THE INVESTMENT HORIZON ISSUE IN USER-OWNED ORGANIZATIONS

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presented to
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In Partial Fulfillment
of the Requirements for the Degree

Doctor of Philosophy

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by
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The undersigned, appointed by the Dean of the Graduate School, have examined the dissertation entitled

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IN USER-OWNED ORGANIZATIONS

presented by Elaine L. Farmer

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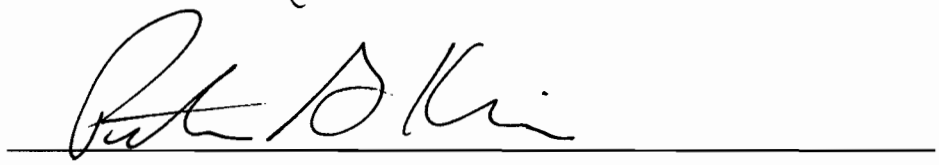

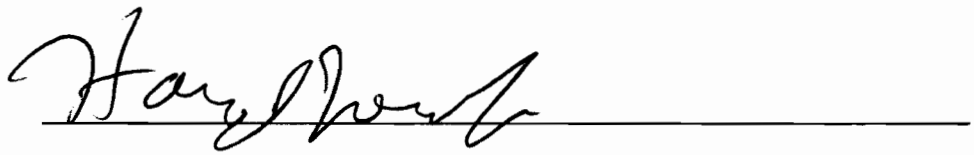

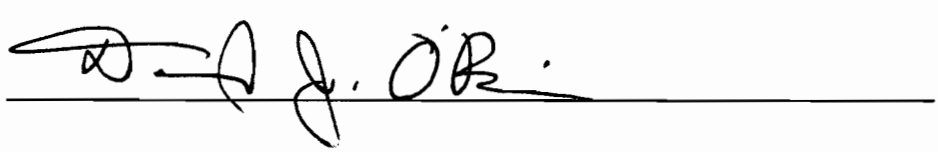

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THE INVESTMENT HORIZON ISSUE
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ABSTRACT

This research addresses the issue of an investment constraint in user-owned agricultural organizations called the horizon problem. Scholars have suggested the restrictions on the transferability of residual claimant rights and the restricted liquidity through a secondary market results in a disincentive for user-owners to invest in growth opportunities. However, despite the conceptual and anecdotal arguments supporting the existence of and degree of investment constraints, the empirical evidence is scarce and inconclusive. This study attempts to fill part of this void in the literature by investigating the investment horizon constraint.

This study divides the horizon problem literature into (1) the agent-control horizon problem and (2) the investment horizon problem, but focuses on the latter. The purpose of this study is to empirically test to what degree the investment horizon problem exists in user-owned agricultural organizations by analyzing several variants of the horizon problem in user-owned organizations: the wait-to-receive horizon problem, the hassle horizon problem, the current obligation horizon problem, the short-term residual horizon problem. This study also identifies the appreciated value horizon problem but space and time preclude its analysis in this study.

In order to analyze to what degree the horizon problem exists in user-owned organizations, this study analyzes data generated by research case studies and member surveys conducted between January 2003 and May 2005. The multiple case studies helped inform the member survey design. Multivariate analysis of the data generated from the member surveys of four agricultural cooperatives inform to what degree the investment horizon problem exists in the selected cooperatives by evaluating the member's investment preferences for the cooperative equity redemption plan and the member's preferences for future cooperative investments. Multivariate data techniques including factor analysis, ordinal probit regression and cluster analysis test whether the member's characteristics have a significant impact on his investment preferences to support or reject the operational hypotheses.

The obtained results suggest that more than one type of horizon problem exists in user-owned agricultural organizations. Each horizon problem is important in certain contexts and for different types of cooperatives. The results suggest the wait-to-receive horizon problem is more prevalent in cooperatives with passive investment where the investment is redeemed over longer revolving periods. As expected, the hassle horizon problem was more prevalent in organizations where the user and investor benefits are not separable. The results suggest the current obligation horizon problem weakly exists in cost of goods sold cooperatives that pay the minimum percent of allocated equities in cash in year generated. As expected the short-term residual horizon problem exists in organizations where the members cannot transfer their shares or cooperative investment. The results of this study have serious implications for cooperative organizational design as well as capital structure policies in user-owned agricultural organizations.

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1. INTRODUCTION TO THE STUDY

This study addresses the issue of an investment constraint in user-owned organizations called the horizon problem. Scholars have suggested that the restrictions on the transferability of residual claimant rights and the restricted liquidity through a secondary market for the transfer of such rights results in a disincentive for user-owners to invest in growth opportunities (Vitaliano, 1985; Condon, 1990; Iliopoulos, 1998). The investment constraint in user-owned organizations has been segmented into three distinct categories: internal free rider, portfolio, and horizon. Despite the conceptual and anecdotal arguments supporting the existence of these constraints, the empirical evidence is scarce and not conclusive. This study attempts to fill part of this void in the literature by investigating the investment horizon problem with multivariate data analysis of survey data collected from the membership of four user-owned organizations. The introductory chapter describes the general issue, discusses the investor constraints in user-owned organizations and lays out the objectives and organization of this study.

1.1. The General Issue

Historically, user-owned organizations, and in particular cooperatives, have played an important economic role in the development of agriculture in the United States as indicated by their aggregate market shares of inputs handled, farm marketings and services provided (USDA, 2004) (Table 1.1). Even though cooperative organizations have been successful in the past, they have been faced with a low growth rate (Fulton, et al, 1995). In addition, profits in U.S. agriculture have been flat or declining for decades

as measured by return on assets and return on equity (Blank, 2001). Since profits from production agriculture alone cannot support most American farmers, many agricultural producers diversified into activities like value-added processing and brand name development that require substantial growth capital.

Table 1.1 U.S. Farmer Cooperative's Share of Farm Marketing and Farm Supply Expenditures, in Percentages, 1951-2002

	1952	1962	1972	1982	1992	1998	2002
Farm Marketing	20	24	26	30	27	29	27
Farm Supply Expenditures	19	21	22	28	29	29	27

Source: USDA-ACS, Cooperative's Historical Statistics, CIR 1, Sec 26 (2004)

With agricultural industrialization, traditional cooperative organizations face challenges to acquire risk capital to finance new ventures and compete in the increasingly global economy[1]. Equity capital acquisition has been cited as a problem for cooperatives (Hansmann, 1996; Hart and Moore, 1998; Olson, 1971; Cook, 1995). Traditionally, growth capital in cooperatives has been sourced from either debt instruments or internally generated earnings rather than through direct investment like in investor-owned organizations. In U.S. cooperatives, members may demand the cooperative to return the internally generated funds eventually (Cook and Iliopoulos, 2000). The number of judicial rulings related to equity redemption procedures in agricultural cooperatives indicates a pressure to speed up equity redemption (Cook, 1976).

Traditional cooperatives in advanced countries have adapted to the institutional and competitive environment by adopting non-traditional cooperative organizational models (Cook, 1995; Cook, 1997; Cook and Iliopoulos, 1998; Nilsson, 1999; Chaddad

[1] A traditional cooperative is defined as having the following organizational characteristics: open membership, democratic control, internally generated equity capital, illiquid equity ownership rights and benefits to members tied to patronage (Iliopoulos, 1998; Cook and Iliopoulos, 2000).

and Cook, 2002b). Cooperatives have, in general, followed two broad strategies to acquire risk capital (1) internally generate capital with a proportionality strategy; and (2) acquire outside non-member equity and quasi-equity capital without restructuring as an investor-owned firm (Cook, 1995). The organizational innovations include but are not limited to new generation cooperatives, base capital plans, subsidiaries with partial public ownership, preferred trust shares, equity-seeking joint ventures, combined limited liability company-cooperative strategic alliances and permanent equity capital plans (Chaddad and Cook, 2004). Rather than adopt one of the above strategies, some traditional cooperatives have restructured as proprietary firms, liquidated the business, merged with other cooperatives or have been acquired by corporations (USDA, 1999).

As cooperatives continue to adapt to agricultural industrialization, cooperatives may be required to make changes that will affect the equity redemption of the member's equity. However, cooperatives must also align the cooperative's strategy with that of its members.

1.2. Investment Constraint in User-Owned Organizations

Acquiring and redeeming members' equity capital are identified in the literature as major constraints to cooperative organization growth and sustainability (Furubotn and Pejovich, 1972; Murray, 1983; Caves and Peterson, 1986, Bonin, Jones and Putterman, 1993). Several arguments explain the inability of user-owned organizations to acquire sufficient risk capital to finance investment opportunities (Chaddad, 2003). The first argument is that the property rights allocation within the traditional cooperative structure does not provide the necessary incentives to invest (Vitaliano, 1983; Le Vay, 1983; Knoeber and Baumer, 1983; Cook, 1995, Cook and Iliopoulos, 2000). The residual

claims in cooperatives are not appreciable since they are non-transferable and redeemable only at book value (van Wassenaer, 1989). Members derive benefits from cooperatives mainly through usage in the form of favorable prices and patronage refunds, and therefore do not have incentives to contribute risk capital. When patrons share in the return on cooperative equity capital without investing, the patron has an incentive to free ride and under-finance the cooperative (Knoeber and Baumer, 1983).

The second argument indicates that cooperatives have restricted residual claims since only active members may provide the cooperative organization with equity capital. As a result, the number, the wealth and risk bearing capacity of current members limit the acquisition of risk capital in the traditional cooperative. Cooperative residual claims are non-transferable in traditional cooperatives, which prevent the functioning of a secondary market for cooperative stock and leads to the emergence of portfolio and horizon problems. Members in traditional cooperatives tend to influence cooperative investment decisions since they cannot capture the future payoffs of the cooperative's risky investments due to the horizon problem, nor adjust the individual investment portfolio to match their risk preferences due to the portfolio problem (Jensen and Meckling, 1979; Porter and Scully, 1987).

The other arguments supporting the capital constraint hypothesis in cooperatives include (a) equity capital acquisition is tied to member patronage, (b) cooperative equity capital is not permanent and (c) cooperatives have limited access to external sources of funds (Chaddad, 2003). Cooperatives depend primarily on internally generated capital or patronage-based methods to acquire risk capital. The internally generated capital is redeemable at the discretion of the organization's board of directors. Since redeeming

equity is a cash outlay of the cooperative, the allocated patronage refunds in cooperatives may not be considered permanent equity capital (Parliament and Lerman, 1993). Cooperatives may lack access to adequate sources of debt capital if the lender considers the cooperative equity capital as insufficiently permanent to support loans (Vitaliano, 1985).

The first two arguments suggest that three investment problems support the capital constraint hypothesis in user-owned organizations. The free rider, horizon and portfolio problems involve opportunistic behavior on the part of the member not to invest in cooperative growth opportunities (Cook, 1995). The free rider problem occurs when individuals realize benefits or gains from cooperative action but do not fully invest in developing the gains. An individual who receives the benefit as a new member is an internal free rider, whereas an individual who captures the benefit as a non-member is an external free rider (Sykuta and Cook, 2001). The portfolio problem arises when cooperative members are not able to withdraw or reallocate their investment in the cooperative investment portfolio to match their personal interests or risk preferences (Cook, 1995). As important as these constraints are, this study focuses on the horizon problem.

The term "horizon problem" has been used in various literatures to mean different things. This study divides the literature into (1) the agent-control horizon problem and (2) the investment horizon problem. The *agent-control* horizon constraint, as discussed in the corporate governance literature, represents the conflict within organizations when outgoing agents adjust the organization's accounting or business decisions to increase short-term earnings at the expense of future earnings (Dechow and Sloan, 1991; Murphy

and Zimmerman, 1993). The *investment* horizon constraint originates from a subfield of finance dealing with non-publicly traded firms where the property rights are not well defined. The *investment* horizon constraint represents the conflict within user-owned organizations in which an individual stockholder has a disincentive to contribute to the purchase of assets when the individual's claim on the organization's net income is shorter than the economic life of the underlying asset (Porter and Scully, 1987).

Members facing the *investment* horizon problem may place pressure on the management or board of directors to revolve the equity back at a quicker rate (Cook, 1995). However, empirical evidence indicating the entire membership or a subgroup of the membership prefers to receive their equity quicker is limited to non-existent. The objective of this study is to inform the vaguely defined property rights constraints by determining whether the *investment* horizon problem exists in user-owned organizations.

1.2.1. Ownership Rights Typology

Ownership from an economic view concentrates on two distinct concepts: residual rights of control and residual claims (Milgrom and Roberts, 1992; Hart and Moore, 1990). Residual rights of control refer to the rights to make any decision regarding an asset's use not explicitly attenuated by law or assigned to other parties by contract (Grossman and Hart, 1986). Residual claims refer to the rights to the net income generated by the organization after all fixed obligations have been met (Fama and Jensen, 1983a).

Chaddad and Cook (2002b, 2004) design a typology of institutional arrangements based on the broad definition of ownership rights encompassing both residual claim and control rights. They argue that the ownership rights assigned to those economic agents

who are contractually tied to the organization (members, patrons and investors) can distinguish cooperative models. The ownership rights for traditional cooperatives are restricted to member patrons where residual return rights are nontransferable and redeemable and user benefits are distributed to members in proportion to patronage (Cook and Chaddad, 2004). As the cooperative ages, the profile of members becomes more heterogeneous, particularly from an investment preference point of view. The combination of an increasingly heterogeneous membership and a vaguely defined property rights structure can result in the ownership rights in traditional cooperatives becoming misaligned with use, control and investment incentives and benefit distribution. Some cooperatives have adapted their organizational design to align the cooperative's investment opportunities with the member's investment preferences.

The new generation cooperative model is a departure from the traditional cooperative structure that relaxes the restriction on residual claim transferability (Chaddad and Cook, 2004). The residual claims are transferable to provide liquidity and capital appreciation through secondary market valuation. Member patrons are required to purchase up-front delivery rights in proportion to their expected patronage so usage and capital investment are perfectly aligned. The ownership rights in the new generation cooperative are not redeemable by the cooperative, but can generally be sold to other producers upon the board's approval or traded among current member-patrons.

The member-investor cooperative is a departure from the traditional cooperative structure that relaxes the restriction on benefits to patrons (Cook and Chaddad, 2004). In member-investor cooperatives, the returns are distributed in proportion to the member's investment in addition to patronage. Typically, this is accomplished by distributing

dividends in proportion to the member's investment and/or through appreciable cooperative shares.

In addition to ownership rights, cooperatives can also be identified by organizational type, payment type, investment method and degree of investor-user benefit. In general, there are two types of cooperatives by organizational type, multipurpose and marketing. A multipurpose, or Nourse, cooperative includes local or regional cooperatives that operate in a geographic space that perform a combination of input procurement, service provision and/or product marketing. A marketing, or Sapiro, cooperative typically processes a commodity and sells the finished product through a form of vertical integration to increase the margin of a single or multiple commodities. The two cooperatives by payment type, cost of goods sold cooperative and pooled cooperative, are described in the next section.

This study describes cooperatives by three types of investment methods, pro-active, quasi-passive and passive. A pro-active investment occurs in most new generation cooperatives and investor-owned firms where the member directly invests cash in the organization. In comparison, a quasi-passive investment occurs in many pooled cooperatives where the cooperative retains a portion of the member's proceed check for the commodity delivered as the member's investment. A passive investment typically occurs in a cost of goods sold cooperative where the cooperative allocates a portion of the cooperative's net income to the member in proportion to the level of patronage.

Cooperatives also differ by the degree of investor/user benefit. Members in cooperatives with high degree of user benefit receive a benefit primarily through use or

favorable prices. If the member does not conduct business with the cooperative, they do not receive a benefit. In contrast, members in new generation cooperatives may receive a benefit primarily as an investor through the payment of a dividend on their shares in proportion to the number of shares purchased.

The next two sections briefly discuss the methods that traditional user-owned organizations use to acquire and redeem equity capital.

1.2.2. Acquisition of Equity Growth Capital

About 59% of the equity capital in U.S. agricultural cooperatives is in the form of equity certificates or credits allocated to members in proportion to patronage (Chesnick, 2003). Traditional cooperatives typically generate growth capital internally through patronage refunds or per-unit retains depending on how the cooperative reports its income. In the U.S., cooperative income statements are divided into two groups, cost of goods sold cooperative and pooled cooperative. In a "cost of goods sold" cooperative, the income statement begins with the value of sales minus the cost of the goods sold to compute gross savings. Other income is added and operating expenses subtracted to compute the net savings in the cooperative. The "cost of goods sold" cooperative then distributes a portion of the net savings to permanent equity and allocates a portion to the members based on their level of patronage. In a "pooled" cooperative, the advances and final payments to producers may be deducted after operating expenses have been deducted from gross income rather than classifying the payments as cost of goods sold (Cobia, 1989).

The user-ownership principle in cooperatives requires cooperatives to rely primarily on members for growth capital, which limits the sources from which a

cooperative can attract growth capital (Chaddad, 2003). The pool of potential equity capital suppliers is decreasing as the farm sector consolidates into fewer farms and cooperative memberships decrease[2]. Since there are few incentives for direct member investment in traditional cooperatives, they depend primarily on internally generated capital and earnings from non-member business to acquire growth capital. A "cost of goods sold" cooperative typically acquires growth capital through retained patronage refunds whereas a "pooled" cooperative generates growth capital through capital retains. Both types of cooperatives may acquire minimal amounts of growth capital from direct investment, unallocated equity and preferred stock[3].

Retained patronage refunds are portions of the net income allocated to members, in proportion to their patronage, but retained by the "cost of goods sold" cooperative (Cobia, 1989). The retained patronage refunds are new investments made in the cooperative by those who patronize the organization. The "cost of goods sold" cooperative pays at least twenty percent of the patronage refund in cash to the member in the year earned and retains the other portion until the board of directors decides to redeem it.

Capital retains are patron investments in a "pooled" cooperative based on the volume of patronage handled for each member. The member investments are deducted from the proceeds of products marketed. The member receives a payment for the product delivered minus a small amount retained by the cooperative in proportion to the volume

[2] The number of farms in the U.S. reached a peak of almost 7 million in 1936 and reduced to 2.1 million by 2002 (USDA data). Following this trend, the number of cooperative memberships achieved a peak in 1956 (7.7 million) and decreased to 2.7 million by 2003 (Adams et al, 2005).

[3] In 2001, about 59.4% of the equity held by the 100 largest agricultural cooperatives was sourced from equity certificates or credit allocated to the members based on patronage; 17.8% was sourced from preferred stock; 15.8% from unallocated equity and 6.9% from common stock (Chesnick, 2003).

of product delivered. The retained patronage refunds and capital retains represent a claim against the cooperative by present and former members. The claim is partially redeemable at book value to the member at the discretion of the board of directors and therefore might be considered as non-permanent equity by some financial institutions.

Direct investment includes the cash purchases of common stock and membership certificates. Direct investment is typically used to raise the initial funds to start a cooperative (Cobia, 1989). Most established cooperatives use patronage refunds or capital retains as a primary equity source. However, new generation cooperatives, which are formed primarily to pursue value-added ventures, rely heavily on direct investment. In most new generation cooperatives, the members must purchase a delivery right share that provides the right and obligation to deliver a certain quantity of product to the processing plant.

Traditional cooperatives may also acquire growth capital through unallocated equity. Unallocated equity, or permanent equity, may come from sources such as non-operating income, like interest or rent, or from operating income, like joint ventures, subsidiaries or non-member business that is not allocated to the members. Members typically can not receive the unallocated equity portion of the net income unless the cooperative is dissolved.

Preferred stock in traditional cooperatives represents stock issued by the cooperative that carries a dividend rate that must be paid before returns are paid on common stock or other equity obligations. Some cooperatives convert retained refunds from members into preferred stock to assure that the retained amounts receive a specified

return. Other cooperatives may sell preferred stock directly to the public to provide the cooperative with another source of permanent capital.

Although traditional cooperatives have several methods to acquire growth capital, they still face the inability to acquire sufficient risk capital to finance investment opportunities (Chaddad, 2003). Since the ownership rights in traditional cooperatives are not appreciable, non-transferable and redeemable only at book value, members do not have an incentive to invest (Chaddad, 2003). The next section discusses the methods used to redeem ownership rights in traditional cooperatives.

1.2.3. Redemption of Retained Earnings

Equity redemption represents returning the equity in cash to members who previously invested the equity. Over the member's tenure with the cooperative, he accumulates equity from direct investments, retained patronage refunds and capital retains. When the member eventually retires or leaves farming for another reason, his investment level may not be in proportion to his patronage level. When cooperatives do not redeem the equity of inactive or over-invested members, the inactive members bear the burden of financing the cooperative for services they do not use (Peterson and Cobia). The failure to redeem equity also reduces the member's realized return.

In a publicly traded corporation, the members can sell their stock or equity in the secondary market to any potential investor. The value of the retained funds appreciates (or depreciates) through the secondary market's stock price to represent the full value of the retained funds. In contrast, no secondary market exists to sell the stock in traditional agricultural cooperatives. The cooperative must pay out cash to rebalance the investment levels of its members.

Equity redemption programs generally fall into two categories (Peterson and Cobia). Specialized programs are plans that redeem equity only when a special event in the life of the member occurs such as, reach certain age, retire from farming or the member dies. Upon verification of the situation, the cooperative redeems the entire amount of equity at one time or over a period of years subject to board approval. Systematic programs redeem equity through a recurring process that attempts to keep equity investment in the hands of active members. Many cooperatives use a combination of the two equity redemption programs like a revolving equity plan that also redeems equity to estates.

The three systematic plans used to redeem equity are (a) the revolving fund plan, (b) the base capital plan, and (c) the percentage of all equities plan. Under the revolving fund plan, the cooperative pays off, or redeems in cash, the oldest equities in the same chronological order in which they were allocated. Cobia et al (1982) recommend the revolving period be less than seven years to keep investment more in line with patronage, however, the revolving periods in cooperatives range from 18 months to more than thirty years[4]. The revolving fund plan may not function well if the cooperative's margins vary substantially over time. If a previous high patronage refund year becomes payable during a low net income year, the cooperative may have limited cash available to make the redemption and may decide to extend the length of the revolving period.

Cooperatives that use a base capital plan determine a member's equity obligation annually, based on the cooperative's need for capital and the member's use of the

[4] The average revolving period for grain and farm supply cooperatives was nineteen years, whereas the average revolving period for fruit, vegetables and nuts cooperatives was ten years and for dairy cooperatives was fifteen years (Rathbone and Wissman, 1993).

cooperative. Under-invested members continue to invest, whereas over-invested members begin to receive at least partial, if not full, redemption of their excess investment (Peterson and Cobia). The base capital plan links member's investment to current cooperative use.

Cooperatives that use the percentage of all equities plan, retire a percentage of all outstanding equity regardless of issue dates. This plan reduces the equity of all members by the same percentage. This plan encourages new members by rewarding them with prompt equity redemption.

In summary, traditional cooperatives use several methods to acquire and redeem equity capital. Each cooperative has a unique equity acquisition and redemption plan that has been adapted to reflect the needs of the cooperative. With an increasingly heterogeneous membership, cooperatives may need to consider new ways to overcome the investment constraint and the investment horizon problem, which aligns the member's investment preferences with those of the cooperative.

1.3. Objective of the Study

The purpose of this study is to fill part of a void in the property rights literature by determining to what degree the investment horizon problem exists in user-owned organizations. This study will add to the property rights theory and enhance our understanding of the investment constraint in user-owned organizations. Through multiple case studies and surveys of the membership, this research identifies various stakeholders' attitudes toward equity redemption plans and preferences for further cooperative investment in different types of cooperatives. The study also helps identify

characteristics of allocated equities that are correlated with the stakeholders' attitudes toward equity redemption plans.

1.4. Organization of the Study

To accomplish the objective of determining whether the investment horizon exists in user-owned organizations, the study is organized as follows. In Chapter 2, the conceptual and theoretical literature dealing with the horizon problem is reviewed with emphasis on the investment horizon literature in the context of a property rights constraint. The literature review covers the horizon problem in labor-managed firms and in user-owned organizations. Chapter 2 concludes with a discussion of the researchable problem and proposed testable hypotheses. Chapter 3 provides a summary of empirical literature relevant to the investment horizon problem and an overview of the methodological literature on case studies and surveys. Chapter 3 also discusses the steps used in this study to develop the case study and member survey and provides a brief description of the four cooperatives. Chapter 4 describes the statistical tests used to analyze the horizon problem. Chapter 5 provides the results from each of the four surveys and discusses whether each hypothesis is supported or rejected. Each analysis begins with a brief description of the respondents, and then discusses the inferential statistics related to the horizon problem. The results from factor analysis, probit regression and cluster analysis are also presented for each cooperative. Chapter 6 summarizes the study, discusses the implications for capital structure policy in user-owned organizations, and concludes with recommendations for future research.

2. CONCEPTUAL AND THEORETICAL FRAMEWORK

As discussed in the introductory chapter, this study divides the horizon problem literature into (1) the agent-control horizon problem and (2) the investment horizon problem. The corporate governance literature encompassing the management and general finance disciplines primarily explores the *agent-control* horizon problem. However, the *investment* horizon problem originates from a subfield of finance that deals with non-publicly traded firms where property rights are not as well defined. This chapter proffers a brief overview of the *agent-control* horizon problem and then reviews the *investment* horizon literature in the context of a property rights constraint. The chapter concludes with a discussion of the researchable problem and proposed testable hypotheses.

2.1. Brief Overview of the "*Agent-Control*" Horizon Problem

The *agent-control* horizon problem is discussed in corporate governance literature encompassing the management and general finance disciplines. The manager of a firm, acting as the shareholder's agent, may not have the same interests or objectives as the shareholders. When the manager's actions are not easily observable, the manager may have an incentive to engage in activities that are not in the shareholders' best interest (Fama, 1980) especially if he is about to leave the firm. This is known as the *agent-control* horizon problem. It may occur when an outgoing manager (the agent) makes accounting or business decisions that increase the earnings in his final years as a manager at the expense of future earnings (Dechow and Sloan, 1991; Murphy and Zimmerman,

1993). Alternatively, the *agent-control* horizon problem might occur if the agent makes decisions that benefit him in other ways such as entrenchment or empire building at the expense of long-term firm value.

Some literature on the *agent-control* horizon problem focuses on whether the chief executive officer actually alters the discretionary expenditures during his departing years at the firm to ascertain whether the *agent-control* horizon problem actually exists. If the *agent-control* horizon problem exists, then managers near retirement are hypothesized to under-invest in R&D or delay maintenance on fixed assets to increase the firm's earnings in the short-term at the expense of long-term profitability. The literature finds mixed results to support this hypothesis, which are sensitive to the empirical test chosen. For instance, Butler and Newman (1989) use univariate tests to suggest the firm's set of control mechanisms are effective in preventing a decrease in R&D or capital investment expenditures during the executive's final year with the firm. However, using ordinary least squares regressions, Dechow and Sloan's (1991) findings indicate that changes in R&D expenditures during the CEO's final year in office are below average. After controlling for both firm performance and endogenous CEO turnover, Murphy and Zimmerman (1993) find little support for the hypothesis that outgoing CEO's exercise their discretion over accounting or investment variables to increase their earnings based compensation in the year prior to leaving the firm. The overall performance of the firm is a more appropriate measure as it better explains the declines in the discretionary variables preceding CEO departure. Therefore, although theory suggests the *agent-control* horizon problem exists, empirical findings about its existence are mixed.

Other studies have attempted to identify control mechanisms to reduce the *agent-control* horizon problem assuming that it exists. Decision systems that separate the management and control of important decisions at all levels of the organization might reduce the *agent-control* problem (Fama and Jensen, 1983b). Pay-for-performance systems (Baker, Jensen and Murphy, 1988), compensation bonuses tied to reported profits, or bonuses deferred until after retirement (Smith and Watts, 1982) might control the *agent-control* problem between shareholders and managers. By structuring managerial compensation plans that balance both current and future stock price performance, (Bizjak, Brickley and Coles, 1993) optimal investment is emphasized, especially if the CEOs cash compensation becomes more sensitive to stock price performance as the CEO nears retirement (Gibbons and Murphy, 1992).

The prospect of continued board service following a CEO's retirement can reduce the *agent-control* horizon problem in the final years of the CEO's tenure (Brickley, Linck and Coles, 1999). Younger subordinate executives mitigate the *agent-control* horizon problem of older CEOs in firms with long investment horizons (McGinnis et al, 1999).

In the general managerial economics and finance literature, these issues are typically known as the horizon problem. However, this dissertation analyzes the *investment* horizon problem – a more narrowly defined issue related to property rights issues in non-publicly traded firms. The next section provides a brief overview of the ownership rights characteristics of organizations needed to introduce the conceptual framework for the discussion of the *investment* horizon problem.

2.2. Organizational Economics Approach to Study Organizations

Organizations have traditionally been studied through the lens of two different schools of economic thought: neo-classical economics and new institutional economics. In neo-classical economics, the basic unit of analysis is the "firm," which is represented by a production function that specifies the output level obtained by a given level of inputs. The underlying behavioral assumptions in the neo-classical model include (1) rational choice, (2) stable preferences and (3) equilibrium structures of interaction (Eggertsson, 1990). Furthermore, neo-classical economics assumes (1) zero transaction costs and (2) complete information where the economic actors possess all relevant information when making decisions. The manager therefore minimizes costs or maximizes profits subject only to the production and input constraints. Since managers have complete information when developing contracts, there are no coordination, monitoring or enforcement costs.

Neo-classical theory is useful for analyzing how the firm's optimal production choice varies with input and output prices, to understand the aggregate behavior of an industry and to study the consequences of strategic interaction between firms once the assumption of perfect competition has been dropped (Hart, 1995). However, neo-classical theory ignores problems within the firm and does not deal with issues arising from the internal organization of the firm.

In new institutional economics, the basic core of neoclassical economics is preserved, but the supporting assumptions of zero transaction costs and complete information are eliminated. Coase (1937) introduced transaction costs into formal economic analyses when he observed that firms exist as a relatively efficient means of

economizing on costs associated with market transactions, like search and information costs, bargaining and decision costs, and policing and enforcement costs. When property rights are not well defined or as secure as assumed in neoclassical theory, transaction costs emerge (Coase, 1960).

At the macro level, new institutional economics advanced to analyze the relationships between political, economic and social systems by examining the effects of institutional variables on economic performance (North, 1990). In contrast, at the micro level, new institutional economic theories advanced to study the organization and governance of transactions within and between firms. Transaction cost, agency cost and property rights/incomplete contract theories are three general sets of theories incorporated into the micro level analysis. These theories suggest the allocation of value, uncertainty and property rights between contracting parties will be determined by the characteristics of the transaction, the costs of monitoring and enforcement, the relationship between the parties and the negotiation skills of each party (Sykuta and Cook, 2001).

Property rights theory helps describe the ownership and control of resources in an organization. Property rights theory also helps examine the efficiency of organizations in terms of the alignment of the residual rights of control and residual claimant rights over the firm's assets (Milgrom and Roberts, 1992; Hart and Moore, 1990). The basic assertion of this approach is that ownership, accompanied by secure property rights, is the most effective institution for providing stockholders with incentives to create, maintain and improve the organization's assets.

New institutional economics literature (Fama and Jensen, 1983a; Hart and Moore, 1990; Hart, 1995; Condon, 1990) identifies four characteristics of the property rights

structure in any organization: (1) ownership of residual claims and alignment of residual control and residual claimant rights; (2) transferability of residual claims; (3) redeemability of residual claims; and (4) ownership horizon of residual claims. Business organizational forms like sole proprietorships, investor-owned firms, cooperatives, mutual, labor-managed firms and non-profit organizations have different property rights structures, which affect how the organization allocates the costs and benefits among participants.

Residual claims refer to the right to the firm's net cash flows after all fixed obligations have been met (Fama and Jensen, 1983a). Residual control rights are the rights to make any decision regarding the asset's use that are not explicitly attenuated by law or assigned to other parties by contract (Grossman and Hart, 1986). Aligning residual claimant rights and residual control rights provides the owner with the proper incentives to make efficient decisions regarding the asset use. When claimant and control rights are not aligned, economic decisions made by the organization's stakeholders tend to be inefficient (Milgrom and Roberts, 1992). Transferability refers to the ease of transfer of residual claim from one person to another. Redeemability defines the degree of ease with which the owner of a residual claim can demand, at a given price, return of his equity capital that purchased the rights to the net income of the firm. Ownership horizon pertains to the length of time the residual claim remains valid (Fama and Jensen, 1983a; Hart and Moore, 1990; Hart, 1995; Condon, 1990). These ownership rights characteristics vary across organizational forms and are compared for investor-owned firms and user-owned firms in the next two subsections.

2.2.1. Ownership Rights in Investor-Owned Firms

In most investor-owned firms, a diverse group of equity investors share proportional ownership rights to the residual income of the organization. Few of the investors have any business ties to the organization beyond their equity investment. Investor-owned firms proportionately distribute its residual income based on ownership of equity shares. Transferable, non-redeemable residual claims that are freely tradable among investors in secondary equity capital markets characterize investor-owned firms. The horizon of the residual claims is unlimited because it is rights to net cash flows for the life of the organization (Fama and Jensen, 1983a). In other words, the rights to residual claims are fully transferable and appreciable. This allows investors to change their investment portfolio to meet their personal risk preference at relatively low costs while being able to capture the fully capitalized value of their investment.

In an efficient capital market, residual claims trade among investors costlessly. When the efficient capital market exists, investors evaluate their investment, and its future payoffs, according to the contribution to the current market value of the residual claims (Fama and Jensen, 1985). When the stream of payoffs implied by the corporation's investment decision does not correspond to an investor's optimal consumption stream, the capital market can be used to exchange the investor's residual claims in the corporation for other claims with the same market value and a stream of payoffs that better matches the investor's desired consumption stream and risk preferences. A well-functioning secondary market values the stock in terms of the expected present value of the firm's future net earnings. Therefore, in an efficient capital market, publicly traded investor-owned firms may not face an *investment* horizon

problem because the equity investors, or stockholders, can realize, at any time, the capitalized value of future earnings by selling the stock. Since the equity investor can capture capital gains, he will be concerned with future earnings as well as present earnings when making investment decisions (Staatz, 1987).

2.2.2. Ownership Rights in User-Owned Organizations

User-owned organizations in the U.S. serve one out of every four citizens in health, insurance, agriculture, food and credit sectors (USDA, 1995). In agriculture, cooperatives are user-owned organizations. Individuals who use or patronize agricultural cooperatives also own and control the organization. Another distinguishing characteristic is that user-owned organizations distribute the benefits or residual claims primarily to the user-owners based on patronage (USDA, 1987).

Several alternative sets of cooperative principles, which were modifications of the Rochdale principles from England, have been adopted during the twentieth century. Seven "traditional" cooperative principles help distinguish the traditional cooperative from more recent organizational designs (Abrahamsen). Barton (in Cobia, 1989) identifies the following traditional cooperative principles:

1. Voting is by members on democratic (one-member, one-vote) basis
2. Equity is provided by patrons
3. Net income is distributed to patrons as patronage refunds on a cost basis
4. Dividend on equity capital is limited
5. Membership is open
6. Ownership of voting stock is limited
7. Business is done primarily with member-patrons

The first four principles listed above are the "traditional" hard-core principles widely practiced by cooperatives during this century. The last three principles are not universally listed as traditional principles, but most cooperatives follow them (Cobia, 1989).

The traditional cooperative principles help define the ownership rights structure of cooperatives, which differ from publicly traded investor-owned firms (Table 2.1). Although members of cooperatives invest in the organization, the residual income is distributed based on the member's patronage or business dealings with the organization. Non-transferable and non-appreciable but partially redeemable residual claim rights to the net cash flows of the cooperative characterize a cooperative structure (Condon, 1990). Since the member in a traditional cooperative receives rights to the net cash flows only as long as he is an active patron, the member's horizon of the residual claims is limited (Chaddad and Cook, 2002b).

Table 2.1 Comparison of Residual Claim Characteristics between Publicly Traded Investor Owned Firm and a Traditional Cooperative

Residual Claim Characteristic	Publicly Traded Investor-Owned Firm	Traditional Cooperative
Ownership	No restriction	Member-Patrons only
Horizon	Valid for Life of Firm	Valid Only while Patron
Transferability	Freely Transferable	Generally not Transferable
Valuation	Claims usually valued in common stock market	No secondary market to value claim
Redeemability	Not redeemable	Redeemable

Source: Condon, 1990

The restrictions on ownership, transferability, redeemability and time horizon of cooperative residual claims foster the vaguely defined property rights structure observed in traditional agricultural cooperatives (Iliopoulos, 1998). Cooperative scholars identified five vaguely defined property rights problems: the free rider problem, the

portfolio problem, the horizon problem, the control problem and the influence cost problem that lead to conflicts over residual claims and decision control (Vitaliano, 1985; Porter and Scully, 1987; Staatz, 1987; Peterson, 1992; Cook, 1995; Iliopoulos, 1998).

Iliopoulos (1998) classified the control and influence cost problems as collective decision-making constraints. The control problem is associated with agency costs that arise when trying to prevent divergence of interests between the membership and the representative board of directors and management in a cooperative[5]. The lack of external competitive market pressures (e.g. equity markets and the market for corporate control) that help discipline managers in an investor-owned firm increases the impact of the control problem in user-owned firms (Sykuta and Cook, 2001). In addition, the one-member, one-vote governance structure in traditional cooperatives contributes to the control problem (James and Sykuta, 2003). Influence costs are associated with activities that arise when members or groups of members attempt to influence the management's decision regarding how to distribute the wealth of the cooperative (Cook, 1995). Influence costs are incumbent to all organizations where decisions affect the wealth distribution among individuals or subgroups of individuals. The influence costs are greater when subgroups of members have a wide range of interests and when large amounts of wealth need to be distributed.

Iliopoulos (1998) categorized the free rider, portfolio and horizon problems as investment constraints since these three issues affect the members' incentives to invest in their cooperative enterprises. The free rider problem occurs when individuals realize benefits or gains from cooperative action but do not fully invest in developing the gains.

[5] When the agency costs occur near the end of the management's tenure with the cooperative, it would be considered equivalent to the "agent-control horizon problem".

When the individual who receives the benefit is a new member, the individual is called an internal free rider. However, when the individual capturing the benefit is a non-member, he is an external free rider (Sykuta and Cook, 2001). The portfolio problem arises when cooperative members are not able to withdraw or reallocate their investment in the cooperative investment portfolio to match their personal interests or risk preferences (Cook, 1995). The "*investment*" horizon problem occurs when an individual's residual claim on the net income generated by a cooperative asset does not extend as far as the economic life of the underlying asset. This creates a disincentive to contribute to growth opportunities, through an emphasis on current cash flow at the expense of future earnings (Porter and Scully, 1987).

2.3. The "*Investment*" Horizon Problem

The "*investment*" horizon problem refers to a situation in an organization in which an individual stockholder has a disincentive to contribute to collective growth opportunities because his residual claim on the organization's net income is shorter than the economic life of the underlying asset (Porter and Scully, 1987). The *investment* horizon problem was first discussed in the context of labor-managed firms (Furubotn and Pejovich, 1970; Jensen and Meckling, 1979). In later years, the *investment* horizon problem has been discussed in the context of user-owned organizations (Vitaliano, 1983; Staatz, 1987; Condon, 1990, Ellerman, 1986).

2.3.1. Horizon Problem in Labor Managed Firms

Furubotn and Pejovich (1970) and Jensen and Meckling (1979) first discussed the *investment* horizon problem in the context of labor-managed firms. Furubotn and

Pejovich analyzed labor-managed firms where employees cannot privately own capital goods. Employees only received the right to use the firm's capital, which allowed them to produce, buy or sell the capital goods as long as the firm maintained the book value of assets and paid interest on the value of the capital to the state. In the Balkans during the period of the study, employees managed the organization through an elected body that made all major decisions including decisions about the wage rate and investment. The elected body determined the distribution of the firm's profit between the Wage Fund and the Investment Fund and the criteria used to distribute wages among employees. When the elected body allocated profits to the Investment Fund (also known as retained earnings) to purchase additional capital goods, employees benefited from enhanced future revenues and profits only as long as they remained employed by the firm. The employees could not directly receive the value of their reduced wages in the Investment Fund.

In the case of Yugoslavia, an individual had no ownership rights in the firm's capital stock, merely the right to use the capital (Furubotn and Pejovich, 1972). A worker acquired the right to share in the residual income when he joined the firm, but lost all rights when he/she exited the firm. In other words, each worker in the labor-managed firm had claims to the current stream of net earnings, which were contingent on continued employment at the organization and were not transferable. As long as the worker remained employed by the firm, he was in the position to realize a gain through higher future wage payments. Once the individual left the firm, he had no claim on the firm's future net revenues (Furubotn, 1976). When a worker has a short time period left with the firm, the individualized return on any internally financed investment project must be sufficient during the worker's tenure with the firm to compensate for both (1) the

interest foregone from alternative investment opportunities and (2) the principal of the worker's contribution to finance the project (Bonin et al, 1993). When the worker's residual claim on the assets in the labor-managed firm is neither permanent nor transferable, the decision maker operates with a relatively short horizon compared to an organization with transferable residual claims (Furubotn, 1976).

The *investment* horizon problem affects the evaluation of potential projects and investment in labor-managed firms (Jensen and Meckling, 1979). If a worker intends to belong to the labor-managed firm for a period shorter than the time it takes for the stream of discounted net returns from the project to equal his initial cost of investment, then the structure of ownership rights in the labor-managed firm prevents the worker from fully recouping his share of the initial investment. If the worker has no transferable rights to the returns from the project after leaving the firm, he evaluates his individualized return using a truncated stream of discounted future returns with the final date coinciding with his expected departure (Bonin et al, 1993). The worker prefers projects where the present value of the truncated cash flows exceeds the present value of expenses. Therefore, workers, with a short planning horizon, have a disincentive to finance capital goods with internal funds when they do not have individual and transferable ownership rights in the firm's assets. These workers would vote to distribute the entire amount of net earnings to themselves in the form of wages or bonuses and make all investments with borrowed capital (Furubotn and Pejovich, 1970; Vanek, 1977).

According to Jensen and Meckling (1979), the implications of the horizon problem in labor-managed firms that increase near-term cash flows at the expense of future cash flow streams are:

a. Large amount of investment in projects with high near-term cash flows. Workers with short employment horizons prefer projects requiring a short investment and development period, whose payoffs occur within their horizon.

b. Reduction, postponement or elimination of maintenance of capital goods. Workers with short employment horizons prefer the delay of maintenance of capital goods so the major negative effects on cash flows of the investment decisions occur in the future beyond their horizons, which could result in higher salaries today.

c. Issuance of long-term bonds with low coupons (low interest payments) and no sinking fund provisions.[6] Workers with short employment horizons prefer financing projects with long-term debt, which is repaid in periods beyond their expected membership horizons. The cash proceeds from lower interest payments or no sinking funds can be paid out directly in higher wages to the current employees or in increased fringe benefits. Financing projects with long-term bonds place the repayment burden on future generations of workers.

d. Increase in the pension benefits of current workers. Current workers with short employment horizons have incentives to increase their pension benefits with no funding provisions so the full burden of the payment of the pensions is shifted to future generations of the organization's workers.

An organization that continues to make decisions to increase near-term cash flow at the expense of future cash flow streams, or relies substantially on retained earnings for

[6] Publicly traded bonds use sinking funds where the firm pays a sum of cash into the fund to repurchase and retire the bonds. If the firm cannot pay cash into the sinking fund, the lender can demand their money back.

financing investments without providing individualized rights to assets will tend to be undercapitalized (Bonin et al, 1993). Although the property rights theory predicts underinvestment in labor-managed firms that rely on internal funds for investments, little to no empirical literature exists to either support or refute this hypothesis.

2.3.2. Two Types of Investment Horizon Problem in User-Owned Organizations

Ellerman (1986) examined the difference between ownership rights in an investor-owned firm and a worker cooperative to develop a framework to describe two types of *investment* horizon problem: (1) the "Furubotn-Pejovich" horizon problem and (2) the "residual" horizon problem. The ownership rights in a conventional investor-owned firm consist of (1) voting rights and (2) the rights to the economic value of the corporation (Ellerman, 1986). The value of a corporation can be expressed in a "book value plus goodwill" formula[7] (Ellerman, 1982) as in equation (2.1).

$$V = NBV + \frac{ENI}{r} \tag{2.1}$$

In other words, Ellerman divides the value of the corporation between rights to the net book value of corporate assets, *NBV,* and goodwill, *ENI/r*, which is the discounted present value of future stream of economic net income (Ellerman, 1984). Both the control rights and the rights to the economic value of the investor-owned corporation are *property rights* represented by voting shares, which shareholders own and can freely transfer to other shareholders.

[7] This formula is equivalent to Miller and Modigliani's corporation value but allows one to separate the underlying property rights into actual assets and liabilities of the corporation and assets and liabilities appropriated in the future.

A worker cooperative assembles the bundle of ownership rights differently because the cooperative assigns the rights of membership to the functional role of working in the firm. The rights to the *net book value, NBV,* of the organization's assets and liabilities is a *property right* that represents the capital paid in by past members and the retained portion of the organization's net income. In comparison, the *current voting or control rights* and the *current rights to stream of economic profits, ENI/r*, are *personal rights* assigned to the worker's functional role in the organization and are therefore, non-transferable and non-marketable (Ellerman, 1984).

Ellerman (1986) relates the "Furubotn-Pejovich" and the "residual" horizon problems to the two components of the value of the corporation. The "Furubotn-Pejovich" horizon problem is concerned with the claim on the balance sheet equity or net book value, *NBV*. The "Furubotn-Pejovich" horizon problem is the inability of workers in a social property labor-managed firm to recoup their claims on the retained earnings of the firm. This is not an issue if the asset completely depreciates during the worker's tenure at the firm. However, workers leaving the firm before the asset depreciates forfeit the un-depreciated portion of the asset that they helped finance through reinvested earnings.

The "residual" horizon problem is concerned with the discounted present value of future stream of economic profits, *ENI/r*, where the member is unable to capture the future stream of economic profits (Ellerman, 1986). In a worker cooperative, the right to this stream of profits is a *personal right* attached to the functional role of working in the firm. Current members in a worker cooperative do not own the future residual claimant rights in the organization. Rather, future members in a worker cooperative, who will

produce the products in the organization, are the residual claimants to future streams of economic profits. This creates an incentive to distribute all earnings to current workers and finance all investments through borrowing (Ellerman, 1986; Vanek, 1977).

While describing how to derive the cash flow of a project's net present value, Gittinger identified two components of the rate of return on the member's investment in a cooperative: (1) the return of capital and (2) the return on capital (Gittinger, 1972). Although Gittinger was not discussing the horizon problem, these two components are similar in description to the classification made by Ellerman. The return of capital is the recovery of the initial and annual investments made by the member with no appreciation or interest. The return on capital is the additional net earnings engendered by the investment. In a cooperative, the speed of the return of capital depends on the cooperative's equity redemption program and is similar to the "Furubotn-Pejovich" horizon problem. A member derives the return on capital through patronage, limited interest payments on capital invested in the organization and the cooperative's provision of public and semipublic goods (Staatz, 1987). The return on capital is similar to the "residual" horizon problem or the difficulty of capturing (1) the appreciated or market value of the capital invested in the organization and (2) the future streams of economic profits.

The two distinctions made by Ellerman regarding the types of horizon problem and by Gittinger regarding the return on the member's investments suggest that two subtypes of the horizon problem may exist in user-owned organizations. The next two subsections of this chapter discuss the literature on user-owned organizations related to the two types of horizon problem.

Return of Capital: Furubotn-Pejovich Horizon Problem

As stated in section 2.2.2, the user owns and controls the cooperative, where benefits are distributed based on use (USDA, 1987). A *traditional* cooperative has ownership rights characteristics similar to the labor-managed firm in that the member's residual claim to the net revenues is nontransferable, not appreciable and is contingent on the member's patronage with the organization (Chaddad and Cook, 2002). The residual claims to cash flows of a cooperative are restricted to a group of member-patrons who purchase inputs from the organization or supply the organization with raw material for further processing. The residual claims are acquired differently in a 'cost of good sold" cooperative versus a cooperative operating on a "pooled" basis.

In a "cost of goods sold" cooperative, the cooperative's board of directors determines the proportion of net income to retain as permanent equity and the portion to allocate to the members as patronage refunds in proportion to the member's level of patronage or business with the cooperative. For the patronage refunds to qualify for exemptions from inclusion in the cooperative's taxable income, the cooperative must follow the following criteria specified by the Internal Revenue Code. (1) The cooperative must pay at least twenty percent of the patronage refund immediately to the member in cash. (2) Net income must have resulted from patronage-sourced business. (3) A preexisting obligation exists by the cooperative to pay the patronage refund. (4) Notification of the refund and cash payment must be made to the member within specified time limits (Cobia, 1989). When the member agrees to include the entire patronage refund (cash and non-cash) as income when filing his taxes, the member passively invests in the cooperative. Typically, the member receives the retained portion

of the patronage refunds payable after several years at book value, depending on the cooperative's equity redemption plans, and if the board of directors chooses to redeem the patronage refunds (Cobia, 1989).

A "pooled" cooperative determines the amount to withhold from the member's proceed check (per unit retain) as a contribution to working capital, based on the value or quantity of products marketed through the cooperative (Cobia, 1989). The member receives a check for the gross value of the product delivered to the cooperative minus the member equity capital withheld. So rather than receiving a portion of the net income like in a "cost of goods sold" cooperative, a member in a "pooled" cooperative receives a proceeds check for a reduced amount reflecting the book value of the member's passive investment. The cooperative is not required to refund twenty percent of per unit retains immediately in cash; however the member must pay taxes on the full amount withheld by the cooperative. The member typically receives the capital retains after several years at book value depending on the cooperative's equity redemption plan and whether the board of directors chooses to redeem the capital retains (Cobia, 1989).

Members of traditional cooperatives typically derive benefits from the cooperative solely through patronage. The equity acquisition and redemption policies in both "pooled" and "cost of goods sold" cooperatives prevent the member from separating his investment from patronage. The member can only receive benefits of their investment decisions over the time horizons of their expected membership in the organization. When the member ceases to patronize the organization, he typically does not have full and immediate ownership rights to his allocated portion of equity capital.

When members hold equity in proportion to their patronage where each member's share of financing is equal to his share of benefits received, the Furubotn-Pejovich horizon issue is less of a problem. Over time, when the member begins reducing his level of patronage, the member may have a higher allocated portion of equity capital compared to the benefits received unless the organization implements an appropriate equity redemption policy. If the member's patronage decreases relative to his investment, then the marginal return the member receives also decreases. If this is the case, the senior or "over-invested" members (contributed more capital relative to their current patronage than the perfectly proportionally invested member) might pressure management to accelerate the equity redemption or to pay dividends on capital invested at the expense of retained earnings. This would allow the "over-invested" member to capture the book value of his equity in a preferred period (Staatz, 1987; Cook, 1995).

The pressure to accelerate equity redemption is indicative in the increased number of attempts to change statutory provisions and the increased number of judicial rulings related to equity redemption procedures in farmer cooperatives (Cook, 1976). This indicates the *Furubotn-Pejovich* horizon problem is indeed an issue. The State Supreme Courts or Federal Courts decided more than sixty legal cases dealing with member-patron rights in patronage refunds between 1899 and 1975 (Cook, 1976). Several judicial rulings dealt with the timing of patronage refund distribution and ruled that the directors of the association determine the distribution of patronage refunds at their discretion, but the exercise of their discretion is subject to judicial review. The court cases indicated that neither the termination of a business relationship between a member and a cooperative nor the death of a member entitles the member to *immediate* payment of the patronage

refunds (Cook, 1976). The 1979 General Accounting Office report to Congress recommended that Congress develop legislation to make it mandatory for cooperatives to pay interest on dividends and/or retire retained equities within a certain time unless cooperatives adopt more equitable equity redemption plans (GAO, 1979). However, Congress did not develop the legislation for mandatory redemption.

Memberships of cooperatives have always included farmers of all ages and at all points in the life of their farm businesses (Ginder, 1999). Until the 1970s, the farm operations of cooperative members in the Midwest were typically diversified family farm operations with grain, hogs, cattle or perhaps dairy with similar production technologies (Ginder, 1999). However, over time, members' characteristics become less homogeneous, placing greater emphasis on the time horizon issue. The degree of membership heterogeneity can be measured by the following eight factors (Ginder 1999; Iliopoulos and Cook, 1999):

a. Variance in size of farm operations. Members with large farm operations might have different preferences for cooperative investment compared to members with small operations. A wide range of large versus small farm operations within a cooperative has a negative impact on firm efficiency by inducing lower producer prices and lower levels of investment (Banerjee, et al, 1997).
b. Degree of specialization. Members who specialize in a single commodity may have different investment preferences compared to members who diversify their farm operation.
c. Variation in financial positions. Members who finance their farm operation primarily with equity may have different preferences for investments compared to

members who primarily use debt capital. Members who primarily finance their operations with debt capital may have a higher demand for near-term cash flows.

d. Geographic dispersion of membership. Cooperative members in distant regions or countries may have different sets of investment preferences. One subgroup of members may prefer the cooperative investment be located in their region where they can benefit from the investment directly.

e. Variance in member's education level. Different levels of education increase the heterogeneity within the membership. Higher educational levels may introduce some members to new research and technologies that are costly for the cooperative to implement and may not benefit the entire membership.

f. Variance in member's percentage of non-farm income. As the percentage of cooperative members earning a higher portion of their income from non-farm sources grows, this source of heterogeneity becomes increasingly important. Members who receive a greater portion of income from non-farm sources may prefer the cooperative to invest in assets that reduce the time the member spends on the farm.

g. Differences between members in terms of business objectives. Members who farm with a lifestyle objective are likely to have different investment preferences compared to those who farm with a business objective. Members who farm with a business objective may require different cooperative investments to facilitate their expected growth plans.

h. Variance in member's age or time horizon. Younger and older members may have different preferences for short and long-term investments. Members may try

to influence the cooperative decisions in favor of investments and policies that allow them to maximize their individual benefits while they patronize the organization.

Members with different membership horizons may have different preferences in terms of equity redemption plans and projects in which the cooperative invests. The diverse membership characteristics places coordination stress on the cooperative leaders as they attempt to align member's investment preferences with the cooperative investment opportunities. Therefore, one group of members may prefer a quicker return of capital invested in the cooperative whereas other subgroups may prefer a higher return on capital as discussed in the next section.

Return on Capital: The Residual Horizon Problem

The characteristics of residual claims are different in investor-owned firms from user-owned organizations, which affect the way the "*residual*" horizon problem manifests itself in user-owned organizations. The "*residual*" horizon problem occurs when the member's residual claim on the net income generated by a growth opportunity is shorter than the productive life of that asset and the members do not have transferable ownership rights to the firm's assets (Porter and Scully, 1987). The residual claims in publicly traded investor-owned firms are freely transferable to anyone who has the means and desire to purchase them. The secondary market incorporates all available information about the firm's performance while evaluating the present value of the investor-owned firm's residual claims (Fama and Jensen, 1983b). Under the assumption of competitive markets, the current price of a publicly traded investor-owned firm's residual claims accurately reflects the present and future net income streams generated by

the investment decisions of the firm's management (Copeland and Weston, 1983; Brealey and Myers, 2000). The existence of a liquid secondary market to value residual claims allows the holders of the residual claims to capitalize fully the present value of future income streams at any time by selling the claims or by borrowing on its market-established value (Vitaliano, 1983).

