3 tonnes per ha) is considered low in comparison to those achieved in WA (39.5 tonnes per ha). In the tropics, the growing season is shorter, temperatures are warmer and the crop generally matures earlier.

   The rate of seed degeneration is much higher in South East Asia because of the high incidence of pests and diseases, inadequate crop rotations and inadequate on-farm storage.

   Consequently, despite numerous efforts to establish certified seed schemes in South East Asia, no formal seed system supplies more than 5% of a country's annual seed requirements.

   The informal seed systems are of much greater importance. With seed costs often exceeding 50% of total costs of production, few farmers can afford to purchase improved seed and because of the higher risk of crop failure in the tropics, few farmers can afford to take the risk.

3. throughout South East Asia, potatoes are not part of the traditional diet, but as personal disposable income increases, the demand for potatoes and processed potato products (french fries and crisps) increase. The major demand for seed potatoes in South East Asia will be for those varieties considered most suitable for processing.

   The varieties that are currently in greatest demand include Atlantic and Kennebec.

---

[21] Batt, Peter J. (1997), *A Review of the Export Market for Western Australian Seed Potatoes in South East Asia,* New Industries Program, Agriculture WA.

4. the majority of potatoes are grown in the tropical highlands. Depending on the frequency of planting and the availability of irrigation, crops may be planted as often as three times per year (October, February and June). However, as land pressures intensify and crop rotations become shorter, the incidence of pests and diseases are accumulating, increasing the costs of production and depressing yields. Consequently, there is a general move away from the traditional areas of production to the tropical lowlands. However, in this environment, the cropping season is very short. Potatoes are planted in October to November for harvest January through March.

5. with seed potatoes being harvesting in WA from January through April, WA is well placed to export seed for planting June to October. Seed from the northern hemisphere (Europe and North America) is generally too young and problems have been often experienced with poor germination. However, for shipments made after May, seed will need to cool stored.

6. very few of the varieties currently grown in WA have proven suitable in the tropics. While Atlantic and Kennebec are preferred by processors, they are far from ideal. Consideration should be given to the introduction and cultivation in WA of the varieties considered more suitable to the market including Granola, Diamant, Lemhi and Famosa.

   The National Potato Programs are currently selecting clonal material which is more adapted to the agro-ecological climate experienced in the tropics. In the longer term, there may be opportunities to commercially propagate this material in WA for subsequent re-export to markets in South East Asia.

7. allowing for the importance of the informal seed system and the farmers average rate for seed renewal, the demand for potato seed in South East Asia approaches 31,900 tonnes per annum.

   However, the real demand is much lower because quantitative restrictions and import quotas often limit the entry of seed potatoes, and, because of the farmers inability to pay.

   The real demand for imported seed potatoes is estimated to be;

   a. 1,000 tonnes per annum in Indonesia
   b. 1,200 Thailand
   c. 565 the Philippines
   and 270 Vietnam.

8. Indonesia and Thailand are currently considered to have the greatest potential for WA seed potatoes.

9. WA will face increasing competition for a share of the seed potato market in South East Asia. Greater quantities of seed from Europe and the USA and other Australian states (Tasmania, Victoria and NSW) are being consigned to the region. In order to compete, WA will need to give greater consideration towards;

    a. producing seed within the desired size range;
    b. producing seed of those varieties that are in demand;
    c. immediately implementing a seed certification system;
    d. nurturing strategic alliances with those seed companies
    e. supplying the processing companies or directly with the
    f. potato processing companies themselves; and,
    g. encouraging greater cooperation.

    This may require

    h. facilitating training courses
    i. cooperative research and development projects
    j. technical exchanges between growers and agronomists
    k. encouraging reciprocal Government support
    l. facilitating and improving communication within the industry

    Given the strength of the Dutch seed potato industry in terms of its potato breeding programs; generic support for promotion, market research and intelligence; and, support for research and extension activities, there may well be an opportunity for the WA seed potato industry to enter the market cooperatively.

10. under the current production regimes and market prices, WA seed potato growers need to receive no less than $385 per tonne to break even. Inclusive of shipping costs, growers need to be able to sell for no less than

    A$617 per tonne in Thailand and Indonesia
    677 in the Philippines
    and 707 in Vietnam.

11. the greatest opportunity for WA will be to encourage the greater adoption of cut seed in South East Asia.

    Because of limitations imposed on seed producers by the Potato Marketing Corporation, growers must maximise the production of small round seed. However, even after adopting industry best practice, the yield of small round seed is unlikely to exceed 40%. If it were possible to cut and suberize the larger tubers prior to export, the profitability of seed production in WA would greatly improve.

Potato Production in Western Australia[22].

In 1990, Australia produced almost 1.18 million tonnes of potatoes from some 40,640 hectares (ABS, 1990). Victoria had the largest area under cultivation, with over 13,000 hectares devoted to potato production. But, the highest average yields per hectare were achieved in Tasmania, where from some 6,850 hectares, almost 297,500 tonnes were produced; an average of 43.4 tonnes per hectare (Table 1).

Table 1. Potato Production in Australia.

State	Area (ha)	%	Prodn (tonnes)	%	t/ha
Victoria	13,319	32.8	368,409	31.3	27.7
Tasmania	6,852	16.9	297,488	25.3	43.4
New South Wales	6,666	16.4	130,109	11.0	19.5
Queensland	6,224	15.3	121,909	10.3	19.6
South Australia	5,082	12.5	161,257	13.7	31.7
Western Australia	2,497	6.1	98,705	8.4	39.5
AUSTRALIA	40,640			1,177,877	29.0

(ABS, 1990)

Although by no means the smallest State in Australia, for Western Australia is over 2.52 million square kilometres, WA is the smallest producer of potatoes in Australia. In 1990, almost 2,500 hectares of potatoes were cultivated in Western Australia, but the average yield achieved (39.5 tonnes per hectare) was second only to Tasmania and far in excess of the Australian national average of only 29 tonnes per hectare.

It has been suggested that whereas the majority of the potatoes grown in Tasmania are for processing, over 50% of the potatoes grown in Western Australia are consumed fresh. Since the consumers prefer table potatoes to be less than 350 g, where, by contrast, potato processors require a somewhat larger tuber, the yields achieved in Western Australia are restricted.

In 1990/91, over 45,000 tonnes were consumed by the fresh market in Western Australia. Some 12,000 tonnes were used for the manufacture of potato crisps, over 17,000 tonnes were processed as french fries and over 10,000 tonne were exported to adjacent markets, including Mauritius. Around 5,000 tonnes of potato seed for both fresh and processing markets were produced (WAPMA, 1992; ABS, 1991).

[22] Batt, Peter J. (1994), Potato Production in Western Australia, in Rasco, E.T and F.B. Aromin (ed), *Proceedings of the Fourth APA Triennial Conference*, Vol 1. Asian Potato Association, 167-171.