The traditional cooperative contractually ties the formal claims for the cooperative's residual income to the member's patronage transactions. Therefore the residual claimants capture the benefits of investment decisions only over the time horizons of their expected membership in the organization (Vitaliano, 1983) and they surrender any future residual claims when they cease to patronize the cooperative (Staatz, 1987). In addition, state statutes, articles of incorporation and cooperative bylaws of a traditional U.S. agricultural cooperative might prohibit the transferability of residual claims. Even if the institutional framework allowed for the transferability of residual claims, there is not much of an incentive to transfer the residual claims if the redeemed price is the discounted *book* value rather than a discounted *market* value of the residual claims. Therefore, members in a traditional agricultural cooperative do not have the ability to realize directly the capitalized value of the cooperative's future income stream beyond the member's expected membership horizon (Vitaliano, 1985; Staatz, 1987; Condon, 1990).

The non-transferability and non-appreciable characteristics of the residual claims results in members receiving only the book value of their equity, not the market or appreciated value. Without a transferable right or secondary market, the member cannot capture the future returns from new projects, from increases in market value due to

improved performance nor from the positive impact of intangible assets after leaving the cooperative. The member's reinvested equity might increase the organization's future net worth but the member cannot capture the increased economic value beyond their membership horizon. Members may evaluate the cooperative investments in terms of the returns they generate during the member's expected membership horizons by discounting income streams beyond this horizon to zero (Vitaliano, 1985; Condon 1990; Bonin, Jones and Putterman, 1993). Therefore, members might be reluctant to invest in the cooperative and contribute to collective growth opportunities since they cannot capture part of the market value of their residual claims, especially if the investment is for intangible assets like research and development or brand name advertising (Staatz, 1984; Porter and Scully, 1987; Cook, 1995).

Members close to retirement also tend to influence cooperative investment decisions by pressuring management to finance investments with borrowed funds rather than internal funds or reinvested equity (Furubotn, 1976; Jensen and Meckling, 1979; Porter and Scully, 1987). If a sufficient number of cooperative members face the "*residual*" horizon problem, the cooperative is more likely to exhibit an investment portfolio skewed towards shorter-term projects and projects that return higher rates of return in the short-term (Condon, 1990).

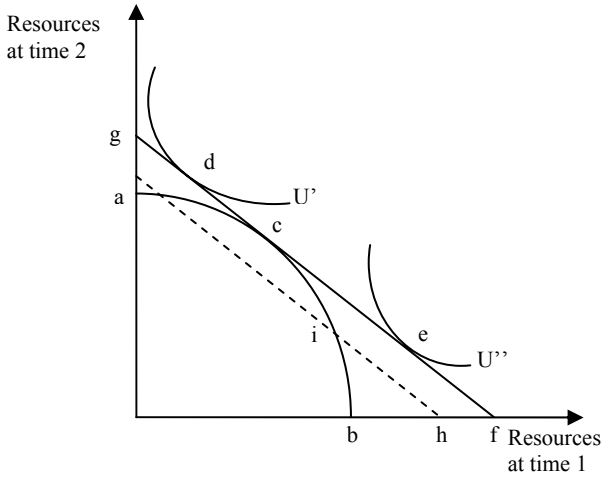
Vitaliano (1985) provides a conceptual framework to depict the cooperative "*residual*" Horizon Problem using a standard graphical analysis of a two period investment.[8] This graph depicts the inability of capturing the increased or appreciated value of the organization when members cannot transfer the residual claims. The

[8] Fama and Jensen (1985) use the two-period investment problem to evaluate the choice of organizational form and investment for open corporations and proprietorships.

horizontal axis measures the resources currently available whereas the vertical axis measures resources available in the future. The curve *ab* in Figure 2.1 represents the production efficient frontier for a firm that can invest resources at time period 1 up to point *b* and generate future period resources in amounts indicated by the curve. The investment level chosen by a firm with marketable claims to net cash flows, like an investor-owned organization, is point *c* where the participating investors maximize their utility regardless of their individual time preferences.

When investors have different utility functions in an investor-owned firm, they can lend or borrow at the market interest rate to achieve their preferred utility function. The investment strategy that maximizes the utility of all members corresponds to point *c* on the investment opportunity set regardless of the individual time preferences of the two groups of investors. An investor with time preference skewed toward the future (U') can lend his un-invested portion of current period resources at market interest rates to achieve

Figure 2.1 Horizon Problem of Cooperative Investment *(Vitaliano, 1985)*



a utility maximum at point *d*. An investor with preference skewed toward the present (U'') can pursue an investment strategy illustrated by point *c* by selling or borrowing

against the resulting net cash flows to achieve a utility maximum at point *e*. Investors in an investor-owned firm would support the investment strategy that maximizes the present value of the claims to the firm's future cash flows, illustrated by point *f* by evaluating the investment with a market value rule.

In a traditional agricultural cooperative, the member cannot market nor transfer their claims on net cash flows through a secondary security exchange. Members with time preferences skewed toward the present, such as members close to retirement or members with current individual cash flow constraints, cannot realize a utility at point *e* when attempting to achieve the present value of future cash flows (*f*). They will likely pursue a strategy involving lower levels of current resources investment (*i*) and a lower present value (*h*) (Vitaliano, 1985). Therefore, the market value rule, in general, cannot model the investment decisions in cooperatives (Fama and Jensen, 1985).

Van Wassenaer (1989) develops a theoretical cooperative decision model that identifies the optimal ownership structure for a cooperative by maximizing the joint income for members and the cooperative. Based on the theoretical model, Van Wassenaer hypothesizes an ownership structure with revolving equity does not resolve the horizon problem completely if the cooperative's investment pays off over several periods after its cost has been incurred and some members reduce their share of patronage before the investment has paid off. In essence, the study states that a revolving fund does not account for the *residual* horizon problem. Since the theoretical model is complex, the thesis does not empirically test the hypotheses generated.

Nadav (1993) developed a theoretical framework using optimal control theory for a supply cooperative to deal with the dynamics of the cooperative's capital stock, its

production and investment decisions and the distribution of returns to patronage and equity. Using comparative statics, Nadav shows that when the member's rate of time preference is skewed toward the present (members demand immediate cash benefits), the cooperative will have lower equity and capital stock. When the marginal return from farming is less than or equal to the rate of patronage refund, the member is more willing to finance the cooperative. On the other hand, when marginal return from farming is greater than the rate of patronage refund, members may pressure the cooperative to pay higher percentage of patronage refunds in cash.

The *residual* horizon problem becomes an issue when members have alternative investment opportunities for which they can utilize the residual claims (Condon, 1990). If alternative investment opportunities did not exist, members might consider the reduced realizable return associated with the horizon-shortened investments as a cost of doing business with the organization and the *residual* horizon problem would not be an issue. However, when the member has alternative investment opportunities at the farm-level, the member might consider his ability to leverage his residual claims to borrow debt capital. Most allocated retained patronage refunds or capital retains in traditional agricultural cooperatives are not acceptable as collateral or security by creditors (Cook, 1976). Members who can use the residual claims in the cooperative as collateral for on-farm purchases capture some portion of the market value of their claims. If members cannot use the residual claims as collateral, then the *residual* horizon problem may be binding.

Iliopoulos (1998) identified three conditions for the *residual* horizon constraint to be a serious problem, regardless of whether the considered investment is a tangible asset or an intangible asset.

a. The expected payback horizon of an investment is longer than the expected membership horizon of the majority of members. When the expected payback horizon of an asset is longer than the expected membership horizon, the majority of the members will favor no further investment in the cooperative.
b. Restrictions exist on the transferability of cooperative residual claims. If members cannot transfer the ownership of their residual claims, they must wait until the board decides to redeem the equities.
c. No established secondary market exists for the transfer of the cooperative residual claims. If members cannot trade their residual claims in a liquid secondary market, they cannot capture the market value of their investment.

The residual horizon problem might manifest itself in members who pressure the management to liquidate the cooperative's assets in whole or in part so, they can receive more than the book value of their stock (Staatz, 1987). The *residual* horizon problem may be more serious in cooperatives with the following characteristics (Staatz, 1987).

a. Per-member capital investment in the cooperative is large. If members have large investments in the cooperative, they may place pressure to accelerate the equity retirement programs or increase the dividend paid on their capital invested in the organization.
b. Cooperative has a closed membership. If the cooperative has a closed membership, then the value of the farm does not capitalize the member's value in

the cooperative. However, if the cooperative has a completely open membership policy, then the value of the farm fully capitalizes the value of the cooperative. This holds if the cooperative is the only buyer in the region for the member's product or the only seller in the region of the member's inputs, which is seldom the case for traditional farm supply cooperatives. If the cooperative restricts membership to a certain geographic region and the cooperative is the only organization, which provides a certain service, the land value of farms in that geographic region partially capitalize the discounted value of the cooperative's future earnings (Staatz, 1987).

c. Few of the member's farms are legally incorporated. When a farm is incorporated, and the corporation itself is a member of the cooperative, the expected future earnings of the cooperative are capitalized in the value of the incorporated farm. If very few of the member's farms are legally incorporated, the member's farms cannot capture the expected future earnings of the cooperative.

d. The intergenerational transfer of membership within families is prohibited. If members cannot transfer their membership within families, they may be less willing to finance long-term investment. However, if members can transfer their membership within the family, they may be more willing to finance long-term cooperative investments even if they do not directly benefit from the investment.

e. Cooperative has a large and/or diverse membership. Large diverse membership results in a heterogeneous group of producers with variability in age and time

horizon. The horizon problem may pose fewer challenges in a smaller cooperative in which the members have strong ties to one another.

Although cooperative scholars suggest the implications of the "*residual*" horizon problem occur in agricultural cooperatives, little to no empirical evidence exists to indicate whether the *investment* horizon problem exists.

2.4. A Refinement of the *Investment* Horizon Problem

The literature up to now on the *investment* horizon problem has focused on two basic issues: the return of capital in the *Furubotn-Pejovich* horizon problem and the return on capital in the *residual* horizon problem. This section proposes additional forms of the horizon problem may exist in user-owned organizations.

Collective action theory states that individuals act collectively in an organization because they have a common interest in obtaining a collective benefit (Olson, 1971). The individual's incentives to contribute to the group depend on the degree of interest that specific group members have for the collective good and the ability to notice an individual's contributions within the group. When a member receives a large enough fraction of the total benefit, like in a small group, he would be willing to provide the collective good himself. However, when others do not notice the contribution an individual member makes in the group, the members have an incentive to free ride on the efforts of others in the group. In general, the larger the group, the less noticeable are the individual contributions.

In traditional agricultural cooperatives, the common benefit might be to provide a missing service or competitive prices (Sexton and Iskow, 1988). The core committee that organizes the cooperative typically has a strong common interest that binds the group

together. Within the small group, no single member receives a large enough share of the benefits to give him the incentive to provide the collective good himself, but the individual contribution is noticed by other members in the group. As the group becomes larger and more heterogeneous, the individual interests start to differ from the common "collective" interest of the original members. To continue to be successful in obtaining the collective benefit, large latent groups may need to adopt selective incentives, voluntary coercion or a federated structure (Olson, 1971).

When the founders organized traditional agricultural cooperatives, they developed selective incentives to encourage the members to contribute to the collective good. The selective incentives, as specified within the articles of incorporation or the bylaws of the organization, helped ameliorate the "*start-up*" horizon problem. The "*start-up*" horizon problem represents the disincentive to invest when the organization is formalized because the economic life of the organization is longer than the producer's tenure. In traditional agricultural cooperatives, members typically pay a small membership fee so they can receive a claim to the cooperative's net income and benefit from the collective good. If the group of farmers did not organize as a cooperative, then the needed service might remain missing and the farmers might not receive competitive prices on the inputs purchased from the cooperative or products marketed through the cooperative. As long as the member continues to conduct business with the organization, he receives a benefit through use and through the residual claim. When the traditional cooperative organizes, the member's benefit as a user is likely to be greater than his benefit as an investor.

Over time, the member changes his ratio of patronage to investment in the cooperative. Most traditional cooperatives introduced equity redemption plans to attempt

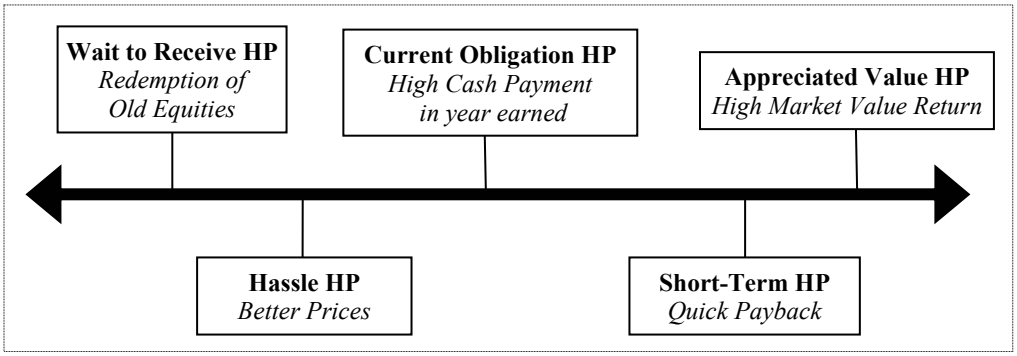
to align the member's patronage with their investment whereas other cooperatives adopted base capital plans. The equity redemption plan might be considered a partial solution for the "*ex-post start-up*" horizon problem. The "*ex-post start-up*" horizon problem evolves over time and represents the disincentive for members to continue to invest in the organization after start-up because the economic life of the tangible or intangible asset is longer than the member's horizon.

As the organization becomes larger and transitions into second and third generations, members may have more diverse preferences and membership horizons. In addition, each member may be at a different stage in their relationship with the cooperative: (1) the investment period, (2) the growth period and (3) the disinvestment period (Royer and Wissman, 1989). The investment period starts when the patron begins doing business with the cooperative and ends when the cooperative begins redeeming the member's equity. During the investment period, the member passively invests in the cooperative through retained patronage refunds or capital retains on which he pays income taxes. He receives a portion of the patronage refunds or capital retains in cash from the cooperative. In addition, he might receive a benefit from additional cash flows at the farm level. The growth period starts when the cooperative begins redeeming the patron's equity and ends when the patron quits doing business with the cooperative. During the growth period, the patron continues to invest equity capital passively through retained patronage refunds or per unit retains. In addition to the cash patronage refunds and higher farm cash flows, he receives the redemption of his retained patronage refunds. The disinvestment period starts when the patron quits doing business with the cooperative and ends when the cooperative retires the last of the patron's equity capital. The member

no longer invests additional money in the cooperative, and only receives the redemption of his proportion of retained patronage refunds.

The members in each stage of their relationship with the cooperative may have different horizons with the cooperative and therefore different preferences. A continuum of member's level of preferred investment might exist within an organization like in Figure 2.2 ranging from no investment to long-term investment. The perceived preferences appear in the figure in italics. Each proposed horizon problem will be briefly discussed.

Figure 2.2 Continuum of Member's Investment Preference related to the Horizon Problem



Wait-to-Receive Horizon Problem. Inactive or retired members might prefer to "disinvest" or get their equity out of the cooperative. Most traditional cooperatives have an equity redemption plan with a revolving fund, which redeems the older equities at the discretion of the Board of Directors. If members no longer benefit from using the cooperative through patronage, they might prefer the cooperative to accelerate the redemption of older equities. Members who retire from farming become inactive members and no longer benefit from the cooperative through patronage. This dilemma as discussed in section 2.3.2 is known as the "Furubotn-Pejovich" horizon problem or the "return of capital" horizon problem. From this point forward, this horizon problem will

be called the "*wait-to-receive*" horizon problem because members wait to receive the book value of their residual claim until the board of directors chooses to redeem the equities. As a result, the following hypotheses are proposed:

> *Hypothesis 1a: The number of years until retirement will be negatively associated with preference for quicker redemption of older equities.*
>
> *Hypothesis 1b: The number of years until retirement will be negatively associated with preference for higher fair value share price.*

Hassle Horizon Problem. Some members may prefer limiting investment or no further investment because understanding the capital formation and redemption process of their investment, such as the amount of the residual claim to include on income tax returns, the number of years before redemption of residual claims, or the value of the member's investment, is too complex. These members are said to have a "*hassle*" horizon problem. They might prefer the cooperative provide competitive prices similar to an investor-owned firm, rather than patronage refunds (Hartley and Burt, 1989). These members are likely to perceive their cooperative investment is not worth understanding. For these members, the marginal benefit received from the residual claims is less than the marginal cost of understanding the details of their investment. For these reasons, the following hypotheses are proposed:

> *Hypothesis 2a: The level of member's patronage will be negatively associated with the attitude that the cooperative investment is not worth understanding.*

Hypothesis 2b: Plans for the family to continue farming will be negatively associated with the attitude that the cooperative investment is not worth understanding.

Hypothesis 2c: The inability to borrow against the cooperative investment will be positively associated with the attitude that the cooperative investment is not worth understanding.

Current Obligation Horizon Problem. Members with time preferences skewed toward the present, such as members with current individual cash flow constraints, receive some benefit from the residual claims. However, the cost to pay the taxes on the residual claims in combination with the current obligations to service debt is greater than the benefits. Therefore, these members prefer to receive higher cash in the year earned and thus prefer the cooperative not retain as much of their equity as allocated. However, if the member can borrow against their investment in the cooperative, then the member may prefer slightly lower cash paid in year earned. This horizon problem might be called "*current obligation*" horizon problem. For the above reasons, the following hypotheses are proposed:

Hypothesis 3a: The constraint from high current cash obligations will be positively associated with preference for higher cash patronage refunds.

Hypothesis 3b: The constraint from high current cash obligations will be positively associated with preference for competitively priced products.

Hypothesis 3c: The inability to borrow against the cooperative investment will be positively associated with preference for higher cash patronage refunds.

Short-Term Horizon Problem. Active members nearing retirement might have time preferences skewed slightly toward the present. Since they have a shorter membership horizon, the members discount the income streams for investments beyond their membership horizon to zero. These members prefer the cooperative not invest in assets from which they cannot extract complete benefit during their membership horizon. The members prefer short-term investments with a quick payback since they cannot capture the future value of long-term investments. For this study, the *residual* horizon problem is called the "*short-term*" horizon problem and leads to the following hypotheses:

> *Hypothesis 4a: The number of years until retirement will be negatively associated with preference for investments with quick payback.*
>
> *Hypothesis 4b: The number of years until retirement will be negatively associated with preference for no further cooperative investment.*
>
> *Hypothesis 4c: Fewer years until retirement will be negatively associated with preference for investment in technologies that pay back over more years.*

Appreciated Value Horizon Problem. In cooperatives with a high amount of "goodwill" and intangible assets, such as brand name, patents or copyrights, the market value of the cooperative is likely to be greater than the book value since the value from the "goodwill" and intangible assets does not typically show up on the balance sheets. If the member perceives the market value of the cooperative is greater than the book value, then the member may expect to capture some of the appreciated value. These members perceive their residual claims as an investment and expect the cooperative to allocate the

appreciated value of the cooperative. If the cooperative does not allocate the appreciated value of the cooperative, the member prefers liquidation of the organization. This issue might be called the "*appreciated value*" horizon problem because the member has disincentive to invest if he cannot capture the appreciated market value of the organization. The study of the "appreciated value" horizon problem was beyond the scope of this study due to time and expenses.

Cooperative scholars suggest implications that the "Furubotn-Pejovich" and the "residual" horizon problems occur in user-owned organizations. However, little to no empirical evidence tests whether these horizon problems exist in user-owned organizations or whether other variations of the horizon problem exist. Therefore, the following questions remain:

1. Does the "Furubotn-Pejovich" or "wait-to-receive" horizon problem exist in user-owned organizations?
2. Does the "residual" horizon problem exist in user-owned organizations?
3. Do additional forms of the horizon problem exist in user-owned organizations?

This dissertation attempts to answer the above questions. Based on the previously mentioned literature, the next section summarizes the hypotheses this study will study.

2.4.1. Operational Hypotheses

Cooperative scholars have provided implications that the "Furubotn-Pejovich" and "residual" horizon problems exist in user-owned organizations. Therefore, the null hypothesis is that the members in user-owned organizations have similar investment preferences with respect to equity redemption policies and short-term vs. long-term

investments. Each alternative hypothesis evaluates the various types of horizon problems. The alternative hypotheses derived from the above discussion are summarized in Table 2.2.

Table 2.2 Summary of Hypotheses

Main Hypothesis	
H_0:	Members in user-owned organizations have similar investment preferences with respect to equity redemption policies and short-term vs. long-term investments.
Operational Hypotheses Related to "Wait to Receive" Horizon Problem	
H_{1A}:	The number of years until retirement will be negatively associated with the preference for quicker redemption of older equities.
H_{1B}:	The number of years until retirement will be negatively associated with the preference for higher share value price.
Operational Hypotheses Related to "Hassle" Horizon Problem	
H_{2A}:	The level of member's patronage will be negatively associated with the attitude that the cooperative investment is not worth understanding.
H_{2B}:	Plans for family to continue farming will be negatively associated with the attitude that the cooperative investment is not worth understanding.
H_{2C}:	The inability to borrow against the cooperative investment will be positively associated with the attitude that the cooperative investment is not worth understanding.
Operational Hypotheses Related to "Current Obligation" Horizon Problem	
H_{3A}:	The constraint from high current cash obligations will be positively associated with preference for higher cash patronage refunds.
H_{3B}:	The constraint from high current cash obligations will be positively associated with the preference for competitively priced products.
H_{3C}:	The inability to borrow against the cooperative investment will be positively associated with the preference for higher cash patronage refunds.
Operational Hypotheses Related to "Short-Term Residual" Horizon Problem	
H_{4A}:	The number of years until retirement will be negatively associated with the preference for investments with quick payback.
H_{4B}:	The number of years until retirement will be negatively associated with the preference for no further cooperative investment.
H_{4C}:	Fewer years until retirement will be negatively associated with preference for investments that pay back over more years.

2.5. Summary

In summary, a member's time horizon with an organization and the organizational design or property rights of the member's residual claims affects the *investment* horizon constraint. The *investment* horizon problem is relevant for user-owned organizations and is concerned with the implications a member's short horizon has on their incentive to invest in the organization.

The conceptual literature indicates two types of *investment* horizon problems: the "Furubotn-Pejovich" and the "residual" horizon problem. Both the Furubotn-Pejovich horizon problem and the residual horizon problem are concerned with portions of the member's residual claims or ownership rights. The difference is the Furubotn-Pejovich horizon problem focuses on temporal issues in capturing the book value of residual claims that the cooperative organization "previously" retained, whereas the residual horizon problem is concerned with capturing the present value of "future" economic benefits/earnings generated from the member's passive investment in tangible or intangible assets.

This research proposes that other variations of the *investment* horizon problem exist that impacts the member's incentive to invest in the organization: wait-to-receive, hassle, current obligation, short-term residual and appreciated value horizon problems. The next chapter discusses a few empirical studies related to the *investment* horizon problem in user-owned organizations and the methodology used to describe the *investment* horizon problem.

3. GENERAL METHODOLOGY TO DESCRIBE THE INVESTMENT HORIZON PROBLEM

This chapter provides an overview of the general methodology used to describe the investment horizon problem. In particular, this chapter provides a summary of the empirical literature relevant to the investment horizon problem and an overview of methodological literature on case studies and surveys. The chapter concludes with steps in developing the case studies and survey methodology. The statistical methods used to analyze the acquired information are presented in Chapter 4.

3.1. Empirical Literature Review

In the last ten years, there has been an increasing conceptual but limited empirical exploration of the investment horizon constraint. Many authors have described equity redemption plans used by farmer cooperatives (Brown and Volkin, 1977; Griffin et al, 1980; Groves, 1981; Cobia et al, 1982; Royer, 1984; Rathbone and Wissman, 1993), but the papers do not analyze whether the redemption plan affects the member's incentive to invest. Cook (1976) describes an increase in the number of judicial rulings or legal cases dealing with member pressure on cooperatives to redeem patronage refunds. The judicial rulings led to a number of studies analyzing the equity redemption programs from both the member point of view and the cooperative point of view. To assess improvement in equity redemption programs, Rathbone and Wissman (1993) use the following criteria: (1) greater use of systematic programs compared to special programs, (2) shorter revolving fund cycles, and (3) the financial ability to redeem as measured by equity-to-

asset ratio. They conclude that equity redemption programs improved between 1974 and 1991, but suggest member expectations be explored to see how closely member expectations about equity redemption plans are aligned with the cooperatives practices.

This section reviews literature on models evaluating equity redemption plans, case studies and cooperative surveys that may address some of the types of "*investment*" horizon problem.

3.1.1. Models Evaluating Equity Redemption Plans

Several authors analyze equity redemption plans in user-owned organizations by evaluating the after-tax value to the member (Tubbs, 1971; Fenwick, 1972; Beierlein and Schrader, 1978; Royer, 1982; VanSickle and Ladd, 1983; and Knoeber and Baumer, 1983). Others analyze the impact of changing the equity redemption plans on the cooperative's performance (Dahl and Dobson, 1976; Newman, 1983; Royer, 1983; Royer and Cobia, 1984; Caves and Peterson, 1986; Diaz-Hemelo et al, 2001). Several of the latter studies examine the impact of mandatory equity redemption on cooperative financial strength following the 1979 General Accounting Office report to Congress on cooperatives. The GAO (1979) report challenged cooperatives to voluntarily make equity redemption plans more equitable or legislation will be developed to make it mandatory to (a) retire equities within a certain time, (b) pay interest or dividends on retained equities or (c) do both a and b.

Tubbs (1971) uses discounted cash flows to investigate the impact that the member's patronage refunds from the cooperative has on their farm operations. Tubbs indicates that aggressive farmers planning to expand their operations make capital contributions to the cooperative at large sacrifices to their farm operation. In addition,

Tubbs found that farmers in high income tax brackets may actually lose money when the cooperative pays a minimum of 20% of the patronage refund in cash and 80% in allocated equity and the farmer pays income taxes on both portions immediately but does not receive the allocated equity portion for many years under the revolving fund plan.

Fenwick (1972) evaluates the impact of changing the cooperative's capital structure on the savings to members using a linear programming model. His analysis reveals that a six-year revolving period and a thirty-three percent of net savings paid in cash minimizes the cooperative's cost of capital and thus increases the net savings to members.

Beierlein and Schrader (1978) use simulations of cooperative and member cash flows over a twenty-year period to analyze the effect that changes in cooperative capital structure have on the financial value of the cooperative to its members. Their simulations indicate increasing the minimum cash patronage refund or requiring a dividend payment on all member equity actually results in a lower after-tax present value of member benefits.

VanSickle and Ladd (1983) develop a cooperative finance model with the objective to maximize the total after-tax profits of the cooperative member patrons. Their results show a cooperative paying about seventy percent of its patronage refunds in cash has higher after-tax profits for its members than a cooperative that pays all in cash or only twenty percent in cash. In addition, shortening the revolving fund period leads the cooperative to use more debt and pay less patronage refunds in cash.

Knoeber and Baumer (1983) develop a model to explore the determinants of the percent of patronage refunds retained. They find the variables that affect the percent of

patronage refunds retained include the expected rates of return on cooperative equity capital, return on farming assets and the members expected future proportion of patronage with the cooperative. Members who differ in their expected change in patronage with the cooperative also have different preferences on the percentage of patronage refunds to retain. They support their model using financial data from seventeen regional supply cooperatives with ordinary least squares regression (when using national estimates of return on equity in farming assets).

Royer (1982, 1993) illustrates a trade-off between the level of cash patronage refunds and the length of the revolving period. At any growth rate, the revolving period lengthens as the percentage of cash patronage refunds increases. However, the after-tax present value to a member depends on the growth rate of the cooperative. At low growth rates, the largest present values correspond to combinations of high cash patronage refunds and long revolving periods. At high growth rates, the largest present values are associated with 20% minimum level of cash patronage refunds and shorter revolving periods (Royer, 1982). Royer and Shihipar (1997) develop a collective choice model to predict which patronage refund and equity revolving fund practices dominate under specific patron and cooperative characteristics. At some point in the member's farming career, the member prefers the cooperative to begin paying a smaller proportion of patronage refunds in cash in order to accelerate redemption of equity. The age at which the member changes his preference toward cash patronage is sensitive to the member's discount rate, the cooperative's rate of return and equity growth rate (Royer and Shihipar, 1997).

Rather than measuring the effect of equity redemption plans on members, Dahl and Dobson (1976) examined the optimal financial structure for 189 Wisconsin local farm supply cooperatives using recursive linear programming models. Their analysis revealed the financial structure with the smallest cost of capital includes more permanent equity capital (preferred and common stock), more certificates of indebtedness capital and substantially less revolving fund capital.

Caves and Peterson (1986) developed a growth model to examine the joint effect of taxation and equity rotation on the sustainable growth rate of the cooperative. They examined financial data of the largest 100 cooperatives for 1962-1980 periods and conclude that cooperatives are capable of high short-term growth rates. However, the cooperative cannot sustain the growth rates once it begins to redeem the allocated equities, so there is a tradeoff between cooperative growth rates and redemption plans.

Diaz-Hermelo et al (2001) develop a stochastic dynamic financial simulation model to explore the alternative capital management strategies of farmer-owned cooperatives. The dynamic simulation model accounts for the interaction between cooperative's profitability, growth, and user-owner allocation, the cooperative's competitors and the member-owners cash flow burdens. After incorporating members' expected responses, the results found that decreasing cash patronage refunds in West Texas cotton-ginning cooperative to increase equity redemptions is a poor strategy because it results in a negative response from the members. However, members perceive using debt to increase equity redemptions as a good strategy if the cooperative has a low initial debt to equity ratio. From the overall members' perspective, a base capital plan

that uses debt to control the debt/equity mix in financing the cooperatives assets results in the highest amount of cash flows to membership.

A number of studies have attempted to analyze the impact of mandatory redemption and reached contradictory conclusions. Conley and Lewis (1980) conclude that the financial strength of grain cooperatives in Illinois without equity redemption plans is not significantly different from the cooperatives with equity redemption programs. Dahl, Dobson, and Veium (1982) conclude that mandatory equity retirement could substantially reduce the solvency and financial strength of many farm supply cooperatives in Wisconsin. From a study of equity redemption policies of Kansas grain marketing and supply cooperatives, Newman (1983) concludes that the financial strength of cooperatives differ significantly so a mandatory equity redemption plan would cause problems for the financially weak cooperatives. Royer (1983) also concludes some cooperatives can meet the requirements of mandatory programs, but other cooperatives might not be able to generate adequate cash flow to replace redeemed equity.

In summary, the models discussed above indirectly inform possible variables needed to analyze the "*wait-to-receive*" horizon problem. By evaluating the changes in the equity redemption plans at either the member or cooperative level, the authors were looking at ways to increase the member's after-tax value of their equities. However, the studies do not evaluate how the higher after-tax value affects the member's incentive to invest when members have different horizons. Beierlein and Schrader's (1978) simulations assume a twenty-year patronage horizon and does not consider the impact of the equity redemption plans when members have different patronage horizons. In addition, most of the models either simulate data or utilize financial data at the

cooperative level. Although Royer (1983) suggests that individual member preferences for an equity redemption plan will differ according to their situation, none of the studies above analyze whether the cooperative's redemption plan matches the individual member preference. Older members may not share the same preferences with younger members on equity redemption, investment and rate of patronage refunds. Therefore, this research attempts to fill this void by analyzing the member preferences about their cooperative's redemption policy. If members have different preferences regarding the cooperative's redemption policy, it might suggest that the "*wait-to-receive*" or "*current obligation*" horizon problems exist in the particular organization.

3.1.2. Models Evaluating Incentive to Invest in User-Owned Organizations

In the literature, very few empirical studies exist that evaluate the member's incentive to invest in user-owned organizations. Iliopoulos (1998, 2003) creates a structural equation model and tests whether the property rights characteristics of cooperative firms play an important role in affecting members' incentive to invest in their cooperative. Iliopoulos uses a latent variable, member's investment incentives, measured by two solvency ratios: 1) investment per member, defined as a modified ratio of member's equity to number of members and 2) ownership ratio, calculated by dividing member's equity by total cooperative assets. With relatively low statistical significance, Iliopoulos finds that transferability and appreciability of cooperative equity shares increase a member's incentive to invest. However, the existence of equity redemption plans does not significantly affect member's investment incentives.

Vyn (2001) uses an experimental economics technique with a subject pool of graduate and undergraduate students. He shows that individuals with the new generation

cooperative treatment reinvest more than individuals with traditional cooperative treatment do. This suggests that the characteristics of new generation cooperatives reduce the disincentive to invest in long-term projects.

Chaddad and Heckelei (2003) use an econometric approach and estimate a reduced-form investment model to investigate the cooperative financial constraint hypothesis with the fundamental Q approach econometric analysis. They compare the investment model using accounting data collected from a panel of US agricultural cooperatives and corporations during 1996-2000 periods. Their results support the claim that agricultural cooperatives are financially constrained when making investment decisions. Chaddad and Cook (2002a) found that larger cooperatives, cooperatives with low amounts of permanent equity capital, and cooperatives with high credit risk are more financially constrained.

Iliopoulos' structural equation model that measures the member's investment incentives assumed members have equal investment in the cooperative. The model does not account for different amounts of equity that members have invested in the cooperative nor different membership horizons. In addition, the model does not account for the member's preferences for long versus short-term investments. Vyn's experimental economics technique only indicates that members might have stronger preferences to invest in an organization with characteristics similar to a new generation cooperative but does not show that the horizon problem exists in traditional user-owned organizations. The Chaddad study evaluated the cooperative financial constraint using cooperative financial data but did not incorporate the impact the constraint has on the cooperative members.

Although the above studies look at the member's incentive to invest in agricultural cooperatives, they do not study to what degree the *residual* horizon problem exists in user-owned organizations. However, the studies suggest an analysis is needed to compare member's incentive to invest in user-owned organizations with investments that can appreciate as well as organizations with investments that are returned at book value. This research attempts to address to what degree the *residual* horizon problem exists by evaluating the member's investment preferences.

3.2. Methodological Literature Review

The selection of a research strategy depends on (1) the type of research question posed, (2) the extent of control an investigator has over actual behavioral events and (3) the degree of focus on contemporary events as opposed to historical events (Yin, 2003). The different research strategies are summarized in Table 3.1. A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context especially when the boundaries between phenomenon and context are not evident (Yin, 2003). A survey is a systematic method for gathering information from entities

Table 3.1 Relevant Situations for Different Research Strategies

Research Strategy	Form of Research Question	Requires Control of Behavioral Events?	Focuses on Contemporary Events?
Experiment	How, why	Yes	Yes
Archival Analysis	Who, what, where, how many, how much	No	Yes/No
History	How, why	No	No
Survey	Who, what, where, how many, how much	No	Yes
Case Study	How, why	No	Yes

Source: Yin, 2003

with the purpose of constructing quantitative descriptors of the larger population (Groves et al, 2004). Questions that ask "how" and "why" favor the use of case studies, experiments and histories whereas questions that ask "who, what, where, how many or how much" favor archival analysis and surveys.

To contextualize the horizon problem, this research uses a combined case study and survey methodology. The case study methodology and the survey methodology are discussed in the next two sections.

3.2.1. Case Study Methodology

The number of case studies in agricultural economics has increased as a means to collect data and understand business decisions made by agribusinesses. In general, there are two types of case studies: teaching cases and research cases. The purpose of a teaching case is to establish a framework for discussion and debate among students (Yin, 2003). The teaching case enables students to put themselves in the place of actual managers, analyze situations, choose plans of actions and defend their findings in small groups. Teaching notes summarize the learning objectives, identify pertinent literature and background data and propose a teaching approach (Ivey Publishing, 2005).

Research cases, on the other hand, provide a complete and accurate rendition of actual events. By asking the questions of how or why, research case studies meet one of the three objectives of research: (1) conduct applied, problem-solving research, (2) develop new theory, or (3) test or clarify existing theory (Sterns et al, 1998). If the researcher conducts a case study of the specific problem facing an organization, then the problem studied is the central research question. However, if the researcher conducts the case study on the organization, he examines *how* the decision maker addresses the

problem and/or *why* the organization chose a particular course of action when faced with the problem (Sterns et al, 1998).

When the purpose of research is to develop new theory, the researcher may choose to conduct case studies on one or two "archetypical" organizations that represent a particular type of organization or set of business decisions. Another option in developing new theory is to conduct case studies on "outlier" organizations that are unique in their set of business choices or other distinguishing characteristic (Sterns et al, 1998). The information gathered from the case studies helps broaden the theory base on which to build the understanding of the organizations decision-making process.

When the purpose of the research is to test or clarify existing theory, the researcher selects a set of case studies to challenge and test *a priori* assumptions and theoretical assertions (Stern et al, 1998). Carefully selected case studies can determine whether the theory "holds up" under the specific conditions of a given case.

Given the specified research question and purpose of the case study, the researcher decides whether to conduct a single-case or a multiple-case study and whether to use a single unit of analysis or multiple unit of analysis as summarized in Table 3.2. A single-case design is used when the case represents (1) a critical case; (2) a rare or unique circumstance; (3) a representative or typical case, or the case serves a (4) revelatory purpose or (5) longitudinal purpose (Yin, 2003). Multiple case studies can provide more compelling results than single-case studies but may require extensive resources and time beyond the means of an independent researcher. Multiple cases must be carefully selected to (a) predict similar results (literal replication) or (b) predict contrasting results but for predictable reasons (theoretical replication) (Yin, 1994). The number of

replications of the case study depends on the certainty the researcher wants to have about the multiple-case results because higher certainty lies with larger number of cases.

Table 3.2 Basic Types of Designs for Case Studies

Unit of Analysis	Number of Cases	
	Single-Case	**Multiple-Case**
One	Single Case, with 1 unit of analysis	Multiple Cases, each with 1 unit of analysis
Multiple	Single Case, with several unit of analyses	Multiple Cases, each with several unit of analyses

Source: Yin, 2003

The case study may involve more than one unit of analysis depending on the design of the initial research question. The unit of analysis could be a single organization or program, or it could include outcomes from committees or key individuals within the organization. A single unit of analysis design is advantageous when no logical subunits can be identified to analyze or when the relevant theory underlying the case study has a holistic nature (Yin, 2003). However, a single unit of analysis design conducted at an abstract level might lack any clear measures and prevent the researcher from examining a specific phenomenon. In comparison, a multiple unit of analysis case study design adds significant opportunities for extensive analysis that enhances the insights into a single case, but too much emphasis on the subunits may result in the researcher ignoring the larger aspects of the case.

Case studies have been written to describe many investor-owned firms but relatively few case studies have been published on cooperatives, and even fewer on traditional agricultural cooperatives. Although the Harvard Business School has one of the largest collections of teaching cases, they have written only a few case studies on agricultural cooperatives. The agricultural cooperatives studied in Harvard Business

School case studies are Finn Coop Pellervo in Finland (Enright and Cohn, 1993), Ocean Spray Cranberries (Vietor and Murray, 1994), Diamond Walnut Growers (Goldberg and Carter, 1996), Tri Valley Growers (Goldberg and Carter, 1997), MD Foods in Denmark (Goldberg, Knoop and Reavis, 1998), and Fonterra in New Zealand (Goldberg and Porraz, 2003). These case studies primarily provide an industry analysis, a brief description about the organization and the challenges the cooperative faces. The cases do not provide a description of the membership or a description on the interactions between the cooperative and the membership that might inform the horizon problems.

Some case studies have focused on the role of cooperatives in rural development. The University of Wisconsin conducted fourteen case studies on innovative non-agricultural cooperatives that played a successful role in rural development. The case studies selected represent cooperatives that independently or jointly with other cooperatives created new economic development ventures unrelated to their core business (Zeuli et al, 2003 a, b). Another project describing how agricultural cooperatives relate to their communities to foster rural development utilized a multiple case study approach (USDA, 2001). Two primary units of analysis were considered for each of the five case studies—the cooperative and its community. The case studies described how communities formed cooperatives and the impacts on both the community and the members. In two of the three new generation cooperatives described, a second equity drive was needed to raise enough equity to finance the plant construction (USDA, 2001). Directors of South Dakota Soybean Processors displayed concern with the difference between the member's desire for short-term profits and the cooperative's need for long-term investments (USDA, 2001).

Some case studies have focused on the cooperative's decision to change its ownership structure. Anderson and Henehan (2002) discuss lessons learned from Agway who filed for Chapter 11 bankruptcy in 2002. Amanor-Boadu et al (2003) describe how Vestar Capital Partners in 2002 acquired Birds Eye Foods, Inc, a wholly owned subsidiary of Pro-Fac Cooperative, Inc. Even though Pro-Fac stock traded on the NASDAQ, the low volume of activity of Pro-Fac's stock meant the stock market was an ineffective mechanism to generate equity (Amanor-Boadu et al, 2003). Thongchua et al (2002) describe the decision for Walton Bean Growers' Cooperative to sell the cooperative's assets and dissolve the business. Crooks (2004 a, b) described the sale of Minnesota Corn Processors to Archer Daniels Midland.

Following the startup of new generation cooperatives, several case studies have described this ownership structure. The Illinois Institute for Rural Affairs published a collection of case studies on thirteen new generation cooperatives (Holmes et al, 2001). The collection of case studies examined why some new generation cooperatives succeed but others do not get beyond the early development stages. A major hurdle in the formation and operation of a new generation cooperative is obtaining capital to build the processing facilities (Waner, 2001).

Case studies can also provide a framework to analyze the innovative techniques developed to enable members to capture the future value of current investment decisions. Based on multiple case study evidence, Chaddad and Cook (2002b) propose a typology of discrete organizational models that differ from the traditional cooperative structure and the investor-owned firm. They identify five non-traditional models observed in advanced agricultural countries that cooperatives may adapt to ameliorate the perceived financial

constraints. The three non-traditional cooperative models with ownership rights restricted to member patrons are (1) proportional investment cooperative, (2) member-investor cooperative, and (3) new generation cooperative. The two non-traditional models that do not restrict ownership rights to member-patrons are (1) cooperatives with capital seeking entities and (2) investor-share cooperatives. The case study evidence suggests that the solutions to the investment horizon constraint in cooperatives entail some degree of organizational redesign where the ownership rights related to residual return and control rights are redefined and reassigned. However, the authors conclude that cooperative leaders need to consider the trade-offs involved with organizational redesign.

An ownership structure with fixed patronage shares might resolve the horizon problem for intangible assets but it has two disadvantages: (1) members cannot allocate their product efficiently between the cooperative and its alternative uses and (2) members do not have a mechanism to measure the performance of the cooperative relative to other firms (Van Wassenaer, 1989). The author uses a case study on the Cooperative Company Freisland to illustrate the two disadvantages of the ownership structure with fixed patronage shares (Van Wassenaer, 1989). However, the case study does not illustrate the extent the horizon problem existed in the cooperative.

Crooks (2004a, b) applied a list of conditions for a severe horizon problem to a case study of a new generation cooperative, the Minnesota Corn Processors. According to Staatz, the conditions for a severe horizon problem include (1) the per-member capital investment in the cooperative is large; (2) the cooperative has a closed membership; (3) few of the member firms are legally incorporated; (4) the intergenerational transfer of

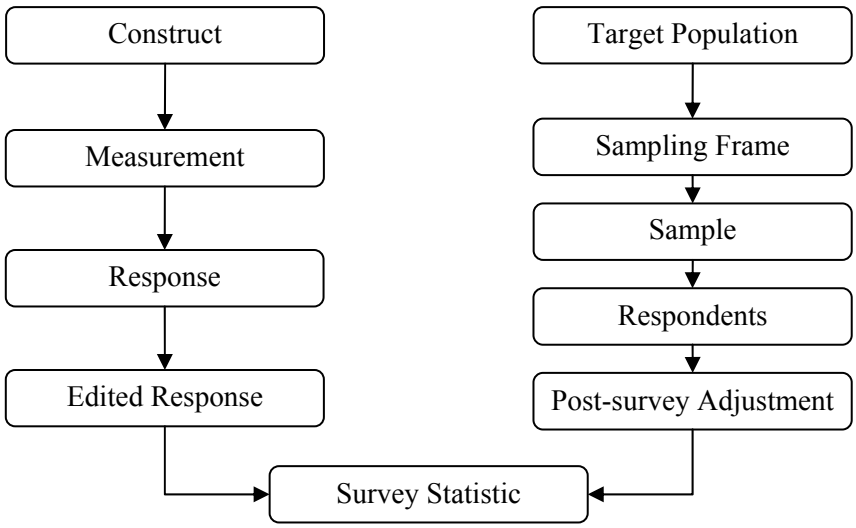
membership within families is prohibited; and (5) the cooperative has a large and/or diverse membership (Staatz, 1987). Some cooperative analysts believe the design of new generation cooperatives principally overcomes the shortcomings of the traditional marketing cooperative by accruing benefits of ownership through member's equity investment along with their patronage (Crooks, 2004). However, Minnesota Corn Processors did not have a well-functioning secondary market for its shares. Crooks (2004) suggests the sale of Minnesota Corn Processors to Archer Daniels Midland was an extreme case of the "horizon problem" whereby the tendency of emphasizing current cash flow at the expense of future earnings was executed by a total liquidation of assets.

In summary, case studies have been used to discuss business decisions made by organizations. In the area of agricultural cooperatives, very few case studies have been published. Many of the case studies mentioned above describe cooperatives from a rural development point of view. Chaddad and Cook (2002), Crooks (2004) and Van Wassenaer (1989) are the only attempts to use a case study of an agricultural cooperative to describe the horizon problem. However, Van Wassenaer does not show that the horizon problem existed in the cooperative. Crooks illustrated the horizon problem in a new generation cooperative. Chaddad and Cook provide brief descriptions of five organizational forms that they propose solve the investment horizon constraint. None of these case studies evaluates the horizon problem from the member's point of view. This research will use case studies to inform the member survey design to analyze to what degree the horizon problem exists in user-owned organizations.

3.2.2. Survey Methodology

Surveys are one of the most commonly used methods in social sciences to understand the way societies work and to test theories of behavior (Groves et al, 2004). The way, in which the researcher asks questions, collects the answers and selects the respondents can affect the quality of the survey results. From a design perspective, survey designs move from abstract ideas to concrete actions as illustrated in Figure 3.1. The measurement dimension on the left side describes the way in which the researcher asks the questions and collects the answers about the observational units in the sample. The representational dimension on the right side concerns how the researcher selects the peoples within the populations to answer the survey (Groves et al, 2004).

Figure 3.1 Survey lifecycle from a design perspective *(Groves et al, 2004)*



The constructs in the survey are the elements of information the researcher seeks to find. The researcher gathers information about the constructs through measurements, posed as questions to the respondents. Designing questions that produce answers to measure the constructs perfectly is the difficult task of measurement. The respondent provides the response or answers for each question, which the researcher may edit for accuracy of the original responses obtained. The edited responses are the data from which the researcher makes inferences about the values of the construct for an individual respondent.

Mail, telephone and face-to-face methods were the dominant forms of data collection in the past decades of survey research, but the web survey is increasing in popularity with the introduction of the internet. The methods vary on degree of interviewer involvement, degree of interaction with the respondent, degree of privacy, channels of communication, and use of technology. Mail surveys are more often used for surveys of specialized populations for which a list exists. Although face-to-face surveys and telephone surveys on average have higher response rates than mail, the paper-based methods tend to obtain higher response rates than their electronic equivalents (Groves et al, 2004). The interviewer administration and computer assistance seem to reduce the rate of missing data relative to self-administration and paper-based data collection. Mail surveys typically have lower costs to administer than face-to-face interviews or telephone interviews. Although there are many claims that Web surveys are significantly cheaper than mail surveys, the relative costs of the two methods may depend on what is included in the cost estimate and the volume of work. Web surveys have larger fixed costs than mail surveys, but lower variable costs. Overall, for non-threatening survey items, surveys

yield similar results whether administered by telephone or done on paper or via the Web (Groves et al, 2004). Table 3.3 provides a short overview of the advantages and disadvantages of mail surveys.

Pennings et al (1999) conducted a telephone interview with U.S. agricultural farmers who did not respond to a mail survey to gain insight into factors influencing the response rate of mail surveys. The authors conclude a relatively brief time window exists for effectively conducting mail surveys of crop farmers. January and February were the

Table 3.3 Advantages and Disadvantages of Mail Surveys

Advantages	Disadvantages
• Not subject to interviewer bias • Respondents work at their own pace • Can ensure anonymity of respondents • Wide distribution possible • Good for personal, sensitive questions • Least expensive	• Cannot control speed of response • Researchers cannot explain ambiguous questions • Does not allow probing with open-ended questions • Difficult to change sequence of questions • Sequence bias: respondents can view entire questionnaire as they respond

Source: Pennings et al, 1999

most preferred months for receiving questionnaires with the next best month being December. Farmers are willing to spend, on average, a maximum of thirteen minutes to complete a mail survey. Therefore, lengthy surveys tend to result in low response rates. About half the farmers expected the organization to compensate them with money for completing the survey. However, farmers did not expect to receive compensation from a University or government organization. Surveys that consist of questions that require rating and checking boxes are preferred over open-ended questions. In addition, crop farmers are more willing to answer questions not requiring them to consult records for information (Pennings et al, 1999).

Most of the empirical literature on the investment horizon problem deals with either comparative statics or simulations of a theoretical model or uses financial data to evaluate a model. Iliopoulos (1998) developed a set of surveys to collect primary data from a group of U.S. agricultural cooperative management leaders and test the hypothesis that the property rights characteristics of cooperative firms plays an important role in affecting members' incentive to invest in their cooperative. The chief executive officer (CEO) answered one survey and the chief financial officer (CFO) or the person most knowledgeable about the cooperative's financial issues answered the second survey. The survey design included several questions within each survey to capture the various aspects of the free rider problem, the horizon problem and the portfolio problem. The survey questions regarding the cooperative's investment in intangible assets included R&D and brand advertising; debt to equity ratios; issuance of long-term bonds; pressure for liquidation of firm assets; the type of equity redemption plans; when inactive members lose the right to vote; and whether cooperative shares are transferable or appreciable. The study found that transferability and appreciability of the cooperative equity shares create a semi-liquid secondary market for the cooperative's stock and therefore helps ameliorate the horizon problem (Iliopoulos, 1998). However, equity redemption plans do not significantly affect members' investment incentives. One probable explanation is that equity redemption plans succeed to align the use and benefits for investments that payback over the membership horizons of current members, but fail to do so for long-term investments (Iliopoulos, 2003). Another explanation might be that equity redemption plans do not capture the value of the cooperative investment decisions

like transferable and appreciable rights, which depict the value of the cooperative investment in their market price.

A survey of members of a new generation cooperative in Oklahoma and a random sample of Oklahoma wheat growers identified factors that influenced the member's investment decision (Puaha and Tilley, 2003). The dependent variable in the Tobit model was the number of share units the producers invested in the cooperative. The independent variables included (1) distance of respondent's farm location from the cooperative, (2) number of years respondent farmed, (3) respondent's awareness of the cooperative, (4) respondent's perception about fair treatment delivered by the cooperative, (5) respondent's perception about the cooperative's marketing contract, (6) respondents perception about risk on the cooperative's investment, (7) respondent's perception that cooperative creates social/non-monetary benefit to investor, (8) expected rate of return from cooperative investment, (9) dummy variable for off-farm employment, and (10) dummy variable for Oklahoma producer income tax credit. Results from factor analysis and the Tobit model suggest that social and non-monetary benefits from investment are significant factors that influence producer investment decisions in the new generation cooperative (Puaha and Tilley, 2003). The authors also conclude that producers with strong preferences for low-risk investment were less willing to invest in the cooperative. In addition, full-time farmers showed a greater interest to invest rather than part-time farmers (Puaha and Tilley, 2003).

In summary, very few studies have utilized surveys to analyze the member's incentive to invest in user-owned organizations. The Iliopoulos survey gathered information from the cooperative management regarding the member's incentive to

invest. The Puaha and Tilley survey actually surveyed members of a new generation cooperative to gather the member's investment preferences. However, the latter study does not analyze the member's investment preferences in traditional agricultural cooperatives. Therefore, this dissertation uses a member survey to analyze the member's investment preferences regarding the cooperative equity redemption plan and regarding future investment in both traditional agricultural cooperatives and new generation cooperatives.

The next two sections discuss the procedures used to develop the multiple case studies and surveys used in this dissertation.

3.3. Multiple Case Studies Procedure

The investment horizon problem has been studied under various contexts as mentioned in the literature review. The questions that this research answers are: (1) Does the "Furubotn-Pejovich" or "wait-to-receive" horizon problem exist in user-owned organizations; (2) Does the "residual" horizon problem exist in user-owned organizations; and (3) Do additional forms of the horizon problem exist in user-owned organizations?

The questions above are addressed using a multiple stage methodology. The first stage, multiple case studies, informs the survey design. The second stage, surveys at the member level, informs the analysis of the research questions.

3.3.1. Case Study Design

The purpose of this research is to investigate if the horizon problem(s) exists and if so, how the horizon problem(s) manifests itself in user-owned organizations.

Therefore, this research conducts multiple case studies on various agricultural cooperatives to lay the groundwork for the survey, which is designed to identify to what degree the horizon problem exists. The case studies examine multiple units of analyses within each agricultural cooperative: the strategy/structure interface, the financial structure and the member investment preferences.

Each cooperative's competitive environment, legal framework, financial and organizational structure and history are similar, yet different. These institutional factors might influence how the horizon problem influences the member's investment preferences. Therefore, each case study describes the institutional factors surrounding the cooperative. The case study also helps inform how the survey questions must be adapted to be understood by each cooperative's members.

3.3.2. Criteria to Select Organizations

The population of organizations to be considered for the multiple case studies is the entire population of agricultural cooperatives in advanced agricultural countries. According to the 2003 survey of marketing, farm supply and related service cooperatives by USDA's Rural Business Cooperative Service, there are 2,982 U.S. farmer-owned cooperatives (Adams et al, 2005). About ninety-seven percent of the cooperatives are local cooperatives with individual farmers as members, with the remaining three percent being either federated cooperatives with cooperatives as members, or mixed cooperative with both farmers and cooperatives as members (Adams et al, 2004).

The criteria to select the organizations for this dissertation were organizational type, payment type, investment method and degree of investor/user benefit. In addition, the cooperatives were selected based on variability in size of member's farm; variability

in lengths of membership horizon; variation in attributes of equity acquisition and redemption policies and variability in intangible assets. More than thirty agricultural cooperatives were identified for consideration for this research project. The criteria discussed below reduced the number to eight organizations, which were invited to participate in the project. The criteria for the final four cooperatives who agreed to participate in each step of the project are summarized in Table 3.4.

Table 3.4 Criteria for Selection of Organizations to Study Horizon Problem

	Effingham Equity	**West Central**	**NMGP**	**Fonterra**
Organizational Type	Multipurpose	Multipurpose	Marketing	Marketing
Payment Type	Cost of Goods Sold	Cost of Goods Sold	Cost of Goods Sold	Cost of Goods Sold
Investment Method	Passive	Passive	Pro-Active	Pro-Active
User vs. Investor Benefit	User benefit	User benefit	Primarily investor benefit	Primarily investor benefit
Producer Size Variability	High	Medium	High	High
Years as Member Variability	Med-High	Med-High	Low	Recently Low
Equity Redemption Policy	12 yrs revolving; redeem if age 65 and retire	Redeem 9% of allocated each year (estates then oldest equities)	Base Capital	Base capital; redeem upon exit
Intangible assets	Low	Low	Medium	Medium
Return of Capital	Medium	Medium	Low	High
Return on Capital	Low	Low	Medium-High	Medium

The cooperatives were selected to represent both organizational types, multipurpose and marketing. Two of the cooperatives participating in the study are multipurpose grain and farm supply cooperatives and two of the cooperatives are marketing cooperatives. All four of the cooperatives participating in the study have a

cost of goods sold payment type. The members receive market price for their product or pay market price for their inputs and at the end of the year, the net surplus is paid out to the member as patronage refunds or dividends. Two of the cooperatives have passive investments and the other two cooperatives have pro-active investment. The members in two of the cooperatives benefit as a user, whereas the members in the other two cooperatives benefit as an investor.

Producer size variability represents variability in the size of the producer-member's farm operation. "High" means there is a wide range in the size of the cooperative's members. The cooperative may have a skewed distribution of members based on size of the member's farm operation, with many small and medium sized members but yet a few large members. The small number of large members represents a significant proportion of the cooperative business. It is preferred to see a medium to high rating for each cooperative.

Years as Member represents the variability in the number of years the producer-member has belonged to the cooperative. "High" means that there is wide range in the number of years the members have belonged to the cooperative, whereas, "Low" means that most of the members have belonged to the cooperative for the same number of years. It is preferred to see some variation in the responses for each cooperative.

Equity Redemption Policy represents the type of equity redemption policy implemented at the cooperative to redeem the member's equity. As discussed in Section 1.2.3, the alternative equity redemption plans are (1) revolving fund, (2) base capital, (3) percentage of all equities, and (4) special plans (Rathbone and Wissman, 1993). It is

preferred to have a variation of equity redemption policies for the different cooperatives selected.

Intangible Asset represents the variability in the market value of the cooperative and the book value. "High" means that the market value is much greater than the book value; "Medium" means the market value is approximately equal to the book value; and "Low" means the market value might be less than the book value. It is preferred that variation exists across the cooperatives.

Cooperative Financial Measures represent the presence of financial instruments hypothesized to solve the horizon problems. The financial measures are further delineated to indicate instruments that address the "return of capital" and those that address "return on capital". "High" for "return of capital" means that members can receive their equity capital quickly when they cease their business with the cooperative whereas "Low" means the members must wait to receive their equity. "High" for "return on capital" means that members can transfer their equity capital and capture the appreciated value of the organization whereas "Medium" means that the members may have some options to capture the appreciated value. "Low" indicates that members have few, if any, options to capture the appreciated value of their investment. It is preferred to have some cooperatives with low, medium and high for return of capital as well as for return on capital.

Upon selection of the organizations for consideration, the chief executive officer and chairperson of the board of directors were contacted to request participation in the project, which would evaluate the strategy/structure interface between the cooperative and its members. During an initial meeting with the cooperative's leaders, the following

topics were discussed (a) research question, (b) how the cooperative can potentially benefit from the project, and (c) whether the cooperative was amenable to move forward with the project and review a situational case. Other cooperatives were also contacted but did not agree to collaborate on the research project.

Once agreement of participation was tentatively agreed upon, a situational case was developed. The situational case (a) summarized the industry and business specific issues about the cooperative gathered from public sources, (b) described the agricultural economic environment important to the cooperative and (c) laid the groundwork for establishing a dialogue with the cooperative's leadership to identify possible capital and investment constraints. The situational case usually consisted of twenty pages of descriptions with approximately ten to twenty exhibits.

The situational case was then sent to the cooperative participants. The cooperative's leadership reviewed the situational case for accuracy and tone. A second meeting with key individuals at the cooperative was organized to (a) clarify observations made in the situational case, (b) ask questions specific to the case study and (c) gain the cooperative's tentative approval to do a survey of the membership. The next section provides a brief overview of each cooperative using ownership rights characteristics[9].

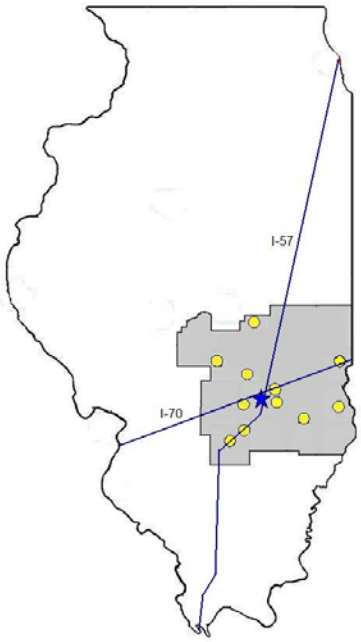
3.3.3. Brief Description of the Selected Cooperatives

This section provides a brief description of each cooperative in terms of the industry in which it participates, the market territory, a brief history and organizational design.

[9] Detailed research cases are planned to be submitted for publication subsequent to this dissertation.

Effingham Equity is a traditional farm supply multipurpose cooperative situated in southeastern Illinois (Figure 3.2). Effingham's headquarters is located at the intersection of two major transport routes (Interstate 70 and Interstate 57) and the Illinois

Figure 3.2 Effingham Equity Market Territory with Major Interstates



Central Railroad providing good access for transport of grain and farm supplies by truck or rail. The market area covers approximately 10,000 square miles in sixteen counties. Effingham Equity sells farm supply products like fertilizer, agricultural chemicals, and seed through thirteen branch locations. The feed mill located at the headquarters provides feed to livestock producers. Three-grain elevators provide grain storage and grain market access for the farmers in the market area.

Effingham Equity was organized in 1919 to collectively bargain for farm inputs such as coal, hay and feed ingredients. Over its eighty-five year history, Effingham Equity expanded its membership from 56 to 4,600 stockholders and expanded its range of services and size of operations to become one of the largest local agricultural

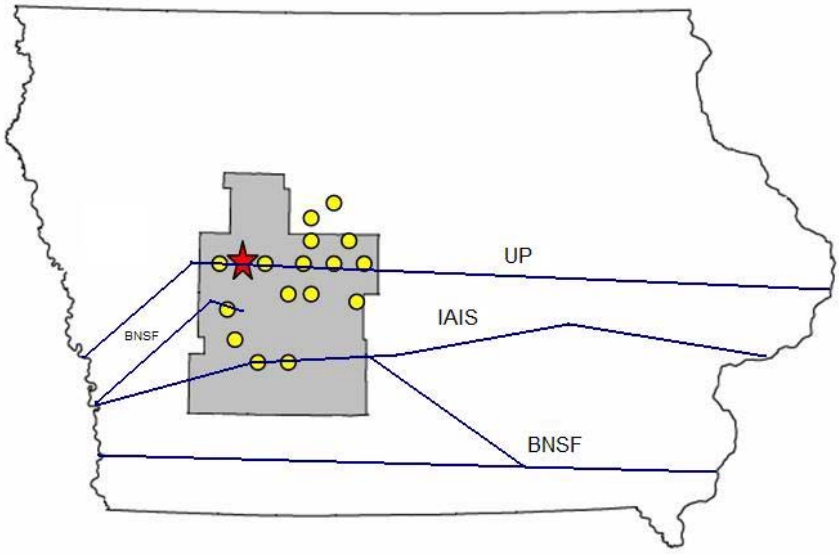
cooperatives in Illinois. The cooperative expanded and modified its services to reflect the increasing importance of purchased farm inputs as agriculture became increasingly specialized and capital intensive. In recent years, the cooperative introduced agronomy services like GPS/GIS technologies and equipment to custom apply crop protectants and fertilizers. In 2003, eighty-five percent of the $109 million in sales was generated from farm supply products and services with the other remaining fifteen percent from marketing corn and soybeans (Effingham Equity website).

The ownership rights in Effingham Equity are restricted to agricultural producers in Illinois. Members of Effingham purchase one share of voting stock for $25, which receives a small dividend each year. This share of voting stock allows the member to receive a portion of the net income each year as patronage refunds in proportion to the member's level of patronage throughout the year. If the member increases or decreases his patronage, the cooperative does not immediately adjust the investment. Effingham redeems the member's equity with a revolving fund plan by redeeming the oldest equities first and has a 12-15 year revolving fund (Wente, 2002). Effingham also has a special redemption plan that allows a member who dies, reaches the age of 65, or leaves Illinois to request the cooperative to redeem their allocated equities in cash by relinquishing the right to rejoin the cooperative (Wente, 2002).

West Central is a traditional grain marketing multipurpose cooperative located in west central Iowa. The corporate headquarters in Ralston, Iowa acts as the hub for the company's trade territory that spans ten counties and extends fifty-five miles in each direction. West Central's geographic position with more than twenty locations places it at the center of the world's most productive corn and soybean region where it can

transport grain on three major rail lines – Union Pacific, Burlington Northern and Iowa Interstate – or by truck on two interstate highways (Figure 3.3).

Figure 3.3 West Central Market Territory showing Branch Locations and major Railroads



West Central's operating divisions include grain, agronomy, feed, soy processing and administration (West Central website). In 2004, West Central marketed 72 million bushels of grain through five locations with 100-car unit train loading facilities, and thirteen other locations with grain storage. West Central is recognized as the 15th or 16th largest grain marketer in the United States (Stroburg, 2005). West Central also processed over 115,000 tons of feed in three feed mills, processed 8.4 million bushels of soybeans at the Soy Center, and processed 80 million pounds of soybean oil into methyl esters (Stroburg, 2005).

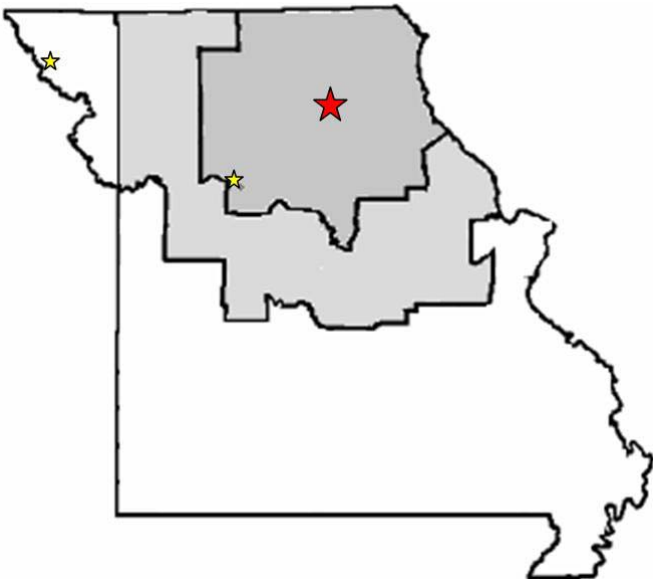
West Central was organized in 1907 to buy and sell grain. In 1933, it restructured and incorporated in the state of Iowa. Over its seventy-two year history, West Central expanded its membership to 3,500 stockholders (West Central website). The cooperative expanded and modified its grain operations by purchasing other grain storage facilities.

In 1942, West Central built its first soybean processing plant. About thirty years later, the cooperative built a new soy-processing center to commercialize innovative processes and products. In 1996, West Central built the first biodiesel manufacturing facility that has expanded to make West Central the nation's largest producer of biodiesel. In 2003, West Central generated fifty-nine percent of the $219 million in sales from grain marketing, twenty-four percent from the Soy Center, nine percent from feed and eight percent from agronomy (Stroburg, 2004). Sales from the Soy Center are expected to experience rapid growth.

The ownership rights in West Central are restricted to agricultural producers who generate at least half their income from farming or to cooperatives that purchase feed or biodiesel products from West Central. Members of West Central purchase one share of common voting stock for $100. If the member does not conduct business with the cooperative for three years, the cooperative may decide to pay out the membership fee to take the vote away from inactive members. This share of voting stock allows the member to receive a portion of the net income each year in the form of Preferred C stock in proportion to the level of patronage throughout the year. In addition, a certain amount of patronage each year is placed in Preferred B non-revolving stock, which is paid out over five years when the member retires (Stroburg, 2005). If the member increases or decreases their patronage, the cooperative does not immediately adjust their investment. West Central redeems the member's equity with a revolving fund plan by redeeming the oldest equities first and has a 10-12 year revolving fund (Stroburg, 2005). West Central also has a special redemption plan that allows member's estates to request the cooperative to redeem the Preferred C stock in cash.

Three hundred ten Missouri corn producers within 120-mile radius of Macon, Missouri, own **Northeast Missouri Grain Processors**, a new generation cooperative (Figure 3.4). Northeast Missouri Grain Processors invested 82% of the required equity to build Northeast Missouri Grain LLC, an ethanol plant, in Macon, Missouri (Livingston et al, 2001). The non-producer investors included Broin Enterprises, Corn Energy Investors, Missouri Corn Merchandising Council and Ralls County Electric Cooperative (NEMO Grain, LLC). Two other corn ethanol plants are in operation in Missouri,

Figure 3.4 Northeast Missouri Grain Processors 120-mile radius market territory



Golden Triangle Energy, LLC in Craig with 20 million gallons of ethanol per year and Mid-Missouri Energy, Inc in Malta Bend with 45 million gallons of ethanol per year (RFA website).

Northeast Missouri Grain started operation in May 2000 with the capacity to process 15 million gallons of ethanol annually. NEMO Grain increased production and ethanol yield to the point that the ethanol plant was producing 23 million gallons of ethanol per year (NEMO Grain). In May 2003, NEMO Grain expanded its operation to 36 million gallon capacity and introduced the production of two co-products, distillers

dried grain with soluble (DDGS) and carbon dioxide. At the end of five years of production, the ethanol plant processes 45,000 bushels of corn per day, and manufactures 125-130 gallons of alcohol per day, 350-400 tons of DDGS per day, and 400 tons of carbon dioxide per day (Eggleston, 2005). The DDGS is a high protein palatable feed product sold primarily to livestock producers within Missouri. NEMO Grain has started selling the carbon dioxide to slaughter locations for the meat dressing rooms, to Pepsi-Cola and welding factories.

The ownership rights in Northeast Grain Processors are restricted to corn producers in Missouri. During the initial equity drive, each member made a minimum investment of $12,500 for the right and obligation to deliver 5,000 bushels of corn annually to the cooperative (Livingston et al, 1998). Members could purchase additional shares for $2,500 with the obligation to deliver 1,000 bushels of corn. The members are obligated to deliver one-fourth of their share corn each quarter. Members receive a small premium on the share corn delivered and a freight allowance for share corn sourced from further distances (Eggleston, 2005). The original delivery right shares represent permanent capital in the cooperative that can be sold to other members upon the approval of the board of directors at the sealed bid price specified by the producer purchasing the shares. Therefore, the value of the shares can appreciate or depreciate.

Profits at NEMO Grain are passed through to Northeast Missouri Grain Processors in the form of dividends. Then NMGP decides the amount of the dividends to retain for the cooperative to function and pass the rest of the profits to the producer-members as dividends or retained earnings (Eggleston, 2005). Since the cooperative originated in 2000, the revolving period is relatively short.

Fonterra Co-operative Group is a leading multinational dairy company owned by 13,000 New Zealand dairy farmers, which represents about 95% of New Zealand's milk (Fonterra website) (Figure 3.5). In 2004, about 73.5% of New Zealand's dairy cattle were located in the North Island with almost one-third of the dairy cattle in the Waikato region (Statistics New Zealand).

Figure 3.5 Fonterra's Market Territory in New Zealand

Fonterra was formed in 2001 through the merger of New Zealand's previously two largest dairy cooperatives, New Zealand Dairy Group and Kiwi Co-operative Dairies, and the New Zealand Dairy Board. In 2002, Fonterra was the world's second largest dairy company by volume of milk received with 13.9 billion liters of milk processed, the world's fourth largest dairy company by sales with $6.5 billion of sales and the world's largest dairy exporter (Goldberg and Forraz, 2003).

Fonterra has three operating divisions, Ingredients, New Zealand Milk and Fonterra Enterprises. The Ingredients division is responsible for a range of activities from milk collection, to manufacturing and logistics to marketing quality ingredients to

the international food industry under the NZMP brand (Fonterra website). New Zealand Milk markets a wide range of dairy-based consumer and food service branded products to consumers across the globe. Fonterra Enterprises encompasses the innovative ventures like a biotechnology company, a rural retailer and an agricultural website that support the core business.

The ownership rights in Fonterra are restricted to dairy farmers in New Zealand. Members of Fonterra purchase "Fair Value Shares" in proportion to the amount of milk they deliver[10]. If the member increases or decreases their milk production, the cooperative purchases the additional shares or sells the member new shares at the price specified by the Board of Directors. If the member wants to deliver additional milk during the peak season, they must purchase "peak notes" which are non-appreciable, fully redeemable notes[11]. When a member decides to leave dairying, the cooperative immediately redeems the shares in cash. In Fonterra, the returns are distributed to the members in proportion to their shareholdings through the appreciability of cooperative shares.

Table 3.5 provides a summary of the ownership rights for each of the four cooperatives. Effingham Equity and West Central are traditional cooperatives, whereas Northeast Missouri Grain Processors is a new generation cooperative and Fonterra is a member-investor cooperative.

[10] Prior to the mergers, the investment was not in proportion to the patronage.
[11] In 2005, the membership voted to replace peak notes with a capacity charge by which the price of milk will be seasonally adjusted up or down. Farmers who produce a lot of milk during the peak season could receive as much as 3 cents/kg less for milk solids (Dann, 2005).

Table 3.5 Comparison of Ownership Rights for the Four Cooperatives

Ownership Rights	Effingham Equity	West Central	Northeast Missouri Grain Processors	Fonterra
Restricted to Members	Yes	Yes	Yes	Yes
Redeemable from Cooperative	12 - 15 year revolving period, age 65	C stock: 10-12 years revolving period; B stock: retire	Non-Redeemable	Immediate
Benefits User or Investor	User	User	Investor/User	Investor
Proportional to Member Investment	No	No	Yes	Recently yes

3.4. Survey Procedure

Data on qualitative and quantitative observable variables was required to inform the research question to what degree the horizon problem exists in user-owned agricultural organizations. Since a considerable amount of data was required from the membership of several cooperatives, a mail survey was chosen as the most suitable way to acquire the information. The remainder of this chapter presents the steps in developing the survey methodology.

3.4.1. Sample Selection

The first step in designing the survey was the identification of an appropriate sample. The population of the survey sample in this research project depends on the selection of the case studies. The entire membership in all agricultural cooperative represents the population of the sample. Once the cooperative tentatively agreed to do a survey of the membership, the sample population reduced to the entire membership of the selected cooperatives.

3.4.2. Structure of Survey

Prior to constructing the initial survey, several personal interviews with cooperative top management, members of the Board of Directors, and researchers from various institutes provided valuable information in designing the survey instruments. The survey questions addressing each hypothesis were then formalized into a survey template. Other questions representing the independent variables were also formalized in the survey template. The categories of questions in the survey include: (a) description of farm operation, (b) description of member, (c) description of succession plan for the farm, (d) preference of cooperative investment, (e) preference on redemption of equity and (f) views of cooperative organization justification. Following the situational case, the survey template was modified for each organization with respect to information or data gathered from the situational case. The survey was designed in the period between January 2004 and March 2005. The design of the mail surveys (Appendix 1) collected qualitative and quantitative information. All questions were in a close-ended format to achieve the highest possible levels of standardization and user-friendliness.

Initially, questions were written according to the hypotheses to be tested, but they were reordered to facilitate the respondent's convenience to answer. The structure and order of the questions changed slightly based on the cooperative to which the member belonged. The draft of the survey was sent to the cooperative organization. Meetings with key individuals from the cooperative were arranged to (a) discuss each survey question in detail for content, (b) modify the survey questions to increase the member's understanding of terminology, (c) obtain other questions of interest to the cooperative, (d) identify the membership profile and (e) gain approval of a version of the survey. In some

cases, the key individuals included the general manager, in other situations, it included the general manager, the chief financial officer and board chairperson, and in the other two situations, it included the entire top management in the organization. These meetings each lasted from four to eight hours where the key individuals reacted to the proposed survey on a question-by-question basis. These meetings with key individuals at the cooperatives resulted in a modifications of the initial mail survey instrument. After modifications were made to the survey, the final draft was submitted to the cooperative for their final approval.

3.4.3. Mail Survey Process

The mail survey process for each cooperative followed a similar format. However, procedures for each survey varied slightly based on the preference of the cooperative. The key individuals at each cooperative described their membership and helped inform the necessary segments of the membership to analyze. Since each cooperative has a different structure, the sample segmentations required special consideration to capture both variability in farm size and years as a member. Based on the size of the membership at Northeast Missouri Grain Processors, the survey was sent to the entire membership. In the case of Fonterra, the survey was also sent to the entire membership as an insert in a dairy magazine in New Zealand. However, for Effingham Equity and West Central Cooperative, samples from certain segments based on size and specialization were determined.

In Effingham Equity, the majority of the members were crop farmers, but the membership does include some hog and dairy farmers. The largest fifty hog farmers and the largest fifty dairy farmers were surveyed who represent more than 85 percent of the

feed business. The population of the large-crop members (83 members), the population of the medium-crop members (427 members), and a random sample of 600 small-crop members were surveyed[12]. In addition, a sample of 567 members who did no crop business with the cooperative were surveyed. This last group included members who were inactive due to retirement, no credit, doing business under another entity or former employees who farmed. In total, 38.6% of the members, or 1,777 members, received a survey.

In West Central Cooperative, the segments of membership were selected based on the level of grain marketed through the cooperative, which corresponded with the approximate number of grain acres the members farmed. All the large-grain members (122 members), all the medium-grain members (303 members), and a random sample of 500 small-crop members were surveyed[13]. In total, approximately 26.4% of the members, or 925 members, received a survey.

In addition to the survey, the cover letter requires special attention to explain (a) the project, (b) the member's benefit, (c) amount of time necessary to complete the survey, (d) that results will remain anonymous, and (e) the procedure to return the survey. For each cooperative, the cover letter indicated the survey was part of a larger study to explore the value of the cooperative system in the future and to address the long-term viability success factors of agricultural cooperatives. The letter indicated that the survey seeks the member's views to determine how well the cooperative's strategy is aligned

[12] The general manager identified the large-crop member did more than $75,000 business annually with the cooperative in crop input purchases, the medium-crop member did between $25,000 and $75,000 business annually with the cooperative in crop input purchases and the small-crop member did less than $25,000 business annually with the cooperative in crop input purchases.

[13] The cooperative identified the large-grain member had more than 1,000 acres of grain, the medium-grain member had between 500 and 1,000 acres of grain and the small-grain member farmed less than 500 acres of grain.

with the member's farm strategy. The cover letter also indicated that research personnel at the University of Missouri would treat the information provided with utmost confidentiality and keep the identity of the member completely anonymous.

After Effingham Equity approved the final draft of the survey and the cover letter, copies of the survey were formatted in booklet style. The survey booklet included 16 letter-sized pages containing thirty-six questions and one title page. Three colors of surveys represented the different levels of member business volume. Large-crop members received light blue surveys and medium-crop members received gold surveys. Small-crop members, livestock members and all other members received bright yellow surveys. The Board President, the General Manager and Professor Michael L. Cook signed the cover letter printed on Effingham Equity letterhead (Appendix 2) to indicate the cooperative's endorsement of the project. The surveys, cover letter and business reply envelope were mailed from the University of Missouri to the 1,777 members of Effingham Equity on November 17 and 18, 2004 using mailing labels sent to the University of Missouri. Since the membership list was kept confidential, no follow-up surveys or reminders were sent to the members. The members were requested to complete the survey and mail it back to the University of Missouri in the enclosed business reply envelope by November 29, 2004 based on agreement of the cooperative leadership and the research team.

After West Central Cooperative's board of directors approved the final draft of the survey and cover letter, copies of the survey were made in booklet style. The survey booklet included 16 letter-sized pages containing thirty-seven questions and one title page. Three colors of surveys represented the different levels of member business

volume. Large-grain members received light blue surveys and medium-grain members received gold surveys, and small-grain received bright yellow surveys[14]. Professor Michael L. Cook signed the cover letter printed on University of Missouri, Division of Applied Social Sciences letterhead (Appendix 2). The surveys, cover letter and business reply envelope were mailed from the University of Missouri in four boxes to West Central Cooperative on April 1, 2005 through Fed Ex. West Central Cooperative placed the mailing labels on the envelopes and mailed them to approximately 910 members of West Central Cooperative on April 5 and 6, 2005. Since the membership list was confidential, no follow-up surveys or reminders were sent to the members. The members were requested to complete the survey and mail it back to the University of Missouri in the enclosed business reply envelope by April 22, 2005 based on agreement of the cooperative leadership and the research team.

After Northeast Missouri Grain Processors, Inc approved the final draft of the survey and cover letter, copies of the survey were made in a booklet style. The survey booklet included 12 letter-sized pages containing twenty-six questions and one title page. All members received a survey printed on gold paper. Professor Michael L. Cook signed the cover letter printed on University of Missouri, Social Science Unit letterhead (Appendix 2). The surveys, cover letter and business reply envelope were mailed from the cooperative (who put the mailing labels on the envelopes) to the 311 members of Northeast Missouri Grain Processors, Inc on December 2, 2004. Since the membership list was kept confidential, no follow-up surveys or reminders will be sent to the members.

[14] In the process of shipping, Fed Ex did not deliver all the contents of the four boxes. At least fifty surveys were returned to the University of Missouri unopened and unaddressed from a Tennessee U.S. postal service. Therefore, the respective size of grain farmer may not have received the intended survey.

The members were requested to complete the survey and mail it back to the University of Missouri in the business reply envelope by December 13, 2004. If the member wanted to receive a summary of the results, they included their email address with the survey.

After Fonterra approved the final draft of the survey and cover letter, Fonterra's management requested that the survey be sent out as an insert in *Dairy Exporter,* an industry trade magazine in New Zealand. The survey booklet included twelve 7-½ x 9-¾ sized pages containing twenty-five questions. All recipients of the magazine received a survey printed on white paper. Professor Michael L. Cook signed the cover letter printed on University of Missouri, Social Science Unit letterhead (Appendix 2). The surveys, cover letter and return envelope were mailed to all *Dairy Exporter* magazine subscribers in the December edition of *Dairy Exporter* during the third week of November 2004. Since the membership list was kept confidential, no follow-up surveys or reminders were sent to the members. The members were requested to complete the survey and mail it back to the *Dairy Exporter* in a return envelope by December 4, 2004. If the member wanted to receive a summary of the results, they included their email address with the survey. *Dairy Exporter* mailed the completed surveys to the University of Missouri in various packages between December 2004 and March 2005.

A detailed description of the procedures for both the multiple case studies and the member surveys are summarized in Table 3.6.

Table 3.6 Steps in Developing Multiple Case Studies and Member Surveys

Formalize Research Methodology
1. Identify research problem to investigate
2. Conduct literature review to identify how others have informed the research problem
3. Determine methodology to analyze research problem
4. Develop general and operational hypotheses

5. Formalize general survey questions in a survey template to address each hypothesis
6. Formalize other questions in survey template to inform the hypotheses and describe the membership
7. Submit proposal to Institutional Review Board for approval of research methodology

Preparation for Case Studies

8. Identify population of organizations
9. Develop criteria to select the most relevant organizations
10. Use criteria and narrow number of organizations to 8-10
11. Contact CEO of each organization to request opportunity to discuss research project
12. Initial meeting with organization's leaders to discuss a) topic of research, b) how organization can benefit from project, and c) request to write a situational case on the organization
13. Organization tentatively agrees to go forward with project and review the situational case
14. Write a 20 page situational case with 10-20 exhibits on the organization using public sources to a) summarize industry and business specific issues about the organization, b) describe agricultural economic environment important to organization, and c) lay groundwork to establish dialogue with organization's leadership regarding the research problem
15. Send the situational case to the organization
16. Arrange meeting with key individuals at the organization to a) clarify observations made in situational case, b) ask questions specific to case study, and c) gain tentative approval to do a survey of the membership

Preparation for Member Survey

17. Organization tentatively agrees to do a survey of the membership
18. Modify the questions in survey template for the particular organization with respect to information gathered from situational case
19. Send the survey template to the organization
20. Arrange meeting with key individuals at the organization to a) discuss each survey question in detail for content, b) modify the survey questions to increase the member's understanding of terminology, c) obtain other questions of interest to the organization, d) identify profile of the membership, and e) gain approval of a version of the survey
21. Modify survey template for the particular organization with respect to suggestions from meeting with key individuals at the organization
22. Send final draft of survey to organization for approval
23. Identify number of segments of membership would like to sample
24. Ask organization for input on divisions between segments (like level of business volume indicating a member is large versus medium)
25. Ask organization for the number of members that are in each identified segment
26. Determine number of members to sample in each segment to result in approximately 125 respondents in each segment for statistical purposes

Logistics for Survey

27. Determine size of outer envelopes and business reply envelopes so no folding is

necessary
28. Determine the name and address to include on the outer envelopes
29. Determine the name and address of whom the business reply envelopes will be returned
30. Arrange for payment of postage on returned envelopes through a business reply permit. Receive approval for the layout of the business reply envelope
31. Request cost estimate of outer envelope, business reply envelope, and surveys
32. Determine the postage needed for the weight of a survey, cover letter, business reply envelope and outer envelope
33. Order printing of outer envelopes and business reply envelopes
34. Order printing of surveys – using different colors to represent the pre-defined segments
35. Ask organization if they want to endorse the survey by putting the cover letter on their letterhead and if key individuals want to sign the cover letter
36. Draft the cover letter explaining a) the project, b) the benefit to the member, c) amount of time to complete the survey, d) results will be anonymous, and e) procedure to return the survey
37. Send draft of cover letter to organization for approval
38. Upon organization's approval make copies of the cover letter on the appropriate letterhead

Mailing of Surveys

39. Determine if the organization will send the mailing list to the research team or if arrangements need to be made to deliver the surveys to the organization where mailing labels are applied and sent out
40. Purchase necessary stamps for the outer envelopes
41. Arrange for personnel to help collate the surveys with the cover letters, seal envelopes and apply postage and mailing labels.
42. Deliver the surveys to post office for mailing or arrange for delivery of boxes of surveys to the organization so they can apply the mailing labels
43. Repeat steps 12 – 42 for each organization

3.5. Summary

Although several studies have looked at certain aspects of the horizon problem, no study has empirically tested to what degree the horizon problem exists. This dissertation uses multiple case studies to inform the survey design. In addition, the dissertation includes member surveys of four agricultural cooperatives to identify if the horizon problem exists in user-owned organizations. The statistical methods used to analyze the data are discussed in Chapter 4.

4. STATISTICAL METHODS USED TO TEST THE HORIZON PROBLEM

The mail survey provides valuable information about member's characteristics, his farm operation, his succession plan and his investment preferences. Translating this information into a useful form requires the use of several statistical techniques. Descriptive and inferential statistical methods describe the respondent's background, describe the responses to each question and describe the relationship between variables. Descriptive statistics like measures of central tendency and measures of dispersion provide information on the distribution of a single variable. Inferential statistical methods like cross tabulations or frequency tables, difference of means, and correlation analysis provide insights into possible association and relationships between variables. Multivariate data analysis tests whether the member's characteristics have a significant impact on his investment preferences.

The combined use of descriptive statistics, inferential statistics and multivariate data analysis will test the operational hypotheses stated in Chapter 2. This chapter describes the various statistical methods used in analyzing the survey. The results for each survey will be discussed in Chapter 5 using the statistical methods.

4.1. Descriptive Statistics

Descriptive statistics such as mean, median and mode describe the data in terms of measures of central tendency. The statistics describe the location of the center of the distribution or shows the frequency that certain values of a variable occur. The selection of a particular measure of central tendency depends on the type of variables described

(Table 4.1). The mean is the arithmetic average of observations for variables measured on a numerical scale. The median is the middle observation for variables measured on an ordinal scale. The mode of a distribution, or the value that occurs most frequently, should be used when the distribution has two or more peaks and you want the prevailing view, characteristic or quality. The mode is the only measure of central tendency appropriate for nominal or categorical variables.

Table 4.1 Summary statistics according to the level of measurement

	Level of measurement of variable		
Type of Statistic	**Nominal**	**Ordinal**	**Numeric**
Measure of central tendency	Mode	Median	Mean
Measure of dispersion	Variation ratio	Range, percentile, inter-quartile range	Variance, standard deviation

Source: Fink, 2003

Measures of dispersion are descriptive statistics that depict the spread of the data. The four kinds of measures of dispersion for ordinal or numeric data are range, percentiles, inter-quartile range and standard deviation (Fink, 2003). The range represents the difference between the largest observation and the smallest. Percentile is a number that indicates the percentage of a distribution that is equal to or below that number. The inter-quartile range is the difference between the 25^{th} and 75^{th} percentiles of the data. For numerical data, the standard deviation is the measure of the spread of data around the mean. The variation ratio, used with nominal variables, is the proportion of observations not in the modal category (de Vaus, 2002). The qualitative data gathered from the surveys are described using the appropriate statistic in Chapter 5.

4.2. Inferential Statistics

Inferential statistical techniques provide insights into the possible associations and relationships between variables. Since most of the data acquired in this survey is qualitative in nature, measured with either nominal or ordinal scales, chi-square tests, correlation analysis, differences of means tests and analysis of variance are used to assess the relationships between variables of interest. The chi-square test detects whether there is a significant association between two categorical or nominal variables. A correlation analysis determines if a linear relationship exists between two variables. The difference of means test looks at the effect of one variable on another variable by systematically changing some aspect of the first variable. Analysis of variance indicates how the independent variables interact with each other and what effects the interactions have on the dependent variable. This section describes the calculation of each inferential statistic and the appropriate test for significance.

4.2.1. Chi-Square (χ^2) Test

The chi-square χ^2 test is the only test available to analyze the association between two categorical or nominal variables. It is a non-parametric test, so no assumptions are made about the type of data—it can be used with non-normal data. The analysis is carried out on the ranks rather than the actual data so some information about the magnitude of difference between scores is lost (Field, 2000). Therefore, non-parametric tests are less powerful than the parametric tests. If there is a genuine effect in the data, a parametric test is more likely to detect it than a non-parametric test. Therefore, there is

an increased chance of a type II error using non-parametric tests (a greater chance of accepting that there is no difference between groups when, in reality, a difference exists).

The chi-square test of significance compares the *expected* frequency for each category with the frequency *observed* from the survey data. It tests the null hypothesis that the proportions of observations in each category of a variable are equal or that no difference exists among the categories of the variables (Fink, 2003). The chi-square test identifies whether the perceived differences between observed and expected frequencies are the result of sampling error.

Before showing the equation to calculate the chi-square statistic, the expected frequencies of the categorical variables need to be computed for the 2x2 contingency matrix like in Table 4.2. The cell values $O_{j,k}$ represent the *observed* frequencies for each variable's category and $E_{j,k}$ represent the *expected* frequencies where j is the row number and k is the column number. The columns represent variable one with two categories, and the rows represent variable two with two categories. The column total is the sum of the observed frequency for the respective category of variable one and the row total is the sum of the observed frequency for the respective category of variable two.

Table 4.2 Sample 2x2 Contingency Table

Variable 1 / Variable 2	Column 1	Column 2	Row Totals
Row 1	$O_{1,1}$ ($E_{1,1}$)	$O_{1,2}$ ($E_{1,2}$)	$O_{1,1} + O_{1,2}$
Row 2	$O_{2,1}$ ($E_{2,1}$)	$O_{2,2}$ ($E_{2,2}$)	$O_{2,1} + O_{2,2}$
Column Totals	$O_{1,1} + O_{2,1}$	$O_{1,2} + O_{2,2}$	$O_{1,1} + O_{1,2} + O_{2,1} + O_{2,2}$

The expected frequencies are calculated for each cell by multiplying the row total by the column total and dividing by the grand total as demonstrated in equation (4.1)

$$E_{1,1} = \frac{\sum_{k=1}^{c} O_{1,k} \times \sum_{j=1}^{r} O_{j,1}}{\sum_{j=1}^{r}\sum_{k=1}^{c} O_{j,k}} = \frac{(O_{1,1} + O_{1,2}) \times (O_{1,1} + O_{2,1})}{O_{1,1} + O_{1,2} + O_{2,1} + O_{2,2}} \quad \textbf{(4.1)}$$

where c represents the number of categories in the column variable and r represents the number of categories in the row variable.

The calculation of the chi-squared statistic consists of measuring the difference between the expected frequencies and those observed from the survey process using equation (4.2). $O_{j,k}$ is the frequency observed in row *j* and column *k* and $E_{j,k}$ is the expected frequency in row *j* and column *k* if no difference exists among the variables' categories (Neter et al, 1996).

$$\chi^2 = \sum_{j=1}^{r}\sum_{k=1}^{c} \frac{(O_{jk} - E_{jk})^2}{E_{jk}} \quad \textbf{(4.2)}$$

The computed chi-square statistic above is compared with the critical values in the chi-square distribution table to determine the level of statistical significance. To identify the critical chi-square value from the table, the degrees of freedom need to be computed and an appropriate level of confidence needs to be selected. The degrees of freedom for the chi-square statistic equal the number of categories in the column variable minus one multiplied by the number of categories in the row variable minus one. For the sample 2x2 contingency matrix, the degrees of freedom equal one, or (2-1) x (2-1). The appropriate level of confidence for chi-square statistics is generally 95 percent or 99 percent.

If the computed chi-square statistic exceeds the critical value in the chi-square distribution table, then the null hypothesis of equal distributions is rejected. The

differences between the obtained and expected frequencies for the categories are a reflection of genuine differences and not due to sampling error. In other words, a statistically significant relationship exists between the two variables. If the computed chi-square statistic is less than the critical value in the table, then the null hypothesis that no significant association exists between the two variables is accepted.

For the chi-square statistic to be accurate in a 2x2 contingency table, the expected frequencies for each category must be greater than five (Field, 2000). If a 2x2 table has a cell with an expected frequency less than five, the Fisher's exact test must be computed. The Yates' continuity corrected chi-square in 2x2 contingency matrices reduces the magnitude of the difference between observed frequencies and expected frequencies by 0.5 (Field, 2000) although there is some debate whether or not the correction is accurate (Howell, 1997). In larger tables, the rule is that all expected frequencies are greater than one and no more than 20% of the expected frequencies are less than five. If the expected frequency is less than five, some categories could be merged to eliminate the problem.

In addition, the categories in the contingency table must be mutually exclusive so that each respondent or case can only contribute to one cell of the contingency table (Field, 2000). For chi-square tests, the observations in the sample data are assumed to be randomly and independently drawn.

The chi-square statistics phi, Cramer's V and contingency coefficient measure the strength of the association for *nominal* or *categorical* data. These measures modify the chi-square statistic to take into account the sample size and degrees of freedom and try to restrict the range of the test statistic from zero to one. Phi statistic is a chi-square measure of association in 2x2 contingency tables that divide the chi-square statistic by

the sample size and take the square root of the result. Cramer's V is another measure of association based on chi-square, which is identical to phi when both variables have only two categories. If one of the two categorical variables contains more than two categories, then Cramer's V is preferred to phi because phi fails to reach its maximum value of one (Field, 2000). The contingency coefficient ranges between zero and one with zero indicating no association between the row and column variables and values close to one indicating a high degree of association between the variables.

The chi-square statistics gamma, somers' d, Kendall's tau-b and tau-c measure the strength of association for *ordinal* variables (SPSS, 2003). Gamma is a symmetric measure of association between two ordinal variables that ranges from negative one and positive one. Values close to an absolute value of one indicate a strong relationship between the two variables, and values close to zero indicate little or no relationship. Somers' d is an asymmetric extension of gamma that differs only in the inclusion of the number of pairs not tied to the independent variable. Kendall's tau-b is a nonparametric measure of correlation for ordinal or ranked variables that consider ties. The sign of the coefficient indicates the direction of the relationship and its absolute value indicates the strength of the relationship with larger absolute values indicating stronger relationships. Kendall's tau-c is similar to tau-b except it ignores ties. Most statistical packages like SPSS, which is used in this study, compute the tests for significance and the chi-square statistics automatically.

4.2.2. Correlation Analysis

A correlation is a measure of *linear* relationship between two variables. Variables can be positively related, negatively related or not related at all. If there is a relationship between two variables, then as one variable deviates from its mean, the other variable should deviate from its mean in the same or the directly opposite way. There are two types of correlation: *bivariate* and *partial*. A bivariate correlation is a correlation between two variables, whereas a partial correlation looks at the relationship between two variables while "controlling" the effect of one or more additional variables.

The covariance is a good way to assess whether two variables are related to each other. The covariance is the sum of products of the deviation of the score of one variable (x) from its mean multiplied by the deviation of the corresponding score of the other variable (y) for all pairs of scores, which is divided by the number of observations or pairs minus one as in equation (4.3).

$$\mathrm{cov}(x, y) = \frac{\sum_{i=1}^{N} (x_i - \bar{x})(y_i - \bar{y})}{N - 1} \tag{4.3}$$

A positive covariance indicates that as one variable deviates from its mean, the other variable deviates in the same direction. A negative covariance indicates that as one variable deviates from its mean, the other variable deviates in the opposite direction. However, covariance is not a standardized measure, so it depends on the scales of measurement used.

To express the covariance in a standard unit of measurement, the covariance is divided by the standard deviations of the two variables as shown in equation (4.4) in

$$r = \frac{\text{cov}_{x,y}}{s_x s_y} = \frac{\sum_{i=1}^{N}(x_i - \bar{x})(y_i - \bar{y})}{(N-1)s_x s_y} \quad \textbf{(4.4)}$$

which s_x is the standard deviation of the first variable and s_y is the standard deviation of the second variable.

The coefficient in equation (4.4) is known as *Pearson product-moment correlation coefficient* (Field, 2000). The value of Pearson correlation coefficient lies between negative one and positive one. A coefficient of positive one indicates the two variables are perfectly positively correlated, so as one variable increases, the other also increases by a proportionate amount. However, a coefficient of negative one indicates a perfectly negative relationship, so as one variable increases, the other variable decreases by a proportionate amount. A coefficient of zero indicates no linear relationship between the two variables.

Most statistical packages automatically compute a significance value for the correlation. The significance value indicates whether the relationship between two variables is genuine. Usually, social scientists accept any probability value below 0.05 as being statistically meaningful. The correlation coefficients give no indication of the direction of *causality* because there may be other measured or unmeasured variables affecting the results. However, the correlation coefficient squared (R^2) is a measure of the amount of variability in one variable explained by the other variable, but this still says nothing about which variable causes the other to change.

Pearson's coefficient requires parametric data because it is based on the average deviation from the mean (Field, 2000). The assumptions for parametric data are: (1)

normally distributed data, (2) homogeneity of variance, (3) interval or numeric data, and (4) independent data. Two correlation coefficients can be used when data violates parametric assumptions and/or the distributional assumptions: Spearman's Rho and Kendall's tau-b. Spearman's test first ranks the ordinal data and then applies the Pearson's equation to the ranks. If the significance value for spearman's rho correlation coefficient is less than 0.05, it can be concluded there is a significant relationship between the two variables. Kendall's tau-b should be used for small data sets with a large number of tied ranks rather than the Spearman's coefficient. The Kendall's tau-b statistic is also a better estimate of the correlation in the population than the Spearman's statistic (Howell, 1997).

A biserial and point-biserial correlation coefficients are used when one of the two variables is dichotomous (has only two categories). When one variable is a discrete dichotomy, the point-biserial correlation coefficient is used, whereas the biserial correlation coefficient is used when one variable is a continuous dichotomy. Table 4.3 summarizes the correlation coefficients for different types of variables.

Table 4.3 Summary of Correlation Coefficients by Type of Variable

	Level of measurement of variable		
	Nominal	**Ordinal**	**Numeric or Interval**
Correlation coefficient	Biserial or point biserial	Spearman's Rho or Kendall's tau-b	Pearson's correlation coefficient

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4.2.3. Difference of Means Test

The statistical technique used to examine the relationships between variables depends on the type of data in each variable and the number of categories for the

independent and dependent variables (Table 4.4)[15]. When both the dependent and independent variable are nominal or categorical variables, a chi-square analysis is a sufficient test of significance. However, when the dependent variable is a numeric variable and the independent variable has two categories, the Difference of Means test is a more powerful test of significance. A dependent t-test is used when there are two experimental conditions and the same subjects took part in both conditions of the

Table 4.4 Guide to Select Data-Analytic Methods for Surveys

Number of Variables	Type of Data		Potential Analytic Method
	Independent Variable	Dependent Variable	
One independent and one dependent variable	Nominal	Nominal	Chi-square; Fisher's exact test
	Nominal (dichotomous)	Numeric	One-sample t-test, dependent t-test, and independent samples t-test; Wilcoxon signed-ranks test; Wilcoxon rank-sum test
	Nominal (more than 2 categories)	Numeric	One-way analysis of variance
2 or more independent and one dependent variable	Nominal	Nominal	Log-linear
	Nominal and numeric	Nominal and dichotomous	Logistic regression
	Nominal	Numeric	Analysis of variance
	Numeric	Numeric	Multiple regression
	Nominal with confounding factors	Numeric	Analysis of covariance
2 or more independent & dependent variables	Nominal	Numerical	Multivariate analysis of variance

De Vaus, 2002

[15] When independent variables are measured on an ordinal scale, they are often treated as nominal variables. However, when dependent variables are measured on an ordinal scale, they are often treated as numeric (Fink, 2003).

experiment (Field, 2000). The independent t-test is used when there are two experimental conditions and different subjects were assigned to each condition. The independent t-test compares the means of one variable for two groups of respondents. For the independent t-test, the subjects should be randomly assigned to two groups, so that any difference in the variables is due to the treatment and not to other factors. In addition, the observations should be independent random samples from normal distributions. The grouping variable can be a variable with two categories or a numeric variable split into two groups by specifying a cut point (SPSS, 2003).

The independent t-test looks at the differences between the overall means of the two samples and compares them to the expected differences between the means of the two populations. The differences between groups are divided by the standard deviation of the sampling distribution of differences between groups. Equation (4.5) is the independent t-test when sample sizes are equal

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\left(\frac{s_1^2}{N_1} + \frac{s_2^2}{N_2}\right)}} \qquad \textbf{(4.5)}$$

where X_1 represents the mean for category 1 of the independent variable, X_2 represents the mean for category 2 of the independent variable, s_1^2 and s_2^2 represent the variance for the respective category of the independent variable, and N_1 and N_2 represent the number of observations in the respective category of the independent variable.

When the sample sizes in each group are not equal, a pooled variance t-test is used which weights the variance of each sample to take into account the difference in sample size (Field, 2000). The pooled variance t-test is calculated in most statistical

packages. A Levene's Test for equality of variances tests the hypothesis that the variances in the two groups are equal (Field, 2000). If the Levene's test is significant at $p \leq 0.05$, then we conclude the null hypothesis is incorrect and the variances are significantly different. It the Levene's test is not significant, then we accept the null hypothesis the variances are roughly equal.

The value of the t-statistic is assessed against the critical value of t with certain degrees of freedom. The degrees of freedom for the t-test are calculated by adding the two sample sizes and then subtracting the number of samples ($df = N_1 + N_2 - 2$). If the t-statistic is greater than the critical t-value for a particular confidence level, then there is significance difference between the means of the two samples. In contrast, if the t-statistic is less than the critical value, no significant differences exist between the two samples.

4.2.4. Analysis of Variance

The t-test is useful when measuring only one independent variable with two categories. The Analysis of Variance, or ANOVA, tests whether three or more means of independent variables are equal. ANOVA tells how the independent variables interact with each other and what effects the interactions have on the dependent variable. The advantage of doing ANOVA over many t-tests is the probability of making a type I error (falsely rejecting the null hypothesis) is lower for ANOVA compared with many t-tests.

The assumptions under which ANOVA is reliable are (1) data should be from a normally distributed population, (2) variances in each category of independent variable are similar, (3) observations should be independent and (4) the dependent variable should

be measured on at least an interval scale (Field, 2000). If the variances of groups are not equal, steps can be taken to equalize the variances through data transformation like taking the square root of the dependent variable (Howell, 1997). An ANOVA produces an F-statistic or F-ratio, which is similar to the t-statistic in that it compares the amount of systematic variance in the data with the amount of unsystematic variance. The F-ratio is a measure of the ratio of the variation explained by the model and the variation explained by unsystematic factors. The F-ratio can be calculated by dividing the model mean squares by the residual mean squares as in equation (4.6)

$$F = \frac{MS_M}{MS_R} = \frac{SS_M}{df_M} \Big/ \frac{SS_R}{df_R} = \frac{\sum_{i=1}^{c} n_i(\bar{x}_i - \bar{X})^2}{c-1} \Big/ \frac{\sum_{i=1}^{c}(x_i - \bar{x}_i)^2}{N-c} \qquad \textbf{(4.6)}$$

where c represents the number of groups, i indicates the group number, n represents the number of observations in a group and N represents the total number of observations. The F-statistic specifies whether the means of the samples are the same, but it does not provide information on which groups or categories are affected. If the F-statistic is significant, it indicates that one or more of the differences between means is statistically significant.

To contrast the different groups without inflating the type I error, you could break down the variance accounted for by the model into component parts, or compare every group but use a stricter acceptance criterion (Field, 2000). The first option uses planned comparisons depending on the hypotheses you want to test, whereas the latter option uses post hoc comparisons. A Games-Howell post hoc test is utilized when the variances of the groups are not similar (Levene statistic is significant) and the sample sizes for each

group are unequal. A Hochberg's GT2 test is used when the variances of the groups are similar (Levene statistic is not significant) and sample sizes are different (Field, 2000).

The Analysis of Variance can also be extended to include one or more continuous variables that predict the dependent variable called covariates. If any variables are known to influence the dependent variable, then Analysis of Covariance (ANCOVA) can be used to remove the bias of the covariates (Field, 2000). This indicates the effect an independent variable has on the dependent variable after we control for the effect of the covariate.

In summary, several statistical techniques can be used to analyze relationships that exist between variables. Nevertheless, other techniques exist to analyze whether the member's characteristics have a significant impact on his investment preferences. These are discussed in the next section.

4.3. Multivariate Data Analysis

Multivariate data analysis involves analyzing multiple variables in a single relationship or a set of relationships. The multivariate techniques used in this research are factor analysis, ordinal probit regression, and cluster analysis. In factor analysis and cluster analysis, no single variable or group of variables are specified as the independent or dependent variables. Rather the procedures involve the simultaneous analysis of all variables in the set. Factor analysis analyzes interrelationships among a large number of variables and explains the variables in terms of their common underlying dimensions or factors. Cluster analysis classifies a sample of respondents into a small number of mutually exclusive groups based on similarities among the respondents. In contrast, ordinal probit regression models the dependence of an ordinal response on a set of

predictors or independent variables. The rest of this chapter discusses each multivariate technique, the relevant assumptions and tests for significance.

4.3.1. Factor Analysis

The primary purpose of factor analysis is to define the underlying structure in a data set. Factor analysis analyzes the structure of interrelationships among a large number of variables by defining a set of common underlying dimensions, known as factors (Hair et al, 1998). After the underlying dimensions have been determined, factor analysis can either (1) summarize the underlying dimensions in a smaller set of factors or components or (2) reduce the data by substituting scores for each underlying dimension in place of the original values (Hair et al, 1998). Factor analysis involves the simultaneous analysis of all variables in the set rather than predicting a dependent variable.

Factor analysis can analyze correlations between variables or correlations between individual respondents. The latter factor analysis is based on inter-correlations between respondents whereas cluster analysis, discussed in the next section, creates groups of individuals using a distance-based similarity measure between the respondents' scores on the variables being analyzed (Hair et al, 1998). Most researchers utilize a cluster analysis to group individual respondents and use factor analysis to analyze the correlations between variables.

As a general rule of thumb, there should be at least five times as many observations as there are variables to be analyzed in factor analysis (Hair et al, 1998). The basic assumption underlying factor analysis is that an underlying structure exists in

the set of selected variables. In addition, the sample must be homogenous with respect to the underlying factor structure.

To justify the data matrix has sufficient correlations for a factor analysis, one considers the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. The KMO, which ranges from zero to one, quantifies the degree of inter-relationships among the variables. The value of the KMO should be greater than 0.5 for the sample to be adequate for factor analysis (Field, 2000). The KMO measure increases as (1) the sample size increases, (2) the average correlations increase, (3) the number of variables increase and (4) the number of factors decrease (Hair et al, 1998). The Bartlett test of sphericity tests whether the population correlation matrix resembles an identity matrix. If the population correlation matrix resembles an identity matrix, then all correlation coefficients would be zero.

The anti-image correlation matrix measures the sampling adequacy for each variable along the diagonal. The diagonal elements, like the KMO measure, should all be greater than 0.5 if the sample is adequate for the given pair of variables. Any pair of variables with a value less than 0.5 should be considered to be dropped (Field, 2000).

After specifying the variables, a method to extract the factors is selected and the number of factors to represent the underlying structure in the data is specified. The selection of the extraction method depends on the objective. Component analysis summarizes most of the original variables in a minimum number of factors for prediction purposes (Hair et al, 1998). In essence, the component analysis establishes which linear components exist within the data and how a particular variable contributes to the

component (Field, 2000). In contrast, the common factor analysis identifies underlying factors that reflect the common aspects of the variables.

Any individual factor that accounts for the variance of at least a single variable is retained for interpretation. This occurs when the eigen value for the factor is greater than one. Using the eigen value for establishing the number of factors to consider is more reliable when the number of variables is between twenty and fifty (Hair et al, 1998). Another approach is to interpret the factors that explain a specified amount of the variance. In social sciences, it is not uncommon to consider a solution that accounts for sixty percent of the total variance (Hair et al, 1998). A scree test can be used to identify the optimum number of factors that can be extracted before the unique variances begin to dominate the common variance structure. The optimum number of factors is at the point where the plot of the eigen values against the factor numbers begins to straighten out.

After the number of factors is identified, the initial unrotated factor matrix is compared with the rotated matrix to achieve a more meaningful factor solution. An orthogonal rotation rotates the axes of the factors by ninety degrees, whereas an oblique rotation allows factors to be correlated. If the goal of the research is to reduce the number of original variables, the appropriate solution is orthogonal. However if the goal is to obtain several theoretically meaningful factors or constructs, an oblique solution is appropriate (Hair et al, 1998).

From a practical significance, the larger the absolute size of the factor loading for a particular variable, the more important the variable is in interpreting the factor matrix. The squared loading indicates the amount of the variable's total variance accounted for by the factor. Loadings greater than ±.40 are considered important and account for about

sixteen percent of the variable's variance. For statistical significance, a sample size of 100 respondents requires a factor loading of .55 whereas a sample size of at 200 requires a factor loading of .40 (Hair et al, 1998).

The relationship between variables for the principal components can be displayed in an X-Y scatter plot of the factor loadings. Vectors can be drawn from the origin of the scatter plot to the significant factor loadings. Each factor loading in the scatter plot can also be labeled with the variable name. The plot tells which variables are correlated to the principal components (by a small angle between the variable's vector and the axis) and which variables may be highly correlated to each other (by a small angle between the two variable's vectors). Vectors that are orthogonal to each other indicate the variables are independent.

Based on which variables loaded highest into the factors, the factors are then labeled. Variables with higher loadings are considered more important and have greater influence on the name or label selected to represent the factor. The label is intuitively developed based on the appropriateness for representing the underlying dimension of the factor. In this dissertation, factor analysis will be used to identify logical combinations of variables to better understand the interrelationships among variables.

4.3.2. Ordinal Probit Regression Analysis

The analysis of an individual's attitudes regarding a particular topic, like investment preferences, typically results in developing a response variable, Y, which may be restricted to a small number of ordinal values. In this survey, members were asked to respond to several statements related to their investment preferences by indicating on a

scale of one to seven their level of agreement or disagreement. An ordered dependent variable model is utilized to analyze the variation in the member's investment preferences.

The outcome of the ordered categories (1 to 7) for the member's investment preference statements is denoted by the observed y_i variable. The latent variable ordered probit model is

$$y_i^* = X_i\beta + \varepsilon_i \tag{4.7}$$

where y_i^* is the latent variable, X_i is a vector of characteristics about the member, β is a vector of parameter estimates, *i* represents the ordered value from 1 to *k*-1, *k* represents the number of response levels and ε_i is a normally distributed random error. The probabilities of lower response levels are modeled in the cumulative probit model

$$\text{Prob}(y \leq i) = \Phi(\mu_i - \beta' X) \tag{4.8}$$

where μ_i represent the estimated parameters for the intercepts and $\Phi[.]$ is the evaluation of a standard normal distribution. The probability that y_i takes values between two points along the range, as indicated in equation 4.9, is the cumulative probability value for a point minus the cumulative probability of the next lower ordered point (Greene, 2000).

$$\begin{aligned}
&\Pr ob(y = 1 \mid x_i) = \Phi(\mu_1 - \beta' X) \\
&\Pr ob(y = 2 \mid x_i) = [\Phi(\mu_2 - \beta' X)] - [\Phi(\mu_1 - \beta' X)] \\
&\vdots \\
&\Pr ob(y = 6 \mid x_i) = [\Phi(\mu_6 - \beta' X)] - [\Phi(\mu_5 - \beta' X)] \\
&\Pr ob(y = 7 \mid x_i) = 1 - [\Phi(\mu_6 - \beta' X)]
\end{aligned} \tag{4.9}$$

In each probit model, the set of member characteristics are the explanatory variables. For nominal explanatory variables, the category with greatest number of respondents is removed to correctly identify the model. The ordinal variables used as independent variables were transformed into cardinal variables using the terza method (Terza, 1987), which creates a new cardinal value based on the frequency of observations. The terza method transforms h_j, the discrete category value for variable H, into $\hat{h}_j$ that is calculated by equation (4.10) where j=1, … , J and J represents the number of discrete categories.

$$\hat{h}_j = \frac{[n_{j-1}(\delta_{j-1}) - n_j(\delta_j)]}{p_j} \quad \textbf{(4.10)}$$

In equation (4.10), p_j is the percentage of the sample observed in category j, n is the probability density function of the standard normal distribution evaluated at δ_j, which is calculated as follows

$$\delta_j = N^{-1}(\sum_{i=1}^{j} p_i) \quad \textbf{(4.11)}$$

where j=1,…,J-1 and N^{-1} is the inverse of the standard normal cumulative distribution function, $\delta_0 = -\infty$ and $\delta_J = +\infty$. The ordinal variables in the survey were transformed using the terza method.

The dependent variable in the ordinal probit regression is assumed to be ordinal, with the lowest value defining the first category. The log-likelihood statistic indicates how much unexplained information exists after the model has been fitted (Field, 2000). Large values of the log-likelihood statistic indicate the model does not predict the outcome very well. SPSS multiplies the log-likelihood value by -2 because -2LL has a chi-square distribution, which can be compared with the critical chi-square values. If the

chi-square value for the model is significant then the model including the independent variables is better than the model without the independent variables.

In addition to the likelihood ratio, SPSS provides several measures comparable to the R^2 measure in OLS regression to evaluate the model fit. Higher values of the Cox and Snell R^2 indicate a greater model fit, but this measure cannot reach the maximum value of one. Nagelkerke R^2 is preferred because it can achieve a maximum value of one.

The values of the parameters in ordinal probit regression are estimated using the maximum-likelihood method, which selects coefficients that measure the probability the dependent variable takes on values between two points along the range. The Wald statistic in equation (4.12), which has a chi-square distribution, indicates whether the β coefficient for the independent variable is significantly different from zero where β

$$Wald^2 = \left(\frac{\beta}{SE}\right)^2 \qquad \textbf{(4.12)}$$

represents the parameter estimate and SE is the standard error of the parameter estimate. If the coefficient is significantly different from zero then the independent variable makes a significant contribution to the prediction of the dependent variable. However, the Wald statistic should be used cautiously because when the regression coefficient is large, the standard error becomes inflated resulting in the Wald statistic being underestimated (Menard, 1995). The inflation of the standard error increases the probability of making a Type II error (rejecting an independent variable as being significant when in reality it makes a significant contribution to the model).

4.3.3. Cluster Analysis

Cluster analysis is a multivariate technique that groups respondents based on the characteristics they possess. Within a cluster, the respondents are very similar to others with respect to a predetermined selection criterion. Respondents in different clusters exhibit high heterogeneity. Cluster analysis is the only multivariate technique that does not empirically estimate the set of variables representing the characteristics used to compare respondents, but uses the variables specified by the researcher. Cluster analysis is comparable to factor analysis in its objective to assess the structure of the data, but cluster analysis groups respondents, whereas factor analysis is primarily concerned with grouping variables (Hair et al, 1998).

Cluster analysis is useful to reduce the information from an entire population, or sample, to information about specific, smaller subgroups. It is also helpful to develop hypotheses concerning the nature of the data or to examine previously stated hypotheses. The clusters specified from previously stated hypotheses can be grouped for further analysis.

Three questions must be determined before doing a cluster analysis: (1) how to measure similarity, (2) how to form clusters, and (3) number of groups to form. Similarity can be measured using correlation between respondents, the distance between observations or association between respondents for nominal or ordinal variables. The most common similarity measure used is Euclidean distance that measures the proximity in two-dimensional space between observations. If the variables have different scales, then prior to cluster analysis, the variables should be standardized to a standard score by

subtracting the mean and dividing by the standard deviation of each variable (Hair et al, 1998).

Clusters can be formed using the hierarchical procedure or the nonhierarchical procedure. Hierarchical procedures involve the construction of a hierarchy of a treelike structure where the two most similar observations are grouped in a cluster and additional clusters are combined until all observations are in a single cluster. Five popular algorithms used to develop clusters are (1) single linkage, (2) complete linkage, (3) average linkage, (4) Ward's method, and (5) centroid method (Hair et al, 1998). The single linkage procedure is based on minimum distance between objects, whereas the complete linkage procedure criterion is based on maximum distance and the average linkage is based on the average distance from all individuals in one cluster to all individuals in another. In Ward's method, the distance between two clusters is the sum of squares between the two clusters summed over all variables. The centroid method measures the distance between the centroids of the two clusters.

The nonhierarchical procedure assigns objects into clusters once the number of clusters to be formed is specified. The use of nonhierarchical methods depends on the researcher's ability to select seed points, or the initial cluster center, according to a practical, objective or theoretical basis. Nonhierarchical procedures are less susceptible to outliers in the data, the distance measure used and the inclusion of irrelevant or inappropriate variables (Hair et al, 1998). However, the benefits of nonhierarchical methods are realized only with the use of nonrandom seed points.

The selection of number of clusters is a subjective decision on the part of the researcher by examining increases in the agglomeration coefficient. The cluster solution

may be defined when the agglomeration coefficient exceeds a specified value or when the successive values between cluster steps makes a sudden jump indicating a substantial decrease in similarity (Hair et al, 1998).

Interpreting the clusters involves examining each cluster in terms of the cluster's centroids. The clusters are named based on the average profiles of the respondents in each cluster. The derived clusters can then be compared to those proposed by prior theory.

To ensure practical significance of the final cluster solution, the researcher can validate the results by splitting the sample into two groups, analyzing each cluster separately and comparing the results. To describe the characteristics of each cluster, data not previously included in the cluster procedure like demographic characteristics can be used. The emphasis is on the characteristics that differ significantly across clusters and those that could predict membership in a particular cluster.

4.4. Summary

The combined use of descriptive statistics, inferential statistics and multivariate data analysis will test the operational hypotheses stated in Chapter 2. This chapter described the various statistical methods used in analyzing the survey.

Descriptive and inferential statistical methods help describe the respondent's background, describe the responses to each question and describe the relationship between variables. Descriptive statistics provide information on the distribution of a single variable. Inferential statistical methods provide insights into possible association and relationships between variables related to the horizon problem.

Multivariate data analysis tests whether the member's characteristics have a significant impact on his investment preferences. Factor analysis analyzes interrelationships among a large number of variables and explains the variables in terms of their common underlying dimensions or factors. The factor analysis can analyze the interrelationships among the variables indicating the horizon problem and explain the variables in terms of underlying factors. Ordinal probit regression identifies independent variables that are significant in explaining the variation in probability the ordered response variable takes on values between two points along the range. Cluster analysis classifies a sample of respondents into a small number of mutually exclusive groups based on similarities among the respondents. The cluster analysis can classify respondents into groups based on their investment preferences related to the horizon problem. A profile of each cluster can identify the respondent's relevant characteristics.

The results for each survey will be discussed in Chapter 5 using the statistical methods above.

5. EMPIRICAL RESULTS

This chapter presents the statistical results from the four surveys that help inform the main hypothesis. The statistical results are presented individually for each survey and then an overall summary of the results is presented at the end of the chapter. For each survey, general demographic information describes the respondents in terms of their farm operation, growth plans, age, succession plans and constraints for growth. Then descriptive and inferential statistics describe the various types of horizon problem in tables and/or charts. Cross-tabulations of relevant variables provide evidence supporting or rejecting each hypothesis. Then the results of the multivariate data analysis techniques are presented for each survey. At the end of the chapter, a brief discussion of the overall results explains whether the results help accept or reject the main hypothesis.

5.1. Effingham Equity Survey Results

The Effingham Equity survey (Appendix 1A) consisting of thirty-six questions was sent to 1,777 Effingham members in November 2004. Different subgroups of members received different colors of surveys. The 83 large crop members (2.2% of total crop members) represent approximately twenty percent of the crop product sales. The 427 medium crop members (11.5% of total crop members) represent about thirty-six percent of the crop product sales. The other 3,210 small crop members (86% of total crop members) represent about twenty-seven percent of the crop product sales. Non-members represent the other seventeen percent of crop product sales.

Between November 2004 and January 2005, two hundred eighty-eight surveys were returned to the University of Missouri. Eleven surveys were returned undeliverable based on mailing addresses and ten surveys were returned blank resulting in two hundred sixty-seven completed surveys. This represents an overall 15% response rate (267 respondents/1,777 members), or about six percent of the entire membership (Table 5.1). The response rate is higher among members with livestock and larger crop input business volume.

Table 5.1 Response Rate for various Subgroups of Effingham Equity's Membership

	Approximate # of members	**# surveys mailed**	**# surveys received**	**Response rate**
Large Crop	83	83 (blue)	29	34.5%
Medium Crop	427	427 (gold)	104	24.4%
Small Crop	3,210	Sample of 600 (yellow)	134 answered, 11 undelivered, 10 unanswered	11.1% answered 12.9% overall
No crop	880	Sample of 600 (yellow)		
Dairy[a]	50	50 (1 B, 13 G, 36 Y)	22 (1 B, 5 G, 16 Y)	44%
Hogs[a]	50	50 (4 B, 18 G, 28 Y)	28 (3 B, 12 G, 13 Y)	56%
Total	**4,600 members**	**1,777 surveys**	**267 answered**	**15%**

[a] Classified based on farm revenue from respective livestock.

Respondents who generated more than thirty percent of farm revenue from hogs or dairy (question 17) were classified as either 'hog' or 'dairy' members. Table 5.2 indicates that hog members were more likely than dairy members to be diversified in both livestock and grain with greater volumes of crop product sales.

Table 5.2 Effingham Equity Crop Product Sales Volume by Crop Product Sales Volume with Livestock

	Crop Product Sales Volume with Livestock				
Crop Product Sales Volume	Small Crop Volume	Med. Crop Volume	Large Crop Volume	Hog Farmer	Dairy Farmer
Small Crop Volume	100.0%	---%	---%	46.4%	72.7%
Medium Crop Volume	---	100.0	---	42.9	22.7
Large Crop Volume	---	---	100.0	10.7	4.5
N	**105**	**87**	**25**	**28**	**22**

The large and medium crop farmers who responded represent approximately sixteen percent of the total crop product sales. The hog and dairy farmers who responded represent approximately forty percent of the feed business. Therefore, the respondent's answers are assumed to represent the total population of Effingham Equity members.

The next section provides a general description of the 267 respondents. Descriptive statistics help describe the respondents in terms of the size and location of farm, growth plans, type of operator, age of respondent, succession plans and constraints for production growth. Section 5.1.2 helps inform the horizon problem with descriptive and inferential statistics. Sections 5.1.3 to 5.1.4 use multivariate data analysis to support or reject the hypotheses in Chapter 2.

5.1.1. Description of Effingham Equity Respondents

About 21.8% of the respondents conduct their business primarily with Effingham headquarters (question 14). About 45.3% of the respondents conduct business with a branch location within thirty miles of Effingham and about 32.8% conduct most of their business with a branch location more than thirty miles from Effingham. Table 5.3 indicates that members who do business primarily with the headquarters are either livestock producers or purchase less than $25,000 of crop inputs products and services annually from the cooperative. About fifty-three percent of the respondents who conduct business with a location within thirty miles of Effingham and fifty percent of respondents who conduct business with a location further than thirty miles purchase more than $25,000 of their crop inputs from the cooperative. This indicates the importance of access to the feed mill in Effingham for the livestock farmers and the importance of the crop input business at the branch locations outside of Effingham.

Table 5.3 Type of Farmer by Effingham Equity Branch Location Where Conduct Most of Business

	Location of Branch Where Conduct Most of Business with Respect to the Headquarters		
Type of Farmer	Headquarters	Less than 30 miles	More than 30 miles
Small Crop Volume	44.8%	32.1%	43.9%
Medium Crop Volume	5.2	44.0	35.7
Large Crop Volume	0.0	10.1	14.3
Hog Farmer	25.9	6.4	6.1
Dairy Farmer	24.1	7.3	0.0
N	**58**	**109**	**98**

Cramer's V statistic: .365, Sig. 0.000

The respondent's average size farm is approximately 950 acres, which is in the 500 to 1,000 acre category (question 20, Table 5.4). This is more than double the 408 acres average size farm of harvested cropland in Effingham's sixteen county market territory (USDA, 2004). The 267 respondents represent about three percent of total farms in the sixteen counties, but farm approximately 244,000 acres, or 6.7% of the harvested acres in the territory. Therefore, the respondents are, on average, larger than the typical farmer in this area.

Table 5.4 Frequency Table of Effingham Equity Respondent's Size of Crop Operation

Size of Crop Operation	Frequency	Percent	Valid Percent	Cumulative Percent
Fewer than 100 acres	15	5.6	5.8	5.8
100 – 500 acres	76	28.5	29.6	35.4
501 – 1,000 acres	74	27.7	28.8	64.2
1,001 – 1,500 acres	44	16.5	17.1	81.3
1,501 – 2,000 acres	20	7.5	7.8	89.1
2,001 – 2,500 acres	13	4.9	5.1	94.2
More than 2,500 acres	15	5.6	5.8	100.0
Total	257	96.3	100.0	
Missing	10	3.7		
N	**267**	100.0		

Members closer to the headquarters have, on average, smaller crop farms than the members who conduct business primarily with the branches more than 30 miles from the

headquarters (Table 5.5). About one-fourth of the respondents conducting most of their business with a branch further than thirty miles from the headquarters have larger than 2,000-acre farms (question 20). This indicates the potential for higher volumes of crop product sales at branches further from the headquarters.

Table 5.5 Size of Crop Operation by Effingham Equity Branch Location Where Conduct Most of Business

	Location of Branch Where Conduct Most of Business		
Size of Crop Operation	Headquarters	Less than 30 miles	More than 30 miles
Fewer than 100 acres	17.0%	3.7%	2.1%
100 – 500 acres	54.7	23.4	23.2
501 – 1,000 acres	17.0	38.3	25.3
1,001 – 1,500 acres	5.7	21.5	17.9
1,501 – 2,000 acres	3.8	8.4	8.4
2,001 – 2,500 acres	0.0	1.9	11.6
More than 2,500 acres	1.9	2.8	11.6
N	**53**	**107**	**95**

Cramer's V statistic: .349, Sig. 0.000

Respondents with a higher crop inputs business volume with Effingham also purchase a higher percent of their total crop input products/services from the cooperative (question 25, Table 5.6).

Table 5.6 Percent of Crop Inputs Purchase from Effingham by Value of Crop Input Business

	Value of Crop Input Business with Effingham		
Percent of Crop Inputs	Small	Medium	Large
Not Applicable	4.8%	---%	---%
0 – 15%	12.7	3.9	---
16 – 75%	34.9	29.4	27.6
76 – 90%	18.3	27.5	10.3
Greater than 90%	29.4	39.2	62.1
N	**126**	**102**	**29**

Cramer's V statistic: .226, Sig. 0.001

The distance from the headquarters indicates that respondents who conduct business primarily with a branch location within thirty miles of the headquarters also purchase a higher percent of crop inputs from the cooperative relative to the other

respondents (Table 5.7). Respondents from the Stewardson branch location purchase the highest average percent of crop inputs from the cooperative whereas respondents from Robinson purchase the lowest average percent.

Table 5.7 Percent of Crop Inputs Purchase from Effingham by Location of Branch where Conduct Most of Business with respect to the Headquarters

	Location of Branch with Respect to the Headquarters		
Percent of Crop Inputs	Headquarters	Less than 30 Miles	More than 30 Miles
Not Applicable	5.6%	----%	3.2%
0 – 15%	18.5	2.8	7.5
16 – 75%	31.5	22.2	41.9
76 – 90%	14.8	25.0	20.4
Greater than 90%	29.6	50.0	26.9
N	**54**	**108**	**93**

Cramer's V statistic: .254, Sig. 0.000

Respondents who conduct business primarily at the headquarters also market a higher percent of grain to the cooperative relative to the other respondents (Table 5.8). Respondents from the Effingham and Stewardson branch locations market the highest average percent of grain to the cooperative. This is reflective of grain elevators only located at Effingham, Marshall, and Alma locations.

Table 5.8 Percent of Grain Market to Effingham by Location of Branch where Conduct Most of Business with respect to the Headquarters

	Location of Branch with Respect to the Headquarters		
Percent of Grain	Headquarters	Less than 30 Miles	More than 30 Miles
Not Applicable	11.1%	6.5%	32.3%
0 – 15%	42.6	60.7	64.5
16 – 75%	25.9	19.6	2.2
Greater than 75%	20.4	13.1	1.1
N	**54**	**107**	**93**

Cramer's V statistic: .327, Sig. 0.000

Between 1997 and 2002, the number of harvested acres in Effingham's sixteen county market territory increased by about four percent (USDA, 2004). The median

respondent increased crop production 1-10% over the last five years (Table 5.9, question 22), but plans to stay the same size in the next five years (question 23).

Table 5.9 Frequency Table of Effingham Equity Respondent's Change in Crop Production in Last Five Years

Change in Crop Production Last 5 Years	Frequency	Percent	Valid Percent	Cumulative Percent
Decreased	21	7.9	8.2	8.2
Stayed Same	96	36.0	37.6	45.9
Increased 1-10%	47	17.6	18.4	64.3
Increased 11-20%	40	15.0	15.7	80.0
Increased 21-30%	24	9.0	9.4	89.4
Increased 31-40%	8	3.0	3.1	92.5
Increased 40%+	19	7.1	7.5	100.0
Total	255	95.6	100.0	
Missing	12	4.5		
N	**267**	100.0		

The respondent's expected rate of cropland production growth for the next five years is similar to the growth rate over the last five years (Table 5.10). About 42.3% of

Table 5.10 Effingham Equity Growth of Crop Production during next 5 years by Growth of Crop Production in last 5 years

Growth of crop Production **next** 5 years	Growth of Crop Production in **last** 5 years						
	Decreased	Stayed Same	Increased 1-10%	Increased 11-20%	Increased 21-30%	Increased 31-40%	Increased > 40%
Decrease	30.0%	6.5%	6.7%	7.5%	0.0%	0.0%	10.5%
Stay Same	70.0	63.4	48.9	15.0	12.5	28.6	5.3
Increase 1-10%	0.0	15.1	28.9	27.5	25.0	14.3	10.5
Increase 11-20%	0.0	7.5	11.1	4.0	20.8	14.3	26.3
Increase 21-30%	0.0	5.4	2.2	0.0	25.0	28.6	15.8
Increase 31-40%	0.0	1.1	0.0	2.5	16.7	0.0	15.8
Increase > 40%	0.0	1.1	2.2	2.5	0.0	14.3	15.8
N	**20**	**93**	**45**	**40**	**24**	**7**	**19**

Cramer's V statistic: .318, Sig. 0.000

the respondents expect to grow at the same rate in the next five years as in the previous five years. About 35% expect to decrease their rate of growth and 22.5% expect to increase their rate of growth.

The expected plan to change crop production in the next five years tends to differ with the size of the crop operation (Table 5.11). About 77% of the respondents with farms smaller than 500 acres plan to stay the same size over the next five years or decrease crop production. In comparison, only 40% of the respondents with 500 to 1,000 acres, thirty-eight percent of respondents with 1,000 to 2,000 acres and twenty-five percent of respondents with more than 2,000 acres plan to stay the same size or decrease crop production over the next five years.

Table 5.11 Effingham Equity Growth of Crop Production during next 5 years by Size of Crop Operation

Growth of crop Production **next** 5 years	Size of Crop Operation						
	< 100 acres	100-500 acres	510-1,000 acres	1,000-1,500	1,501-2,000	2,001-2,500	> 2,500 acres
Decrease	13.3%	9.6%	8.2%	10.3%	---%	7.7%	---%
Stay Same	73.3	65.8	31.5	30.8	31.6	23.1	20.0
Increase 1-10%	---	12.3	23.3	20.5	31.6	23.1	26.7
Increase 11-20%	6.7	5.5	20.5	23.1	15.8	38.5	26.7
Increase 21-30%	---	4.1	6.8	7.7	15.8	7.7	13.3
Increase 31-40%	6.7	2.7	4.1	---	5.3	---	13.3
Increase > 40%	---	---	5.5	7.7	---	---	---
N	**15**	**73**	**73**	**39**	**19**	**13**	**15**

Cramer's V statistic: .207, Sig. 0.003

About 8.2% of the respondents have dairy cattle, 24.7% have beef cattle (question 28) and approximately 4.1% of the respondents have beef cattle and hogs. About 53.6% of the respondents have no livestock, resulting in 93 respondents with cattle. The median respondent with beef cattle has 1-50 cows, whereas the median respondent with dairy cattle has 51-125 cows (Table 5.12). Therefore, the average dairy farmer has more cows compared to the average beef farmer. The beef farmers typically have a crop operation in addition to raising cattle.

Table 5.12 Size of Effingham Equity Respondent's Cattle Operation by Primary Type of Livestock Farmer

	Primary Type of Livestock Farmer		
Size of Cattle Operation	Dairy	Beef	Hogs
1 – 50 cows	4.8%	60.7%	27.3%
51 – 125 cows	52.4	26.2	45.5
126 – 200 cows	23.8	9.8	18.2
201 – 275 cows	4.8	1.6	9.1
276 – 350 cows	9.5	1.6	----
More than 350 cows	4.8	----	----
N	**21**	**61**	**11**

Cramer's V Statistic: .377, Sig. 0.003

About 13.5% of the respondents have hogs (question 29) and 3.7% of the respondents have hogs and dairy or beef cattle resulting in 45 respondents with hogs. Sixty-two percent of the total hog producers generate more than 30% of their farm revenue from hogs. The median respondent specialized in producing hogs has more than 4,000 hogs, but the median respondent for all hog producers has 2,001 to 3,000 hogs (Table 5.13).

Table 5.13 Size of Effingham Equity Respondent's Hog Operation by Primary Type of Livestock Farmer

	Primary Type of Livestock Farmer		
Size of Hog Operation	Hogs	Beef	Dairy
1 – 500 hogs	11.4%	71.4%	66.7%
501 – 1,000 hogs	8.6	28.6	33.3
1,001 – 2,000 hogs	14.3	----	----
2,001 – 3,000 hogs	8.6	----	----
3,001 – 4,000 hogs	5.7	----	----
More than 4,000 hogs	51.4	----	----
N	**35**	**7**	**3**

Cramer's V Statistic: .490, Sig. 0.017

Respondents who conduct business primarily with the headquarters also purchase a higher percent of feed from the cooperative relative to the other respondents (Table 5.14). Respondents from Effingham and Farina branch locations purchase the highest

average percent of feed from the cooperative whereas respondents from Arcola and Pana purchase the lowest average percent.

Table 5.14 Percent of Feed Purchase from Effingham by Location of Branch where Conduct Most of Business with respect to the Headquarters

	Location of Branch with Respect to the Headquarters		
Percent of Feed	Headquarters	Less than 30 Miles	More than 30 Miles
Not Applicable	7.0%	10.0%	11.1%
0 – 15%	7.0	40.0	52.8
16 – 75%	20.9	20.0	13.9
Greater than 75%	65.1	30.0	22.2
N	**43**	**50**	**36**

Cramer's V statistic: .318, Sig. 0.000

Respondents who primarily raise hogs or dairy cattle also purchase a higher average percent of feed from the cooperative (Table 5.15). This indicates that hog farmers depend more on the cooperative for feed relative to the other respondents. However, dairy farmers purchase a higher percent of feed, on average, relative to beef cattle members.

Table 5.15 Percent of Feed Purchase from Effingham by Type of Livestock Farmer

	Type of Livestock Farmer			
Percent of Feed	Crop	Beef Cattle	Dairy Cattle	Hog
Not Applicable	11.1%	12.5%	4.8%	5.6%
0 – 15%	55.6	45.3	9.5	19.4
16 – 75%	11.1	17.2	38.1	11.1
Greater than 75%	22.2	25.0	47.6	63.9
N	**9**	**64**	**21**	**36**

Cramer's V statistic: .264, Sig. 0.001

Larger hog operations purchase a significantly greater percent of feed from the cooperative relative to the smaller hog operations. In addition, larger hog farmers also market a higher percent of hogs through the cooperative (question 31) relative to the smaller hog farmers (Table 5.16).

Table 5.16 Percent of Hogs Market through Effingham by Size of Hog Operation

Percent of Hogs Marketed	Size of Hog Operation		
	1 – 1,000 hogs	1,000 – 4,000 hogs	More than 4,000 hogs
0 – 15%	100.0%	50.0%	21.4%
46 – 75%	----	----	14.2
Greater than 90%	----	50.0	64.3
N	**13**	**10**	**14**

Cramer's V statistic: .502, Sig. 0.005

Regarding the respondent's plans to retire from farming, the median respondent plans to relinquish control over the farm in 6-10 years[16] (Table 5.17). About 28% of the respondents do not know when they plan to relinquish control over their farm (question 11). The range of responses suggests these members might have different preferences for investments related to the horizon problem, which will be discussed in the next section.

Table 5.17 Frequency Table of Effingham Equity Respondent's Years before Relinquishing Control over Farm

Years to Relinquish Control	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	75	28.1	28.4	28.4
Already Relinquished	18	6.7	6.8	35.2
< 1 Year	2	0.7	0.8	36.0
1-2 Years	4	7.5	1.5	37.5
3-5 years	20	1.5	7.6	45.1
6-10 years	45	16.9	17.0	62.1
11-15 years	30	11.2	11.4	73.5
16-20 years	70	26.2	26.5	100.0
Total	264	98.9	100.0	
Missing	3	1.1		
N	**267**	100.0		

The years to relinquish control over the farm differ by the type of operator (Table 5.18). Dairy farmers, on average, plan to relinquish control over their farm in fewer years than the crop farmers and the hog farmers. About 59% of the dairy farmers plan to relinquish control in less than ten years, compared to 23% of the crop farmers and 28% of

[16] The do not know category received a -1 code; the other categories received 1-7 codes.

the hog farmers. The hog farmer and the medium and large crop input volume members have a greater percent of respondents who plan to relinquish control in the long term, 15 to 20 years. The small crop input volume members have a higher percent of respondents who do not know when they plan to relinquish control over the farm.

Table 5.18 Effingham Equity Respondent's Years to Relinquish Control over Farm by Type of Operator

	Type of Operator				
Years to Relinquish Control over Farm	Small Crop Volume	Med Crop Volume	Large Crop Volume	Hog Farmer	Dairy Farmer
Don't Know	39.4%	23.5%	16.0%	21.4%	18.2%
Already Relinquished	11.5	2.4	8.0	7.1	---
Less than 5 years	7.7	8.2	12.0	7.1	27.3
6-10 years	13.5	17.6	12.0	21.4	31.8
11-15 years	7.7	16.5	20.0	7.1	4.5
15-20 years	20.2	31.8	32.0	35.7	18.2
N	**104**	**85**	**25**	**28**	**22**

Cramer's V statistic: .189, 0.010

When asked the succession plan the respondent is considering for their farming operation (question 12), there was a range of responses. Two responses indicate that the respondent might be concerned about the farm and the cooperative in the longer term: maintain ownership and leave the farm to family who will continue to farm. Another two responses indicate the respondent may not be concerned about the cooperative in the long term: sell the farm and leave the farm to family who will not continue to farm. About 17.6% of the respondents indicated they do not have a succession plan. About 24.7% plan to maintain ownership, about 41.2% plan to leave the farm to family who will continue to farm, and another 5.3% are considering both of these options. About 1.9% of the respondents plan to sell the farm and 6.4% plan to leave the farm to family who will not continue to farm. The other 1.9% of the respondents are considering other succession

plans. This indicates there may be differences of preferences regarding the indicators for the horizon problem.

The median respondent is 51-55 years old (question 10). About 44% of the respondents are younger than 50 and about 15% are older than 65 years (Table 5.19). At 65 years, the members in Effingham Equity have the option to request the cooperative to redeem their investment by relinquishing the right to rejoin the cooperative. This suggests that age might be a dimension to consider when describing the horizon problem.

Table 5.19 Frequency Table of Effingham Equity Respondent's Age

Respondent's Age in years	Frequency	Percent	Valid Percent	Cumulative Percent
< 40	38	14.2	14.3	14.3
41-45	32	12.0	12.0	26.3
46-50	47	17.6	17.7	44.0
51-55	45	16.9	16.9	60.9
56-60	38	14.2	14.3	75.2
61-65	25	9.4	9.4	84.6
> 65	41	15.4	15.4	100.0
Total	266	99.6	100.0	
Missing	1	0.4		
N	**267**	100.0		

A comparison of the respondent's age with the type of crop farmer (question 19) indicates that respondents who are primarily owners, on average, are older than respondents who crop share or cash rent (Table 5.20). When the respondent is younger, he might cash rent until he can purchase land.

Respondents who were primarily owners or primarily cash rent, on average, have smaller crop operations than owner/crop share and owner/cash rent (Table 5.21). The owner increases the size of his operation by either renting other land with cash or through crop share.

Table 5.20 Age of Effingham Equity Respondent by Type of Grain Farmer

	Type of Grain Farmer						
Age of Respondent	Not Applicable	Cash Rent	Crop Share	Owner	Owner/ Cash Rent	Owner/ Crop Share	Other
Younger than 40	20.0%	24.4%	17.1%	9.0%	36.4%	---%	11.8%
41-45	20.0	19.5	12.9	9.0	---	21.1	5.9
46-50	20.0	26.8	22.9	12.0	9.1	10.5	23.5
51-55	---	9.8	20.0	22.0	9.1	5.3	17.6
56-60	40.0	9.8	8.6	16.0	18.2	31.6	5.9
61-65	---	4.9	4.3	13.0	9.1	10.5	17.6
Older than 65	---	4.9	14.3	19.0	18.2	21.1	17.6
N	**5**	**41**	**70**	**100**	**11**	**19**	**17**

Cramer's V statistic: .195, Sig. 0.034

Table 5.21 Effingham Equity Size of Crop Operation by Type of Grain Farmer

	Type of Grain Farmer					
Size of Crop Operation	Cash Rent	Crop Share	Owner	Owner/ Cash Rent	Owner/Crop Share	Other
< 100 acres	9.8%	8.8%	4.0%	---%	---%	5.9%
100-500	39.0	16.2	38.6	45.5	15.8	11.8
501-1,000	17.1	32.4	29.7	18.2	31.6	41.2
1,001-1,500	14.6	20.6	15.8	9.1	15.8	23.5
1,501-2,000	2.4	11.8	4.0	9.1	15.8	17.6
2,001-2,500	12.2	1.5	4.0	9.1	10.5	---
> 2,500 acres	4.9	8.8	4.0	9.1	10.5	---
N	**41**	**68**	**101**	**11**	**19**	**17**

Cramer's V statistic: .183, Sig. 0.043

Members were asked to indicate the percent of the allocated retained earnings they could borrow against (question 8, Table 5.22) About seventy percent of the respondents do not know what percent of the market value against which they can borrow. About eighteen percent of the respondents indicated the lender values their shares at less than fifteen percent of the market value. About ten percent of the respondents indicate the lender values the shares at more than forty-five percent of its market value.

Table 5.22 Frequency Table of How the Lender Values the Allocated Retained Earnings of Effingham Equity Respondent relative to the Market Value

Percent of Market Value	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	176	65.9	70.1	70.1
0 – 15%	45	16.9	17.9	88.0
16 – 30%	4	1.5	1.6	89.6
31 – 45%	1	0.4	0.4	90.0
46 – 60%	6	2.2	2.4	92.4
61 – 75%	9	3.4	3.6	96.0
76 – 90%	4	1.5	1.6	97.6
> 90%	6	2.2	2.4	100.0
Total	251	94.0	100.0	
Missing	16	6.0		
N	**267**	100.0		

The farm is an important source of revenue for the majority of the respondents, although 19.7% of the respondents generate less than half of their household income from farm sources (question 13, Table 5.23). The median respondent generates seventy to eighty percent of their household income from farm sources.

Table 5.23 Frequency Table of Effingham Equity Respondent's Percent of Household Income from Farm Sources

Percent of Household Income from Farm	Frequency	Percent	Valid Percent	Cumulative Percent
< 40%	37	13.9	14.6	14.6
41 – 50%	13	4.9	5.1	19.7
51 – 60%	22	8.2	8.7	28.4
61 – 70%	23	8.6	9.1	37.5
71 – 80%	33	12.4	13.0	50.5
81 – 90%	40	15.0	15.8	66.3
> 90%	85	31.8	33.6	100.0
Total	253	94.8	100.0	
Don't Know	7	2.6		
Missing	7	2.6		
N	**267**	100.0		

Livestock farmers, on average, generate a higher percent of their household income from farm sources than the crop farmers (Table 5.24). Respondents who

purchase less than $25,000 crop input products from the cooperative were the most likely group to generate less than sixty percent of their household income from farm sources.

Table 5.24 Effingham Equity Respondent's Percent of Household Income from Farm Sources by Type of Operator

	Type of Operator				
Percent of Household Income from Farm	Small Crop Volume	Med Crop Volume	Large Crop Volume	Hog Farmer	Dairy Farmer
< 40%	27.3%	4.9%	4.3%	7.1%	13.6%
41 – 50%	7.1	6.2	---	---	7.7
51 – 60%	14.1	7.4	4.3	3.6	---
61 – 70%	12.1	7.4	13.0	3.6	4.5
71 – 80%	10.1	13.6	21.7	14.3	13.6
81 – 90%	10.1	18.5	30.4	25.0	4.5
> 90%	19.2	42.0	26.1	46.6	59.1
N	**99**	**81**	**23**	**28**	**22**

Cramer's V statistic: .237, Sig. 0.000

The respondents generate, on average, about seventy-eight percent of their farm revenue from grain and twenty percent of their farm revenue from livestock (question 16 to 18). Crop farmers generate a higher percent of their farm revenue from grain than livestock farmers (Table 5.25). Of the livestock farmers, dairy farmers generate the highest average percent of farm revenue from livestock. From 2004 to 2009, hog.

Table 5.25 Effingham Equity Respondent's Average Farm Revenue from Grain and Livestock by Type of Operator

Grain or Livestock Revenue by Year	Type of Operator[a]				
	Crop	Beef	Hogs	Dairy	Total
Grain Revenue 1999	94.3%	72.1%	43.5%	21.1%	76.5%
Livestock Revenue 1999	2.7	25.3	54.9	77.3	20.9
Grain Revenue 2004	96.3%	70.5%	44.0%	22.1%	77.5%
Livestock Revenue 2004	---	27.4	54.7	75.8	19.6
Grain Revenue 2009	96.2%	74.4%	48.7%	28.1%	79.2%
Livestock Revenue 2009	3.1	24.4	49.8	69.7	18.1
N 1999, 2004	**143**	**47**	**34**	**22**	**246**
N 2009	**129**	**44**	**33**	**19**	**225**

farmers expect to reduce their farm revenue from livestock by about five percent and dairy farmers by about six percent. The hog and dairy farmers plan to increase their grain revenue by the respective amounts. The remaining revenue each year might be for a forage crop, specialty crop or a result of the percentages in the respondent's surveys not summing to one hundred. The reduction in number of respondents from 2004 to 2009 is mostly due to uncertainty of plans in five years

When respondents were asked to circle the constraints that limited their crop or livestock production growth over the last five years (question 35), about 8.6% did not circle any constraints, which is indicative their growth was not constrained over the last five years (Table 5.26). About 9.7% do not expect their crop or livestock production growth to be limited by constraints over the next five years (question 36). The average number of constraints was 2.1 for the last five years and 2.3 over the next five years, illustrating the respondents, on average, expect to be limited by about the same number of constraints over the next five years. About 28.8% of the respondents indicated they expect to face *more* constraints in the next five years than in the previous five years, and

Table 5.26 Effingham Equity Frequency Table of Number of Constraints Limiting Crop or Livestock Production Growth over Last Five Years and Next Five Years

Number of Constraints **Last** 5 Years	Frequency	Percent	Number of Constraints **Next** 5 Years	Frequency	Percent
None	23	8.6	None	26	9.7
1	77	28.8	1	73	27.3
2	71	26.6	2	51	19.1
3	54	20.2	3	61	22.8
4	27	10.1	4	34	12.7
5	13	4.9	5	14	5.2
More than 5	2	0.8	More than 5	8	3.0
N	**267**	100.0	**N**	**267**	100.0

17.6% of the respondents expect to face *fewer* constraints in the next five years and about 53.6% expect to face the *same* number of constraints.

About sixty-four percent of the respondents indicated that land cost or land availability was a constraint in the last five years but only sixty percent perceive land cost to be a constraint in the next five years (Table 5.27). This is a concern as the price of land continues to increase. In the next five years, a higher percent of large crop volume

Table 5.27 Percent of Effingham Equity Respondents Indicating Constraints that Limited their Crop and Livestock Production Growth over Last Five Years and Will Limit Production Growth in Next Five Years

Constraints Limiting Crop or Livestock Production Growth	Percent of Respondents **Last** 5 Years	Percent of Respondents **Next** 5 Years	Change in Percent of Respondents
Land Cost or Availability	64.4%	59.6%	***- 4.8%***
Rising Input Costs	39.0%	43.5%	**+ 4.5%**
Falling Commodity Prices	32.6%	34.1%	+ 1.5%
Limited Available Time	18.7%	16.5%	***- 2.2%***
My Capacity to Service More Debt	12.4%	11.2%	- 1.2%
Cost of Supporting Family	10.1%	9.0%	- 1.1%
Labor Costs or Availability	9.7%	12.4%	**+ 2.7%**
Environmental Concerns/Regulations	9.4%	13.1%	**+ 3.7%**
Urban Encroachment/Subdivision Pressures	4.1%	4.5%	+ 0.4%
Management Capacity	3.4%	5.2%	+ 1.8%
Lack of Suitable Off-Farm Employment Opportunities	2.6%	1.5%	- 1.1%
Better Rate of Return from producing Alternative Commodity	1.9%	3.4%	+ 1.5%
Complexity of Effingham Investments	1.9%	1.1%	- 0.8%
Herd Costs	1.9%	1.9%	---
Water Costs or Availability	0.4%	0.0%	- 0.4%
Impending Retirement		12.7%	
None of the Constraints	8.6%	9.7%	**+ 1.1%**

respondents expect land cost to be a constraint relative to small and medium crop volume respondents, hog farmers and dairy farmers.

More respondents perceive rising input costs as a constraint to their growth in the next five years than in the past five years. This constraint has become a greater constraint as the price of fertilizer and other crop inputs increase. Rising input costs are a significantly greater constraint for crop producers than livestock producers. Although only 40% of the large crop volume respondents perceived rising input costs to be a constraint in the last five years, 52% perceive it to be a constraint in the next five years (Table 5.28). Although only 7.1% of the hog farmers perceived rising input costs to be a constraint in the last five years, 28.6% perceive it to be a constraint in the next five years.

Falling commodity prices continue to be a constraint for about one-third of the respondents in the next five years, but relatively less of a constraint for the livestock farmers compared with the crop farmers. Labor costs and environmental concerns are expected to be a greater constraint in the next five years than in the past five years and a significantly greater constraint for livestock producers than for crop producers (Table 5.28). A higher percent of hog farmers perceive environmental concerns and labor costs to be a constraint in the next five years relative to the last five years. Hog farmers also appear to be more constrained by capacity to service debt relative to dairy farmers and crop farmers. Crop farmers with small and medium crop input business volume have a greater percent of respondents with a constraint to service debt relative to respondents with a large crop input business volume.

The descriptions about the respondents provided above will help inform which variables might be important in analyzing the horizon problem.

Table 5.28 Percent of Effingham Equity Respondents Facing Constraint by Type of Operator

	Type of Operator				
Percent of Respondents Facing Constraint	Small Crop Volume	Med Crop Volume	Large Crop Volume	Hog Farmer	Dairy Farmer
99 Land Cost/Availability*	55.2%	74.7%	68.0%	67.9%	59.1%
09 Land Cost/Availability***	47.6	71.3	84.0	60.7	40.9
99 Rising Input Costs***	43.8%	46.0%	40.0%	7.1%	27.3%
09 Rising Input Costs**	46.7	48.3	52.0	28.6	18.2
99 Environment Concerns***	2.9%	10.3%	---%	17.9%	36.4%
09 Environment Concerns***	3.8	13.8	12.0	28.6	36.4
99 Labor Cost/Availability**	8.6%	8.1%	---%	14.3%	27.3%
09 Labor Cost/Availability***	3.8	16.1	4.0	25.0	31.8
99 Limited Available Time**	18.1%	12.6%	12.0%	39.3%	27.3%
09 Limited Available Time	15.2	16.1	12.0	28.6	13.6
99 Capacity to Service Debt*	11.4%	10.3%	4.0%	28.6%	13.6%
09 Capacity to Service Debt**	11.4	8.1	4.0	28.6	9.1
N	**105**	**87**	**25**	**28**	**22**

Level of significance of difference of means: * Ten percent level, ** Five percent level, *** One percent level

5.1.2. Descriptive and Inferential Statistics Related to Horizon Problem

Two questions in particular were designed in the survey to analyze the horizon problem in Effingham Equity (question 5 and question 6). Question five tests hypotheses H_2 and H_{4B}. Question six tests hypotheses H_{1A}, H_{3A} and H_{3C}. Two other questions indirectly evaluate the horizon problem by looking at the respondent's preference for competitively priced inputs that provide quick return to the member (question 21 and question 26). These questions test hypotheses H_{3B}, and H_{4A}.

The first statement analyzed requests respondents to indicate their attitude about whether it is worth the effort to understand their cooperative investment (question 5). This question evaluates whether the "hassle" horizon problem exists by testing hypotheses 2 and 4B. About half of the respondents answered 1 or 2 indicating it *is* worth their effort to understand their investment (Table 5.29). About 14.5% percent of

the respondents perceived it is *not* worth the effort to understand their investment by answering 6 or 7.

Table 5.29 Frequency Table of Respondent's Preference to "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment"

Response to Survey Question 5		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Disagree	72	27.0	27.5	27.5
2		60	22.5	22.9	50.4
3		33	12.4	12.6	63.0
4	Doesn't Matter	31	11.6	11.8	74.8
5		28	10.5	10.7	85.5
6		24	9.0	9.2	94.7
7	Strongly Agree	14	5.2	5.3	100.0
	Total	262	98.1	100.0	
	Missing	5	1.9		
N		**267**	100.0		

The statement regarding whether the cooperative investment is worth the effort to understand has a negative significant relationship with years to relinquish, value of crop input business volume and the variable comparing the cooperative and on-farm return on investment (Table 5.30). The statement has a positive significant relationship with preference for allocated versus unallocated retained earnings and the succession plan. The Kendall's tau-b coefficient indicates if the variables have a significant relationship,

Table 5.30 Nonparametric Correlations with Statement "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment"

Not Worth Effort to Understand Investment	Years to Relinquish	Crop Input Volume	Return on Investment	Allocated vs. Unallocated	Succession Plan
Kendall's tau b Coefficient	-.170***	-.168***	-.139***	.218***	.134***
Sig. (2-tailed)	.001	.001	.000	.000	.008
N	**259**	**262**	**256**	**248**	**259**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

but does not indicate if the particular categories within the variable are significantly different from each other.

In the cross tabulations, more than 20% of the expected frequencies are less than five, so the chi-square statistics are not provided since it would not be accurate. Therefore, each relationship will be evaluated further with difference of means test and one-way ANOVA. Neither the succession plan variable nor the return on investment variable has a significant difference of means at the five percent level so the results for these variables will not be shown. Since the difference of means is not significant for the succession plan variable nor the variable indicating the respondent's ability to borrow against the shares, hypotheses 2B and 2C are not supported.

The member's value of crop business volume has significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.31). This holds true if the livestock categories are added for hogs and dairy.

The variances of the groups are not equal since the Levene statistic (2.62, sig 0.035) is significant at the five percent level. Post hoc tests are computed to compare

Table 5.31 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" by Value of Crop Input Business Volume

Crop Input Business Volume and Livestock	Mean	N	Std. Deviation
Small Crop Input Volume	3.45	102	1.928
Medium Crop Input Volume	2.88	85	1.693
Large Crop Input Volume	2.40	25	1.732
Hog Farmer	2.14	22	1.758
Dairy Farmer	3.64	22	2.172
Total	**3.04**	**262**	**1.888**

each group of respondents based on value of crop input business volume and livestock category using the Games-Howell test. Respondents who purchase less than $25,000 crop input products or services score higher toward investment not being worth the effort to understand compared to large crop volume members and hog farmers. Dairy farmers also score higher toward the Effingham Equity investment not being worth the effort to understand compared to hog farmers. Hog farmers and large crop input volume members tend toward the cooperative investment being worth the effort to understand. This supports hypothesis 2A which states "level of member patronage will be negatively associated with the attitude that the cooperative investment is not worth understanding".

Table 5.32 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" vs. Crop Input Business Volume and Livestock using Games-Howell test

Dependent Variable: Not Worth Effort to Understand Investment					
Games-Howell test	(I) Crop Input Volume/Livestock	(J) Crop Input Volume/Livestock	Mean Difference (I-J)	Std. Error	Sig.
	Small Volume	Medium Volume	.569	.265	.205
		Large Volume	1.051*	.396	.079
		Hog Farmer	1.308**	.383	.011
		Dairy Farmer	-.185	.501	.996
	Dairy Farmer	Hog Farmer	1.494*	.570	.086

Level of significance Games-Howell test: ** Five percent level, *** One percent level

The member's level of hogs marketed through the cooperative has significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.33). Members who market a greater percent of hogs through the cooperative tend toward perceiving their cooperative investment is worth understanding.

The variances of the groups are not equal since the Levene statistic (6.31, sig 0.002) is significant at the one percent level. Post hoc tests are computed to compare

Table 5.33 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" by Level of Hogs Market through the Cooperative

Percent of Hogs Market through Cooperative	Mean	N	Std. Deviation
None	3.17	200	1.849
Less than 90%	2.85	48	2.083
More than 90%	1.86	14	1.292
Total	**3.04**	**262**	**1.888**

each group of respondents based on level of hogs marketed through the cooperative using the Games-Howell test. Respondents who market the majority of their hogs through the cooperative score lower toward investment being worth the effort to understand compared to members who do not market any hogs through the cooperative. This supports hypothesis 2A.

Table 5.34 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" vs. Percent of Hogs Market using Games-Howell test

Dependent Variable: Not Worth Effort to Understand Investment					
Games-Howell test	(I) Percent of Hogs Marketed	(J) Percent of Hogs Marketed	Mean Difference (I-J)	Std. Error	Sig.
	More than 90%	None	-1.313***	.369	.007
		Less than 90%	-.997*	.458	.089

Level of significance Games-Howell test: ** Five percent level, *** One percent level

The number of years to relinquish control has significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.35).

The variances of the groups are not equal since the Levene statistic (3.24, sig 0.007) is significant at the one percent level. Post hoc tests are computed to compare each group of respondents based on years to relinquish using the Games-Howell test. Respondents with more than ten years to relinquish control tend toward the investment

Table 5.35 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" by Years to Relinquish Control

Years to Relinquish Control	Mean	N	Std. Deviation
Don't Know	3.66	74	1.882
Already Relinquished	2.53	17	1.940
< 5 years	2.80	25	1.658
6 – 10 years	3.24	45	2.134
11 – 15 years	2.66	29	1.396
15 – 20 years	2.58	69	1.826
Total	**3.03**	**259**	**1.890**

being worth the effort to understand compared to members who do not know when they will relinquish (Table 5.36). This weakly supports hypothesis 4B, which states, "the number of years until retirement will be negatively associated with preference for no further cooperative investment". However, the categories representing members who have already relinquished control or are within 5 years of relinquishing control do not have statistically different means.

Table 5.36 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" vs. Years to Relinquish Control using Games-Howell test

Dependent Variable: Not Worth Effort to Understand Investment					
Games-Howell test	(I) Years to Relinquish	(J) Years to Relinquish	Mean Difference (I-J)	Std. Error	Sig.
	Don't Know	Already relinquished	1.133	.519	.838
		Less than 5 years	.862	.397	.271
		6 – 10 years	.418	.386	.887
		11 – 15 years	1.007**	.339	.045
		15 – 20 years	1.082***	.310	.008

Level of significance Games-Howell test: *Ten percent level; ** Five percent level, *** One percent level

Respondent's preference for allocated versus unallocated retained equities (question 7) has a significantly different means for the statement about whether it is worth the member's effort to understand their investment (Table 5.37).

Table 5.37 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" by "The Cooperative should have more Unallocated Retained Earnings rather than Allocated Retained Earnings"

Preference for Allocated vs. Unallocated Earnings	Mean	N	Std. Deviation
1 - Strongly Disagree	2.33	24	2.259
2	2.39	44	1.588
3	2.68	25	1.773
4 – Doesn't Matter	3.31	98	1.646
5	3.90	31	1.972
6	2.78	18	2.102
7 – Strongly Agree	4.00	8	2.204
Total	**3.04**	**248**	**1.869**

The variances of the groups are not equal since the Levene statistic (2.26, sig 0.038) is significant at the five percent level. Therefore, the one-way analysis of variance is not reliable. Post hoc tests are computed using the Games-Howell test to compare each group of respondents based on preference for allocated vs. unallocated retained earnings. Respondents who tend toward preference for more allocated retained earnings versus unallocated retained earnings tend toward the investment being worth the effort to understand compared to respondents who indicate it does not matter (Table 5.38).

Table 5.38 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Effingham Equity Investment" vs. "The Cooperative should have more Unallocated Retained Earnings rather than Allocated Retained Earnings" using Games-Howell Test

Dependent Variable: Not Worth Effort to Understand Investment					
Games-Howell test	(I) Allocated vs. Unallocated	(J) Allocated vs. Unallocated	Mean Difference (I-J)	Std. Error	Sig.
	2	1-Allocated	.053	.519	1.000
		3	-.294	.428	.993
		4	-.920**	.291	.035
		5	-1.517**	.428	.013
		6	-.391	.550	.991
		7-Unallocated	-1.614	.815	.486

Level of significance Games-Howell test: ** Five percent level, *** One percent level

The second statement requests respondents to indicate their preference for equity redemption policy (question 6). This question helps to analyze whether the "wait-to-receive" horizon problem exists by testing hypothesis 1A. This question also helps analyze whether the "current obligation" horizon problem exists by testing hypotheses 3A and 3C. About seventeen percent of the respondents answered 6 or 7 indicating they prefer quicker redemption of allocated retained earnings (Table 5.39). About twenty percent answered 1 or 2 indicating they prefer higher cash patronage refund today and slower redemption of allocated retained earnings. Slightly more than one-third of the respondents prefer the current policy. The median respondent answered 4, indicating the same as current policy. About eleven percent did not have an opinion and about six percent were indifferent.

Table 5.39 Frequency Table of Effingham Equity Respondent's Preference to "I would Most Prefer the board chooses a policy that pays 1=Higher cash Patronage Refund today and Slower Redemption, 4=Same as current policy, 7=Lower cash Patronage Refund today and Quicker Redemption of Allocated Retained earnings"

Response to Survey Question 7		Frequency	Percent	Valid Percent	Cumulative Percent
	Don't Know	29	10.9	11.0	11.0
	Indifferent	15	5.6	5.7	16.7
1	Higher Cash	40	15.0	15.2	31.8
2		12	4.5	4.5	36.4
3		9	3.4	3.4	39.8
4	Middle	95	35.6	36.0	75.8
5		15	5.6	5.7	81.4
6		29	10.9	11.0	92.4
7	Quicker Redemption	20	7.5	7.5	100.0
	Total	264	98.9	100.0	
	Missing	3	1.1		
N		**267**	100.0		

After removing the forty-four respondents who did not have an opinion or were indifferent, the statement regarding the member preference for equity redemption policy

has a negative significant relationship with years to relinquish control, preference for crop input products, and change in crop production in the last five years, and herd cost and cost to support family constraints (Table 5.40). The statement regarding the preference for higher cash patronage refunds is not statistically related with variable indicating ability to borrow against shares, so hypothesis 3C is not supported.

Table 5.40 Nonparametric Correlations with Effingham Equity Statement "I would Most Prefer the board chooses a policy that pays 1=Higher cash Patronage Refund today and Slower Redemption, 4=Same as current policy, 7=Lower cash Patronage Refund today and Quicker Redemption of Allocated Retained earnings"

Preference for Equity Redemption Policy	Years to Relinquish	Crop Input Preference	Growth Cropland last 5 years	09 Herd Cost constraint	09 Support Family constraint
Kendall's tau b	-.116**	-.129**	-.134**	-.139**	-.108*
Sig. (2-tailed)	.034	.035	.020	.022	.076
N	**218**	**210**	**209**	**220**	**220**

Level of significance correlation Coefficient: *Ten percent level, **Five percent level,

All the variables have more than 20% of the expected values less than five in the cross tabulations, so the relationships will be evaluated with difference of means test. The variable "years to relinquish control" has significant difference of means for the preference for equity redemption policy (Table 5.41).

Table 5.41 Means for Effingham's Equity Redemption Policy Preference by Years to Relinquish Control

Years to Relinquish Control	Mean	N	Std. Deviation
Don't Know	4.05	58	1.868
Already Relinquish	3.77	13	2.315
Less than 5 years	4.70	23	1.690
6 – 10 years	4.03	39	1.857
11 – 15 years	4.08	26	1.623
15 – 20 years	3.37	59	1.691
Total	**3.92**	**218**	**1.825**

The variances of the groups are equal since the Levene statistic (.69, sig 0.634) is not significant. Therefore, the one-way analysis of variance is reliable. The F-statistic from the ANOVA for years to relinquish is significant at the ten percent level so one or more of the differences of means is significantly different from the other means (F (5, 212) = 2.086, p <.10).

Table 5.42 Effingham Equity ANOVA Table for Equity Redemption Policy Preference vs. Years to Relinquish Control

ANOVA					
Preference for Equity Redemption Policy	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.88	5	6.78	2.086	.068*
Within Groups	688.64	212	3.25		
Total	**722.51**	**217**			

Level of significance F-Test: * Ten percent level , ** Five percent level, *** One percent level

Post hoc tests are computed to compare each group of respondents based on years to relinquish control using Hochberg's GT2 test since the variances of the groups are similar and sample sizes for each group are different. Members who have less than five years to relinquish control score higher toward quicker redemption of allocated retained earnings relative to members who have more than fifteen years to relinquish control

Table 5.43 Effingham Equity Multiple Comparisons for Equity Redemption Policy Preference vs. Years to Relinquish Control using Hochberg's GT2

Dependent Variable: Equity Redemption Policy Preference					
Hochberg GT2 test	(I) Years to Relinquish	(J) Years to Relinquish	Mean Difference (I-J)	Std. Error	Sig.
	< 5 years	Don't Know	.644	.444	.905
		Already relinquish	.926	.625	.890
		6 – 10 years	.670	.474	.921
		11 – 15 years	.619	.516	.979
		15 – 20 years	-1.32**	.443	.046

Level of significance Hochberg GT2 test: ** Five percent level, *** One percent level

(Table 5.43). This supports hypothesis 1A. The members with more than fifteen years to relinquish control score lower toward higher cash patronage refunds.

The preference for full range of timely delivered crop input services versus competitively priced crop input products has a significant difference of means for the equity redemption policy preference (Table 5.44).

Table 5.44 Effingham Equity Means for Equity Redemption Policy Preference by Preference for Crop Inputs

Crop Input Preference	Mean	N	Std. Deviation
Don't Know	4.00	9	1.414
Full Range of Timely Delivered Services	4.38	63	1.621
Competitively Priced Inputs	3.76	138	1.901
Total	**3.96**	**210**	**1.818**

The variances of the groups are equal since the Levene statistic (2.20, sig 0.114) is not significant, so the one-way analysis of variance is reliable. The F-statistic from the ANOVA for crop input preference is significant at the ten percent level so one or more of the differences of means is significantly different from the other means.

Table 5.45 Effingham Equity ANOVA Table for Equity Redemption Policy Preference vs. Crop Input Preference

ANOVA					
Preference for Equity Redemption Policy	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.65	2	8.32	2.557	.080*
Within Groups	673.97	207	3.26		
Total	**690.61**	**209**			

Level of significance F-Test: * Ten percent level, ** Five percent level, *** One percent level

Post hoc tests are computed to compare each group of respondents based on crop input preference using Hochberg's GT2 test. Members who prefer full range of timely

delivered crop input services tend toward preference for quicker redemption compared to those that prefer competitively priced crop input products (Table 5.46).

Table 5.46 Effingham Equity Multiple Comparisons for Equity Redemption Policy Preference vs. Crop Input Preference using Hochberg's GT2

Dependent Variable: Equity Redemption Policy Preference					
Hochberg GT2 test	(I) Crop Input Preference	(J) Crop Input Preference	Mean Difference (I-J)	Std. Error	Sig.
	Full Range	Don't Know	.381	.643	.911
		Competitively Priced	.620*	.274	.073

Level of significance Hochberg GT2 test: * Ten percent level, ** Five percent level, *** One percent level

The growth of cropland production in the last five years has significant difference of means for the preference for equity redemption policy (Table 5.47). The variances of the groups are equal since the Levene statistic (1.17, sig 0.332) is not significant, so the one-way analysis of variance is reliable. The F-statistic from the ANOVA for cropland

Table 5.47 Effingham Equity Means for Equity Redemption Policy Preference by Cropland Production Growth in last Five years

Cropland Production Growth in last five years	Mean	N	Std. Deviation
Decreased	4.06	17	1.819
Stayed Same	4.23	80	1.793
Increased 1 – 20%	4.17	69	1.671
Increased > 20%	3.23	43	1.862
Total	**3.99**	**209**	**1.800**

Table 5.48 Effingham Equity ANOVA Table for Equity Redemption Policy Preference vs. Cropland Production Growth in Last Five Years

ANOVA					
Preference for Equity Redemption Policy	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	31.50	3	10.50	3.351	.020**
Within Groups	642.48	205	3.13		
Total	**673.98**	**208**			

Level of significance F-Test: * Ten percent level , ** Five percent level, *** One percent level

production growth in last five years is significant at the five percent level so one or more of the differences of means is significantly different from the other means (Table 5.48).

Hochberg's GT2 test indicates that members who increased cropland production by more than twenty percent tend toward preference for higher cash patronage refunds compared to members who stayed the same size or increased less than 20% (Table 5.49).

Table 5.49 Effingham Equity Multiple Comparisons for Equity Redemption Policy Preference vs. Cropland Production Growth in last five years using Hochberg's GT2

Dependent Variable: Equity Redemption Policy Preference					
Hochberg GT2 test	(I) Crop Growth in last 5 years	(J) Crop Growth in last 5 years	Mean Difference (I-J)	Std. Error	Sig.
	Increased > 20%	Decreased	-.826	.507	.483
		Stayed Same	-.992**	.335	.020
		Increased 1-20%	-.941**	.344	.040

Level of significance Hochberg GT2 test: * Ten percent level, ** Five percent level, *** One percent level

Respondents indicating they expect production will likely be constrained in the next five years from cost of supporting family had significant relationship with preference for equity redemption policy (Table 5.50). Respondents who expect to limit their crop production due to the cost of supporting the family tended toward preference for higher cash patronage refunds today.

Table 5.50 Effingham Equity Means for Equity Redemption Policy Preference by Cost of Supporting Family Constraint

Cost of Supporting Family Constraint - 2009	Mean	N	Std. Deviation
Yes	3.22	18	1.592
No	3.97	202	1.831
Total	**3.91**	**220**	**1.821**

The variances of the groups are equal since the Levene statistic (.002, sig 0.968) is not significant, so the one-way analysis of variance is reliable. The F-statistic from the ANOVA for cost to support family constraint is significant at the ten percent level so

members who expect to face the cost to support family constraint has significantly different mean compared to the other members. This supports hypothesis 3A at the ten percent level.

Table 5.51 Effingham Equity ANOVA Table for Equity Redemption Policy Preference vs. Cost of Supporting Family Constraint

ANOVA					
Preference for Equity Redemption Policy	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	9.25	1	9.25	2.812	.095*
Within Groups	716.93	218	3.29		
Total	**726.18**	**219**			

Level of significance F-Test: * Ten percent level , ** Five percent level, *** One percent level

The third and fourth statements requests respondents to indicate their preference for the cooperative to provide full range of timely delivered crop input services versus competitively priced crop input products (question 21 and 26). These questions helps to test the hypotheses whether the "short-term residual" horizon problem exists by testing hypotheses 4A. The questions also help test whether the "current obligation" horizon problem exists by evaluating hypothesis 3B. About half of the respondents answered 1 or 2 indicating they prefer the cooperative provide competitively priced crop input products (Table 5.52). About fifteen percent answered 6 or 7 indicating they prefer cooperative provide full range of crop input services. The median respondent answered three, indicating he tends toward preference for competitively priced products.

The statement regarding the member preference for crop input products versus services has a negative significant relationship with branch location, size of crop operation, growth in crop production in last five years and variable indicating return on

Table 5.52 Frequency Table of Effingham Equity Respondent's Preference to "I Prefer the Cooperative provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products"

Response to Survey Question 26		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Disagree	53	19.9	21.0	21.0
2		66	24.7	26.2	47.2
3		29	10.9	11.5	58.7
4	Indifferent	42	15.7	16.7	75.4
5		23	8.6	9.1	84.5
6		25	9.4	9.9	94.4
7	Strongly Agree	14	5.2	5.6	100.0
	Total	252	94.4	100.0	
	Missing	15	5.6		
N		**267**	100.0		

investment (question 34) (Table 5.53). The statement has a positive significant relationship with the percent of farm revenue from livestock in 2004 so members who received a higher percent of farm revenue from livestock tended toward preference for full range of crop input services.

The variables either have more than 20% of the expected values less than five in the cross tabulations or insignificant chi-square statistics, so the relationships will be evaluated with difference of means test. The variables indicating high current cash

Table 5.53 Nonparametric Correlations with Effingham Equity Statement "I Prefer the Cooperative provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products"

Preference for Crop Input Products vs. Services (likert)	Branch location	% Farm Revenue Livestock	Size of Crop operation	Crop Growth in last 5 years	Return on Investment
Kendall's tau b	-.176***	.114**	-.161***	-.101**	-.159***
Sig. (2-tailed)	.001	.029	.001	.045	.002
N	**250**	**238**	**249**	**247**	**248**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

obligations do not have statistically significant relationships with the preference for crop inputs so hypothesis 3B, which states that the constraint from high current cash

obligations will be positively associated with preference for competitively priced products, is not supported. The variable indicating the number of years before relinquishing control does not have statistically significant relationships with the statement about crop input preferences so hypothesis 4A, which states that the number of years until retirement will be negatively associated with preference for investments with quick payback, is not supported.

The variable indicating the branch location where the member conducts most of his business has significant difference of means for the preference for competitively priced crop inputs versus full range of crop input services (Table 5.54).

Table 5.54 Means for "I Prefer the Cooperative provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products" by Distance of Branch Location from Effingham

Distance of Branch Location from Effingham	Mean	N	Std. Deviation
Effingham headquarters	3.77	52	1.854
Less than 30 miles	3.30	107	1.939
More than 30 miles	2.70	91	1.595
Total	**3.18**	**250**	**1.840**

The variances of the groups are not equal since the Levene statistic (4.30, sig 0.015) is significant at the five percent level. Post hoc tests are computed using Games-Howell test to compare each group of respondents based on branch locations. Respondents who conduct business with a branch location further than thirty miles from Effingham tend toward preference for competitively priced crop input products (Table 5.55).

The variable indicating the change in crop production in the last five years does not have significant difference of means for the preference for competitively priced crop

Table 5.55 Multiple Comparisons for "I Prefer the Cooperative provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products" vs. Distance of Branch Location from Effingham using Games-Howell test

Dependent Variable: Preference for Full Range of Services vs. Competitively Priced Inputs					
Games-Howell test	(I) Distance from Effingham	(J) Distance from Effingham	Mean Difference (I-J)	Std. Error	Sig.
	> 30 miles	Effingham	-1.066***	.307	.002
		< 30 miles	-.596**	.251	.049

Level of significance Games-Howell test: *Ten percent level, **Five percent level, *** One percent level

inputs versus full range of crop input services. However, the variable representing the size of crop operation has significant difference of means (Table 5.56).

Table 5.56 Effingham Equity Means for "I Prefer the Cooperative provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products" by Size of Crop Operation

Size of Crop Operation	Mean	N	Std. Deviation
< 500 acres	3.63	86	1.809
501 – 1,000 acres	3.14	73	1.895
1,001 – 2,000 acres	2.81	63	1.575
> 2,000 acres	2.67	27	2.019
Total	**3.17**	**249**	**1.829**

The variances of the groups are approximately equal since the Levene statistic (2.361, sig 0.072) is not significant at the five percent level, so the one-way analysis of variance is reliable. The F-statistic from the ANOVA for size of crop operation is significant at the five percent level so one or more of the differences of means are significantly different from the other means (Table 5.57).

Post hoc tests are computed using Hochberg's GT2 test to compare each group of respondents based on size of crop operation. Respondents who have larger crop operations tend toward preference for competitively priced crop input products compared to respondents with smaller operations

Table 5.57 Effingham Equity ANOVA Table for "I Prefer the Cooperative provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products" vs. Size of Crop Operation

ANOVA					
Preference for Crop Input Products vs. Services	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	33.14	3	11.05	3.398	.019**
Within Groups	796.44	245	3.25		
Total	**829.57**	**248**			

Level of significance F-Test: * Ten percent level, ** Five percent level, *** One percent level

Table 5.58 Effingham Equity Multiple Comparisons for "I Prefer the Cooperative provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products" vs. Size of Crop Operation using Hochberg's GT2 test

Dependent Variable: Preference for Full Range of Services vs. Competitively Priced Inputs					
Hochberg's GT2 test	(I) Size of Crop Operation	(J) Size of Crop Operation	Mean Difference (I-J)	Std. Error	Sig.
	< 500 acres	501-1,000 acres	.491	.287	.424
		1,001-2,000 acres	.818**	.299	.039
		> 2,000 acres	.961*	.398	.094

Level of significance Hochberg's GT2 test: *Ten percent level, **Five percent level, *** One percent level

Question 21 requests respondents to circle their preference for full range of timely delivered services or competitively priced crop input products. About sixty-seven percent of the respondents prefer the cooperative provide competitively priced crop input and twenty-seven percent prefer a full range of timely delivered crop input services

Table 5.59 Frequency Table of Effingham Equity Respondent's Preference to Crop Input Products vs. Services

Response to Survey Question 21	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	15	5.6	5.9	5.9
Full Range Services	69	25.8	27.1	32.9
Competitively Priced	171	64.0	67.1	100.0
Total	255	95.5	100.0	
Missing	12	4.5		
N	**267**	100.0		

(Table 5.59). About six percent do not know have an opinion. The median respondent prefers competitively priced crop input products.

The preference for competitively priced inputs vs. full range of timely delivered crop input services has a positive significant relationship with branch location, crop input business volume, size of crop operation and falling commodity prices and rising input prices constraints (Table 5.60).

Table 5.60 Effingham Equity Nonparametric Correlations with Preference for Competitively Priced Inputs vs. Full Range of Timely Delivered Crop Input Services

Preference for Cooperative Investment (categorical)	Branch Location	Crop Input Business Volume	Size of Crop Operation	09 Falling Commodity Constraint	09 Rising Input Costs Constraint
Kendall's tau b	.263***	.166***	.281***	.167***	.181***
Sig. (2-tailed)	.000	.005	.000	.007	.003
N	**253**	**255**	**257**	**255**	**255**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

The cross tabulation of rising input cost constraint with preference for competitively priced inputs versus timely delivered services is statistically significant at the five percent level. In Table 5.61, respondents who expect to limit their production due to rising input costs tend toward preference for competitively priced inputs. If the purchase of inputs is considered a high current cash obligation, this supports hypotheses 3B.

Table 5.61 Preference for Effingham Equity Cooperative Investment by Expected Existence of Rising Input Cost Constraint

	09 Rising Input Cost Constraint	
Preference for Crop Inputs	Yes	No
Don't Know	2.7%	8.3%
Full Range Services	20.8	31.9
Competitively Priced Products	76.6	59.7
N	**111**	**144**

Cramer's V statistic: .187, Approx. Sig. 0.011; χ^2 statistic: 8.952 (d.f.=2), Asymp. Sig. 0.011

The cross tabulation of crop input business volume with preference for competitively priced inputs versus timely delivered services is statistically significant at the five percent level. In Table 5.62, respondents who purchase more than $25,000 of crop input products or services tend toward preference for competitively priced inputs.

Table 5.62 Preference for Effingham Equity Cooperative Investment by Value of Crop Input Business

	Value of Crop Input Business Volume		
Preference for Crop Inputs	< $25,000	$25,000 - $75,000	> $75,000
Don't Know	7.8%	5.0%	---%
Full Range Services	34.1	17.8	28.6
Competitively Priced Products	57.9	77.2	71.4
N	**126**	**101**	**28**

Cramer's V statistic: .150, Approx. Sig. 0.022; χ^2 statistic: 11.436 (d.f.=4), Asymp. Sig. 0.022

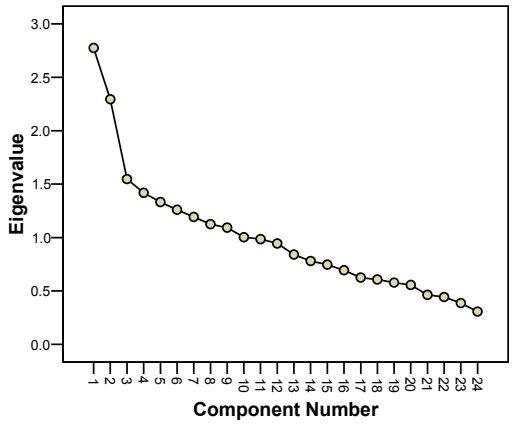
The strong preference for competitively priced input products, which has a shorter pay back period, indicates the "residual short-term" horizon problem may exist in Effingham Equity. Additional questions need to be asked to understand member's attitudes toward technologies that pay back over longer periods.

Multivariate data analysis will be used in the next sections to further test whether the horizon problem exists in Effingham Equity.

5.1.3. Factor Analysis of Effingham Equity Survey

Principal components factor analysis indicates a set of common underlying dimensions among the variables in the Effingham Equity data set. Since the determinant of the correlation matrix (.0326) is greater than the necessary value .00001, multicollinearity is not a problem for this data. The Bartlett's test of sphericity is highly significant (p<0.001) and therefore the factor analysis is appropriate. The Kaiser-Meyer-

Figure 5.1 Scree Plot for Principal Component Analysis of Effingham Equity Survey



Olkin measure of sampling adequacy (.616) indicates the patterns of correlations between variables are mediocre, so the factor analysis should provide reliable factors. The variables indicating the member's preference for equity redemption policy (.437) and rising input cost constraint (.473) have an individual KMO value less than 0.5.

Using the criterion to accept factors with eigen values greater than one, ten factors are retained for interpretation, which explain 62.7% of the total variance. Figure 5.1 indicates only two factors should be retained. Reducing the number of factors to two does not change the determinant and the overall KMO, so two factors will be retained (Table 5.63)

Table 5.64 indicates the statistical significant factor loadings for the component matrix of the Effingham Equity survey. Eight variables have a significant factor loading for the first principal component and explain 11.6% of the total variation. Six variables have significant loading for the second principal component and explain about ten percent of the total variation.

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Table 5.63 Eigen Values Greater than one and Total Variance Explained with Principal Component Analysis for Effingham Equity Survey

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	Percent of Variance	Cumulative Percent	Total	Percent of Variance	Cumulative Percent
1	2.774	11.567	11.56	2.655	11.064	11.06
2	2.294	9.559	21.12	2.413	10.055	21.12
3	1.547	6.445	27.56			
4	1.419	5.912	33.48			
5	1.332	5.550	39.03			
6	1.260	5.250	44.28			
7	1.193	4.970	49.25			
8	1.125	4.688	53.93			
9	1.093	4.554	58.49			
10	1.003	4.104	62.67			

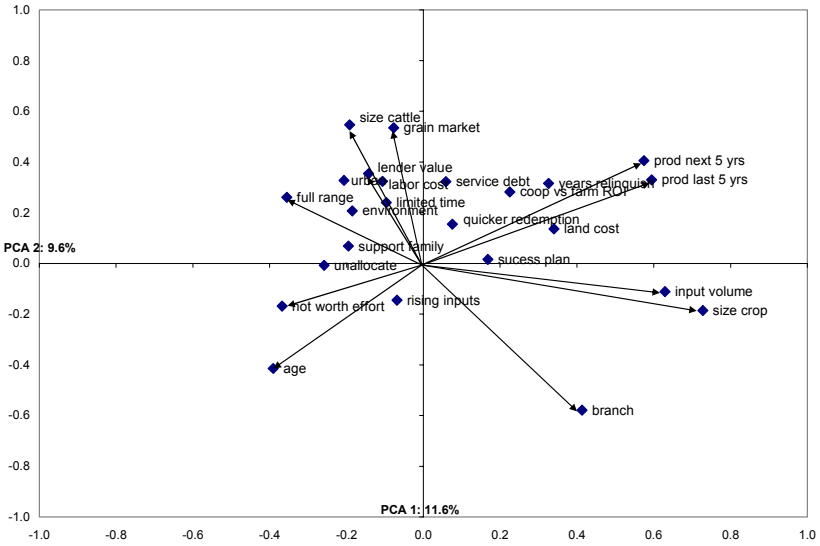
The relationship between variables for the principal component analysis can be seen easier in an X-Y scatter plot of the factor loadings in Figure 5.2. The scatter plot indicates which variables are correlated to the principal components (by a small angle between the variable's vector and the axis) and which variables may be highly correlated

Table 5.64 Loading Factors of Principal Components for Effingham Equity Survey

	Principal Component	
Variable	1	2
Size crop operation in acres	**.727**	
Crop Input Business Volume	**.629**	
Change in crop production last 5 years	**.595**	.330
Change in crop production next 5 years	**.575**	**.405**
Worth effort to understand investment	**-.368**	
Full Range vs. Competitively Priced Inputs	**-.356**	
Land cost/availability constraint	.340	
Years to relinquish	.326	.316
Branch location distance from Effingham	**.413**	**-.579**
Size cattle operation		**.546**
Percent grain market through cooperative		**.535**
Age	**-.391**	**-.414**
Lender Value		**.353**
Urban encroachment constraint		.327
Labor cost/availability constraint		.323
Capacity to service debt constraint		.323

to each other (by a small angle between two variable's vectors). Vectors that are orthogonal to each other indicate the variables are independent. The size of the crop operation and the value of crop inputs purchased from Effingham Equity are positively correlated with each other and with the first principal component. These variables are negatively correlated with the variable indicating preference for full range of crop input services versus competitively priced inputs. This indicates that the larger the crop operation or value of crop input business, the higher the preference for competitively priced inputs.

Figure 5.2 PCA1 and PCA2 for Effingham Equity Survey



The change in crop production in the last five years and the next five years are positively correlated with each other and with both principal components. Age and the variable indicating whether the cooperative investment is worth understanding are negatively correlated with growth in cropland production. As members increase their crop production, they have a stronger preference that the cooperative investment is worth understanding. Younger members are also likely to increase their crop operations.

The size of the cattle operation is positively correlated with the percent of the cooperative investment the member can borrow against. This indicates the larger dairy operations may have the flexibility to borrow against a higher percent of the market value of their investment. These variables are negatively correlated with the distance of the branch location. This indicates that the larger cattle operations are closer to Effingham headquarters. The branch location is also negatively correlated with the preference for full range of crop input services, indicating that members who conduct business with branch locations more than thirty miles from the headquarters tend to have higher preference for competitively priced crop input products.

In summary, hypothesis 2A is weakly supported by factor analysis because members who have higher value of crop input purchased with the cooperative tend toward preference that the cooperative investment is worth understanding. Hypothesis 4B is weakly supported because age is correlated with whether the investment is worth understanding, which indicates that older members perceive the investment is not worth understanding. The variable measuring the member's preference for equity redemption policy does not come up significant on either principal component. Therefore, hypothesis 1A, 3A and 3C are not supported with factor analysis. The variable indicating the ability to borrow against the cooperative investment is orthogonal to whether it is worth the effort to understand the investment, so hypothesis 2C is not supported. Succession plan, return on investment and years to relinquish control variables are not significant on either of the principal components so hypotheses 2B, 3B, and 4A are not supported by factor analysis. The next section analyzes the survey data with probit regression.

5.1.4. Probit Regression Results of Effingham Equity Survey

The analysis of an individual's attitudes regarding a particular topic, like investment preferences, typically results in developing a response variable, Y, which may be restricted to a small number of ordinal values. In this survey, respondents were asked to respond to several statements related to their investment preferences by indicated on a scale of one to seven their level of agreement or disagreement. An ordered dependent variable model is utilized to analyze the variation in the member's investment preferences. The independent variables can be grouped into categories:

1. Succession Plans: the number of years before the member plans to relinquish control over the farm (question 11); the member's plan for the farm after relinquish control (question 12), years a member of Effingham Equity (question 2) and age (question 10)
2. Growth: the ability for the member to borrow against his cooperative investment (question 8); crop production growth in the last five years (question 22); constraints for production growth in the last five years (question 35) and comparison of return on investment at cooperative level versus farm level (question 34)
3. Description of the Member: the type of grain farmer in terms of how acquire land (question 19), whether the member is specialized in grain or diversified in grain and livestock (derived from question 17) and the level of household income from farm versus non-farm sources (question 13)
4. Description of Member in terms of farm operation: the branch location the member conducts most of business (derived from question 14); the acres of land

farmed (question 20), and the value of crop inputs purchased annually from Effingham Equity (survey color)

The nominal variables listed above were coded as dummy variables. To identify the model correctly, at least one of the dummy indicators was removed for each variable. The ordinal independent variables were transformed using the terza method described in Chapter 4 and input as covariates. Ordinal probit regression was conducted using SPSS 12.0 for Windows.

To evaluate hypothesis 2 and 4B, the dependent variable is the respondent's answer to whether the cooperative investment is worth understanding with 1=is worth and 7=not worth. The χ^2-statistic for the regression model in Table 5.65 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected, however, the model only explains about twenty-four percent of the total variation.

Table 5.65 Ordinal Probit Regression Model Fitting Information for "It is Not Worth the Effort of trying to Understand the Composition of My Effingham Equity Investment"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	704.23				
Final	638.76	65.47	14	.000***	.236

N: 251; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The results for the ordinal probit regression model for the variable indicating whether the cooperative investment is worth understanding are shown in Table 5.66. Two variables indicating the level of member patronage (grain marketed through cooperative and small crop input volume) were significant at the five percent level. Members who market more grain through the cooperative tend toward the attitude their cooperative investment is worth the effort to understand, compared to members who do

not market grain through the cooperative. Members with small crop input volume tend toward the attitude their cooperative investment is not worth the effort to understand, compared to members who purchase more than $25,000 crop inputs from the cooperative. Hog farmers tend toward the investment being worth the effort to understand, which could indicate the importance of the cooperative to market the hogs or provide a feed source, whereas dairy farmers tend toward the investment not being worth the effort to understand. This supports hypothesis 2A at the five percent significance level. The

Table 5.66 Coefficients for Ordinal probit Regression Model, Dependent Variable: "It is Not Worth the Effort of trying to Understand the Composition of My Effingham Equity Investment"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Not Worth Investment = 1	.116	.312	.139	.710
Not Worth Investment = 2	.842	.315	7.162	.007***
Not Worth Investment = 3	1.189	.317	14.055	.000***
Not Worth Investment = 4	1.587	.321	24.420	.000***
Not Worth Investment = 5	2.050	.328	39.013	.000***
Not Worth Investment = 6	2.713	.348	60.943	.000***
Location				
Relinquish don't know	.806	.188	18.318	.000***
Relinquish < 5 years	.162	.215	.566	.452
Relinquish 5-10 years	.466	.213	4.377	.036**
Relinquish 10-15 years	.288	.247	1.366	.242
Hog Farmer	-.492	.214	5.303	.021**
Dairy Farmer	.516	.257	4.040	.044**
Small Crop Input Volume	.380	.140	7.347	.007***
Percent Grain Market to Cooperative	-.186	.078	5.656	.017**
Lender 0-15%	.179	.315	.323	.570
Lender 16-60%	-.433	.439	.972	.324
Lender 61-90%	1.366	.423	10.404	.001***
Lender Don't Know	.366	.279	1.714	.191
Off-farm opp. Constraint	1.316	.466	7.974	.005***
Support family constraint	-.603	.244	6.121	.013**

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

succession plan variable was not significant in the model, so hypothesis 2B cannot be rejected.

Respondents who can borrow sixty-one to ninety percent of the market value of their allocated retained earnings tend toward perceiving their investment is not worth understanding, compared to respondents who can borrow more than ninety percent. Therefore, the results weakly support Hypothesis 2C that states the "inability to borrow against their cooperative investment will be positively associated with attitude that the cooperative investment is not worth understanding".

Respondents who do not know when they will relinquish control and who plan to relinquish control in six to ten years tend toward the investment not being worth the effort to understand compared to respondents who plan to relinquish control in more than fifteen years. The variable is not significant for respondents who plan to relinquish control in less than five years. Therefore, hypothesis 4B, which states members closer to retirement will be negatively associated with preference for no further cooperative investment, is weakly supported.

Hypothesis 1A, 3A and 3C can be evaluated with the dependent variable being the respondent's preference for the equity redemption policy with 1=higher cash patronage refund and 7=quicker redemption. The respondents who indicated indifferent or did not have an opinion were removed from the model specification. The χ^2-statistic for the regression model in Table 5.67 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model explains about 15.5% of the total variation in preference for equity redemption policy.

Table 5.67 Effingham Equity Ordinal probit Regression Model Fitting Information for "I Most Prefer the board chooses a policy that pays 1=Higher Cash Patronage Refund today, 4=Same as current policy, 7=Quicker Redemption of Allocated Retained Earnings"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	631.42				
Final	599.34	32.07	11	.001***	.155

N: 198; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for equity redemption policy are shown in Table 5.68. The coefficients on the variables indicating less than ten years until relinquish control are statistically significant at the five percent level. Respondents who have less than ten years until relinquishing

Table 5.68 Effingham Equity Coefficients for Ordinal probit Regression Model, Dependent Variable: "I Most Prefer the board chooses a policy that pays 1=Higher Cash Patronage Refund today, 4=Same as current policy, 7=Quicker Redemption of Allocated Retained Earnings"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Equity Redemption Plan = 1	-.667	.168	15.674	.000***
Equity Redemption Plan = 2	-.413	.164	6.336	.012**
Equity Redemption Plan = 3	-.259	.162	2.534	.111
Equity Redemption Plan = 4	.992	.172	33.412	.000***
Equity Redemption Plan = 5	1.250	.177	50.012	.000***
Equity Redemption Plan = 6	1.936	.201	92.597	.000***
Location				
Relinquish don't know	.646	.218	8.743	.003***
Relinquish < 5 years	.827	.252	10.779	.001***
Relinquish 5-10 years	.500	.237	4.448	.035**
Relinquish 10-15 years	.281	.270	1.087	.297
Change in Crop Production last 5 years	-.102	.084	1.475	.225
Percent Grain Market to Cooperative	-.137	.085	2.561	.110
Lender Value	.122	.095	1.651	.199
Sell Farm, Family not Farm	.445	.284	2.451	.117
Allocated vs. Unallocated	-.237	.080	8.766	.003***
Capacity to Service Debt constraint	.306	.229	1.787	.181
Support family constraint	-.475	.269	3.123	.077*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

control tend toward a preference for a quicker redemption compared to respondents who have more than fifteen years until they relinquish control. This supports hypothesis 1A, which states the "number of years until retirement will be negatively associated with preference for quicker redemption of older equities".

Respondents who limited production growth due to the cost of supporting their family tend toward a preference for higher cash patronage refund today. This supports hypothesis 3A at the ten percent level, which states the "constraint from high current cash obligations will be positively associated with preference for higher cash patronage refunds".

The variable indicating member's ability to borrow against their cooperative shares is not statistically significant so the model does not support hypothesis 3C, which states the "inability to borrow against the cooperative investment will be positively associated with preference for higher cash patronage refunds".

The respondent's preference for competitively priced inputs that provide quick return to the member can test hypotheses H_{3B} and H_{4A}. The dependent variable is the respondent's preference for crop input products versus services with 1=competitively priced products and 7=full range of services. The χ^2-statistic for the regression model in Table 5.69 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model only explains about 16% of the total variation in preference for crop input products or services.

Table 5.69 Effingham Equity Ordinal probit Regression Model Fitting Information for "I Prefer the Cooperative Provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	799.81				
Final	758.55	41.26	10	.000***	.163

N: 239; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for crop input products or services are shown in Table 5.70. None of the coefficients for number of years to relinquish control are statistically significant so the model does not support hypothesis 4A. The coefficients representing high current cash obligations are not statistically significant so the model does not support hypothesis 3B.

Table 5.70 Effingham Equity Coefficients for Ordinal probit Regression Model, Dependent Variable: "I Prefer the Cooperative Provide a Full Range of Crop Input Services Rather than Competitively Priced Crop Input Products"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Crop Input Preference = 1	-1.438	.200	51.634	.000***
Crop Input Preference = 2	-.629	.189	11.038	.001***
Crop Input Preference = 3	-.312	.188	2.767	.096*
Crop Input Preference = 4	.211	.188	1.260	.262
Crop Input Preference = 5	.593	.192	9.559	.002***
Crop Input Preference = 6	1.255	.214	34.464	.000***
Location				
Dairy Farmer	.668	.257	6.744	.009***
Lender Value	.087	.088	.958	.328
Household Income	.165	.077	4.612	.032**
Branch <30 miles	-.318	.193	2.717	.099*
Branch >30 miles	-.570	.200	8.138	.004***
Percent Crop Input Purchase from coop	.130	.078	2.787	.095*
Coop ROI greater	-.434	.288	2.269	.132
Farm ROI greater	-.455	.146	9.681	.002***
Sell Farm, Family not Farm	-.268	.263	1.032	.310
Other succession plans	-.851	.504	2.853	.091*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

The negative coefficient on the variable for return on investment indicate that a respondent whose on-farm return on investment is greater than cooperative return on investment tends toward preference for competitively priced crop inputs compared to respondents who did not know or seldom think about which return is greater. Dairy farmers tend toward the preference for full range of crop input services compared to other members.

Respondents who conduct business with a branch location more than thirty miles from the Effingham headquarters tend toward preference for competitively priced inputs compared to members who conduct business with the headquarters. Respondents with a higher percent of household income from non-farm sources tend toward preference for full range of crop input products. The next section uses cluster analysis to group the respondents in different clusters.

5.1.5. Cluster Analysis of Effingham Equity Survey

The cluster analysis can separate respondents into similar groups. A hierarchical procedure using a Ward's method algorithm of all respondents resulted in two or five clusters. The largest percentage increase in clustering coefficient occurs in going from two to one clusters and the next noticeable change occurs in combining three to two clusters and six to five clusters (Table 5.71).

The two clusters have significantly different means for five variables. The five clusters have significantly different means for thirteen variables. The question about preference for equity redemption plan is statistically significant in both clusters. The variable about cooperative investment being worth the effort to understand is significant

Table 5.71 Analysis of Agglomeration Coefficient for Hierarchical Cluster Analysis of Effingham Equity Survey

Number of Clusters	Agglomeration Coefficient	Percent Change in Coefficient to next level	Change in Percent
10	4101.91	2.54	-0.36
9	4205.98	2.90	-0.30
8	4327.89	3.20	-0.19
7	4466.24	3.39	-0.04
6	4617.55	3.43	**-2.85**
5	4775.79	6.28	0.15
4	5075.51	6.12	-1.14
3	5386.32	7.26	**-8.15**
2	5777.46	15.41	**15.41**
1	6667.98	---	---

in the group of five clusters. The preference for crop input product or services is significant in the group of five clusters. Variables with statistically significant means for the two clusters are indicated in Table 5.72.

Table 5.72 Means for Significant Variables for the Two Clusters of Effingham Equity Survey

	Two Clusters (means)	
Variable	1	2
Equity Redemption Plan	0.46	**4.72**
Unallocated vs. Allocated	3.91	3.47
On-Farm ROI Greater (%)	34.3	**49.0**
Herd Cost constraint (%)	5.7	---
Land Cost constraint (%)	54.3	**73.0**
N	**70**	**146**

Respondents in cluster 1 do not have an opinion for equity redemption plan, are indifferent to the choices or prefer a higher cash patronage refund. Respondents in cluster 2 prefer quicker redemption of retained equities or prefer the current equity redemption policy. Cluster 2 respondents tend to have a higher percentage of respondents who limited their crop production in the last five years due to land cost or

availability. Cluster 2 also has a higher percent of respondents who perceive their on-farm return on investment is greater than the cooperative return on investment.

The five clusters divide Cluster 1 into two clusters, 1a and 1b, and divides Cluster 2 into three clusters, 2a, 2b, and 2c (Table 5.73). Cluster 1a tends to be an older group of respondents who have a lower number of years, on average, before they plan to relinquish control. A higher percent of respondents in cluster 1a indicate they conduct business primarily with the headquarters and purchase less than $25,000 in crop inputs annually. A greater percent of the respondents in this cluster do not have an opinion about the equity redemption plan or prefer higher cash patronage refund today. A greater percent of respondents in this cluster limited production growth in the last five years due to cost to support the family.

Cluster 1b represents the younger farmers who had the most aggressive crop production in the last five years and expect to have the most aggressive growth in the next five years. The highest percent of respondents in this cluster prefer competitively priced inputs. About half of the respondents in cluster 1b conduct business with a branch location within thirty miles from the headquarters. About half the respondents in this cluster preferred higher cash patronage refund today, but the other half did not have an opinion. The respondents in this cluster, on average, perceive it is worth the effort to understand their investment.

Cluster 2a represents respondents who purchase, on average, a higher value of crop input products/services from the cooperative. This cluster has the highest percent of respondents who prefer full range of timely delivered crop inputs. More than half of the

respondents in this cluster prefer the current equity redemption plan and tend toward perceiving the investment is worth understanding.

Table 5.73 Means for Significant Variables for the Five Clusters of Effingham Equity survey

	Five Clusters (means)				
Variable	1a	1b	2a	2b	2c
Age	**4.7**	2.9	3.9	3.8	3.6
Years to Relinquish	1.6	**6.6**	5.8	2.6	-0.1
Growth Crop last five years	2.8	**4.4**	3.3	2.7	3.1
Growth Crop last five years	2.6	**3.6**	3.1	3.1	2.7
Branch Effingham (%)	**33.3**	12.9	18.9	24.3	8.6
Branch < 30 miles (%)	41.0	**54.8**	40.5	48.7	42.9
Branch > 30 miles (%)	25.6	32.3	40.5	27.0	**48.6**
Support family constraint (%)	**23.1**	6.5	6.8	5.4	20.0
Land cost constraint (%)	48.7	61.3	**78.4**	64.9	71.4
Unallocated vs. Allocated	**4.5**	3.2	3.6	3.7	3.0
Large crop input volume (%)	10.3	12.9	**13.5**	5.4	8.6
Medium crop input volume %	25.6	41.9	**52.7**	32.4	40.0
Small crop input volume (%)	**64.1**	45.2	33.8	62.2	51.4
Equity Redemption Plan	0.3	0.6	4.6	**4.9**	4.7
Not worth effort understand	4.1	2.2	2.0	**5.6**	2.0
Prefer crop input services (%)	23.1	9.7	**35.1**	32.4	25.7
Prefer crop input products (%)	64.1	**90.3**	62.2	56.8	74.3
Crop input service vs. products	3.6	2.6	3.2	**3.8**	2.5
N	**39**	**31**	**74**	**37**	**35**

Cluster 2b represents members who tend toward perceiving the investment is not worth understanding. About one-third of the respondents in this cluster prefer quicker redemption of allocated retained earnings. About one-third of the respondents in this cluster prefer full range of crop input services. The respondents in this cluster expect to grow at a faster rate, on average, in the next five years compared to the last five years.

Cluster 2c represents members who do not know when they plan to relinquish control or have already relinquished control. About half of the respondents in this cluster conduct most of their business with a branch location more than thirty miles from the headquarters. About thirty-seven percent of the respondents in this cluster prefer quicker

redemption of their allocated retained earnings. The respondents in this cluster tend to perceive their investment is worth understanding. About three-fourths of the respondents prefer competitively priced crop input products and one-fourth prefer full range of timely delivered crop input services.

If the respondents who did not have an opinion for equity redemption plan are removed from the analysis, the five clusters have means as shown in Table 5.74. Cluster 1 includes younger members with more years to relinquish control, larger crop operations

Table 5.74 Means for Significant Variables for the Five Clusters of Effingham Equity survey without Respondents indicating don't know or indifferent for equity redemption plan

	Five Clusters (means)				
Variable	1	2	3	4	5
Age	2.9	**4.3**	4.0	4.0	3.3
Years to Relinquish	**6.4**	5.5	0.7	4.9	-0.1
Growth Crop last five years	4.3	3.0	2.7	**4.9**	4.8
Growth Crop last five years	**4.1**	2.8	2.4	3.5	2.9
Lender Value	-0.1	0.4	-0.2	**1.1**	-0.6
Size Crop Operation	**3.7**	**3.7**	2.6	2.9	3.5
Size Cattle Operation	2.0	1.4	2.0	**2.1**	1.3
Support family constraint (%)	2.3	7.7	20.5	4.5	**21.4**
Service debt constraint (%)	16.3	9.6	5.1	18.2	**32.1**
Unallocated vs. Allocated	3.1	3.8	**4.5**	3.1	2.8
No livestock (%)	23.3	**71.2**	35.9	50.0	64.3
Beef cattle farmer (%)	**58.1**	1.9	51.3	4.6	14.3
Dairy cattle farmer (%)	4.7	9.6	10.3	**22.7**	---
Hog Farmer (%)	14.0	17.3	2.6	**22.7**	21.4
Large crop input volume (%)	**18.6**	13.5	7.7	---	7.1
Medium crop input volume %	39.5	**55.8**	25.6	31.8	39.3
Small crop input volume (%)	41.9	30.8	66.7	**68.2**	53.6
Equity Redemption Plan	2.7	**4.9**	3.3	**4.9**	**4.8**
Not worth effort understand	2.0	1.9	4.1	**5.9**	2.0
Prefer crop input services (%)	11.6	**44.2**	23.1	36.4	32.1
Prefer crop input products (%)	**86.1**	53.9	64.1	59.1	67.9
Crop input service vs. products	2.6	3.3	3.3	**4.1**	3.1
N	**43**	**52**	**39**	**22**	**28**

and a higher percent of beef cattle farmers. The respondents in cluster 1 tend to perceive the investment is worth understanding, 46% prefer higher cash patronage refunds today and 86% prefer competitively priced crop input products.

Cluster 2 represents older members who purchase a higher value of crop input products from Effingham Equity and believe the cooperative investment is worth understanding. A higher percent of respondents in this cluster prefer the cooperative provide a full range of timely delivered crop input services. About one-third of the respondents in this cluster prefer quicker redemption of allocated equities.

Cluster 3 represents a higher proportion of members who purchase less than $25,000 of crop input products from the cooperative, who have the smallest crop production growth amongst all clusters and have a higher preference toward unallocated retained earnings.

Cluster 4 represents members who had aggressive crop production growth in the last five years. About one-fourth of the members in this cluster are dairy cattle farmers and another fourth are hog farmers. The members in this cluster purchase a smaller value of inputs from the cooperative and tend toward perceiving the cooperative investment not being worth understanding. About 46% of the respondents in this cluster prefer quicker redemption of allocated retained earnings.

Cluster 5 represents a higher proportion of members who do not know when they plan to relinquish control and appear to be more constrained by cost to support family and the capacity to service debt. The respondents in this cluster tend toward believing the cooperative investment is worth understanding yet 42% of the respondents prefer quicker redemption of allocated retained earnings.

The cluster analysis grouped the respondents based on whether the cooperative investment is worth understanding. In addition, the cluster analysis grouped respondents based on preference for equity redemption plan and crop input product vs. services. Therefore, cluster analysis indicates that the horizon problem may be more severe for certain clusters of members in Effingham Equity.

5.1.6. Summary

The descriptive and inferential statistics regarding variables related to the horizon problem indicate the attitude toward whether the cooperative investment is worth understanding is related to years to relinquish control, crop input volume, and percent of hogs marketed through the cooperative. The factor analysis indicates that older members tend toward the investment not being worth understanding. The ordinal probit regression also indicate the statistical significance of years to relinquish, the value lender places on cooperative investment, and level of grain marketed through the cooperative.

Members, who purchase a higher volume of crop inputs from the cooperative, or market a higher percent of grain or hogs through the cooperative, indicate a lower score toward the investment being worth understanding, which supports hypothesis 2A. The coefficient for lender value is only significant in the regression results. Some members who can borrow against their cooperative investment tend toward the investment not being worth understanding, whereas other members tend toward the investment being worth understanding. Therefore, the model weakly supports hypothesis 2C. Respondents who plan to relinquish control in five to ten years perceive the investment is not worth the effort to understand when compared to respondents who plan to relinquish control in

more than fifteen years, which weakly supports hypothesis 4B. Hypothesis 2B is not supported since the succession plan variable is not significant in the model.

The descriptive and inferential statistics indicate the preference for equity redemption plan is related to years to relinquish control, change in crop production in the last five years and cost to support family constraint. The preference for equity redemption plan was not correlated with the principal component factors in factor analysis. In ordinal probit regression, years to relinquish control and cost to support family constraint are statistically significant as in the descriptive statistics. Respondents with fewer years before they relinquish control tend toward a preference for quicker redemption, which supports hypothesis 1A. Respondents who limited their production growth due to the cost to support the family tended toward higher cash patronage refund today, which supports hypothesis 3A. The lender value variable was not statistically significant for the model, so hypothesis 3C is not supported.

The descriptive and inferential statistics indicate that the preference for crop input products vs. services is correlated with the branch location, size of crop operation, and return on investment variable. The factor analysis indicates the variable was significantly related to the branch location, size of the crop operation and the value of crop inputs purchase from the cooperative. The ordinal probit regression also indicates on-farm ROI is significant in the model. Respondents who have a greater on-farm ROI compared to the cooperative ROI tend toward preference for competitively priced crop input products. The years to relinquish control and constraints indicating high cash obligations are not significant in the model, so hypotheses 3B and 4A are not supported.

The cluster analysis indicates the membership might be separated into two or five clusters. The first separation into clusters identifies a group who prefers higher cash patronage refund today or does not have an opinion for an equity redemption plan. The second cluster represents members who prefer the current equity redemption plan or quicker redemption of allocated retained earnings.

The separation of the members into five clusters separated the members more distinctly on whether the investment is worth understanding and the preferences for crop input products or services. The members who felt the Effingham Equity investment was not worth understanding also had a higher preference toward quicker redemption and a lower preference for competitively priced crop input products. The members who had the highest preference for competitively priced crop input products were the youngest group with the most number of years before relinquishing control.

When the respondents who did not have an opinion about the equity redemption policy were removed, the five clusters separated the members more distinctly on equity redemption plan preference, whether the investment is worth understanding and the preferences for crop input products or services. The members who felt the Effingham Equity investment was not worth understanding (cluster 4) also had a higher preference toward quicker redemption and a higher preference for timely delivered crop input services. The members in cluster 4 had purchased a smaller volume of crop inputs from the cooperative and represented a higher percent of dairy and hog farmers. The members who had the highest preference for competitively priced crop input products (cluster 1) had the greatest preference for higher cash patronage refund today and were the youngest

group with the most number of years before relinquishing control. Members in cluster 1 had larger crop operations and a higher percent of beef farmers.

The results from the Effingham Equity survey indicate evidence the "wait-to-receive" horizon problem exists – hypothesis 1A is supported with both descriptive statistics and probit regression. The results indicate weak evidence that the "hassle" horizon problem exists – hypothesis 2A is supported by descriptive statistics, factor analysis and regression, hypothesis 2B is not supported and hypothesis 2C is weakly supported with probit regression. The results indicate weak evidence the "current obligation" horizon problem exists – hypothesis 3A is weakly supported with descriptive statistics and regression, and hypotheses 3B and 3C are not supported. The results indicate weak evidence the "short-term residual" horizon problem exists – hypothesis 4A is not supported but hypothesis 4B is supported with descriptive statistics, factor analysis and regression.

5.2. West Central Cooperative Survey Results

The West Central survey (Appendix 1B) consisting of thirty-seven questions was sent to about 910 West Central members in April 2005. Different subgroups of members received different colors of surveys[17].

Between April and May 2005, one hundred sixty-four surveys were returned to the University of Missouri. Four surveys were returned blank resulting in one hundred sixty completed surveys. This represents an overall 17.6% response rate (160

[17] Due to FedEx not delivering the boxes intact, the large and the small grain member received surveys that did not match the intended colors.

respondents / 910 members), which represents about five percent of the entire membership.

Respondents who indicate they expect to produce hogs or beef cattle (question 17) are classified as a 'hog' or 'beef' member. Table 5.75 indicates that almost sixty percent of the respondents grow only corn and soybeans, another thirty-one percent raise beef cattle and seventeen percent raise hogs.

Table 5.75 West Central Frequency Table by Type of Farmer

Type of Farmer	Frequency	Percent	Valid Percent	Cumulative Percent
Only Crop Farmer	95	59.4	59.7	59.7
Crop and Beef Farmer	37	23.1	23.2	83.0
Crop and Hog Farmer	15	9.4	9.4	92.5
Crop/Hog and Beef	12	7.5	7.5	100.0
Total	159	99.4	100.0	
Missing	1	0.6		
N	**160**	100.0		

Using the middle point of each category in question 22, the approximate number of acres represented by the respondents can be calculated by multiplying the number of respondents in each category by the approximate average acres in each category. The 160 respondents represent about two percent of total farms in the ten counties but farm approximately 198,750 acres, which is about 6.6% of the total corn and soybean acres in West Central's ten county territory (2002 US Census of Agriculture). Therefore, the respondent's answers are assumed to represent the total population of West Central members.

The next section provides a general description of the 160 respondents. Descriptive statistics help describe the respondents in terms of the size and location of farm, growth plans, age of respondent, type of operator, succession plans, and constraints

for production growth. Section 5.2.2 helps inform the horizon problem with descriptive and inferential statistics. Sections 5.2.3 to 5.2.5 use multivariate data analysis to support or reject the hypotheses in Chapter 2.

5.2.1. Description of West Central Cooperative Respondents

About 48% of the respondents conduct their business primarily with branch locations that have 100-car load out facilities on the Union Pacific Railroad (question 16, Table 5.76). About 23% of the respondents conduct business with a branch location that has twenty-five to seventy-five car load-out facilities, and about 29% conduct business primarily with branch locations that do not have any railroad facilities.

Table 5.76 Frequency Table of West Central's Respondent's Branch Location

Branch Location	Frequency	Percent	Valid Percent	Cumulative Percent
No railroad	46	28.8	28.8	28.8
25 – 75 car load-out	37	23.1	23.1	51.9
100 car unit train	77	48.1	48.1	100.0
Total	160	100.0	100.0	

The average size farm of the respondents is approximately 1,200 acres, which is in the 1,001 to 1,500 acre category (question 22, Table 5.77). This is almost two and one-half times the 488 acres average size farm of harvested cropland in West Central's ten county market territory (USDA, 2004). Therefore, the respondents are, on average, larger than the typical farmer in this area.

Respondents with smaller crop operations tend to market a higher percent of grain through West Central (question 25, Table 5.78). About 63% of the respondents with more than 1,000 acres marketed less than three-fourths of their grain through the

cooperative, compared to 30% of respondents with less than 500 acres and 53% of the respondents with 500-1,000 acres.

Table 5.77 Frequency Table of West Central's Respondent's Size of Crop Operation

Size of Crop Operation	Frequency	Percent	Valid Percent	Cumulative Percent
Fewer than 500 acres	20	12.5	12.7	12.7
500 – 1,000 acres	54	33.8	34.4	47.1
1,001 – 1,500 acres	36	22.5	22.9	70.1
1,501 – 2,000 acres	25	15.6	15.9	86.0
2,001 – 2,500 acres	9	5.6	5.7	91.7
2,501 – 4,000 acres	11	6.9	7.0	98.7
More than 4,000 acres	2	1.3	1.3	100.0
Total	157	98.1	100.0	
Missing	3	1.9		
N	**160**	100.0		

Table 5.78 Percent of Grain Market through West Central by Size of Crop Operation

Percent of Grain Market	Size of Crop Operation			
	< 500 acres	501-1,000	1,001-2,000	> 2,000 acres
Don't Know	5.0%	---%	---%	---%
1 – 30%	5.0	1.9	14.8	13.6
31 – 75%	25.0	51.9	47.5	50.0
76 – 90%	15.0	9.3	21.3	31.8
Greater than 90%	50.0	37.0	16.4	4.5
N	**20**	**54**	**61**	**22**

Cramer's V statistic: .267, Sig. 0.001

Respondents with larger crop operations tend to purchase a higher percent of crop inputs from West Central (question 28, Table 5.79). About 86% of the respondents with more than 2,000 acres purchased at least some of their crop inputs from West Central compared to 70% of respondents with fewer than 2,000 acres.

Between 1997 and 2002, the number of harvested acres in West Central's ten county market territory increased by about one percent (USDA, 2004). The median

Table 5.79 Percent of Crop Inputs Purchase from West Central by Size of Crop Operation

	Size of Crop Operation			
Percent of Crop Inputs	< 500 acres	501 – 1,000	1,001 – 2,000	> 2,000
Don't Know	10.0%	---%	---%	---%
None	20.0	29.6	31.1	13.6
1 – 30%	25.0	25.9	26.2	18.2
31 – 75%	20.0	22.2	24.6	50.0
76 – 90%	15.0	11.1	6.6	---
Greater than 90%	10.0	11.1	11.5	18.2
N	**20**	**54**	**61**	**22**

Cramer's V statistic: .236, Sig. 0.035

respondent increased crop production 1-10% over the last five years (Table 5.80, question 23), and the median respondent plans to increase crop production 1-10% in the next five years (question 24).

Table 5.80 Frequency Table of West Central Respondent's Change in Crop Production in Last Five Years

Change in Crop Production Last 5 Years	Frequency	Percent	Valid Percent	Cumulative Percent
Decreased	8	5.0	5.0	5.0
Stayed Same	60	37.5	37.7	42.8
Increased 1-10%	25	15.6	15.7	58.5
Increased 11-20%	28	17.5	17.6	76.1
Increased 21-30%	17	10.6	10.7	86.8
Increased 31-40%	6	3.8	3.8	90.6
Increased 40%+	15	9.4	9.4	100.0
Total	159	99.4	100.0	
Missing	1	0.6		
N	**160**	100.0		

The respondent's expected rate of growth for the next five years is similar to the growth rate over the last five years (Table 5.81). About 41% of the respondents expect to grow at the same rate in the next five years as in the last five years. About 38.5% expect to decrease their rate of growth and 20.5% expect to increase their rate of growth.

Table 5.81 Growth of Crop Production for West Central Respondents in next 5 years by Growth of Crop Production in last 5 years

	Growth of Crop Production in **last** 5 years						
Growth of crop Production **next** 5 years	Decreased	Stayed Same	Increased 1-10%	Increased 11-20%	Increased 21-30%	Increased 31-40%	Increased > 40%
Decrease	50.0%	8.6%	4.2%	3.6%	---%	---%	---%
Stay Same	25.0	60.3	37.5	17.9	29.4	16.7	33.3
Increase 1-10%	12.5	19.0	37.5	28.6	35.3	16.7	---
Increase 11-20%	12.5	5.2	12.5	35.7	11.8	33.3	20.0
Increase 21-30%	---	6.9	4.2	10.7	17.6	33.3	13.3
Increase 31-40%	---	---	4.2	---	5.9	---	13.3
Increase > 40%	---	---	---	3.6	---	---	20.0
N	**8**	**58**	**24**	**28**	**17**	**6**	**15**

Cramer's V statistic: .319, Sig. 0.000

The change in crop production in the last five years appears to differ based on the size of the crop operation (Table 5.82). About 77% of the respondents with farms smaller than 500 acres plan to stay the same size over the next five years or decrease crop production. In comparison, only 40% of the respondents with 500 to 1,000 acres, thirty-eight percent of respondents with 1,000 to 2,000 acres and twenty-five percent of respondents with more than 2,000 acres plan to stay the same size or decrease crop production over the next five years.

Table 5.82 West Central Growth of Crop Production during last 5 years by Size of Crop Operation

Change in crop Production **last** 5 years	Size of Crop Operation (acres)						
	< 500	501-1,000	1,001-1,500	1,501-2,000	2,001-2,500	2,501-4,000	> 4,000 acres
Decrease	10.0%	9.3%	---%	4.0%	---%	---%	---%
Stay Same	80.0	50.0	30.6	20.0	11.1	---	---
Increase 1-10%	10.0	13.0	16.7	24.0	11.1	18.2	---
Increase 11-20%	---	16.7	25.0	8.0	66.7	9.1	50.0
Increase 21-30%	---	3.7	11.1	12.0	---	54.5	50.0
Increase 31-40%	---	1.9	8.3	8.0	---	---	---
Increase > 40%	---	5.6	8.3	24.0	11.1	19.2	---
N	**20**	**54**	**36**	**25**	**9**	**11**	**2**

Cramer's V statistic: .313, Sig. 0.000

Regarding the respondent's plans to retire from farming, the median respondent was in the 11-15 year category (Table 5.83). About 12.6% of the respondents do not know when they plan to relinquish control over their farm (question 13). About one third plan to relinquish control in more than 15 years. The range of responses suggests these members might have different preferences for investments related to the horizon problem, which will be discussed in the next section.

When asked the succession plan the respondent is considering for their farming operation (question 14), there was a range of responses. About 14.4% of the respondents indicated they do not have a succession plan. About 26.9% plan to maintain ownership, about 29.4% plan to leave the farm to family who will continue to farm, and another 6.9% are considering both of these options. About 4.4% plan to sell the farm and 13.1% plan to leave the farm to their family who will not continue to farm. About 3.1% are considering other succession plans. This indicates there may be differences of preferences regarding the indicators for the horizon problem.

Table 5.83 Frequency Table of West Central Respondent's Years before Relinquishing Control

Years to Relinquish Control over farm	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	20	12.5	12.6	12.6
Already Relinquished	6	3.8	3.8	16.4
< 1 Year	1	0.6	0.6	17.0
1-2 Years	4	2.5	2.5	19.5
3-5 years	18	11.3	11.3	30.8
6-10 years	21	13.1	13.2	44.0
11-15 years	32	20.0	20.1	64.2
> 15 years	57	35.6	35.8	100.0
Total	159	99.4	100.0	
Missing	1	0.6		
N	**160**	100.0		

The median respondent is between 51 and 55 years (question 12). About 38% of the respondents are younger than 50 and about 20% are older than 65 years (Table 5.84). This suggests that age might be a dimension to consider when describing the horizon problem.

Table 5.84 West Central Frequency Table of Respondent's Age

Respondent's Age in years	Frequency	Percent	Valid Percent	Cumulative Percent
< 40	16	10.0	10.1	10.1
41-45	24	15.0	15.1	25.2
46-50	21	13.1	13.2	38.4
51-55	31	19.4	19.5	57.9
56-60	19	11.9	11.9	69.8
61-65	17	10.6	10.7	80.5
> 65	31	19.4	19.5	100.0
Total	159	99.4	100.0	
Missing	1	0.6		
N	**160**	100.0		

A comparison of the respondent's age with the type of crop farmer (question 21) indicates that respondents who are primarily owners, on average, are older than

Table 5.85 West Central Age of Respondent by Type of Crop Farmer

	Type of Grain Farmer					
Age of Respondent	Owner	Owner/ Cash Rent	Crop Share	Crop Share/Rent	Rent	Owner/Rent/Share
Younger than 40	6.6%	11.1%	---%	---%	25.0%	---%
41-45	11.5	11.1	17.9	14.3	18.2	18.8
46-50	13.1	22.2	5.9	14.3	15.9	12.5
51-55	11.5	11.1	35.3	28.6	22.7	18.8
56-60	9.8	11.1	5.9	28.6	11.4	18.8
61-65	16.4	22.2	11.8	---	4.5	6.3
Older than 65	31.1	11.1	23.5	14.3	2.3	25.0
N	**61**	**9**	**17**	**7**	**44**	**16**

Cramer's V statistic: .234, Sig. 0.071

respondents who crop share or cash rent (Table 5.85). When the respondent is younger, he might cash rent until he can purchase land.

Members were asked to indicate whether the lender accepts the stock in West Central as collateral (question 8, Table 5.86). About twenty-one percent of the respondents do not have any debt. About one-third of the respondents indicated the lender *does not* accept their stock as collateral and about thirteen percent of the respondents indicate the lender *does* accept the stock as collateral.

Members were also asked to indicate the percent of the stock they could borrow against (question 9, Table 5.87). About half of the respondents who have debt do not know what percent of the market value against which they can borrow. About one-fourth of the respondents who have debt indicated the lender values the stock at zero percent of the market value. About fourteen percent of the respondents who have debt indicate the lender values the shares at more than forty-five percent of its market value.

Table 5.86 Frequency Table of "My Lender Accepts my Stock in West Central Cooperative as Collateral"

Stock as Collateral	Frequency	Percent	Valid Percent	Cumulative Percent
Don't have debt	33	20.6	20.8	20.8
1 – Strongly disagree	27	16.9	17.0	37.7
2	24	15.0	15.1	52.8
3	13	8.1	8.2	61.0
4 – Don't Know	29	18.1	18.2	79.2
5	12	7.5	7.5	86.8
6	10	6.3	6.3	93.1
7 – Strongly agree	11	6.9	6.9	100.0
Total	159	99.4	100.0	
Missing	1	0.6		
N	**160**	100.0		

Farming is an important source of revenue for the majority of the respondents, although 11% of the respondents generate less than half of their household income from

Table 5.87 Frequency Table of How the Lender Values the Stock in West Central relative to the Market Value

Percent of Market Value	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	67	41.9	51.9	51.9
0 %	36	22.5	27.9	79.8
1 - 15%	5	3.1	3.9	83.7
16 – 30%	2	1.3	1.6	85.3
31 – 45%	---	---	---	85.3
46 – 60%	3	1.9	2.3	87.6
61 – 75%	---	---	---	87.6
76 – 90%	3	1.9	2.3	89.9
> 90%	13	8.1	10.1	100.0
Total	129	80.6	100.0	
NA	29	18.1		
Missing	2	1.3		
N	**160**	100.0		

farm sources (question 15, Table 5.88). The median respondent generates seventy to eighty percent of their household income from farm sources.

Table 5.88 West Central Frequency Table of Respondent Percent of Household Income from Farm Sources

Percent of Household Income from Farm	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	2	1.3	1.3	1.3
< 40%	8	5.0	5.0	6.3
41 – 50%	10	6.3	6.3	12.5
51 – 60%	22	13.8	13.8	26.4
61 – 70%	19	11.9	11.9	38.4
71 – 80%	22	13.8	13.8	52.2
81 – 90%	24	15.0	15.1	67.3
> 90%	52	32.5	32.7	100.0
Total	159	99.4	100.0	
Missing	1	0.6		
N	**160**	100.0		

The respondents generate, on average, about eighty-seven percent of their farm revenue from grain and twelve percent of their farm revenue from livestock (question 18 to 20). Crop farmers generate a higher percent of their farm revenue from grain

compared to livestock farmers (Table 5.89). Of the livestock farmers, the diversified beef and hog farmers generate the highest percent of farm revenue from livestock. From 1999 to 2004, the farm revenue from livestock for hog farmers decreased by 6.5%. From 2004 to 2009, hog farmers expect to reduce their farm revenue from livestock by about two percent and increase their grain revenue by the respective amounts. The remaining revenue each year might be for a forage crop, specialty crop or a result of the percentages in the respondent's surveys not summing to one hundred. The reduction in number of respondents from 2004 to 2009 is mostly due to uncertainty of plans in five years.

Table 5.89 West Central Average Farm Revenue from Grain and Livestock by Type of Operator

Grain or Livestock Revenue by Year	Type of Operator				
	Crop	Beef	Beef/Hogs	Hogs	Total
Grain Revenue 1999	94.0%	76.6%	50.6%	59.9%	83.6%
Livestock Revenue 1999	4.6	22.6	48.9	40.0	15.3
N 1999	**89**	**35**	**10**	**15**	**149**
Grain Revenue 2004	98.0%	77.7%	54.6%	66.5%	87.0%
Livestock Revenue 2004	0.7	22.0	43.2	33.5	12.0
N 2004	**90**	**35**	**11**	**15**	**151**
Grain Revenue 2009	98.5%	78.5%	52.5%	68.6%	87.0%
Livestock Revenue 2009	0.7	21.3	45.4	31.4	12.3
N 2009	**82**	**32**	**12**	**14**	**140**

When respondents were asked to indicate the constraints that limited their crop production growth over the last five years (question 36), about 3.3% indicated their growth was not constrained over the last five years (Table 5.90). About 3.3% do not expect their crop production growth to be limited by constraints over the next five years (question 37). The average number of constraints was 4.1 for the last five years and 3.9 over the next five years, illustrating the respondents, on average, expect to be limited by about the same number of constraints over the next five years. The median number of

constraints was four during the last five years and during the next five years. About 23.5% of the respondents indicated they expect to face *more* constraints in the next five

Table 5.90 West Central Frequency Table of Number of Constraints Limiting Crop or Livestock Production Growth over Last Five Years and Next Five Years

Number of Constraints **Last** 5 Years	Frequency	Percent	Number of Constraints **Next** 5 Years	Frequency	Percent
None	5	3.1	None	5	3.1
1	8	5.0	1	13	8.1
2	16	10.6	2	21	13.1
3	34	21.3	3	26	16.3
4	30	18.8	4	31	19.4
5	25	15.6	5	25	15.6
More than 5	33	20.6	More than 5	29	18.1
Total	151	94.4	Total	150	93.8
Missing	9	5.6	Missing	10	6.3
N	**160**	100.0	**N**	**160**	100.0

years than in the previous five years, and 29.5% of the respondents expect to face *fewer* constraints in the next five years and about 46.9% expect to face the *same* number of constraints.

About sixty-three percent of the respondents indicated that land cost was a constraint in the last five years but only fifty-eight percent perceive land cost to be a constraint in the next five years (Table 5.91). Land availability received the highest average points out of 100 as the constraint that most limited crop production growth in the last five years (32.5 points) and the second highest points in the next five years (32.1 points). Land cost had the next highest points behind land availability. This is a concern as the price of land continues to increase.

About nine percent more respondents anticipate limiting their production growth in the next five years due to impending retirement than in the past five years. The

average number of points increased from 28.6 to 41.5 to indicate impending retirement is a much greater constraint in the next five years.

Environmental concerns and regulations are perceived to be a greater constraint by more respondents in the next five years compared to the last five years. Fewer

Table 5.91 West Central Percent of Respondents Indicating Constraints that Limited their Crop Production Growth over Last Five Years and Will Limit Production Growth in Next Five Years and Average Point out of 100

Constraints Limiting Crop Production Growth	Percent of Respondents **Last** 5 Years	Average Points **Last** 5 Years	Percent of Respondents **Next** 5 Years	Average Points **Next** 5 Years
Land Cost	62.5%	28.8	58.1%	30.1
Land Availability	60.0	32.5	55.6	32.1
Rising Input Costs	58.8	23.8	60.6	25.7
Falling Commodity Prices	52.5	27.0	48.1	23.5
Capacity to service more debt	23.1	19.5	17.5	17.5
Limited Available Time	21.3	16.2	16.9	15.4
Environmental Concerns/Regulations	18.1	12.0	**20.6**	**17.3**
Cost of Supporting Family	17.5	12.5	16.8	11.4
Weather/Climate	16.9	15.0	13.1	**20.0**
Impending Retirement	11.9	28.6	**20.6**	**41.5**
Management Capacity	11.3	20.2	7.5	16.7
Better Rate of Return from Alternative Commodity	10.0	13.0	8.1	15.0
Labor Costs or Availability	9.4	14.0	**13.8**	12.6
Complexity of West Central Investments	4.4	10.0	3.1	11.0
Lack of Suitable Off-Farm Employment Opportunities	3.8	10.3	2.5	**16.3**
None of the Constraints	3.1	100.0	3.1	100.0
Urban Encroachment /Subdivision Pressures	1.9	11.7	2.5	11.3
Herd Costs	1.3	10.0	---	---
Water Costs or Availability	---	---	0.6	10.0

respondents perceive falling commodity prices to be a constraint to their growth in the next five years (48.1%) than in the past five years (52.5%). This constraint also received fewer points in the next five years, so the importance of falling commodity prices as a constraint is decreasing. Rising input costs remain a constraint for about sixty percent of the respondents with an average 25 points out of one hundred.

The descriptions about the respondents provided above help inform which variables might be important in analyzing the horizon problem.

5.2.2. Descriptive and Inferential Statistics Related to Horizon Problem

Three questions in particular were designed in the survey to analyze the horizon problem in West Central (questions 7, 10, and 27). Question ten tests hypotheses H_2 and H_{4B}. Question seven tests hypotheses H_{1A}, H_{3A} and H_{3C}. Another question indirectly evaluates hypotheses H_{3B}, and H_{4A} by looking at the respondent's preference for competitively priced inputs that provide quick return to the member (question 27).

The first statement analyzed requests respondents to indicate their attitude about whether it is worth the effort to understand their cooperative investment (question 10). This question evaluates whether the "hassle" horizon problem exists by testing hypotheses 2 and 4B. About half of the respondents answered 1 or 2 indicating it *is* worth their effort to understand their investment (Table 5.92). About 18.1% percent of the respondents perceived it is *not* worth the effort to understand their investment by answering 6 or 7. The median respondent answered 3 which tends toward perceiving the investment is worth understanding.

Table 5.92 Frequency Table of Respondent's Preference to "It is Not Worth the Effort of trying to Understand the Composition of my West Central Investment"

Response to Survey Question 10		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Disagree	30	18.8	19.5	19.5
2		46	28.8	29.9	49.4
3		11	6.9	7.1	56.5
4	Doesn't Matter	26	16.3	16.9	73.4
5		13	8.1	8.4	81.8
6		15	9.4	9.7	91.6
7	Strongly Agree	13	8.1	8.4	100.0
	Total	154	96.3	100.0	
	Missing	6	3.8		
N		**267**	100.0		

The statement regarding whether the cooperative investment is worth the effort to understand has a negative significant relationship with years as a member (question 2) and ability to use West Central stock as collateral (question 8) (Table 5.93). The statement has a positive significant relationship with preference for investment in technology for soybean processing (question 29) and in business areas that one uses on the farm (question 11) and the importance of knowing whether the book or market value of West Central is greater (question 34). The Kendall's tau-b coefficient indicates if the variables have a significant relationship, but does not indicate if the particular categories within the variable are significantly different from each other.

Table 5.93 Nonparametric Correlations with Statement "It is Not Worth the Effort of trying to Understand the Composition of my West Central Investment"

Not Worth Effort to Understand Investment	Years a Member	Business Investment Preference	Importance Market Value	Stock As Collateral	Preference for soybean technology
Kendall's tau b Coefficient	-.123**	.155**	.215***	-.137**	.125**
Sig. (2-tailed)	.045	.015	.001	.029	.046
N	**149**	**152**	**148**	**153**	**154**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

More than 20% of the expected frequencies are less than five in the cross tabulations, so the chi-square statistics are not provided since they would not be accurate. Only the variable indicating preference for investment in all or some business areas has a significant difference of means. Since the succession plan variable is not significant, hypothesis 2B is not supported. The negative coefficient on the stock as collateral variable indicates respondents who can use stock as collateral score lower toward the investment being worth the effort to understand. However, the differences of means are not significant so hypothesis 2C is weakly supported. The variable indicating years as a member is negatively correlated with years to relinquish control so the more years as a member, or the fewer years to relinquish control, the lower the score toward the investment being worth the effort to understand. This does not support hypothesis 4B which states the number of years until retirement will be negatively associated with preference for no further cooperative investment.

The member's preference for investment in certain business areas has significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.94).

Table 5.94 Means for "It is Not Worth the Effort of trying to Understand the Composition of my West Central Investment" by "I Most Prefer the Cooperative Invest in 1=All Business Areas, 4 = Indifferent, and 7=Only in Business Areas I Use On My Farm"

Business Area Investment Preference	Mean	N	Std. Deviation
All Business Areas (1 or 2)	2.96	75	1.983
Indifferent (3, 4 or 5)	3.36	53	1.744
Business Areas I Use on Farm (6 or 7)	4.35	20	1.927
Don't Know	3.75	4	2.363
Total	**3.30**	**152**	**1.940**

The variances of the groups are approximately equal since the Levene statistic (.582, sig 0.627) is not significant so the one-way analysis of variance is reliable (Table 5.95). The F-statistic for business area investment preference is significant so one or more of the differences of means is significantly different from the other means (F (3, 148) = 2.917, $p<.05$).

Post hoc tests are computed to compare each group of respondents based on business area investment preference using Hochberg's GT2 test since the variances of the groups are similar and sample sizes for each group are different. Respondents who prefer

Table 5.95 ANOVA Table for Not Worth Effort to Understand West Central Investment vs. Business Area Investment Preference

ANOVA					
Not Worth Effort to Understand Investment	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	31.71	3	10.57	2.917	.036**
Within Groups	536.37	148	3.62		
Total	**568.08**	**151**			

Level of significance F-Test: * Ten percent level , ** Five percent level, *** One percent level

investment in business areas they can use on their farm scored higher toward investment not being worth the effort to understand compared to respondents who prefer investment in all business areas. Since the preference for investment in all business areas is not correlated with percent of grain marketed through the cooperative or the percent of crop inputs purchased through the cooperative, it does not indicate the level of member patronage. Therefore, the multiple comparisons does not support hypothesis 2A which states level of member patronage will be negatively associated with the attitude that the cooperative investment is not worth understanding.

Table 5.96 Multiple Comparisons for Not Worth the Effort to Understand my West Central Investment vs. Business Area Investment Preference using Games-Howell test

Dependent Variable: Not Worth Effort to Understand Investment					
Hochberg's GT2 test	(I) Business Area Preference	(J) Business Area Preference	Mean Difference (I-J)	Std. Error	Sig.
	All business areas	Don't Know	-.790	.977	.961
		Indifferent	-.398	.342	.812
		Areas use on farm	-1.390**	.479	.025

Level of significance Hochberg's GT2 test: ** Five percent level, *** One percent level

The second statement requests respondents to indicate their preference for equity redemption policy (question 7). This question helps to analyze whether the "wait-to-receive" horizon problem exists by testing hypothesis 1A. This question also helps analyze whether the "current obligation" horizon problem exists by testing hypotheses 3A and 3C. About twenty percent of the respondents answered 6 or 7 indicating they prefer quicker redemption of old equities (Table 5.97). About twenty-four percent answered 1 or 2 indicating they prefer higher cash payment in year earned and slower redemption of old equities. About twenty-eight percent of the respondents prefer the

Table 5.97 Frequency Table of West Central Respondent's Preference to "I would Most Prefer the chooses a policy that pays 1=Higher cash Payment in Year Earned and Slower Redemption, 4=Same as current policy, 7=Lower cash Payment in Year Earned and Quicker Redemption of Old Equities"

Response to Survey Question 7		Frequency	Percent	Valid Percent	Cumulative Percent
	Don't Know	12	7.5	7.7	7.7
	Indifferent	11	6.9	7.1	14.8
1	Higher Cash Payment	27	16.9	17.4	32.3
2		11	6.9	7.1	39.4
3		11	6.9	7.1	46.5
4	Same Policy	44	27.5	28.4	74.8
5		7	4.4	4.5	79.4
6		16	10.0	10.3	89.7
7	Quicker Redemption	16	10.0	10.3	100.0
	Total	155	96.9	100.0	
	Missing	5	3.1		
N		**160**	100.0		

current policy. The median respondent answered 4, indicating the same as current policy. About eight percent did not have an opinion and about seven percent were indifferent.

After removing the twenty-three respondents who did not have an opinion or were indifferent, the statement regarding the member preference for equity redemption policy has a negative significant relationship with ability to use stock as collateral (question 8) and management capacity and cost to support family constraints (question 36) (Table 5.98). The equity redemption statement has a positive significant relationship with years as member (question 3) and the variable indicating whether market value or book value is greater (question 33).

Table 5.98 Nonparametric Correlations with West Central Statement "I would Most Prefer the chooses a policy that pays 1=Higher cash Payment in Year Earned and Slower Redemption, 4=Same as current policy, 7=Lower cash Payment in Year Earned and Quicker Redemption of Old Equities"

Preference for Equity Redemption Policy	Years a Member	Market vs. book value	Stock as Collateral	99 Management constraint	99 Support Family constraint
Kendall's tau b	.211***	.146**	-.140**	-.176**	-.149**
Sig. (2-tailed)	.001	.038	.039	.021	.050
N	**129**	**128**	**132**	**132**	**132**

Level of significance correlation Coefficient: *Ten percent level, ** Five percent level, *** One percent level

More than 20% of the expected frequencies are less than five in the cross tabulations, so the chi-square statistics are not provided since they would not be accurate. None of the variables above has a significant difference of means. The statement regarding the preference for higher cash payment in year earned does not have significant different means for the variable indicating ability to use stock as collateral, so hypothesis 3C is not supported.

The variable "years to relinquish control" has significant difference of means for the preference for equity redemption policy (Table 5.99).

Table 5.99 West Central Means for Equity Redemption Policy Preference by Years to Relinquish Control

Years to Relinquish Control	Mean	N	Std. Deviation
Don't Know	2.94	17	2.106
Less than 5 years	4.25	24	1.294
6 – 10 years	4.89	18	2.111
11 – 15 years	4.24	25	1.855
More than 15 years	3.23	48	1.960
Total	**3.80**	**132**	**1.968**

The variances of the groups are not equal since the Levene statistic (3.24, sig 0.014) is significant so the one-way analysis of variance is not reliable. Post hoc tests are computed to compare each group of respondents based on years to relinquish control using Games-Howell test. Members who have less than ten years to relinquish control score higher toward quicker redemption of allocated retained earnings relative to members who have more than fifteen years to relinquish control (Table 5.100). This supports hypothesis 1A. The members with more than fifteen years to relinquish control score the lowest toward higher cash patronage refunds.

Table 5.100 West Central Multiple Comparisons for Equity Redemption Policy Preference vs. Years to Relinquish Control using Games-Howell Test

Dependent Variable: Equity Redemption Policy Preference					
Game-Howell test	(I) Years to Relinquish	(J) Years to Relinquish	Mean Difference (I-J)	Std. Error	Sig.
	>15 years	Don't Know	.288	.584	.987
		< 5 years	-1.021*	.387	.075
		6 – 10 years	-1.660*	.572	.051
		11 – 15 years	-1.011	.466	.209

Level of significance Games-Howell test: * Ten percent level, ** Five percent level, *** One percent level

Respondents indicating they limited production in the next five years due to cost of supporting family have significant relationship with preference for equity redemption

policy (Table 5.101). Respondents who limited their crop production due to the cost of supporting the family tend toward preference for higher cash patronage refunds today.

Table 5.101 West Central Means for Equity Redemption Policy Preference by Cost of Supporting Family Constraint

Cost of Supporting Family Constraint – 1999	Mean	N	Std. Deviation
Yes	3.08	24	1.666
No	3.95	108	2.002
Total	**3.80**	**132**	**1.968**

The variances of the groups are equal since the Levene statistic (.516, sig 0.474) is not significant, so the one-way analysis of variance is reliable. The F-statistic from the ANOVA for cost to support family constraint is significant at the five percent level so members who limited production in the last five years due to the cost to support family has significantly different means compared to the other members. This supports hypothesis 3A at the five percent level.

Table 5.102 West Central ANOVA Table for Equity Redemption Policy Preference vs. Cost of Supporting Family Constraint

ANOVA					
Preference for Equity Redemption Policy	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	14.88	1	14.88	3.926	.050**
Within Groups	492.60	130	3.79		
Total	**507.48**	**131**			

Level of significance F-Test: * Ten percent level , ** Five percent level, *** One percent level

The third statement requests respondents to indicate their preference for the cooperative to provide full range of agronomy services versus competitively priced crop input products (question 27). This question helps test hypothesis 4A whether the "residual short-term" horizon problem exists. The questions also help test whether the "current obligation" horizon problem exists by evaluating hypothesis 3B. About half of

the respondents answered 6 or 7 indicating they prefer the cooperative provide competitively priced crop input products (Table 5.103). About twenty percent of the respondents answered 1 or 2 indicating they prefer cooperative provide full range of agronomy services. The median respondent answered six, indicating he tends toward preference for competitively priced products.

The statement regarding the member preference for crop inputs versus services has a positive significant relationship with the variable indicating the branch location with railroad facilities (question16), growth in crop production in last five years and next

Table 5.103 West Central Frequency Table of Respondent's Preference to "I Prefer the Cooperative provide 1= Full Range of Agronomy Services, 4=Indifferent and 7=Competitively Priced Crop Inputs"

Response to Survey Question 27		Frequency	Percent	Valid Percent	Cumulative Percent
	Don't Know	3	1.9	1.9	1.9
1	Agronomy Services	17	10.6	10.8	12.7
2		15	9.4	9.5	22.2
3		5	3.1	3.2	25.3
4	Indifferent	23	14.4	14.6	39.9
5		12	7.5	7.6	47.5
6		44	27.5	27.8	74.3
7	Competitively Priced	39	24.4	24.7	100.0
	Total	158	98.8	100.0	
	Missing	2	1.3		
N		**160**	100.0		

five years (question 23 and 24) and variable indicating return on investment (question 34) (Table 5.104). The statement has a negative significant relationship with the return on equity variable (question 32) and the capacity to service debt constraint (question 36).

All variables have more than 20% of the expected values less than five in the cross tabulations, so the relationships will be evaluated with difference of means test.

The variables indicating crop production growth in the last five years and the next five years do not have significant differences of means for the crop input preference.

Table 5.104 Nonparametric Correlations with West Central Statement "I Prefer the Cooperative provide 1=Full Range of Agronomy Services, 4=Indifferent, 7=Competitively Priced Crop Inputs"

Preference for Crop Input Products vs. Services (likert)	Branch with Railroad Facilities	Crop Growth in last 5 years	Crop Growth in next 5 years	Service Debt Constraint	Return on Equity
Kendall's tau b	.210***	.130**	.158***	-.127*	-.124**
Sig. (2-tailed)	.002	.041	.015	.060	.053
N	**158**	**157**	**154**	**158**	**154**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

The variable indicating the branch location where the member conducts most of his business has significant difference of means for the preference for competitively priced crop inputs versus full range of agronomy services (Table 5.105).

Table 5.105 West Central Means for "I Prefer the Cooperative provide 1= Full Range of Agronomy Services, 7=Competitively Priced Crop Inputs" by Branch Location with Railroad Facilities

Branch Location with Railroad Facilities	Mean	N	Std. Deviation
No Railroad	4.39	46	2.155
25 – 75 car load out facility	3.84	37	2.328
100 car unit train facility	5.39	75	1.931
Total	**4.73**	**158**	**2.181**

The variances of the groups are approximately equal since the Levene statistic (2.58, sig 0.079) is not significant at the five percent level, so the one-way ANOVA is reliable (Table 5.106). The F-statistic from the ANOVA for branch location is significant at the one percent level so members conducting business at different branch locations has significantly different means compared to the other members.

Post hoc tests are computed using Hochberg's GT2 test to compare each group of respondents based on branch locations. Respondents who conduct business with a branch

Table 5.106 West Central ANOVA Table for Crop Input Product/Services Preference vs. Branch Location with Railroad Facilities

ANOVA					
Preference for Crop Input Product/Services	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	67.07	2	33.53	7.646	.001***
Within Groups	679.77	155	4.39		
Total	**746.84**	**157**			

Level of significance F-Test: * Ten percent level , ** Five percent level, *** One percent level

location that has a 100-unit car facility tend toward preference for competitively priced crop input products (Table 5.107).

Table 5.107 West Central Multiple Comparisons for Crop Input Product/Services Preference vs. Branch Location with Railroad Facilities using Hochberg's GT2 test

Dependent Variable: Preference for Full Range of Services vs. Competitively Priced Inputs					
Hochberg's GT2 test	(I) Branch Location	(J) Branch Location	Mean Difference (I-J)	Std. Error	Sig.
	100 unit car	No railroad	.995**	.388	.032
		25-75 car facility	1.549***	.443	.003

Level of significance Hochberg's GT2 test: *Ten percent level, **Five percent level, *** One percent level

Respondents indicating they limited production in the next five years due to capacity to service debt have a significant relationship with preference for crop inputs versus services (Table 5.108). Respondents who did not limit their crop production due to the capacity to service debt tend toward preference for competitively priced crop inputs.

Table 5.108 West Central Means for Crop Inputs/Services Preference by Capacity to Service Debt Constraint

Capacity to Service Debt Constraint - 1999	Mean	N	Std. Deviation
Yes	4.22	37	2.083
No	4.89	121	2.194
Total	**4.73**	**158**	**2.181**

The variances of the groups are approximately equal since the Levene statistic (.009, sig 0.923) is not significant, so the one-way analysis of variance is reliable. The F-statistic from the ANOVA for capacity to service debt constraint is significant at the ten percent level so members who limited production in the last five years due to the capacity to service debt has significantly different means compared to the other members. This does not support hypothesis 3B, which states, "the constraint from high current cash obligations will be positively associated with preference for competitively priced inputs".

Table 5.109 West Central ANOVA Table for Crop Inputs/Services Preference vs. Capacity to Service Debt Constraint

ANOVA					
Preference for Crop Inputs/Services	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	12.96	1	12.96	2.7555	.099*
Within Groups	733.87	156	4.70		
Total	**746.84**	**157**			

Level of significance F-Test: * Ten percent level , ** Five percent level, *** One percent level

The variable indicating the years to relinquish control has significant difference of means for the preference for competitively priced crop inputs versus full range of agronomy services (Table 5.110).

Table 5.110 West Central Means for "I Prefer the Cooperative provide 1= Full Range of Agronomy Services, 7=Competitively Priced Crop Inputs" by Years to Relinquish Control

Years to Relinquish Control	Mean	N	Std. Deviation
Don't Know	5.50	20	1.960
Less than 5 years	3.76	29	2.559
5 – 10 years	3.95	21	2.376
11 – 15 years	5.23	31	1.857
More than 15 years	4.98	57	1.959
Total	**4.73**	**158**	**2.181**

The variances of the groups are not equal since the Levene statistic (2.49, sig. 0.046) is significant at the five percent level. Post hoc tests are computed using Games-Howell test to compare each group of respondents based on years to relinquish. Respondents who did not know when they plan to relinquish control tend toward preference for competitively priced crop input products when compared to members who plan to relinquish control in less than five years (Table 5.111). Respondents who plan to relinquish control in eleven to fifteen years tend toward preference for competitively priced crop input products compared to respondents who plan to relinquish control in less than five years. This weakly supports hypothesis 4A, but the category for more than fifteen years does not have a significantly different mean.

Table 5.111 West Central Multiple Comparisons for Crop Input Product/Services Preference vs. Years to Relinquish Control using Games-Howell test

Dependent Variable: Preference for Full Range of Services vs. Competitively Priced Inputs					
Games-Howell test	(I) Years to Relinquish	(J) Years to Relinquish	Mean Difference (I-J)	Std. Error	Sig.
	< 5 years	Don't Know	-1.741*	.638	.065
		5 – 10 years	-.194	.703	.999
		11 – 15 years	-1.467*	.580	.100
		> 15 years	-1.224	.541	.177

Level of significance Games-Howell test: *Ten percent level, **Five percent level, *** One percent level

Multivariate data analysis will be used in the next sections to further test whether the horizon problem exists in West Central.

5.2.3. Factor Analysis of West Central Survey

Principal components factor analysis indicates a set of common underlying dimensions among the variables in the West Central data set. Since the determinant of the correlation matrix (.001287) is greater than the necessary value .00001,

multicollinearity is not a problem for this data. The Bartlett's test of sphericity is highly significant (p<0.001) and therefore the factor analysis is appropriate. The Kaiser-Meyer-Olkin measure of sampling adequacy (.572) indicates the patterns of correlations between variables are mediocre, so the factor analysis should provide reliable factors. The following variables have an individual KMO value less than 0.5: type of grain farmer (.498), cooperative vs. on-farm return on equity (.441), market vs. book value of cooperative (.420), debt constraint (.462), and cost to support family constraint (.483). Removing these variables improved the overall KMO by a very small amount so the variables were left in the analysis.

Using the criterion to accept factors with eigen values greater than one, thirteen factors are retained for interpretation, which explain 63.7% of the total variance. Figure 5.3 indicates that three or six factors should be retained. Reducing the number of factors to six does not change the determinant and the overall KMO, so six factors are retained which explains about 38% of the total variation (Table 5.112).

Figure 5.3 Scree Plot for Principal Component Analysis of West Central Survey

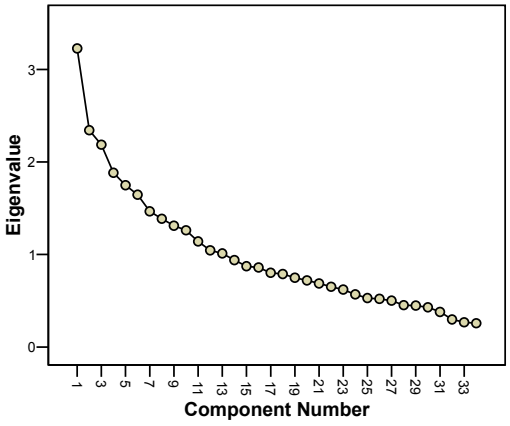


Table 5.112 Eigen Values Greater than one and Total Variance Explained with Principal Component Analysis for West Central Survey

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	Percent of Variance	Cumulative Percent	Total	Percent of Variance	Cumulative Percent
1	3.227	9.491	9.49	3.001	8.826	8.83
2	2.343	6.891	16.38	2.413	7.097	14.92
3	2.187	6.433	22.82	1.995	5.868	21.79
4	1.883	5.539	28.35	1.963	5.773	27.57
5	1.749	5.144	33.50	1.932	5.681	33.25
6	1.646	4.842	38.34	1.732	5.094	38.34
7	1.466	4.312	42.65			
8	1.386	4.077	46.73			
9	1.311	3.857	50.59			
10	1.262	3.711	54.30			
11	1.141	3.357	57.65			
12	1.045	3.074	60.73			
13	1.011	2.974	63.70			

Table 5.113 indicates the statistical significant factor loadings for the orthogonal rotated component matrix of the West Central survey. Five variables have a significant factor loading for the first rotated principal component and explain about nine percent of the total variation.

The relationship between variables for the principal component analysis can be seen Figure 5.4 to Figure 5.6. The size of crop operation, change in crop operation in last five years and expected change in crop operation in next five years are positively correlated with each other and with the first principal component. Respondents who have more years before they relinquish control will typically be members with higher crop production growth plans. These respondents are also likely to indicate land availability is a greater constraint to growth.

Table 5.113 Loading Factors of Rotated Principal Components for West Central Survey

	Rotated Principal Component					
Variable	1	2	3	4	5	6
Change in crop production last 5 years	**.746**					
Change in crop production next 5 years	**.733**					
Size crop operation in acres	**.586**					
Years to relinquish	**.565**					
Land availability constraint	.449					
Falling commodity prices constraint		**-.637**				
Rising input costs constraint		**-.574**				
Lender value on West Central stock		**.482**				
Ability to use stock as collateral		**.461**				
Labor cost or availability constraint		.444				
Percent crop inputs purchase from W.C.		.438				
Importance of market/book value			**.533**			
Farm is incorporated			**.520**			
Weather constraint			**.480**			
Not worth effort understand investment			.427			
Complexity of investment constraint			.425			
Quicker redemption vs. higher cash pmt.				**.597**		
Years as member				**.577**		
Use of internet				-.444		
Environmental regulation constraint				.435		
Cost of supporting family constraint					**.598**	
Lack of off farm opportunity constraint					.437	
Cooperative vs. on-farm return on equity						**.605**
Preference for crop inputs/services						**-.475**
Market vs. book value of cooperative						**.456**

Four variables are statistically significant in interpreting the second principal component, which explains about seven percent of the total variation in the data. Falling commodity prices constraint and rising input constraint are positively correlated with each other and the second principal component. These two constraints are negatively correlated with the ability to use West Central stock as collateral at the bank. Respondents who can use West Central stock as collateral indicate the ability to borrow a higher percent of the market value of the stock. Respondents who face a greater constraint from rising input costs and falling commodity prices are not as likely to be able to use their stock as collateral with the lender.

Figure 5.4 Rotated PCA1 and PCA2 for West Central Survey

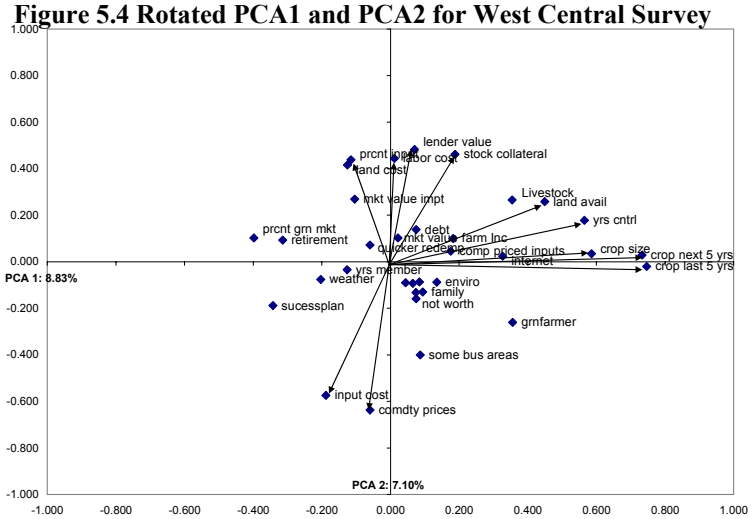


Figure 5.5 Rotated PCA3 and PCA4 for West Central Survey

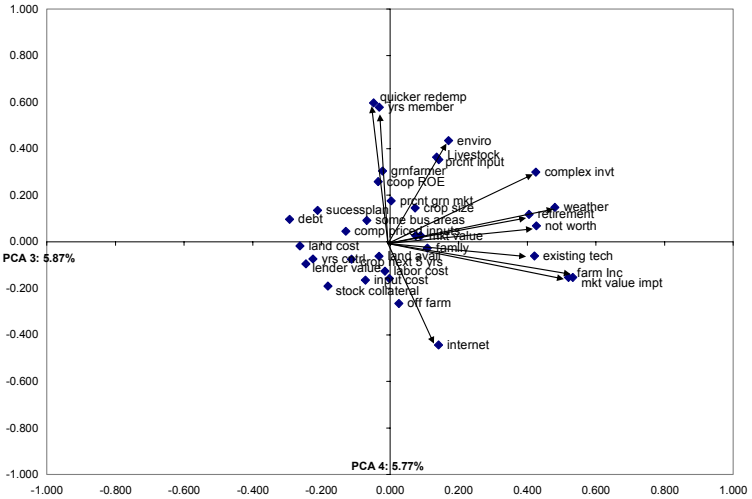
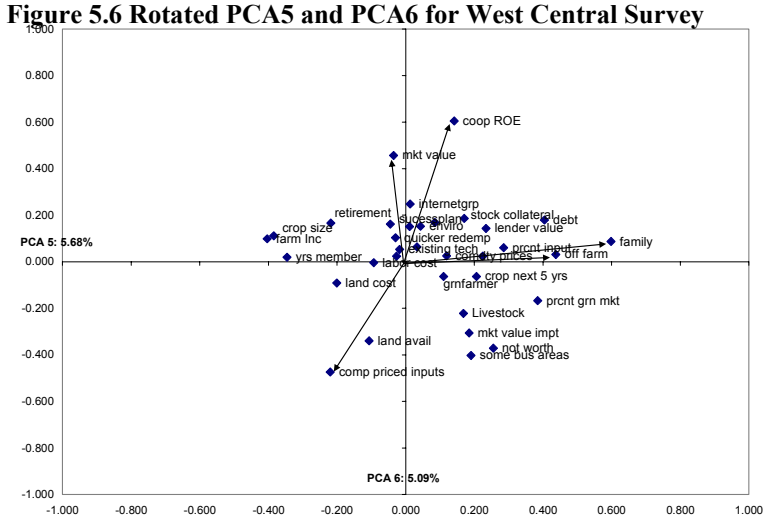


Figure 5.6 Rotated PCA5 and PCA6 for West Central Survey



The third principal component in Figure 5.5 explains about six percent of the total variation in the data. The unimportance of knowing the market versus book value of West Central is highly correlated with whether the respondent's farm is incorporated. Respondents with an incorporated farm are highly correlated with preference for cooperative investment in existing technology to increase the volume of soybeans processed by West Central. Members who limited crop production in the last five years due to the complexity of their West Central investment are likely to perceive the investment is not worth the effort to understand. The perception whether it is worth the effort to understand the investment is negatively (but weakly) correlated with the percent of market value of stock the lender accepts as collateral. This weakly supports hypothesis 2C which states the inability to borrow against the cooperative investment will be positively associated with preference for no further cooperative investment in the cooperative. Respondents who indicate a high constraint from the weather and impending retirement are likely to perceive the cooperative investment is not worth the effort to understand. This indicates members facing retirement are likely to perceive the investment is not worth the effort to understand. This supports hypothesis 4B, which states the number of years until retirement will be negatively associated with preference for no further cooperative investment.

The fourth principal component explains about six percent of the total variation in the data in which two variables are statistically significant. Respondents who have been members of West Central for a higher number of years are also likely to prefer a quicker redemption of old equities. Since the variable indicating the number of years as a member is negatively correlated with years until relinquishing control, hypothesis 1A,

which states the number of years until retirement will be negatively associated with preference for quicker redemption of old equities, is supported.

The fifth principal component in Figure 5.6 explains about 5.68% of the total variation in which two variables are statistically significant. Members who limited crop production growth in the last five years due to cost of supporting family also were more likely to limit growth due to lack of suitable off-farm employment opportunity.

The sixth principal component explains about five percent of the total variation in which three variables are statistically significant. The sixth principal component indicates the member's preference for competitively priced inputs versus full range of agronomy services. Members who believe the on-farm return on equity is greater than cooperative return on equity are more likely to prefer competitively priced crop inputs. Respondents who perceived the cooperative return on equity was greater than the on-farm return on equity were also more likely to perceive the market value of the cooperative was greater than the book value.

In summary, hypothesis 1A is weakly supported by factor analysis because respondents who have been members for more years prefer quicker redemption of old equities. Hypothesis 2C is weakly supported because the percent of stock's market value the member can borrow against is (weakly) negatively correlated with whether the cooperative investment is not worth understanding, which indicates members who can borrow against their shares perceive the investment is worth understanding. Hypothesis 4B is supported because impending retirement constraint is correlated with whether the investment is worth understanding, which indicates that members approaching retirement perceive the investment is not worth understanding.

The variables indicating high current cash obligations, years to relinquish control and succession plan are not significant on the relevant factors so hypothesis 2A, 2B, 3A, 3B and 4A are not supported. The variable indicating the ability to borrow against the cooperative investment is orthogonal to preference for equity redemption plan, so hypothesis 3C is not supported. The next section analyzes the survey data with regression.

5.2.4. Probit Regression Results of West Central Survey

The hypotheses are tested using ordinal probit regression model since the dependent variable included the respondent's answer along a seven point LIKERT scale. The independent variables can be grouped into categories:

1. Succession Plans: the number of years before the member plans to relinquish control over the farm (question 13); the member's plan for the farm after relinquish control (question 14), years a member of West Central (question 3) and age (question 12)
2. Growth: the ability for the member to borrow against his cooperative investment (questions 8 and 9); crop production growth in the last five years (question 23); constraints for production growth in the last five years (question 36) and comparison of return on investment at cooperative level versus farm level (question 32)
3. Description of the Member: the type of grain farmer in terms of how acquire land (question 21), whether the member is specialized in grain or diversified in grain and livestock (question 17) and the level of household income from farm versus non-farm sources (question 15)

4. Description of Member in terms of farm operation: whether the farm is incorporated (question 2); the branch location the member conducts most of business (derived from question 16); the acres of land farmed (question 22), and the percent of crop inputs purchased from West Central (question 28) and the percent of grain marketed through West Central (question 25)

Nominal variables listed above are coded as dummy variables. To identify the model correctly, at least one of the dummy indicators is removed for each variable. Ordinal variables are transformed using the terza method. Ordinal probit regression is run in SPSS 12.0 for Windows.

To evaluate hypothesis 2 and 4B, the dependent variable is the respondent's answer to whether the cooperative investment is worth understanding with 1=is worth and 7=not worth. The χ^2-statistic for the regression model in Table 5.114 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The model explains about thirty-seven percent of the total variation.

Table 5.114 Ordinal probit Regression Model Fitting Information for "It is Not Worth the Effort of trying to Understand the Composition of My West Central Investment"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	467.38				
Final	410.47	56.90	21	.000***	.368

N: 128; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The results for the ordinal probit regression model for the variable indicating whether the cooperative investment is worth understanding are shown in Table 5.115. The respondents with larger crop operations tend toward the investment not being worth the effort to understand. Respondents with more than 1,000 acres deliver a smaller

percent of grain to the cooperative so the respondents with more than 1,000 acres have a smaller patronage compared to respondents with fewer than 1,000 acres. Therefore,

Table 5.115 Coefficients for Ordinal probit Regression Model, Dependent Variable: "It is Not Worth the Effort of trying to Understand the Composition of My West Central Investment"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Not Worth Investment = 1	-1.147	.641	3.201	.074*
Not Worth Investment = 2	-.031	.635	.002	.961
Not Worth Investment = 3	.215	.635	.115	.735
Not Worth Investment = 4	.704	.637	1.222	.269
Not Worth Investment = 5	1.047	.640	6.466	.102
Not Worth Investment = 6	1.652	.650	6.466	.011**
Location				
Relinquish don't know	.812	.348	5.438	.020**
Relinquish < 5 years	.578	.299	3.743	.053*
Relinquish 5-10 years	.761	.384	3.926	.048**
Relinquish 10-15 years	.714	.292	5.970	.015*
Owner	-.307	.595	.265	.606
Owner/Cash Rent	-.260	.703	.136	.712
Crop Share	-.411	.655	.393	.531
Crop Share/Cash Rent	.292	.742	.155	.693
Cast Rent	.207	.590	.124	.725
Owner/Crop Share/Cash Rent	-1.211	.668	3.285	.070*
Crop Size	.208	.118	3.106	.078*
Importance market/book value of coop	.206	.109	3.572	.059*
Lender Value	-.424	.117	13.160	.000***
Hog Farmer	.535	.252	4.513	.034**
Preference for All vs. Some Services	.263	.110	5.753	.016**
Farm vs. Cooperative Return	-.109	.111	.967	.325
Land cost constraint	-1.179	.660	3.198	.074*
Better alternative commodity constraint	-2.100	1.933	1.179	.278
Falling commodity prices constraint	-1.275	.604	4.458	.035**
Support family constraint	4.011	2.098	3.654	.056*
No constraint	-1.115	.631	3.117	.077*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

hypothesis 2A, which states the level of member's patronage will be negatively associated with the attitude that the cooperative investment is not worth understanding, is weakly supported with this model.

None of the succession plan variables are significant, so hypothesis 2B is not supported. The respondents who can borrow a greater percent of the market value of their stock tend toward the investment being worth the effort to understand. Therefore, the results support hypothesis 2C that states the "inability to borrow against their cooperative investment will be positively associated with the attitude that the cooperative investment is not worth understanding".

Respondents with fewer years to relinquish control tend toward the investment not being worth the effort to understand when compared to respondents who plan to relinquish control in more than fifteen years. This supports hypothesis 4B, which states members closer to retirement will be negatively associated with preference for no further cooperative investment.

Respondents who indicated that knowing the market and book value of the cooperative is not important (question 34) tend toward the investment not being worth the effort to understand. Respondents who have greater preference for the cooperative to invest in business areas they can use on their farm also tend toward the attitude the investment is not worth the effort to understand.

Hypothesis 1A, 3A and 3C can be evaluated with the dependent variable being the respondent's preference for the equity redemption policy with 1=higher cash patronage refund and 7=quicker redemption. The respondents who indicated indifferent or did not have an opinion were removed from the model specification. The χ^2-statistic for the regression model in Table 5.116 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke

R-Square indicates the model explains about 25.7% of the total variation in preference for equity redemption policy.

Table 5.116 West Central Ordinal probit Regression Model Fitting Information for "I Most Prefer the board chooses a policy that pays 1=Higher Cash Payment in Year Earned, 4=Same as current policy, 7=Quicker Redemption of Old Equities"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	430.48				
Final	393.42	37.07	8	.000***	.257

N: 129; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for equity redemption policy are shown in Table 5.117. The coefficients on

Table 5.117 West Central Coefficients for Ordinal probit Regression Model, Dependent Variable: "I Most Prefer the board chooses a policy that pays 1=Higher Cash Payment in Year Earned, 4=Same as current policy, 7=Quicker Redemption of Old Equities"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Equity Redemption Plan = 1	-.663	.183	13.192	.000***
Equity Redemption Plan = 2	-.357	.176	4.090	.043**
Equity Redemption Plan = 3	-.044	.174	.065	.798
Equity Redemption Plan = 4	.934	.187	25.053	.000***
Equity Redemption Plan = 5	1.122	.192	34.152	.000***
Equity Redemption Plan = 6	1.662	.215	59.599	.000***
Location				
Relinquish don't know	-.197	.306	.414	.520
Relinquish < 5 years	.365	.274	1.780	.182
Relinquish 5-10 years	1.274	.330	14.893	.000
Relinquish 10-15 years	.534	.263	4.133	.042**
Percent inputs purchase from coop	.187	.101	3.411	.065*
Book value vs. Market value of coop	.203	.095	4.527	.033**
Environment regulation constraint	2.704	1.642	2.712	.100*
Off-farm opportunity constraint	-14.790	8.047	3.378	.066*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

the variables indicating more than five years until relinquish control are statistically significant at the five percent level. Respondents who have between five and fifteen years until relinquishing control tend toward a preference for a quicker redemption of old

equities compared to respondents plan to relinquish control in more than fifteen years. The coefficient on the variable indicating years to relinquish control in less than five years is not significant, so this weakly supports hypothesis 1A, which states the "number of years until retirement will be negatively associated with preference for quicker redemption of older equities".

Respondents who limited production growth due to the lack of suitable off-farm employment opportunities tend toward a preference for higher cash payment today. Respondents who limited production growth due to environmental concerns tend toward a preference for quicker redemption of old equities. These constraints do not represent high current cash obligations so hypothesis 3A, which states the "constraint from high current cash obligations will be positively associated with preference for higher cash patronage refunds," is not supported.

The variable indicating member's ability to borrow against their cooperative shares was not statistically significant so the model does not support hypothesis 3C, which states the "inability to borrow against the cooperative investment will be positively associated with preference for higher cash patronage refunds".

Respondents who purchase a greater percent of their crop inputs from the cooperative tend toward preference for quicker redemption. Respondents who estimate the market value of the cooperative is greater than the book value tend toward preference for quicker redemption of old equities.

The respondent's preference for competitively priced inputs that provide quick return to the member can test hypotheses H_{3B}, and H_{4A}. The dependent variable is the respondent's preference for crop input products versus services with 1=full range of

agronomy services and 7=competitively priced crop inputs. The χ^2-statistic for the regression model in Table 5.118 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model only explains about 18% of the total variation in preference for crop input products or services.

Table 5.118 West Central Ordinal probit Regression Model Fitting Information for "I Prefer the Cooperative Provide a 1=Full Range of Agronomy Services, 4=Indifferent, 7=Competitively Priced Crop Inputs"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	484.61				
Final	454.97	29.64	9	.001***	.180

N: 154; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for crop inputs or services are shown in Table 5.119. Respondents who have five to ten years before they relinquish control tend toward the preference for full range of agronomy services when compared to respondents plan to relinquish control in more than fifteen years. The model does not support hypothesis 4A, which states the number of years to retirement will be negatively associated with preference for investments with quick payback.

Respondents who limited crop production in the last five years due to capacity to service debt tend toward preference for full range of agronomy services. This does not support hypothesis 3B, which states the constraint from high current cash obligations will be positively associated with preference for competitively priced products.

Table 5.119 West Central Coefficients for Ordinal probit Regression Model, Dependent Variable: "I Prefer the Cooperative Provide 1=Full Range of Agronomy Services, 7=Competitively Priced Crop Inputs"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Crop Input Preference = 1	-1.295	.230	31.622	.000***
Crop Input Preference = 2	-.851	.216	15.456	.000***
Crop Input Preference = 3	-.730	.214	11.622	.001***
Crop Input Preference = 4	-.243	.209	1.358	.244
Crop Input Preference = 5	.019	.208	.008	.929
Crop Input Preference = 6	.883	.217	16.628	.000***
Location				
Relinquish don't know	.357	.296	1.457	.227
Relinquish < 5 years	-.334	.2556	1.700	.192
Relinquish 5-10 years	-.474	.281	2.834	.092*
Relinquish 10-15 years	.245	.239	1.052	.305
Branch 25-75 car facility	-.240	.239	1.009	.315
Branch 100 unit car facility	.586	.206	8.066	.005***
Household income from non-farm	-.111	.095	1.355	.244
Capacity service debt constraint	-1.695	.831	4.155	.042**
Weather constraint	-2.238	1.254	3.186	.074*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

Members who conduct business primarily with a branch location that has a 100-car unit train facility tend toward preference for competitively priced crop input products compared to members who conduct business with a branch location with no rail facilities.

The next section uses cluster analysis to group the respondents in different clusters.

5.2.5. Cluster Analysis of West Central Survey

The cluster analysis can separate respondents into similar groups. After standardizing the variables with the Z-score, the hierarchical procedure using a Ward's method algorithm of all respondents resulted in two clusters. The largest percentage increase in clustering coefficient occurs in going from two to one clusters and the next noticeable change occurs in combining three to two clusters (Table 5.120).

Table 5.120 Analysis of Agglomeration Coefficient for Hierarchical Cluster Analysis of West Central Survey

Number of Clusters	Agglomeration Coefficient	Percent Change in Coefficient to next level	Change in Percent
10	4037	3.05	0.02
9	4160	3.03	-0.24
8	4286	3.27	0.10
7	4426	3.16	-0.23
6	4566	3.39	0.05
5	4721	3.35	-0.04
4	4879	3.38	-0.23
3	5044	3.61	**-0.87**
2	5226	4.48	**4.48**
1	5460	---	---

The two clusters have significantly different means for twenty-one variables. Neither the question about preference for equity redemption plan nor whether it is worth the effort to understand the investment are statistically significant in the clusters. The preference for crop input product or services is also not significant in the clusters. Variables with statistically significant means for the two clusters are indicated in Table 5.121.

Respondents in cluster 1 are on average younger with more years before they relinquish control. Cluster 1 respondents have larger crop production growth plans. About one-fourth of the respondents in cluster 1 can borrow against their stock. About half of the respondents in cluster 1 conduct business with a branch location that has a 100-car unit train facility and about one-fourth are hog farmers. The respondents in cluster 1 indicate a greater constraint from land availability and land cost. In addition, respondents in cluster 1 indicate a greater constraint from cost of supporting family, limited available time, and labor cost.

Table 5.121 Means for Significant Variables for the Two Clusters of West Central Survey

	Two Clusters (means)	
Variable	1	2
Branch 100-car unit train (%)	**55.2**	29.5
Branch 25-75 car facility (%)	18.4	**36.4**
Branch no railroad (%)	26.4	34.1
Lender > 60% market (%)	**13.8**	2.3
Lender NA (%)	9.2	**29.5**
Lender 1-60% market (%)	10.3	2.3
Lender 0% market (%)	26.4	18.2
Lender Don't Know (%)	40.2	47.7
Stock as Collateral	**2.94**	1.96
Invest new products (%)	70.1	**86.4**
No investment new products (%)	9.2	2.3
Sell existing knowledge (%)	10.3	4.5
Hog Farmer (%)	**24.0**	7.0
Age	3.33	**5.41**
Years to relinquish control	**2.87**	1.61
Household income from non-farm	**3.36**	2.46
Change crop production last 5 years	**3.77**	2.86
Change crop production next 5 years	**3.41**	2.34
Falling commodity price constraint	8.71	**24.43**
Rising input cost constraint	10.62	**18.59**
Impending retirement constraint	1.03	**8.82**
Weather/climate constraint	1.44	**4.77**
Environmental concern constraint	1.36	**3.93**
Complex investment constraint	0.12	**0.91**
Land availability constraint	**27.81**	7.27
Land cost constraint	**20.85**	11.36
Limited available time constraint	**4.37**	1.25
Cost of supporting family constraint	**2.99**	1.02
Labor cost/availability constraint	**2.07**	---
N	**87**	**44**

Respondents in cluster 2 are older members who perceive impending retirement as a greater constraint. About thirty percent of the respondents in cluster 2 do not have any debt. A higher percent of respondents in cluster 2 prefer the cooperative to invest in innovations or new products like biodiesel. The respondents in cluster 2 are more constrained from falling commodity prices and rising input costs. Respondents in cluster 2 are also more constrained from environmental concerns and the weather.

If the respondents who did not have an opinion for equity redemption plan are removed from the analysis, the three clusters have means as shown in Table 5.122. Both the equity redemption variable and effort to understand investment variable are

Table 5.122 Means for Significant Variables for the Three Clusters of West Central survey without Respondents indicating don't know or indifferent for equity redemption plan

	Three Clusters (means)		
Variable	1	2	3
Age	**5.4**	2.7	3.9
Years to Relinquish	1.4	**3.5**	2.6
Years as member	**26.2**	16.1	18.9
Growth Crop last five years	3.2	**4.1**	2.4
Growth Crop last five years	2.5	**3.8**	2.6
Lender 0% market (%)	19.6	**39.6**	7.1
Lender 1-60% market (%)	5.9	12.5	---
Lender > 60% market (%)	---	---	**71.4**
Lender don't know (%)	49.0	37.5	21.4
Lender NA (%)	**25.5**	10.4	---
Stock as collateral	2.1	2.4	**5.4**
Branch 100-car unit train (%)	35.3	**58.3**	28.6
Branch 25-75 car facility (%)	31.4	12.5	**50.0**
Branch no railroad (%)	33.3	29.2	18.8
Hog Farmer (%)	12.0	**33.0**	7.0
Grain Farmer owner (%)	43.1	14.6	**71.4**
Grain Farmer rent (%)	21.6	**52.1**	21.4
Grain Farmer crop share (%)	7.8	10.4	7.1
Grain Farmer combo (%)	23.5	18.8	---
Percent inputs purchase	1.3	1.3	**2.9**
Household income from non-farm	2.3	**3.6**	**3.4**
Equity redemption plan	**4.1**	3.3	**4.1**
Effort to understand investment	3.2	**3.5**	2.1
Falling commodity price constraint	**18.8**	11.0	4.3
Impending Retirement constraint	**7.0**	0.2	**7.5**
Environmental concern constraint	**3.8**	1.4	---
Land availability constraint	11.0	**30.5**	18.9
Cost to support family constraint	1.1	**4.2**	1.4
Alternative commodity constraint	0.2	**2.8**	---
Limited available time constraint	1.9	2.0	**15.0**
Labor costs/availability constraint	0.4	0.6	**6.8**
N	**51**	**48**	**14**

significant at the ten percent level. Cluster 1 includes older members with fewer years to relinquish control and a higher constraint from impending retirement. About one-fourth of the respondents in cluster 1 indicate no debt. Almost one-third of the respondents in cluster 1 indicate quicker redemption of old equities, whereas one-fourth of the respondents in cluster 1 prefer higher cash payment in year earned. Respondents in cluster 1 also face a greater falling commodity constraint and an environmental constraint.

Cluster 2 represents younger members with more years before relinquishing control and higher percent of household income from non-farm sources. The respondents in cluster 2 experienced higher crop production growth rates than the other clusters, but cannot borrow against their stock. About half of the respondents in cluster 2 primarily rent the crop ground and represent a higher percent of hog farmers. The respondents in cluster 2 score higher toward the investment not being worth the effort to understand. About fifty-eight percent of the respondents in cluster two primarily conduct business with branch locations that have a 100-car unit train facility. The respondents in this cluster face a greater land availability constraint, cost to support family constraint and a better rate of return from producing an alternative commodity constraint. About thirty-nine percent of the respondents in cluster 2 prefer higher cash payment in year earned.

Cluster 3 represents a group of respondents who can borrow a higher percent of the stock's market value and are primarily owners of the cropland. The respondents in cluster 3 purchase a higher percent of their inputs from the cooperative and perceive it is worth the effort to understand their investment. About twenty-one percent of the respondents in cluster 3 prefer quicker redemption of old equities and half of the

respondents prefer the current policy. The respondents in this cluster face a greater limited available time constraint, impending retirement constraint and labor costs/availability constraint.

The cluster analysis grouped the respondents based on whether the cooperative investment is worth understanding after removing the members who do not have an opinion about the equity redemption plan. In addition, the cluster analysis grouped respondents based on preference for equity redemption plan. Therefore, cluster analysis weakly indicates that the horizon problem may be more severe for certain clusters of members in West Central.

5.2.6. Summary

The descriptive and inferential statistics regarding variables related to the horizon problem indicate the attitude toward whether the cooperative investment is worth understanding is related to stock as collateral, years as member and business area investment preference. The factor analysis indicates that members facing a retirement constraint tend toward the investment not being worth understanding. The ordinal probit regression also indicate the statistical significance of the value lender places on cooperative investment, size of crop operation and importance of market versus book value of the cooperative.

Members who farm more acres also deliver a smaller percent of grain through the cooperative, and indicate a higher score toward the investment not being worth understanding, which weakly supports hypothesis 2A. Respondents who can borrow a higher percent of the stock's market value tend toward the investment being worth the effort to understand so the model supports hypothesis 2C. In the factor analysis,

members who limited crop production due to impending retirement tend toward the investment not being worth the effort to understand so hypothesis 4B is weakly supported. The succession plan variable is not significant in the regression model so hypothesis 2B is not supported.

The descriptive and inferential statistics indicate the preference for equity redemption plan is related to years to relinquish control and cost to support family constraint. The preference for equity redemption plan was correlated with years as a member and the fourth principal component factor in factor analysis. In ordinal probit regression, years to relinquish control variable is statistically significant. Respondents with five to fifteen years before they relinquish control tend toward a preference for quicker redemption when compared to respondents who plan to relinquish control in more than fifteen years, which supports hypothesis 1A. The lender value variable and the constraints indicating high current cash obligations were not statistically significant in the model, so hypothesis 3A and 3C are not supported.

The descriptive and inferential statistics indicate that the preference for crop input products vs. services is correlated with the branch railroad facility, crop production growth in last five years and next five years, and return on equity variable. The factor analysis indicates the variable was significantly related to the return on equity variable. The variable indicating years to relinquish control has significantly different means for the crop inputs/service preference so hypothesis 4A is weakly supported. The constraints indicating high cash obligations are not significant in the model, so hypothesis 3B is not supported.

The cluster analysis indicates the membership might be separated into two clusters. The separation into clusters does not identify a group who has a greater preference for the equity redemption plan or who perceives the investment is worth understanding. Cluster 2 who has a higher percent of respondents who prefer the cooperative invest in innovations or new products tends to be the older group who does not have any debt.

When the respondents who did not have an opinion about the equity redemption policy were removed, the three clusters separated the members more distinctly on equity redemption plan preference, and whether the investment is worth understanding. The members who felt the West Central investment was not worth understanding (cluster 2) also had a higher preference toward higher cash payment today. The members in cluster 2 purchased a smaller volume of crop inputs from the cooperative and represented a higher percent of hog farmers. The members who had the highest preference for quicker redemption (cluster 1) were the oldest group with the fewest number of years before relinquishing control.

The results from the West Central survey indicate evidence the "wait-to-receive" horizon problem exists – hypothesis 1A is supported with descriptive statistics, factor analysis and probit regression. The results indicate weak evidence that the "hassle" horizon problem exists – hypothesis 2A is supported by probit regression, hypothesis 2B is not supported and hypothesis 2C is weakly supported with descriptive statistics, factor analysis and probit regression. The results indicate almost no evidence the "current obligation" horizon problem exists in West Central Cooperative – hypothesis 3A is supported with descriptive statistics at the five percent level, hypotheses 3B and 3C are

not supported. The results indicate weak evidence the "short-term residual" horizon problem exists – hypothesis 4A is supported weakly with descriptive statistics and hypothesis 4B is supported with factor analysis and probit regression.

5.3. Northeast Missouri Grain Processors Survey Results

The Northeast Missouri Grain Processors survey (Appendix 1C) consisting of twenty-six questions was sent to all 311 members December 2, 2004. Between December 2004 and January 2005, ninety-seven surveys were returned to the University of Missouri. One survey was returned blank resulting in ninety-six completed surveys. This represents an overall 30.9% response rate (96 respondents/311 members), or thirty-one percent of the entire membership.

Respondents who indicate they generate farm revenue from hogs or beef cattle (question 10) are classified as a 'hog' or 'beef' member. Table 5.123 indicates that almost half the respondents grow only corn and soybeans and another forty percent raise beef cattle. However, only 8.8% of the respondents raise hogs. One respondent indicated his farm generates revenue from dairy in addition to beef and grain.

Table 5.123 NMGP Frequency Table of Type of Farmer

Type of Farmer	Frequency	Percent	Valid Percent	Cumulative Percent
Only Crop Farmer	44	45.8	48.4	48.4
Crop and Beef Farmer	39	40.6	42.9	91.2
Crop and Hog Farmer	8	8.3	8.8	100.0
Total	91	94.8	100.0	
Missing	5	5.2		
N	**96**	100.0		

The respondents farm, on average, about 499 acres of corn (question 13, Table 5.124) which is three times larger than the average corn acreage in the 120-mile radius territory from which NEMO sources its corn (2002 Census of Agriculture, NEMO Grain

LLC, 2004). In total, the respondents farm about 45,390 acres of corn, which represents about three percent of the 2004 corn acreage in the 120-mile radius.

Table 5.124 NMGP Frequency Table of Size of Corn Operation in Acres

Acres of Corn	Frequency	Percent	Valid Percent	Cumulative Percent
Zero	5	5.2	5.5	5.5
Less than 100	7	7.3	7.7	13.2
100 – 499	43	44.8	47.3	60.4
500 – 999	24	25.0	26.4	86.8
1,000 – 1,499	7	7.3	7.7	94.5
1,500 – 1,999	1	1.0	1.1	95.6
More than 2,000	4	4.2	4.4	100.0
Total	91	94.8	100.0	
Missing	5	5.2		
N	**96**	100.0		

In 2004, about half of the respondents harvested more than 60,000 bushels of corn. In total, the respondents harvested about 7.56 million bushels of corn (question 12,

Table 5.125 NMGP Frequency Table of Size of Corn Operation in Bushels Produced

Bushels of Corn	Frequency	Percent	Valid Percent	Cumulative Percent
Zero	5	5.2	5.5	5.5
Less than 20,000	12	12.5	13.2	18.7
20,000 – 59,999	32	33.3	35.2	53.8
60,000 – 99,999	13	13.5	14.3	68.1
100,000 – 139,999	13	13.5	14.3	82.4
140,000 – 179,999	5	5.2	5.5	87.9
180,000 – 219,000	5	5.2	5.5	93.4
More than 220,000	6	6.3	6.6	100.0
Total	91	94.8	100.0	
Missing	5	5.2		
N	**96**	100.0		

Table 5.125), with an average 83,130 bushels per respondent. This results in an average yield of 166 bushels of corn per acre. In 2004, Missouri had record corn yields of 162 bushels per acre, which is about 19 bushels per acre above the previous record set in 2000

(Danekas, 2005), so the bushels reported by the respondents are higher than the typical year. Five respondents indicated they did not produce any corn in 2004. The median respondent delivered about thirty percent of their corn production to fulfill the share corn requirements (question 24) and delivered between forty-six and sixty percent of their total corn production to the cooperative (question 25). This indicates the respondents, on average, deliver corn to the cooperative in addition to their share corn requirements (Table 5.126).

Table 5.126 NMGP Frequency Table of Percent of Corn Production Delivered to Cooperative for Share Corn Requirements and Percent of Corn Production Delivered in Total to Cooperative

	Share Corn Requirements		Delivered in Total to Cooperative	
Percent of Corn Production	Frequency	Percent	Frequency	Percent
0 – 15%	23	24.0	14	14.6
16 – 30%	23	24.0	19	19.8
31 – 45%	12	12.5	10	10.4
46 – 60%	4	4.2	8	8.3
61 – 75%	9	9.4	10	10.4
76 – 90%	7	7.3	12	12.5
More than 90%	13	13.5	20	20.8
Total	91	94.8	93	96.9
Don't Know	3	3.1	2	2.1
Missing	2	2.1	1	1.0
N	**96**	100.0	**96**	100.0

Kendall's tau-b correlation statistic: .625, Sig. 0.000

Using the middle point of each category in question 24 and question 25, the approximate number of bushels each respondent delivered to the cooperative can be calculated by multiplying the number of bushels produced by the approximate percent of corn production delivered to the cooperative. The respondents deliver approximately 2.65 million bushels of corn (or approximately 35% of their corn production) to the ethanol plant to fulfill their share corn requirements. The average respondent delivers

about 29,700 bushels of corn annually for share corn requirements. This represents about 17.1% of the 15.5 million bushels of corn the cooperative utilizes for the ethanol plant. The respondents deliver an additional 1.1 million bushels to the ethanol plant rather than to other buyers. In total, the respondents deliver approximately 3.75 million bushels of corn, which represents about one-fourth of the corn utilized by the ethanol plant annually. The average respondent delivers about 41,000 total bushels annually to the ethanol plant. Therefore, the respondent's answers are assumed to represent the population of Northeast Missouri Grain Processors members.

The next section provides a general description of the 96 respondents. Descriptive statistics help describe the respondents in terms of the size and location of farm, growth plans, constraints for production growth, type of operator, age of respondent and succession plans. Section 5.3.2 helps inform the horizon problem with descriptive and inferential statistics. Sections 5.3.3 to 5.3.5 use multivariate data analysis to support or reject the hypotheses in Chapter 2.

5.3.1. Description of Northeast Missouri Grain Processors Respondents

The cooperative sources the corn for the ethanol plant from 120-mile radius of the cooperative (NEMO Grain, LLC, 2004). The median respondent's farm is 41 to 70 miles from the ethanol plant (question 6, Table 5.127). Only six percent of the respondents have a farm within twenty miles of the ethanol plant. About one-fourth of the respondents travel 21 to 40 miles to reach the plant, whereas another fourth travel more than 70 miles.

Table 5.127 NMGP Frequency Table of Distance from the Respondent's Farm to the Ethanol Plant

Distance of Farm to NEMO Plant	Frequency	Percent	Valid Percent	Cumulative Percent
Less than 20 miles	6	6.3	6.4	6.4
21 – 40 miles	23	24.0	24.5	30.9
41 – 70 miles	40	41.7	42.6	73.4
More than 70 miles	25	26.0	26.6	100.0
Total	94	97.9	100.0	
Missing	2	2.1		
N	**96**	100.0		

The average percent of corn delivered to fulfill *share corn* requirements does not significantly differ based on distance from the NEMO plant. However, the respondents closer to the ethanol plant deliver, on average, a significantly higher percent of their *total* corn production to the cooperative relative to the respondents farther from the ethanol plant (Table 5.128).

Table 5.128 Percent of Corn Production Deliver to Cooperative by Distance from the NMGP Respondent's Farm to the Ethanol Plant

	Distance from the Respondent's Farm to the Ethanol Plant			
Percent of Corn Production Deliver to Cooperative	Less than 20 miles	20 – 40 miles	41 – 70 miles	More than 70 miles
Don't Know	16.7%	4.3%	---%	---%
0 – 15%	16.7	----	15.0	25.0
16 – 30%	----	8.7	22.5	29.2
31 – 45%	----	4.3	15.0	12.5
46 – 60%	----	13.0	7.5	8.3
61 – 75%	----	21.7	10.0	4.2
76 – 90%	----	21.7	12.5	8.3
More than 90%	66.7	26.1	17.5	12.5
N	**6**	**23**	**40**	**24**

Cramer's V statistic: .351, Sig. 0.034; Kendall's tau-b statistic, -.267, Sig. 0.088

Respondents who farm between forty and seventy miles from the ethanol plant have larger corn operations, on average, relative to the other respondents. The

respondents within twenty miles of the plant have the smallest corn operations (Table 5.129).

Table 5.129 Size of Corn Operation by Distance from the NMGP Respondent's Farm to the Ethanol Plant

	Distance from the Respondent's Farm to the Ethanol Plant			
Size of Corn Operation	Less than 20 miles	20 – 40 miles	41 – 70 miles	More than 70 miles
Total Acres	732	7,985	26,831	7,594
Average Number of Acres	183.0	399.3	706.1	345.2
Total Bushels	127,230	1,338,000	4,482,022	1,207,250
Average Number of Bushels	31,808	66,900	117,948	54,875
Average Yield (bu/acre)	173.8	167.6	167.1	159.0
N	**4**	**20**	**38**	**22**

In addition, the respondents forty to seventy miles from the ethanol plant represent a higher proportion of the share corn and total corn delivered by the respondents (Table 5.130). However, the respondents closer to the cooperative deliver a higher percent of their corn production in addition to the share corn requirements. The respondents farther than seventy miles do not deliver much corn in addition to that

Table 5.130 Bushels Deliver to Cooperative by Distance from the Respondent's Farm to the Ethanol Plant

	Distance from the Respondent's Farm to the Ethanol Plant			
Approximate Bushels Deliver to Cooperative for	Less than 20 miles	20 – 40 miles	41 – 70 miles	More than 70 miles
Share Corn Requirements	35,704	444,540	1,897,688	254,568
Average Bushels/Member	8,926	22,227	49,465	11,571
Total Corn Delivered	121,505	932,815	2,353,335	254,778
Average Bushels/Member	30,376	46,640	61,930	11,581
N	**4**	**20**	**38**	**22**

Kendall's tau-b for share corn and distance: -.015, Sig. 0.872; for total corn and distance: -.220, Sig. 0.017

required to fulfill their share corn delivery right obligations. This could reflect that the respondents further than seventy miles from the ethanol plant benefit less from the freight allowance compared to respondents who farm closer to the plant.

Between 2000 and 2004, the number of harvested corn acres in the 120-mile radius territory increased by about one percent (MASS, 2004). However, the number of harvested corn acres in the 60-mile radius increased about five percent. An increase in corn acreage closer to the plant might reflect the increased corn basis in Macon due to the ethanol plant. The median respondent increased corn production 1-10% over the last five years (Table 5.131, question 14) and plans to increase corn production 1-10% in the next five years (question 15).

Table 5.131 Frequency Table of NMGP Respondent's Change in Crop Production in Last Five Years

Change in Corn Production Last 5 Years	Frequency	Percent	Valid Percent	Cumulative Percent
Decreased	6	6.3	6.5	6.5
Stayed Same	26	27.1	28.3	34.8
Increased 1-10%	20	20.8	21.7	56.5
Increased 11-20%	16	16.7	17.4	73.9
Increased 21-30%	11	11.5	12.0	85.9
Increased 31-40%	4	4.2	4.3	90.2
Increased 40%+	9	9.4	9.8	100.0
Total	92	95.8	100.0	
Missing	4	4.2		
N	**96**	100.0		

The respondent's expected rate of growth for the next five years is similar to the growth rate over the last five years (Table 5.132). About 30.4% of the respondents expect to grow at the same rate in the next five years as in the last five years. About 49% expect to decrease their rate of growth and 20.6% expect to increase their rate of growth.

Table 5.132 NMGP Growth of Corn Production during next 5 years by Growth of Corn Production in last 5 years

	Growth of Corn Production in **last** 5 years						
Growth of Corn Production **next** 5 years	Decreased	Stayed Same	Increased 1-10%	Increased 11-20%	Increased 21-30%	Increased 31-40%	Increased > 40%
Decrease	33.3%	15.4%	5.0%	6.3%	---%	---%	11.1%
Stay Same	50.0	50.0	25.0	6.3	45.5	25.0	22.2
Increase 1-10%	---	23.1	45.0	56.3	36.4	25.0	22.2
Increase 11-20%	---	7.7	15.0	25.0	18.2	---	33.3
Increase 21-30%	---	---	10.0	---	---	50.0	11.1
Increase 31-40%	16.7	---	---	6.3	---	---	---
Increase > 40%	---	3.8	---	---	---	---	---
N	**6**	**26**	**20**	**16**	**11**	**4**	**9**

Kendall's tau-b statistic: .263, Sig. 0.089

The median respondent plans to retire from farming between 3 to 5 years (Table 5.133). About 24% of the respondents do not know when they plan to relinquish control over their farm (question 20). About twenty percent of the respondents plan to relinquish control in less than five years. Another one-fourth plan to relinquish control in the medium term (six to fifteen years). Almost twenty percent plan to relinquish control in the long-term (sixteen to twenty years). The range of responses suggests these

Table 5.133 Frequency Table of NMGP Respondent's Years before Relinquishing Control over Farm

Years to Relinquish Control	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	23	24.0	24.5	24.5
Already Relinquished	5	5.2	5.3	29.8
< 1 Year	2	2.1	2.1	31.9
1-2 Years	3	3.1	3.2	35.1
3-5 years	16	16.7	17.0	52.1
6-10 years	14	14.6	14.9	67.0
11-15 years	11	11.5	11.7	78.7
16-20 years	20	20.8	21.3	100.0
Total	94	97.9	100.0	
Missing	2	2.1		
N	**96**	100.0		

respondents might have different preferences for investments related to the horizon problem, which will be discussed in the next section.

When asked which succession plan the respondent is considering for their farming operation (question 21), there was a range of responses. About 14% of the respondents indicated they do not know their succession plan. About 22.6% plan to maintain ownership, about 30.1% plan to leave the farm to family who will continue to farm, and another 16.1% are considering both of these options. Therefore, about sixty-nine percent of the respondents have a long-term view when considering future cooperative investments. About 4.3% plan to sell the farm and 6.5% plan to leave the farm to family who will not continue to farm. About 2.5% plan to maintain ownership and then sell the farm while 3.8% are considering other succession plans. This indicates there may be differences of preferences regarding the indicators for the horizon problem.

The succession plan considered by respondents was significantly positively correlated with the respondent's farm return on investment being greater than NEMO return (question 22, Kendall's tau-b 0.263, significance .003). Almost all the respondents

Table 5.134 NMGP Respondent's Succession Plan by On-Farm Return on Investment Greater than NEMO Return

	On-Farm Return on Investment Greater than NEMO Return	
Succession Plan	On-Farm ROI Greater	Farm ROI **Not** Greater
Don't Know	---%	18.1%
Sell Farm/Family won't Farm	4.8	13.9
Maintain Ownership/Sell Farm	---	2.8
Maintain Ownership/Family will Farm	90.5	62.5
Other	4.8	2.8
N	**21**	**72**

Cramer's V Statistic: .285, Approx. Sig: .109

with a higher on-farm return plan to either maintain ownership or leave the farm to family who will continue farming (Table 5.134).

The median respondent is within the 56-60 age category (question 18). About one-third of the respondents are younger than 50 and almost one-third are older than 60 years (Table 5.135). This suggests that age might be a dimension to consider when describing the horizon problem.

Table 5.135 Frequency Table of NMGP Respondent's Age

Respondent's Age in years	Frequency	Percent	Valid Percent	Cumulative Percent
< 40	10	10.4	10.8	10.8
41-45	8	8.3	8.6	19.4
46-50	13	13.5	14.0	33.3
51-55	12	12.5	12.9	46.2
56-60	20	20.8	21.5	67.7
61-65	9	9.4	9.7	77.4
> 65	21	21.9	22.6	100.0
Total	93	96.9	100.0	
Missing	3	3.1		
N	**96**	100.0		

A comparison of the respondent's age with the type of crop farmer (question 19) indicates that respondents who are primarily owners, on average, are older relative to the other respondents (Table 5.136). When the respondent is younger, he might cash rent to spread fixed costs over more acreage until he can purchase additional land.

Respondents who are primarily owners and cash rent or were owner/renter/crop share, on average, have larger crop operations relative to the other respondents (Table 5.137). The owner increases the size of his operation by renting neighboring land with cash.

Table 5.136 Age of NMGP Respondent by Type of Grain Farmer

	Type of Grain Farmer				
Age of Respondent	Crop Share	Owner/Crop Share	Owner	Owner/Cash Rent	Owner/ Rent/ Crop Share
Younger than 40	40.0%	---%	7.8%	7.7%	16.7%
41-45	40.0	---	2.0	30.8	5.6
46-50	---	16.7	19.6	15.4	---
51-55	---	33.3	7.8	15.4	22.2
56-60	20.0	16.7	25.5	15.4	16.7
61-65	---	---	9.8	---	22.2
Older than 65	---	33.3	27.5	15.4	16.7
N	**5**	**6**	**51**	**13**	**18**

Cramer's V statistic: .329, Sig. 0.021

Table 5.137 NMGP Size of Corn Operation by Type of Operator

	Type of Operator				
Size of Corn Operation	Crop Share	Owner/Crop Share	Owner	Owner/Cash Rent	Owner/ Rent/ Crop Share
< 100 acres	75.0%	16.7%	17.0%	---%	---%
100-499	---	66.7	53.2	30.8	42.1
500-999	25.0	16.7	21.3	38.5	36.8
1,000-1,499	---	---	4.3	15.4	15.8
1,500-1,999	---	---	---	---	5.3
> 2,000 acres	---	---	4.3	15.4	---
N	**4**	**6**	**47**	**13**	**19**

Cramer's V statistic: .287, Sig. 0.022

Members were asked to indicate the percent of the share corn or delivery rights they could borrow against (question 4, Table 5.138). About sixty-two percent of the respondents do not know what percent of the share's market value against which they can borrow. About six percent of the respondents indicated the lender values their shares at less than fifteen percent of their market value. About thirty percent of the respondents indicate the lender values the shares at more than forty-five percent of its market value.

Table 5.138 Frequency Table of How the Lender Values the Share Corn or Delivery Rights of Northeast Missouri Grain Processors relative to the Market Value

Percent of Market Value	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	56	58.3	62.2	62.2
0 – 15%	5	5.2	5.6	67.8
16 – 30%	---	---	---	67.8
31 – 45%	2	2.1	2.2	70.0
46 – 60%	6	6.3	6.7	76.7
61 – 75%	2	2.1	2.2	78.9
76 – 90%	2	2.1	2.2	81.1
> 90%	17	17.7	18.9	100.0
Total	90	93.8	100.0	
Missing	6	6.3		
N	**96**	100.0		

The farm is an important source of revenue for the majority of the respondents, although 18.3% of the respondents generate less than half of their household income from farm sources (question 23, Table 5.139). More than one-third of the respondents generate more than ninety percent of their household income from farm sources. The median respondent generates seventy to eighty percent of their household income from farm sources.

Table 5.139 Frequency Table of NMGP Respondent's Percent of Household Income from Farm Sources

Percent of Household Income from Farm	Frequency	Percent	Valid Percent	Cumulative Percent
< 40%	13	13.5	14.0	14.0
41 – 50%	4	4.2	4.3	18.3
51 – 60%	7	7.3	7.5	25.8
61 – 70%	14	14.6	15.1	40.9
71 – 80%	9	9.4	9.7	50.6
81 – 90%	10	10.4	10.8	61.4
> 90%	36	37.5	38.7	100.0
Total	93	96.9	100.0	
Don't Know	1	1.0		
Missing	2	2.1		
N	**96**	100.0		

The respondents generate, on average, about seventy-six percent of their farm revenue from grain and seventeen percent of their farm revenue from livestock (question 9 to 11). Crop farmers generate a higher percent of their farm revenue from grain relative to livestock farmers (Table 5.140). Hog farmers generate the highest percent of farm revenue from livestock. From 2004 to 2009, hog farmers expect to reduce their farm revenue from livestock by about eighteen percent, which is indicative some of the hog farmers plan to get out of hogs in the future. Each group of farmers increased the percent of farm revenue from corn since 1999. They also expect farm revenue from corn to continue to increase in the next five years. This might be indicative of the ethanol plant's positive impact on the respondent's farm revenue from corn. The remaining revenue each year might be for a forage crop, specialty crop or a result of the percentages in the respondent's surveys not summing to one hundred. The reduction in number of respondents from 2004 to 2009 is mostly due to uncertainty of plans in five years.

Table 5.140 NMGP Average Farm Revenue from Grain, Livestock and Corn by Type of Operator, 1999 - 2009

Grain or Livestock Revenue by Year	Type of Operator[a]			
	Crop	Beef	Hogs	Total
Grain Revenue 1999	88.6%	68.1%	43.1%	75.6%
Livestock Revenue 1999	4.1	29.1	56.9	20.0
Grain Revenue 2004	94.1%	66.1%	48.1%	78.1%
Livestock Revenue 2004	---	30.0	51.9	17.4
Grain Revenue 2009	86.2%	64.9%	66.5%	75.2%
Livestock Revenue 2009	2.3	28.5	33.5	16.5
Corn Revenue 1999	36.1%	30.2%	18.1%	31.9%
Corn Revenue 2004	43.6	32.9	25.8	37.4
Corn Revenue 2009	48.4	33.3	37.9	40.9
N 1999, 2004, 2009	**42, 44, 40**	**38, 39, 36**	**8, 8, 8**	**88, 91, 84**

[a] Farmers indicating they generated any percent of revenue from livestock were classified as that type of operator

When respondents were asked to circle the constraints that limited their corn production growth over the last five years (question 16), about 13.5% did not circle any constraints, which is indicative their growth was not constrained over the last five years (Table 5.141). About 9.4% do not expect their corn production growth to be limited by constraints over the next five years (question 17). The average number of constraints was 2.1 for the last five years and 2.4 over the next five years, illustrating the respondents, on average, expect to be limited by about the same number of constraints over the next five years. The median number of constraints was two during the last five years and during the next five years. About 38.5% of the respondents indicated they expect to face *more* constraints in the next five years than in the previous five years, 18.8% of the respondents expect to face *fewer* constraints in the next five years and about 42.7% expect to face the *same* number of constraints.

Table 5.141 NMGP Frequency Table of Number of Constraints Limiting Corn Production Growth over Last Five Years and Next Five Years

Number of Constraints **Last** 5 Years	Frequency	Percent	Number of Constraints **Next** 5 Years	Frequency	Percent
None	13	13.5	None	9	9.4
1	25	26.0	1	26	27.1
2	20	20.8	2	15	15.6
3	22	22.9	3	27	28.1
4	11	11.5	4	11	11.5
5	2	2.1	5	5	5.2
6	3	3.1	More than 5	3	3.0
N	**96**	100.0	**N**	**96**	100.0

About fifty-nine percent of the respondents indicate that land cost or land availability was a constraint in the last five years and sixty percent perceive land cost to be a constraint in the next five years (Table 5.142). The average value of land and

buildings per acre increased 177% from 1995 to 2004 in the Northeast and North Central regions of Missouri, which represents most of the counties within sixty miles of the ethanol plant (MASS, 2005). In 2004, the average value of land and buildings in the Northeast Missouri region was $1,430 per acre and in the North Central region was $1,210, which was slightly lower than the Missouri average of $1,580 per acre.

Table 5.142 Percent of NMGP Respondents Indicating Constraints that Limited their Corn Production Growth over Last Five Years and Will Limit Production Growth in Next Five Years

Constraints Limiting Corn Production Growth	Percent of Respondents **Last** 5 Years	Percent of Respondents **Next** 5 Years	Change in Percent of Respondents
Land Cost or Availability	59.4%	60.4%	+ 1.0%
Rising Input Costs	43.8%	50.0%	**+ 6.2%**
Falling Corn Price	21.9%	24.0%	+ 2.1%
Better Rate of Return from producing Alternative Commodity	18.8%	13.5%	***- 5.3%***
Labor Costs or Availability	17.7%	21.9%	**+ 4.2%**
Limited Available Time	15.6%	14.6%	- 1.0%
My Capacity to Service More Debt	11.5%	4.2%	***- 7.3%***
Management Capacity	9.4%	6.3%	***- 3.1%***
Water Costs or Availability	4.2%	5.2%	+ 1.0%
Urban Encroachment/Subdivision Pressures	3.1%	3.1%	---
Rising Share Corn Prices	3.1%	1.0%	- 2.1%
Environmental Concerns/Regulations	1.0%	7.3%	**+ 6.3%**
Cost of Supporting Family	1.0%	4.2%	**+ 3.2%**
Lack of Suitable Off-Farm Employment Opportunities	1.0%	1.0%	---
Complexity of Investing in NMGP	---%	1.0%	+ 1.0%
Impending Retirement		18.8%	
None of the Constraints	13.5%	9.4%	***- 4.1%***

More respondents perceive rising input costs as a constraint to their growth in the next five years (50%) than in the past five years (43.8%). Rising input costs has become

a greater constraint as the price of fertilizer increases. Falling corn prices continue to be a constraint for about one-fourth of the respondents in the next five years. Environmental concerns/regulations are expected to be a greater constraint in the next five years than in the past five years.

Several constraints have significantly different means for larger versus smaller corn operations. A greater percent of the small corn operations have limited their growth due to a better rate of return from producing an alternative commodity (Table 5.143). The larger corn operations may not be able to switch to alternative commodities and therefore do not face this constraint.

Table 5.143 Percent of NMGP Respondents Facing Constraint by Size of Corn Operation

	Size of Corn Operation			
Percent of Respondents Facing Constraint	<100 acres	100 – 499	500 – 1,000	> 1,000
99 Better Rate from Alternative Commodity**	41.7%	25.6%	8.3%	---%
09 Better Rate from Alternative Commodity**	33.3	18.6	4.2	---
99 Labor Cost/Availability**	25.0%	14.0%	8.3%	50.0%
09 Labor Cost/Availability*	16.7	14.0	29.2	50.0
99 Capacity to Service Debt	16.7%	4.7%	16.7%	25.0%
09 Capacity to Service Debt*	16.7	---	4.2	8.3
N	**12**	**43**	**24**	**12**

Level of significance of difference of means: * Ten percent level, ** Five percent level, *** One percent level

Labor costs and availability is a constraint for about one-fifth of the respondents. In addition, labor cost and availability is a constraint for a greater percentage of large corn operations relative to the smaller operations. More labor is needed for larger corn operations, which might go beyond the labor provided by the family.

The capacity to service debt was recognized as a greater constraint in the last five years than in the next five years. In addition, a higher percent of the very large and the

very small corn operations faced the capacity to service debt constraint in the last five years. In the next five years, a higher percent of the small corn operations expect to face the constraint to service debt.

The descriptions about the respondents provided above will help inform which variables might be important in analyzing the horizon problem.

5.3.2. Descriptive and Inferential Statistics Related to Horizon Problem

Two questions in particular were designed in the survey to analyze the horizon problem in Northeast Missouri Grain Processors, Inc (question 5 and question 7). These questions test H_2 and H_{4B}. Two other questions indirectly evaluate the horizon problem by looking at the respondent's preference for investment in technology that would pay back over a longer period through an increased share corn return (question 3 and question 26). These questions test hypotheses H_{4C}.

Northeast Missouri Grain Processors is a relatively new cooperative with only five years in operation. The dividends paid to the cooperative from NEMO Grain LLC are, in turn, allocated to the farmer-members. At least twenty percent is paid in cash to the farmer-member in the year earned and the remainder is retained by the cooperative. A question regarding the member's preference of equity redemption was removed from the draft survey at the request of the general manager to avoid confusion and additional questions from the membership. However, the cooperative has not had sufficient time since its inception to redeem equity to its members on a revolving period. Therefore, the survey does not test whether the wait-to-receive horizon problem exists in Northeast Missouri Grain Processors.

The first statement requests respondents to indicate their attitude about whether it is worth their effort to understand their cooperative investment (question 5). This question evaluates whether the "hassle" horizon problem exists by testing hypotheses 2 and 4B. Almost three-fourths of the respondents answered 1 or 2 indicating it is worth their effort to understand their investment (Table 5.144). Only eleven percent perceived it is not worth the effort to understand their investment.

Table 5.144 Frequency Table of NMGP Respondent's Preference to "It is Not Worth the Effort of trying to Understand the Composition of my Cooperative Investment"

Response to Survey Question 5		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Disagree	35	36.5	37.2	37.2
2		33	34.4	35.1	72.3
3		7	7.3	7.4	79.8
4	Doesn't Matter	4	4.2	4.3	84.0
5		4	4.2	4.3	88.3
6		7	7.3	7.4	95.7
7	Strongly Agree	4	4.2	4.3	100.0
	Total	94	97.9	100.0	
	Missing	2	2.1		
N		**96**	100.0		

The statement regarding whether it is worth the member's effort to understand his investment has a negative significant relationship with size of corn operation and with the distance from the plant (Table 5.145). In addition, the statement has a negative relationship with the respondent's change in corn production over the last five years and the variable comparing the cooperative and on-farm return on investment (question 22). In the cross tabulations, more than 20% of the expected frequencies are less than five, so the chi-square statistics are not provided since the chi-square statistic would not be accurate. Therefore, each relationship will be evaluated further with difference of means test.

Table 5.145 Nonparametric Correlations with NMGP Statement "It is Not Worth the Effort of trying to Understand the Composition of my Cooperative Investment"

Not Worth Effort to Understand Investment	Bushels Produced	Corn Acres	Distance from plant	Corn growth last 5 years	Return on Investment
Kendall's tau b Coefficient	-.179**	-.167**	-.225**	-.225***	-.217**
Sig. (2-tailed)	.027	.038	.011	.009	.016
N	**89**	**89**	**94**	**90**	**91**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

Distance from plant was the only variable that indicated significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.146).

Table 5.146 NMGP Means for "It is Not Worth the Effort of trying to Understand the Composition of my Cooperative Investment" by Distance from Farm to Ethanol Plant

Distance to Plant	Mean	N	Std. Deviation
< 20 miles	4.50	6	2.429
21 – 40 miles	2.52	23	1.648
41 – 70 miles	2.25	40	1.548
> 70 miles	2.12	25	1.787
Total	**2.43**	**94**	**1.763**

The variances of the groups are equal since the Levene statistic (1.73, sig 0.170) is not significant (Table 5.147). Therefore, the one-way analysis of variance is reliable. The F-statistic from the ANOVA for distance from the plant is significant so one or more

Table 5.147 NMGP ANOVA Table for "It is Not Worth the Effort of trying to Understand the Composition of my Cooperative Investment" vs. Distance to Plant

ANOVA					
Not Worth Effort to Understand Investment	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	29.60	3	9.87	3.424	.021**
Within Groups	259.38	90	2.88		
Total	**288.98**	**93**			

Level of significance F-Test: ** Five percent level, *** One percent level

of the differences of means is significantly different from the other means ($F(3, 90) = 3.424$, $p<.05$).

Post hoc tests are computed to compare each group of respondents based on distance from the plant. Since the variances of the groups are similar (Levene's test above) and sample sizes for each group are different, Hochberg's GT2 test is used. Comparison of the means indicated the respondents within twenty miles of the ethanol plant have a significantly different answer than the respondents who live more than forty miles away. Therefore, respondents within twenty miles were more likely to perceive it is not worth the effort to understand their investment compared to respondents living forty miles or more from the plant.

Table 5.148 NMGP Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Cooperative Investment" vs. Distance to Plant using Hochberg's GT2

Dependent Variable: Not Worth Effort to Understand Investment					
Hochberg GT2 test	(I) Distance to plant	(J) Distance to plant	Mean Difference (I-J)	Std. Error	Sig.
	< 20 miles	20 – 40	1.978	.778	.052
		41 – 70	2.250**	.743	.008
		> 70 miles	2.38**	.772	.009

Level of significance Hochberg GT2 test: ** Five percent level, *** One percent level

The variable indicating the level of member's patronage is not significantly correlated with the attitude that the investment is not worth understanding, so hypothesis 2A is not supported. The variable indicating the respondent's plan to continue farming is not associated with the attitude that the investment is not worth understanding, so hypothesis 2B is not supported. The variable indicating the ability to borrow against the cooperative investment is also not associated with the attitude the investment is not worth understanding, so hypothesis 2C is not supported with descriptive statistics.

The second statement requests respondents to indicate their attitude about further cooperative investment in the ethanol plant (question 7). This question helps to analyze whether the "residual short-term" horizon problem exists by testing 4B. About fifty-six percent of the respondents answered 6 or 7 indicating they prefer further investment in the ethanol plant (Table 5.149). Only eleven percent agreed that the cooperative should not invest further in the ethanol plant. The median respondent answered six, indicating he prefers further investment.

Table 5.149 Frequency Table of NMGP Respondent's Preference to "I Prefer No Further Cooperative Investment in NEMO"

Response to Survey Question 7		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Agree	5	5.2	5.4	5.4
2		6	6.3	6.5	11.8
3		3	3.1	3.2	15.1
4	Indifferent	11	11.5	11.8	26.9
5		16	16.7	17.2	44.1
6		28	29.2	30.1	74.2
7	Strongly Disagree	24	25.0	25.8	100.0
	Total	93	96.9	100.0	
	Missing	3	3.1		
N		**96**	100.0		

The statement regarding whether the member prefers further cooperative investment in the ethanol plant has a negative significant relationship with age and with the rising share corn constraint (Table 5.150). In addition, the statement has a positive relationship with the respondent's change in corn production over the last five years and the percent of total corn delivered to the cooperative. In the cross tabulations, more than 20% of the expected frequencies are less than five, so the chi-square statistics are not provided since the chi-square statistic would not be accurate. Therefore, each relationship will be evaluated further with difference of means test.

Table 5.150 Nonparametric Correlations with NMGP Statement "I Prefer No Further Cooperative Investment in NEMO"

Prefer No Further Investment in NEMO	Age	Change corn last 5 years	Percent of Total Corn Delivered	1999 Rising Share Corn Constraint
Kendall's tau b Coefficient	-.216**	.300***	.172**	-.239***
Sig. (2-tailed)	.014	.001	.040	.010
N	**90**	**89**	**90**	**93**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

The percent of total corn delivered did not have significant difference of means or a significant F-ratio for the one way ANOVA. Different age groups had significantly different means for the statement about whether the member prefers further cooperative investment in NEMO (Table 5.151).

Table 5.151 Means for "I Prefer No Further Cooperative Investment in NEMO" by NMGP Respondent's Age

Respondent's Age	Mean	N	Std. Deviation
Younger than 40 years	5.90	10	1.197
41 – 50 years	5.67	21	1.461
51 – 65 years	5.28	40	1.633
Older than 65 years	4.32	19	2.187
Total	**5.23**	**90**	**1.742**

The variances of the groups are not equal since the Levene statistic (2.94, sig 0.038) is significant. Therefore, the one-way analysis of variance is not reliable. Post hoc tests compare each group of respondents based on age using Games-Howell test. Comparisons of the ages indicate the respondents younger than forty years have a significantly different answer than respondents older than sixty-five (Table 5.152). Therefore, older members were less likely to prefer the cooperative invest in NEMO compared to younger members. This suggests that the "residual short-term" horizon problem may exist because H_{4B} is supported with the descriptive statistics.

Table 5.152 NMGP Multiple Comparisons for "I Prefer No Further Cooperative Investment in NEMO" vs. Age using Games Howell Test

Dependent Variable: Preference for further Cooperative Investment in NEMO					
Games Howell test	(I) Age Group	(J) Age Group	Mean Difference (I-J)	Std. Error	Sig.
	< 40 years	41 – 50	.233	.495	.965
		51 – 65	.625	.458	.536
		> 65 years	1.58*	.629	.079

Level of significance Games Howell test: * One percent level, ** Five percent level, *** One percent level

Respondents with different production growth patterns had significantly different means for the statement about whether the member prefers further cooperative investment in NEMO (Table 5.153).

Table 5.153 NMGP Means for "I Prefer No Further Cooperative Investment in NEMO" by Respondent's Corn Production Growth in Last Five Years

Corn Production Growth in Last Five Years	Mean	N	Std. Deviation
Decreased	5.33	6	1.211
Stayed Same	4.96	26	1.562
Increased 1 – 10%	4.89	19	1.449
Increased 11 – 30%	5.64	25	1.823
Increased > 30%	6.54	13	.519
Total	**5.39**	**89**	**1.571**

The variances of the groups are equal since the Levene statistic (2.315, sig 0.064) is not significant. Therefore, the one-way analysis of variance is reliable. The F-statistic from the ANOVA for crop production growth in last five years is significant so one or more of the differences of means is significantly different from the other means ($F(4, 88) = 3.128$, $p<.05$) (Table 5.154).

Comparisons of the corn production growth indicate the respondents who stayed the same size or increased corn production by less than 10% have a significantly different

Table 5.154 NMGP ANOVA Table for "I Prefer No Further Cooperative Investment in NEMO" vs. Corn Production Growth in Last Five Years

ANOVA					
Corn Production Growth in Last Five Years	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	28.16	4	7.04	3.128	.019**
Within Groups	189.08	84	2.25		
Total	**217.24**	**88**			

Level of significance F-Test: ** Five percent level, *** One percent level

answer than respondents who increased corn production by more than thirty percent (Table 5.155). Therefore, members with aggressive growth patterns were more likely to prefer the cooperative invest in NEMO compared to members who stayed the same size or increased corn production less than ten percent. However, members who decreased corn production did not have a significantly different mean compared to the other respondents.

Table 5.155 NMGP Multiple Comparisons for "I Prefer No Further Cooperative Investment in NEMO" vs. Corn Production Growth in Last Five Years using Games Howell Test

Dependent Variable: Preference for further Cooperative Investment in NEMO					
Games Howell test	(I) Corn Growth in Last 5 Years	(J) Corn Growth in Last 5 Years	Mean Difference (I-J)	Std. Error	Sig.
	Increased >30%	Decreased	1.205	.515	.253
		Stayed Same	1.577***	.338	.000
		Increased 1-10%	1.644***	.362	.001
		Increased 11-30%	.898	.392	.175

Level of significance Games Howell test: ** Five percent level, *** One percent level

Respondents indicating a constraint from rising share corn prices had significant relationship with the statement about whether the member prefers further cooperative investment in NEMO (Table 5.156). The mean for respondents indicating a rising share corn price constraint was significantly lower compared to other respondents.

Table 5.156 NMGP Means for "I Prefer No Further Cooperative Investment in NEMO" by Rising Share Corn Price Constraint

Rising Share Corn Constraint	Mean	N	Std. Deviation
Yes	2.00	3	1.732
No	5.33	90	1.635
Total	**5.23**	**93**	**1.733**

The variances of the groups are equal since the Levene statistic (.003, sig 0.959) is not significant. Therefore, the one-way analysis of variance is reliable. The F-statistic from the ANOVA for rising share corn price constraint is significant so the mean of respondents with the constraint is significantly different from respondents without the constraint (F (1, 91) = 12.031, p<.01) (Table 5.157). Therefore, respondents who face a constraint in corn production growth from rising share corn prices are more likely to prefer the cooperative not invest in NEMO.

Table 5.157 ANOVA Table for "I Prefer No Further Cooperative Investment in NEMO" vs. Rising Share Corn Price Constraint

ANOVA					
Rising Share Corn Price Constraint	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	32.26	1	32.26	12.031	.001***
Within Groups	244.00	91	2.68		
Total	**276.26**	**92**			

Level of significance F-Test: ** Five percent level, *** One percent level

The third and fourth statements requests respondents to indicate their preference for further cooperative investment in the new technology (question 3 and 26). These questions helps to test the hypotheses whether the "residual short-term" horizon problem exists by testing hypotheses 4C. If the "residual short-term" horizon problem exists, one would expect a variation in preference for new technology, especially if the member cannot capture the capitalized value of their delivery right. About fifty-three percent of

the respondents answered 1 or 2 indicating they prefer investment in new technology (Table 5.158). About sixteen percent prefer that the cooperative not invest in new technology. The median respondent answered two, indicating he prefers further investment in new technology.

Table 5.158 Frequency Table of NMGP Respondent's Preference to "I Prefer the Cooperative's Investment in NEMO be in New Technology, which Increases my Existing Share Corn Requirements"

Response to Survey Question 3		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Agree	24	25.0	26.1	26.1
2		25	26.0	27.2	53.3
3		8	8.3	8.7	62.0
4	Indifferent	12	12.5	13.0	75.0
5		8	8.3	8.7	83.7
6		9	9.4	9.8	93.5
7	Strongly Disagree	6	6.3	6.5	100.0
	Total	92	95.8	100.0	
	Missing	4	4.2		
N		**96**	100.0		

Question 26 requests respondents circle their preference for cooperative investment in new technology, no further investment or indicate they do not know. About seventy-nine percent of the respondents answered preference for cooperative investment in new technology (Table 5.159). About three percent prefer no further

Table 5.159 Frequency Table of NMGP Respondent's Preference to Investment Strategy the Cooperative should Adopt

Response to Survey Question 26	Frequency	Percent	Valid Percent	Cumulative Percent
New Technology	76	79.2	80.8	80.8
No Further Investment	3	3.1	3.2	84.0
Don't Know	15	15.6	16.0	100.0
Total	94	97.9	100.0	
Missing	2	2.1		
N	**96**	100.0		

cooperative investment in NEMO and sixteen percent indicated they do not know which strategy the cooperative should adopt. The median respondent answered preference for further cooperative investment in new technology.

Neither of these statements is significantly related to the other variables. The number of years before the respondent relinquishes control is not correlated with either of the preference for investment in technology, so hypothesis 4C is not supported. The strong preference for new technology indicates the "short-term residual" horizon problem may not exist in Northeast Missouri Grain Processors. This could reflect the ability of members to capture a capitalized value of their investment through appreciable delivery rights.

Additional multivariate data analysis will be used in the next section to further test whether the horizon problem exists in Northeast Missouri Grain Processors.

5.3.3. Factor Analysis of Northeast Missouri Grain Processors Survey

Factor analysis indicates a set of common underlying dimensions among the variables in a data set. A principal components factor analysis was conducted on the data from the Northeast Missouri Grain Processors survey. Since the determinant of the correlation matrix (.03124) is greater than the necessary value .00001, multicollinearity is not a problem for this data. The Bartlett's test of sphericity is highly significant (p<0.001) and therefore the factor analysis is appropriate. The Kaiser-Meyer-Olkin measure of sampling adequacy (.585) indicates the patterns of correlations between variables are mediocre, so the factor analysis should provide reliable factors. The variables distance to plant (.468) and capacity to service debt (.451) had individual KMO values less than 0.5 however, removal of these variables only increased the overall KMO

measure of sampling adequacy by 0.008, so the following analysis describes the factors with these two variables included.

Using the criterion to accept factors with eigen values greater than one, seven factors are retained for interpretation (Table 5.160). The seven factors explain 59.1% of the total variance. Figure 5.7 of the scree plot indicates that either two or seven factors should be considered to describe the data.

Table 5.160 Eigen Values Greater than one and Total Variance Explained with Principal Component Analysis for NMGP Survey

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	Percent of Variance	Cumulative Percent	Total	Percent of Variance	Cumulative Percent
1	2.665	13.33	13.33	1.958	9.79	9.79
2	2.262	11.31	24.64	1.957	9.79	19.58
3	1.666	8.33	32.96	1.796	8.98	28.56
4	1.484	7.42	40.39	1.757	9.79	37.34
5	1.332	6.66	47.04	1.613	8.07	45.41
6	1.246	6.23	53.27	1.435	7.18	52.59
7	1.166	5.83	59.10	1.304	6.52	59.10

Table 5.161 indicates the statistical significant factor loadings for the orthogonal rotated component matrix of the NMGP survey. Three variables have a significant factor loading for the first rotated principal component: rising input cost constraint, better return for an alternative commodity constraint, and the percent of farm revenue in 2004 from corn. This factor explains almost ten percent of the total variation. This factor appears to represent the profitability of corn to the respondent. Members who are constrained from rising input costs or better return from producing an alternative commodity are likely to indicate a smaller percent of farm revenue from corn. Figure 5.8 to Figure 5.10 illustrate the factor loadings for the principal components.

Figure 5.7 Scree Plot for Principal Component Analysis of NMGP Survey

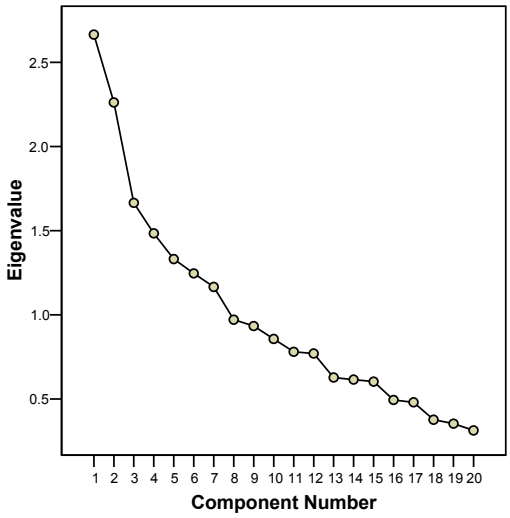


Table 5.161 Loading Factors of Rotated Principal Components for NMGP Survey

	Rotated Principal Component						
Variable	1	2	3	4	5	6	7
Rising Input Cost constraint	**.715**						
Better Return on Alternative Commodity	**.706**						
Percent Farm Revenue from Corn 2004	**-.635**						
Preference to Invest in Cooperative		**.773**					
Rising Share Corn Prices constraint		**-.613**					
Age		**-.601**					
Change in Corn Production last 5 years		**.590**					
No constraint for Corn Production 1999			**-.795**				
Land cost/Availability Constraint			**.749**				
Bushel corn deliver for share corn				**.734**			
Labor cost/availability constraint				**.729**			
Percent corn Production Deliver				.529			
Distance to Plant					**.724**		
Effort to Understand Investment					**-.632**		
Limited Available Time constraint					-.433		
Preference for Investment in technology						**.629**	
Falling Corn Price constraint						**.610**	
Years to Relinquish Control						**.595**	
Capacity to service debt constraint							**.827**
Lender value on share corn							.500

Figure 5.8 Rotated PCA1 and PCA2 for NMGP Survey

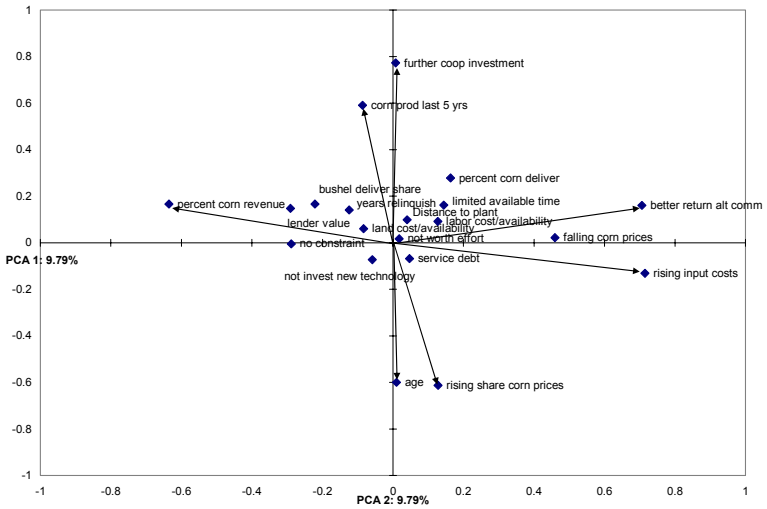


Figure 5.9 Rotated PCA3 and PCA4 for NMGP Survey

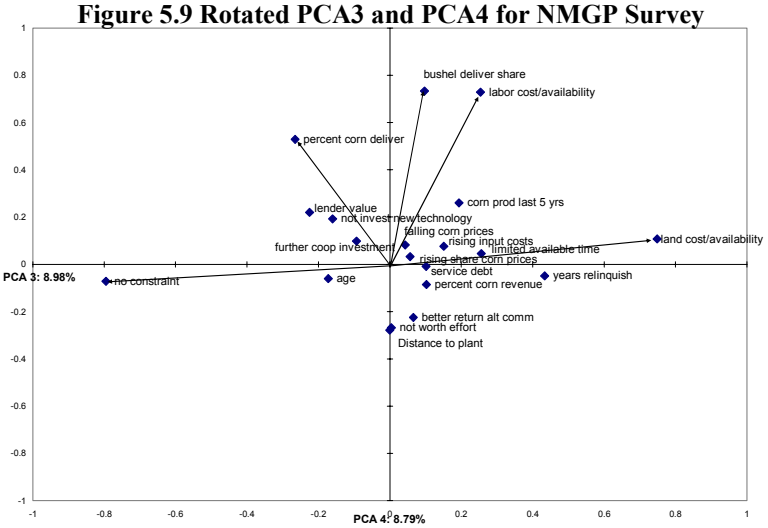


Figure 5.10 Rotated PCA5 and PCA6 for NMGP Survey

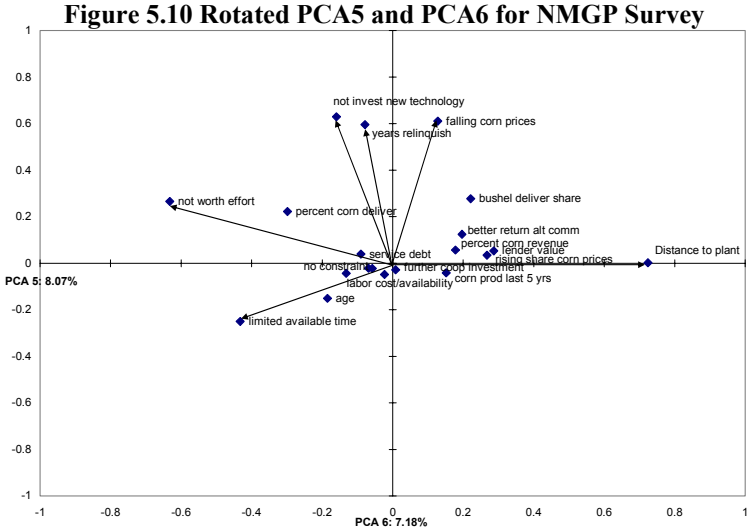


Figure 5.8 illustrates that the constraints for better rate of return from an alternative commodity, rising input costs and falling corn prices are positively correlated with each other and with the first principal component. The percent of farm revenue from corn is negatively correlated with the constraints, which indicates if the respondents are constrained by input costs and commodity prices, the farm revenue from corn is likely to be lower.

The survey question 7 about preference for further cooperative investment in NEMO is highly correlated with the second principal component, which explains about 9.8% of the total variation in the data. Preference for further cooperative investment is positively correlated with the change in corn production in the last five years. Respondents who increase corn production were more likely to prefer further cooperative investment in NEMO. The preference for cooperative investment is negatively related with age and the constraint from rising share corn prices. Older members are less likely to prefer further cooperative investment in NEMO, which supports hypothesis 4B. In addition, if members limited their corn production growth due to increasing share corn prices, they are less likely to prefer further cooperative investment in NEMO.

The third principal component in Figure 5.9 explains about nine percent of the total variation in the data. Two variables have a statistical significant factor loading for the third principal component, which represents the land constraint. The respondents indicated either they did not face any constraints for corn production growth or they faced the land cost or availability constraint.

The fourth principal component explains about 8.8% of the total variation in the data in which two variables are statistically significant. This component represents the

corn delivered for share corn requirements. Interestingly the bushels delivered for share corn requirement is positively related with the labor cost constraint. This indicates that members who deliver a larger amount of corn to fulfill their share requirements also limit their corn production growth due to labor cost/availability. This could indirectly indicate that respondents with larger corn production face a labor constraint.

The fifth principal component in Figure 5.10 explains about eight percent of the total variation in which two variables are statistically significant. The fifth component captures the question regarding whether a member perceives the cooperative investment is worth understanding. The respondent's distance to the ethanol plant is negatively related with whether the investment is worth understanding. This indicates respondents who live *closest* to the ethanol plant are more likely to perceive the investment *is not worth* understanding.

The sixth principal component explains about seven percent of the total variation in which three variables are statistically significant. The sixth principal component indicates the preference for cooperative investment in new technology. The preference for investment in new technology is negatively related with years to relinquish control and with the falling corn prices constraint. This indicates that members with more years before they relinquish control are more likely to prefer the cooperative *not* invest in new technology. This does not support hypothesis 4C. In addition, members who limited their corn production growth due to falling corn prices are more likely to prefer the cooperative *not* invest in new technology.

In summary, the factor analysis supports hypothesis 4B but does not support hypothesis 4C. The variables indicating level of member patronage, succession plan, and

ability to borrow against the investment are not significantly correlated with the factor representing whether it is worth the effort to understand the investment, so hypotheses 2A, 2B and 2C are not supported with factor analysis. Therefore, the new generation cooperative design in Northeast Missouri Grain Processors may reduce the impact of the horizon problem since the members can capture an appreciated value of the delivery rights. The next section analyzes the survey data with probit regression.

5.3.4. Probit Regression Results of Northeast Missouri Grain Processors

To test hypotheses 2 and 4, an ordinal probit regression model is used when the dependent variable involves an answer using a seven point LIKERT scale. The independent variables can be grouped into categories:

1. Succession Plans: the number of years before the member plans to relinquish control over the farm (question 20); the member's plan for the farm after relinquish control (question 21) and age (question 18)
2. Growth: the ability for the member to borrow against his cooperative investment (question 4); corn production growth in the last five years (question 14); constraints for corn production growth in the last five years (question 16) and comparison of return at cooperative level versus farm level (question 22)
3. Description of the Member: the type of farmer in terms of grain or livestock (derived from question 10) and type of farmer in terms of how acquire more farmland (question 19); and the level of household income from farm versus non-farm sources (question 23)

4. Description of Member in terms of corn delivery: the distance of the member from the ethanol plant (question 6); and the bushels of corn deliver to the ethanol plant (derived from question 12 and 25)

The nominal variables listed above are coded as dummy variables. To identify the model correctly, at least one of the dummy indicators is removed for each variable. Ordinal explanatory variables are transformed with the terza method to create a new cardinal variable based on the frequency of observations. Ordinal probit regression is run in SPSS 12.0 for Windows.

To evaluate hypothesis 2, the dependent variable is the respondent's answer to whether their investment is worth understanding with 1=is worth and 7=not worth. The χ^2-statistic for the regression model in Table 5.162 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model performs fairly well.

Table 5.162 NMGP Ordinal probit Regression Model Fitting Information for "It is Not Worth the Effort of trying to Understand the Composition of My Cooperative Investment"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	257.67				
Final	202.59	55.08	15	.000***	.493

N: 87; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The results for the ordinal probit regression model for the variable indicating whether the cooperative investment is worth understanding are shown in Table 5.163. The level of member patronage variable was highly correlated with the member's growth in the last five years, so the bushels delivered variable was removed from the model. Members who increased their corn production in the last five years tend to believe it is

worth their effort to understand their cooperative investment. This weakly supports hypothesis 2A.

Table 5.163 NMGP Coefficients for Ordinal probit Regression Model, Dependent Variable: "It is Not Worth the Effort of trying to Understand the Composition of My Cooperative Investment"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Not Worth Effort to Understand = 1	.567	.442	1.646	.200
Not Worth Effort to Understand = 2	1.891	.473	15.998	.000***
Not Worth Effort to Understand = 3	2.266	.487	21.677	.000***
Not Worth Effort to Understand = 4	2.457	.495	24.599	.000***
Not Worth Effort to Understand = 5	2.681	.507	27.933	.000***
Not Worth Effort to Understand = 6	3.494	.574	37.081	.000***
Location				
Relinquish don't know	.479	.390	1.510	.219
Relinquish < 5 years	.155	.383	.163	.686
Relinquish 5-10 years	1.375	.452	9.244	.002***
Relinquish 10-15 years	.797	.464	2.953	.086*
Owner/Crop Share	-1.369	.585	5.482	.019**
Less than 20 miles from ethanol plant	2.353	.633	13.834	.000***
21 – 40 miles from ethanol plant	.112	.382	.086	.769
41 – 70 miles from ethanol plant	.566	.328	2.974	.085*
Change crop production last five years	-.326	.137	5.694	.017**
Beef Farmer	-.630	.277	5.181	.023**
Don't know Farm vs. coop return	1.433	.390	13.494	.000***
Seldom think about farm vs. coop return	.803	.402	3.992	.046**
On-Farm return greater than coop	.117	.333	.123	.726
Support family constraint	4.302	1.332	10.428	.001***
Limited available time constraint	.659	.358	3.378	.066*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

Members who have between five and fifteen years before they relinquish control of the farm scored higher toward the investment not worth understanding compared to respondents who have more than fifteen years before they relinquish control.

The succession variable is not significant in the model so hypothesis 2B, which states the plans to continue farming will be negatively associated with attitude that the investment is not worth understanding, is not supported. The variables indicating

member's ability to borrow against their cooperative shares are not statistically significant so hypothesis 2C is not supported.

One interesting thing to note is that members with beef cattle tend to indicate their investment is worth understanding. This might be reflective that members with beef cattle are more likely to purchase DDGS as a supplement for their cattle feed and therefore perceive a value in understanding their investment.

Hypothesis 4B can also be evaluated with the dependent variable being the respondent's preference for no further cooperative investment in NEMO with 1=no further investment and 7=further investment. The χ^2-statistic for the regression model in Table 5.164 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model explains about 55.8% of the total variation in preference for cooperative investment.

Table 5.164 NMGP Ordinal probit Regression Model Fitting Information for "I Prefer No Further Cooperative Investment in NEMO"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	273.99				
Final	210.04	63.95	16	.000***	.558

N: 83; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for further cooperative investment in NEMO are shown in Table 5.165. The coefficient on the number of bushels delivered to cooperative is statistically significant at the one percent level. As members increase the bushels of grain delivered to the cooperative, they prefer further cooperative investment in NEMO. In addition, members

who increased their corn production in the last five years tend to prefer further cooperative investment in NEMO.

Table 5.165 NMGP Coefficients for Ordinal probit Regression Model, Dependent Variable: "I Prefer No Further Cooperative Investment in NEMO"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
No further cooperative investment = 1	-2.862	.510	31.437	.000***
No further cooperative investment = 2	-2.164	.413	27.393	.000***
No further cooperative investment = 3	-1.939	.394	24.253	.000***
No further cooperative investment = 4	-1.051	.345	9.297	.002***
No further cooperative investment = 5	-.263	.330	.634	.426
No further cooperative investment = 6	.869	.340	6.542	.011**
Location				
Owner/Cash Rent	-1.067	.423	6.353	.012**
Owner/Crop Share	.319	.568	.316	.574
Crop Share	-.989	.628	2.480	.115
Owner/Cash Rent/Crop Share	.306	.338	.819	.365
Age	-.294	.152	3.758	.053*
Less than 20 miles from ethanol plant	.807	.738	1.194	.274
21 – 40 miles from ethanol plant	-.989	.398	6.167	.013**
41 – 70 miles from ethanol plant	-.558	.338	2.726	.099*
Change crop production last five years	.332	.148	5.014	.025**
Bushels Deliver total to cooperative	.00001	.000	9.196	.002***
Don't know Farm vs. coop return	.849	.411	4.275	.039**
Seldom think about farm vs. coop return	1.214	.425	8.150	.004***
On-Farm return greater than coop	.327	.336	.948	.330
Falling corn price constraint	-.530	.317	2.807	.094*
Rising share corn price constraint	-2.084	.815	6.547	.011**
Urban encroachment constraint	-2.812	.855	10.809	.001***

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

Members who were constrained from a rising share prices tend to score lower toward preference for no further cooperative investment in NEMO. This might indicate that members who cannot afford to purchase additional share corn may not see the benefit from the cooperative making further investments in NEMO.

The variable indicating the years to retire is not statistically significant; however, the age coefficient is significant at the ten percent level. Older members tend to prefer no

further cooperative investment in NEMO, which weakly supports hypothesis 4B. The statistically significant coefficient on the variable own and rent land indicates that members who own and rent the land will tend to have a lower score toward preference for no further investment when compared to members who primarily own land. This may indicate that individuals who own and rent the land cannot benefit as much from further investment.

New technology will typically take longer to make a profit than short-term investments. Therefore, the preference for cooperative investment in new technology can test hypothesis 4C. The dependent variable is the respondent's preference for cooperative investment in new technology with 1=new technology and 7=not new technology. The χ^2-statistic for the regression model in Table 5.166 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model explains about 44.7% of the total variation in preference for cooperative investment in new technology.

Table 5.166 NMGP Ordinal probit Regression Model Fitting Information for "I Prefer the Cooperative Investment in NEMO be in New Technology, which Increases my Existing Share Corn Returns"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	304.04				
Final	255.07	48.98	20	.000***	.447

N: 86; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for cooperative investment in new technology are shown in Table 5.167. The coefficient on the producer who owns, and rents land comes up significant in the model at

five percent level. These members score higher towards preference for no cooperative investment in new technology compared to producers who primarily owned land.

Table 5.167 NMGP Coefficients for Ordinal probit Regression Model, Dependent Variable: "I Prefer the Cooperative Investment in NEMO be in New Technology, which Increases my Existing Share Corn Returns"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Investment in New Technology = 1	-.055	.464	.014	.906
Investment in New Technology = 2	.933	.473	3.889	.049**
Investment in New Technology = 3	1.173	.477	6.048	.014**
Investment in New Technology = 4	1.738	.488	12.670	.000***
Investment in New Technology = 5	2.207	.502	19.319	.000***
Investment in New Technology = 6	2.922	.538	29.468	.000***
Location				
Relinquish don't know	-.496	.404	1.502	.220
Relinquish < 5 years	-.877	.384	5.224	.022**
Relinquish 5-10 years	.490	.477	1.056	.304
Relinquish 10-15 years	-.303	.467	.422	.516
Owner/Crop Share/Cash Rent	-.359	.345	1.084	.298
Owner/Cash Rent	.872	.395	4.865	.027**
Owner/Crop Share	.710	.514	1.912	.167
Crop Share	-.057	.601	.009	.925
Less than 20 miles from ethanol plant	1.282	.718	3.186	.074*
21 – 40 miles from ethanol plant	.281	.379	.550	.458
41 – 70 miles from ethanol plant	.664	.324	4.195	.041**
Change crop production last five years	-.272	.147	3.445	.063*
Beef Farmer	.538	.279	3.170	.054*
Hog Farmer	-1.496	.565	7.007	.008***
Succession plan don't know	-.285	.414	.472	.492
Sell farm/family will not farm	.752	.414	3.296	.069*
Land cost/availability constraint	.349	.272	1.638	.201
Rising share corn price constraint	-1.924	.810	5.643	.018**
Water cost/availability constraint	1.235	.756	2.670	.102
Impending retirement constraint	1.301	.377	11.896	.001***

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

The negative coefficient on the variable relinquish in less than five years indicates that members within five years of retirement scored lower towards the preference for new technology than members who plan to retire in more than fifteen years. This rejects hypothesis 4C which states "fewer years until retirement will be negatively associated

with preference for investment in technologies that pay back over more years". However, these members may be planning to sell their share corn in the near future and anticipate the new technology would result in a higher return when they sell their shares. The positive coefficient for the retirement constraint in the next five years indicates that members who will limit their corn production in the next five years due to retirement score higher towards no cooperative investment in new technology. This weakly supports hypothesis 4C. Cross tabulations for retirement within five years and impending retirement in Table 5.168 indicate that 76.9% of the respondents who plan to relinquish control in less than five years do not perceive their corn production in five years will be limited by impending retirement. About 17.1% of the respondents who plan to relinquish

Table 5.168 NMGP Respondents with Retirement Constraint by Respondents Relinquishing Control in Five Years

	Relinquish Control in Less than 5 Years	
Retirement Constraint	Yes	No
Yes	23.1%	17.1%
No	76.9	82.9
N	**78**	**18**

Cramer's V statistic: .068, Sig. 0.508

control in more than five years foresee impending retirement as a constraint to corn production in the next five years. This slight difference in results for impending retirement constraint and relinquish control in less than five years indicates we cannot reject hypothesis 4C.

The negative coefficient on the variable for hog farmer indicates the hog farmer score lower toward preference for new technology compared to crop farmers. This might be a result of some of the hog farmers planning to exit hogs in the next five years and would like to see new technology that would help increase their farm revenue from corn

at the cooperative level rather than at the farm level. The positive coefficient on the variable for beef farmer indicates the beef farmer scored higher toward preference for no cooperative investment in new technology.

Members who plan to sell their farm or whose family does not plan to farm in the future score higher toward no cooperative investment in new technology when compared to members who plan to maintain ownership or whose family plans to continue farming. The next section uses cluster analysis to group the respondents in different clusters.

5.3.5. Cluster Analysis of Northeast Missouri Grain Processors Survey

The cluster analysis can separate respondents into similar groups. A hierarchical procedure using a Ward's method algorithm resulted in two, four or eight clusters. The largest percentage increase in clustering coefficient occurs in going from two to one clusters and the next noticeable change occurs in combining three into two clusters (Table 5.169). A much lower percentage change occurs in combining five into four clusters or combining nine into eight clusters.

Table 5.169 NMGP Analysis of Agglomeration Coefficient for Hierarchical Cluster Analysis

Number of Clusters	Agglomeration Coefficient	Percent Change in Coefficient to next level	Change in Percent
10	198.762	3.10	0.02
9	204.918	3.08	**0.25**
8	211.232	3.33	-0.03
7	218.263	3.30	0.07
6	225.464	3.37	0.06
5	233.071	3.43	**0.33**
4	241.066	3.76	-0.05
3	250.127	3.71	**0.96**
2	259.397	4.67	**4.67**
1	271.502	---	---

The eight clusters have significantly different means for twenty-two variables. The variable indicating the preference for further cooperative investment in NEMO is significant at the five percent level. The four clusters have significantly different means for fourteen variables and the two clusters have significantly different means for fifteen variables. The question about the cooperative investment being worth the effort to understand is not significant in any of the clusters. The variable indicating the preference for new technology is also not significant in any of the clusters. Variables with statistically significant means for the two clusters are indicated in Table 5.170.

Table 5.170 NMGP Means for Significant Variables for the Two Clusters

	Two Clusters (means)	
Variable	1	2
Livestock Farmer	1.5	1.8
Percent Corn as Share corn	2.0	**4.4**
Percent Corn Deliver Total	2.9	**5.1**
Age	**5.1**	3.6
Years to Relinquish Control	1.2	**3.6**
Household Income Non-farm	2.1	**3.9**
Percent revenue from corn	**41.4**	33.0
Percent revenue from livestock	13.4	**24.0**
No constraints	21.1	---
Alternative Crop constraint	7.9	**34.2**
Rising Input Cost constraint	23.7	**60.5**
Falling Corn Price constraint	13.2	**36.8**
Water Cost constraint	---	10.5
Labor Cost constraint	5.3	**26.3**
Management constraint	15.8	---
N	**38**	**38**

Respondents in cluster 1 are on average older, have fewer years to relinquish control, have less income from non-farm sources and deliver a lower percent of their corn production to the cooperative. Respondents in cluster 2 generate a higher percent of farm revenue from livestock. A greater percent of the respondents in cluster 2 limited their

corn production growth due to falling corn prices, labor costs, rising input costs and better rate of return from alternative commodity. A greater percent of respondents in cluster one limited their corn production growth due to management capacity.

For the four clusters, the group of older respondents in cluster 1 above is separated into three clusters (1a, 1b and 1c). Cluster 2 still represents younger respondents with a higher percent of income from non-farm sources and a higher percent of their corn production delivered to the ethanol plant (Table 5.171). Cluster 1b has the lowest percent of household income from non-farm sources and delivers the lowest percent of their corn production to the ethanol plant. Cluster 1a has the highest increase in the additional corn delivered to the cooperative relative to their share corn requirements. A higher percent of the respondents in Cluster 1a limited their corn

Table 5.171 NMGP Means for Significant Variables for the Four Clusters

	Four Clusters (means)			
Variable	1a	1b	1c	2
Type of Grain Operator	1.9	2.4	1.1	1.7
Percent corn as Share corn	2.3	1.7	2.7	**4.4**
Percent Corn Deliver Total	3.6	2.4	3.9	**5.1**
Age	4.9	5.2	4.9	3.6
Years to Relinquish Control	0.4	1.4	1.1	**3.6**
Succession Plan	1.5	2.0	1.0	1.2
Household Income Non-farm	2.4	1.7	3.3	**3.9**
No constraints	---	4.3	100.0	---
Alternative Crop constraint	12.5	8.7	---	34.2
Rising Input Cost constraint	62.5	17.4	---	60.5
Falling Corn Price constraint	50.0	4.3	---	36.8
Rising Share Corn constraint	37.5	---	---	---
Land Cost constraint	37.5	73.9	---	73.7
Management constraint	75.0	---	---	---
N	**8**	**23**	**7**	**38**

production growth due to rising share corn prices and management capacity. All of the respondents in cluster 1c indicated no constraints limited their corn production growth.

A higher percent of the respondents in 1b are owners-renters-crop share, whereas a higher percent of respondents in 1c are primarily owners. A higher percent of respondents in 1b plans to maintain ownership or leave the farm to family who plans to continue farming. A higher percent of respondents in 1c and 2 do not have a succession plan.

Cluster 1a and 1b and be divided into four clusters. In addition, cluster 2 can be divided into three clusters (Table 5.172). Cluster 2c represents respondents with significantly larger corn operation than the other clusters. Respondents in 2c and 1b* clusters can borrow a higher percent of the market value of their delivery rights from the

Table 5.172 NMGP Means for Significant Variables for the Eight Clusters

	Eight Clusters (means)							
Variable	1a*	1a**	1b*	1b**	1c	2a	2b	2c
Share Corn Bushels (,000)	12	16	21	18	*11*	35	16	**382**
Total Corn Delivered (,000)	*12*	74	43	23	25	47	22	**382**
Total Corn Produced (,000)	52	106	159	76	55	71	*35*	**400**
Corn Acres	280	605	960	460	337	432	*217*	**2,350**
Percent corn as Share corn	2.0	2.4	1.5	1.9	2.7	4.3	4.2	**7.0**
Percent Corn Deliver Total	2.0	4.6	2.5	2.3	3.9	5.1	4.8	**7.0**
Type Operator	1.6	2.1	3.0	2.0	1.1	1.5	1.9	2.3
Age	**6.3**	4.0	4.0	6.1	4.9	3.5	4.0	2.0
Years to Relinquish Control	0.7	0.2	2.2	0.8	1.1	2.8	1.4	**4.0**
Succession Plan	2.0	1.2	2.1	1.9	1.0	0.9	1.5	2.0
Household Income Non-farm	2.7	2.2	1.7	1.6	3.3	**4.4**	3.3	4.0
Percent Lender Value Shares	-0.3	0.0	5.1	0.2	2.1	1.1	-0.4	**7.0**
Prefer Further Investment	2.0	5.4	5.4	5.2	6.0	5.4	5.8	**7.0**
Corn Growth Last 5 years	2.0	3.6	4.6	2.6	2.9	4.2	3.3	5.0
No constraints	---	---	10.0	---	100	---	---	---
Alternative Crop constraint	33.3	---	10.0	7.7	---	---	81.3	---
Rising Input Cost constraint	66.7	60.0	30.0	7.7	---	40.0	93.8	---
Falling Corn Price constraint	33.3	60.0	10.0	---	---	20.0	50.0	100
Land Cost constraint	33.3	40.0	40.0	100	---	80.0	62.5	100
Labor Cost constraint	---	20.0	---	7.7	---	25.0	18.8	100
Management constraint	33.3	100	---	---	---	---	---	---
Debt constraint	---	20.0	40.0	---	---	---	18.8	---
N	**3**	**5**	**10**	**13**	**7**	**20**	**16**	**2**

bank than the other clusters. In addition a higher percent of respondents in cluster 1b* limited their corn production due to capacity to service debt. A higher percent of respondents in cluster 2b limited their corn production growth due to rising input costs and better rate of return from an alternative commodity. Respondents in cluster 1a* are older than the other clusters and prefer the cooperative not make further investment in NEMO.

The cluster analysis did not group the respondents based on whether the cooperative investment is worth understanding. In addition, the cluster analysis did not group respondents based on preference for cooperative investment in new technology. However, the cluster analysis did separate the respondents in eight clusters based on preference for further cooperative investment in NEMO. Only three respondents were in the cluster that preferred no further cooperative investment in NEMO. Therefore, cluster analysis indicates that the horizon problem may not be severe in Northeast Missouri Grain Processors.

5.3.6. Summary

The descriptive and inferential statistics regarding variables related to the horizon problem indicate the attitude toward whether the cooperative investment is worth understanding would be related to distance from the ethanol plant. The factor analysis and ordinal probit regression also indicate that members closest to the plant might tend toward the investment not worth understanding. Beef producers also tend toward the investment being worth understanding.

Members with five to fifteen more years to retirement tend toward the investment not being worth understanding when compared to the members with more than fifteen

years to retirement, which weakly supports hypothesis 4B. The succession plan variables are not significant so the ordered probit model does not support hypothesis 2B. Members who increased corn production in the last five years tended toward the investment being worth understanding, which weakly supports hypothesis 2A since corn production growth has a positive significant relationship with the bushels of corn delivered. Hypothesis 2C is not supported since the value the lender places on the member's share is not statistically significant.

The descriptive and inferential statistics indicate the preference for no further cooperative investment in NEMO would be related to age, corn production growth in last five years and constraint from rising share corn. The factor analysis also indicated that further preference for cooperative investment could be measured on these factors. Age is significant at the five percent level in the ordinal probit regression. Older members tend toward preference for no further cooperative investment in NEMO, which weakly supports hypothesis 4B. Members whose corn production growth was limited by rising share corn price tended toward preference for no further cooperative investment. Members with aggressive corn production growth and members who delivered greater amounts of corn to the cooperative tended toward further cooperative investment in NEMO, which weakly supports hypothesis 2A. However, the results do not support hypothesis 2B or 2C because those variables were not statistically significant in the model.

The descriptive and inferential statistics did not indicate any significant relationships to the preference for cooperative investment in new technology. The factor analysis indicates that members who limited their corn production due to low corn prices

tend toward preference for no investment in new technology. However, the ordinal probit regression indicates other variables may account for the variation in the model. Members who plan to sell the farm or whose family will not farm tend toward no investment in new technology. The members within five years of relinquishing control over their farm tend toward further investment in new technology; however, members who perceive their corn production in the next five years to be constrained by impending retirement tend toward no investment in new technology. This both rejects and supports hypothesis 4C.

The cluster analysis indicates the membership might be separated into two or eight clusters. The first separation into clusters identifies an older group who generates a higher percent of farm revenue from corn relative to the other group. The second group is younger, delivers a higher percent of corn to the cooperative, generates a higher percent of farm revenue from livestock and faces more constraints to corn production growth compared to the first group.

The separation of the members into eight clusters separated the members based on preference for further cooperative investment in NEMO. The members who prefer no further investment in the cooperative are the oldest group of members who delivered the smallest percent of corn to the cooperative. The members who score highest on preference for further cooperative investment in NEMO are the youngest group of member with the most number of years to retirement. However, there are very few members in either of these two clusters so generalization of this result to the entire membership might be difficult.

The results from the Northeast Missouri Grain Processors survey has weak evidence the "hassle" horizon problem exists – hypothesis 2A is weakly supported by ordinal probit regression at the ten percent level and hypotheses 2B and 2C are not supported by any technique. The results indicate inconclusive evidence that the "short-term residual" horizon problem exists – hypothesis 4B is supported with descriptive statistics and factor analysis and weakly supported by probit regression and hypothesis 4C is only supported by regression when considering the impending retirement constraint rather than the years to relinquish control variable.

5.4. Fonterra Survey Results

The Fonterra survey (Appendix 1d) consisting of twenty-five questions was sent to the entire Fonterra membership as an insert in the December issue of *Dairy Exporter*. Between December 2004 and March 2005, one thousand one surveys were returned to the University of Missouri. Four of the surveys were returned blank resulting in nine hundred ninety-seven completed surveys. This represents an 8.2% response rate (997 respondents/ 12,144 shareholders) using an approximate number of shareholders in May 2004 (Fonterra, 2004). The respondents represent about 11.7% of the total milk solids collected by Fonterra in 2003/04 (Table 5.173). The respondents have, on average, a larger herd size than the average Fonterra member (question 16), and deliver a greater amount of milk to Fonterra than the average member (question 15). Although the respondent has almost 40% more cows than the average member, the milk productivity for the respondent's cows is only slightly higher than that of the average member. The respondent's answers are assumed to represent the total population of Fonterra members.

Table 5.173 Comparison of Fonterra Survey Results: Number of Cows and Milk Solids

	Survey Summary	Fonterra Population	Percent of Population
# of members	984[18]	12,144	8.1%
# cows	409,360	3,630,000	11.3%
# milk solids (kg ms)	140,957,195	1,201,000,000	11.7%
Average Herd Size	416	298[19]	140%
Average kg ms/ Member	143,249	98,896	145%
Average kg ms/ Cow	344	330[19]	104%

Source: Fonterra, 2004; Fonterra website, 2005; Fonterra Member Survey results, 2004

The next section provides a general description of the 997 respondents. Primarily descriptive statistics help describe the respondents in terms of the size and location of dairy farm, growth plans, constraints for milk solid production growth, type of operator, age of respondent and succession plans. Section 5.4.2 helps inform the horizon problem with descriptive and inferential statistics. Sections 5.4.3 to 5.4.5 use multivariate data analysis to support or reject the hypotheses in chapter two.

5.4.1. Description of Fonterra Respondents

About 84% of the respondents are from the North Island, but they represent only 73% of the milk production in kilograms of milk solids (kg ms) and 75.6% of the cows. This indicates that, on average, dairy farmers on the North Island are smaller relative to South Island dairy farmers (Table 5.174).

Between 2000 and 2004, the number of milk solids processed in New Zealand increased by about twenty-four percent from 0.97 million tones in 2000 to 1.2 million tones in 2004 (MAF, 2000, 2004). The median respondent increased milk production 11-

[18] Thirteen respondents left the question regarding size of dairy operation in kilograms of milk solids blank.
[19] The Fonterra website (2005) indicates the average New Zealand dairy farm has a herd size of 251 cows, which produce an average of 310 kilograms of milk solids per cow per season.

Table 5.174 Fonterra Dairy Operations on North Island and South Island

		Size of Dairy Operation (kg ms)	Herd Size (cows)	Milk Productivity (kg ms/cow)
North Island	Sum	101,867,124	307,006	
	Average	124,076	374	331.8
	N	821		
South Island	Sum	37,939,071	99,383	
	Average	244,768	641	381.7
	N	155		

Kendall's tau-b statistic for kg ms and island: .271, Sig. 0.000; for cows and island: .233, Sig. 0.000

20% over the last five years (Table 5.175, question 17) and plans to increase milk production 1-10% in the next five years (question 18).

Table 5.175 Frequency Table of Fonterra Respondent's Change in Milk Production in Last Five Years

Change in Milk Production Last 5 Years	Frequency	Percent	Valid Percent	Cumulative Percent
Decreased	40	4.0	4.2	4.2
Stayed Same	118	11.8	12.3	16.4
Increased 1-10%	237	23.8	24.7	41.1
Increased 11-20%	199	20.0	20.7	61.8
Increased 21-30%	141	14.1	14.7	76.5
Increased 31-40%	61	6.1	6.3	82.8
Increased 40%+	165	1645	17.2	100.0
Total	961	96.4	100.0	
Missing	36	3.6		
N	**997**	100.0		

The respondent's expected rate of milk production growth for the next five years is similar to the growth rate over the last five years (Table 5.176). About 25% of the respondents expect to grow at the same rate in the next five years as in the last five years. About 63% expect to decrease their rate of growth and 12% expect to increase their rate of growth. Therefore, the rate of milk production growth is decreasing.

The respondents on the South Island, on average, have increased their milk production at a higher rate relative to the respondents on the North Island. About 36% of

Table 5.176 Fonterra Respondent's Growth in Milk Production during next 5 years by Growth in Milk Production in last 5 years

	Growth in Milk Production in **last** 5 years						
Growth in Milk Production **next** 5 years	Decreased	Stayed Same	Increased 1-10%	Increased 11-20%	Increased 21-30%	Increased 31-40%	Increased > 40%
Decrease	35.0%	17.1%	6.9%	10.7%	4.3%	11.9%	5.5%
Stay Same	20.0	47.9	33.8	18.9	17.9	13.6	10.4
Increase 1-10%	22.5	25.6	45.9	46.9	39.3	35.6	28.0
Increase 11-20%	10.0	6.8	10.4	16.8	29.3	22.0	31.7
Increase 21-30%	7.5	0.9	1.3	4.6	7.9	15.3	9.1
Increase 31-40%	2.5	0.9	---	0.5	---	---	4.9
Increase > 40%	2.5	0.9	1.7	1.5	1.4	1.7	10.4
N	**40**	**117**	**231**	**196**	**140**	**59**	**164**

Kendall's tau-b statistic: .310, Sig. 0.026

the respondents on the South Island increased their milk solid production during the last five years (question 17) by more than 40% compared to only 14% on the North Island. However, the rate of growth in milk production in both regions is declining. In the next five years, 9.7% of the respondents on the South Island plan to increase their milk solid production by more than 40% (question 18) compared to only 2% on the North Island (Table 5.177). Approximately 36% of the respondents on the North Island plan to stay

Table 5.177 Growth of Milk Production during last 5 years and next 5 years for North and South Islands

Growth in Milk Production **last** 5 years	New Zealand Island		Growth in Milk Production **next** 5 years	New Zealand Island	
	North Island	South Island		North Island	South Island
Decreased	4.2%	4.0%	Decrease	10.6%	7.7%
Stayed Same	13.2	7.3	Stay Same	25.7	12.9
Increased 1-20%	48.1	30.5	Increase 1-20%	55.5	60.6
Increased 21-40%	20.7	21.9	Increase 21-40%	6.3	9.0
Increased 40%+	13.7	36.4	Increase 40%+	1.9	9.7
N	**802**	**151**	**N**	**805**	**155**

Kendall's tau-b statistic for last five years and island: .157, Sig. 0.000; next five years: .093, Sig. 0.000

the same size or decrease their milk production compared with about 20% on the South Island.

The expected plan to change milk production in the next five years appears to differ based on the type of dairy operator (question 21), or the respondent's location within his career path (Table 5.178). In New Zealand, about 30% of the dairy farmers come from non-farm backgrounds, compared with less than five percent in Wisconsin (CIAS, 1998). New Zealand provides dairy farming training opportunities in public and private technical schools. At a young age, the farmer, a sharemilker, operates a farm on behalf of the farm owner for an agreed share of farm income. Sharemilking allows young farmers to build assets and dairy management skills without a large input of money. After several years of sharemilking, the young farmer cashes in a portion of his cows, accumulated during sharemilking, to purchase a small farm. As an owner operator, the farmer continues to add cattle and land to his operation. Dairy farmers in New Zealand

Table 5.178 Growth of Milk Production during next 5 years by Type of Fonterra Dairy Operator

	Type of Dairy Operator				
Growth in Milk Production during **next** 5 years	Share-milker	Owner Operator	Owner w/ share-milker	Manager Equity[20]	Other
Decrease	5.6%	11.7%	4.4%	17.3%	8.5%
Stay Same	19.1	22.8	28.7	13.5	30.5
Increase 1-20%	61.8	55.2	62.5	59.6	47.5
Increase 21-40%	9.0	7.3	2.9	7.7	8.5
Increase 40%+	4.5	3.1	1.5	1.9	5.1
N	**89**	**618**	**136**	**52**	**59**

Cramer's V statistic: 0.96, Approx. Sig. 0.095

typically move to larger farms with better forage as they increase their herd size. When the farmer wants to retire, he might enter into share agreements with young contract

[20] Manager equity is an operator who manages the business and has an equity share in the business.

milkers or sharemilkers and therefore become an owner with a sharemilker. The farmer may sell or pass on the farm at this stage of his career path.

Table 5.178 indicates sharemilkers and owner operators expect to increase their milk production in the next five years at a higher rate, on average, than the owner with a sharemilker. About one-third of the owners with a sharemilker and one-third of the owner operators plan to stay the same size or decrease their farm's milk production. This might indicate the respondent plans to retire from farming and sell his farm to other sharemilkers.

In regards to plans to retire from farming, the median respondent was in the 3-5 year category[21]. About 19% of the respondents do not know when they plan to relinquish control over their farm (question 22, Table 5.179). The range of responses suggests these members might have different preferences for investments related to the horizon problem, which will be discussed in the next section.

Table 5.179 Frequency Table of Fonterra Respondent's Years before Relinquishing Control over Farm

Years to Relinquish Control	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	193	19.4	19.9	19.9
Already Relinquished	41	4.1	4.2	24.1
< 1 Year	28	2.8	2.9	27.0
1-2 Years	68	6.8	7.0	34.0
3-5 years	189	19.0	19.4	53.4
6-10 years	243	24.4	25.0	78.4
11-15 years	114	11.4	11.7	90.1
16-20 years	96	9.6	9.9	100.0
Total	972	97.5	100.0	
Missing	25	2.5		
N	**997**	100.0		

[21] The do not know category received a -1 code; the other categories received codes 1-6.

The years to relinquish control over the farm appear to differ based on the type of operator (Table 5.180). Share milkers and owner operators have a higher percent of respondents who plan to relinquish control in the long term, 15 to 20 years. The owner operator and the owner with a sharemilker have a higher percent of respondents who plan to relinquish control in the medium term, 6 to 15 years. The share milkers also have a higher percent of respondents who do not know when they plan to relinquish control over the farm. This could reflect the idea that sharemilkers do not typically own a farm, so the question asked may not be as relevant to them.

Table 5.180 Years to Relinquish Control over Farm by Type of Fonterra Dairy Operator

	Type of Dairy Operator				
Years to Relinquish Control over Farm	Share-milker	Owner Operator	Owner w/ share-milker	Manager Equity	Other
Don't Know	36.0%	15.9%	25.5%	14.8%	28.6%
Already Relinquished	5.6	2.8	5.1	5.6	14.3
Less than 5 years	29.2	29.5	29.2	27.8	30.4
6-10 years	10.1	28.7	19.7	29.6	16.1
11-15 years	6.7	12.5	14.6	9.3	7.1
15-20 years	12.4	10.6	5.8	13.0	3.6
N	**89**	**634**	**137**	**54**	**56**

Cramer's V statistic: .134, Approx. Sig. 0.000

When asked which succession plan the respondent is considering for their farming operation (question 23), there was a range of responses. Two responses indicate that the respondent might be concerned about the farm and the cooperative in the longer term: maintain ownership and leave the farm to family who will continue to farm. Another two responses indicate the respondent may not be concerned about the cooperative in the longer term: sell the farm and leave the farm to family who will not continue to farm. About 13.5% of the respondents indicated they do not know their succession plan. About 25.3% plan to maintain ownership and about 24.6% plan to leave the farm to family who

will continue to farm. About 17.3% plan to sell the farm and 4.6% plan to leave the farm to family who will not continue to farm. About another 7.8% are considering a combination of the previously mentioned plans and 6.7% are considering other succession plans. This indicates there may be differences of preferences regarding the indicators for the horizon problem.

The type of operator also reflects the respondent's age. The median respondent is within the 51-55 age category (question 7). About 43.5% of the respondents are younger than 50 and about 39.4% are older than 55 years (Table 5.181). This suggests that age might be a dimension to consider when describing the horizon problem.

Table 5.181 Frequency Table of Fonterra Respondent's Age

Respondent's Age in years	Frequency	Percent	Valid Percent	Cumulative Percent
< 40	122	12.2	12.4	12.4
41-45	159	15.9	16.1	28.5
46-50	154	15.4	15.6	44.1
51-55	158	15.8	16.0	60.1
56-60	149	14.9	15.1	75.2
61-65	114	11.4	11.6	86.7
> 65	131	13.1	13.3	100.0
Total	987	99.0	100.0	
Missing	10	1.0		
N	**997**	100.0		

A comparison of the respondent's age with the type of dairy operator indicates that sharemilkers, on average, are younger than owner operators and owners with a sharemilker (Table 5.182). When the member reaches his early fifties, he might consider selling his farm and buying a larger farm (CIAS, 1998). Once the member reaches the mid-fifties, he might enter into share agreements with contract milkers or sharemilkers,

which is reflective of the high percent of owners with a sharemilker who are older than sixty years.

Table 5.182 Fonterra Respondent's Age by Type of Dairy Operator

	Type of Dairy Operator				
Respondent's Age	Share-milker	Owner Operator	Owner w/ share-milker	Manager Equity	Other
Younger than 40 years	45.2%	8.7%	5.9%	18.5%	10.0%
41 – 50 years	30.1	37.7	14.8	31.5	15.0
51 – 60 years	6.4	33.9	36.3	18.5	40.0
Older than 60 years	18.3	19.7	43.0	31.5	35.0
N	**93**	**631**	**135**	**54**	**60**

Cramer's V statistic: .231, Approx. Sig. 0.000

Sharemilkers and owner operators typically have smaller dairy operations than owners with sharemilkers (Table 5.183). As the sharemilker transitions to an owner, he sells a few of his cows to purchase land, but then builds up his cows to utilize the pasture. The number of cows the respondent has depends on what stage he is in his dairy career.

Table 5.183 Number of Cows in Dairy Operation by Type of Fonterra Dairy Operator

	Type of Dairy Operator				
Number of Cows	Share-milker	Owner Operator	Owner w/ share-milker	Manager Equity	Other
Fewer than 300 cows	55.3%	53.2%	39.1%	37.0%	44.1%
300 – 499 cows	24.5	25.0	34.8	20.4	22.0
500 – 699 cows	9.6	11.7	12.3	14.8	22.0
More than 700 cows	10.6	10.1	13.8	27.8	11.9
N	**94**	**632**	**138**	**54**	**59**

Cramer's V statistic: 0.091, Approx. Sig. 0.004

Members were asked to indicate the percent of their Fonterra shares they could borrow against (question 8, Table 5.184). About fifty-six percent of the respondents do not know what percent of the market value against which they can borrow. About one-

Table 5.184 Frequency Table of How the Lender Values the Fonterra Shares relative to the Market Value

Percent of Market Value	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	527	52.9	55.8	55.8
0 – 15%	14	1.4	1.5	57.3
16 – 30%	10	1.0	1.1	58.4
31 – 45%	6	0.6	0.6	59.0
46 – 60%	31	3.1	3.3	62.3
61 – 75%	40	4.0	4.2	66.5
76 – 90%	78	7.8	8.3	74.8
> 90%	238	23.9	25.2	100.0
Total	944	94.7	100.0	
Missing	53	5.3		
N	**997**	100.0		

fourth of the respondents indicated they can borrow more than ninety percent of the market value. Another sixteen percent can borrow between 45 and 90 percent of the market value of their shares.

Dairy and milk are important sources of revenue for the majority of the respondents (question 24, Table 5.185). About 70.5% of the respondents generate more.

Table 5.185 Frequency Table of Fonterra Respondent's Percent of Household Income from Farm Sources

Percent of Income from Farm Sources	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	13	1.3	1.3	1.3
< 40%	50	5.0	5.1	6.4
41-50%	18	1.8	1.8	8.2
51-60%	30	3.0	3.0	11.3
61-70%	26	2.6	2.6	13.9
71-80%	54	5.4	5.5	19.4
81-90%	99	9.9	10.1	29.5
> 90%	694	69.6	70.5	100.0
Total	984	98.7	100.0	
Missing	13	1.3		
N	**997**	100.0		

than ninety percent of their household income from farm sources. Another 15.5% generate between seventy and ninety percent of their household income from farm sources. Only 12.6% of the respondents generate less than seventy percent of their household income from farm sources

In addition, the respondents generate a high percent of their farm revenue from milk (question 12 to 14, Table 5.186). In 1999, the respondents, on average, generated about 86% of their farm revenue from milk and 11.3% from livestock, which ranged from beef cattle, bobby calves, meat, sheep and deer. Between 1999 and 2004, the respondents, on average, increased their farm revenue from milk by one percent and generated about the same percent of farm revenue from livestock. Between 2004 and 2009, the respondents, on average, expect to decrease the average percent of farm revenue from milk to 80.9% and increase the average percent of farm revenue from livestock to 14.8%. This indicates some of the respondents anticipate exiting dairy and

Table 5.186 Average Farm Revenue from Milk and Livestock by Type of Fonterra Dairy Operator, 1999 - 2009

Milk or Livestock Revenue by Year	Type of Dairy Operator				
	Share-milker	Owner Operator	Owner w/ share-milker	Other	Total
Milk Revenue 1999	85.2%	86.6%	85.2%	85.0%	86.1%
Livestock Revenue 1999	9.5	11.3	11.3	12.8	11.3
N 1999	**82**	**605**	**134**	**104**	**925**
Milk Revenue 2004	87.6%	86.8%	89.2%	85.6%	87.1%
Livestock Revenue 2004	11.0	11.4	9.1	12.8	11.2
N 2004	**85**	**608**	**135**	**107**	**935**
Milk Revenue 2009	81.8%	80.1%	86.6%	78.2%	81.0%
Livestock Revenue 2009	12.1	15.9	9.0	17.8	14.8
N 2009	**79**	**562**	**126**	**102**	**870**

raising more livestock and/or diversifying into sectors like forestry or tourism. In addition, the owner with sharemilker generates a lower percent of farm revenue from livestock in 2004 and 2009 than the other operators and expects to generate a significantly higher percent of farm revenue from milk in 2009 than the other respondents.

When respondents were asked to circle the constraints that limited their milk solids production growth over the last five years (question 19), about 10.3% did not circle any constraints, which is indicative their growth was not constrained over the last five years (Table 5.187). About 7.2% do not expect their milk solid production growth to be limited by constraints over the next five years (question 20). The average number of constraints was 2.3 for the last five years and 2.7 over the next five years, illustrating the respondents, on average, expect to be limited by more constraints over the next five years. The median number of constraints was two during the last five years and three during the next five years. About 39% of the respondents indicated they expect to face

Table 5.187 Fonterra Frequency Table of Number of Constraints Limiting Milk Solid Production Growth over Last Five Years and Next Five Years

Number of Constraints **Last** 5 Years	Frequency	Percent	Number of Constraints **Next** 5 Years	Frequency	Percent
None	103	10.3	None	72	7.2
1	273	27.4	1	226	22.7
2	225	22.6	2	194	19.5
3	188	18.9	3	222	22.3
4	106	10.6	4	139	13.9
5	50	5.0	5	75	7.5
More than 5	52	5.2	More than 5	78	7.8
N	**997**	100.0	**N**	**997**	100.0

more constraints in the next five years than in the previous five years, and 18.8% of the respondents expect to face fewer constraints in the next five years and about 42% expect to face the same number of constraints.

About half of the respondents indicated that land cost or land availability was a constraint in the last five years and will be a constraint in the next five years (Table 5.188). This is a concern as the price of land continues to increase and the majority of the dairy cows in New Zealand are grass fed. Many dairy farmers in New Zealand purchase land to allow them to increase their herd size or improve the forage on their land.

In addition, more respondents perceive environmental concerns and regulations as a constraint to their growth in the next five years than in the past five years. This is reflective of the Parliamentary Commissioner for the Environment's Growing for Good report putting farming intensification, especially in dairy, under the spotlight (Ferrier, 2005).

Rising input costs, rising share prices and falling payouts limit the milk production growth of slightly more than one-fourth of the respondents. A higher percent of respondents perceive their production growth is likely to be limited by low milk prices (low payouts) in the next five years than in the last five years. A significantly higher percent of respondents on the North Island perceive to be constrained by falling payouts compared to the South Island at the ten percent significance level (Table 5.189). However, a significantly higher percent of respondents on the South Island perceive to be constrained by a rising share price compared to the North Island at the ten percent significance level.

Table 5.188 Percent of Fonterra Respondents Indicating Constraints that Limited their Milk Solid Production Growth over Last Five Years and Will Limit Milk Solid Production Growth in Next Five Years

Constraints Limiting Milk Solid Production Growth	Percent of Respondents **Last** 5 Years	Percent of Respondents **Next** 5 Years	Change in Percent of Respondents
Land Cost or Availability	50.1%	50.1%	--
Rising Fonterra Share Prices	27.3%	28.7%	+ 1.4%
Falling Payouts	26.8%	33.2%	**+ 6.4%**
Rising Input Cost	25.5%	26.9%	+ 1.4%
My Capacity to Service More Debt	24.8%	23.0%	- 1.8%
Labor Costs or Availability	16.5%	18.1%	+ 1.3%
Environmental Concerns/Regulations	14.6%	24.4%	**+ 9.8%**
Management Capacity	10.6%	8.2%	***- 2.4%***
Urban Encroachment/Subdivision Pressures	7.1%	8.8%	+ 1.7%
Complexity of Fonterra Investments	6.5%	7.7%	+ 1.2%
Better Rate of Return from producing Alternative Commodity	6.1%	10.5%	**+ 4.4%**
Herd Costs	5.2%	4.6%	- 0.6%
Water Costs or Availability	5.0%	5.0%	--
Cost of Supporting Family	4.2%	3.6%	- 0.6%
Lack of Suitable Off-Farm Employment Opportunities	0.5%	0.7%	+ 0.2%
Impending Retirement		16.4%	
None of the Constraints	10.3%	7.2%	**- 3.1%**

About one-fourth of the respondents were constrained by their capacity to service debt. In the last five years, a significantly higher percent of respondents from South Island were constrained by their capacity to service debt, but the means were not significantly different in the next five years.

Table 5.189 Percent of Fonterra Respondents Facing Constraint by Location of Dairy Operation

Percent of Respondents Facing Constraint	Location of Dairy Operation	
	North Island	South Island
99 Falling Payouts***	28.7%	16.7%
09 Falling Payouts*	34.3	26.9
99 Rising Fonterra Share Price	26.4%	32.7%
09 Rising Fonterra Share Price*	27.6	35.3
99 Capacity to Service Debt*	23.9%	30.1%
09 Capacity to Service Debt	22.2	27.6
99 Labor Cost/Availability**	15.4%	23.1%
09 Labor Cost/Availability**	16.9	25.0
99 Water Cost/Availability***	3.1%	15.4%
09 Water Cost/Availability***	3.0	16.0
09 Impending Retirement**	17.4%	10.9%
N	**833**	**156**

Level of significance of difference of means: * Ten percent level, ** Five percent level, *** One percent level

Labor cost and water cost have significantly different means at the ten percent significance level for the Island from which the member lives and for different size of dairy operations. A significantly higher percent of respondents from the South Island perceive to be constrained by cost and availability of labor and water. A higher percent of respondents with more than 500 dairy cows perceive to be constrained by water cost and availability than smaller dairy farms (Table 5.190). Respondents with fewer than 300 dairy cows are not as constrained by labor cost and availability as larger dairy farms.

Respondents with smaller dairy operations are more constrained from urbanization. This might indicate that the large operations have dairy operations further from the towns. Respondents with smaller dairy operations are also more constrained by the cost to support their family. This might indicate that the smaller operations tend toward family operations. In addition, a higher percent of respondents with smaller dairy operations expect to limit their dairy operations in the next five years due to impending retirement.

Table 5.190 Percent of Fonterra Respondents Facing Constraint by Size of Dairy Operation

	Size of Dairy Operation in Number of Cows			
Percent of Respondents Facing Constraint	<300 cows	300 – 499	500 – 699	> 700 cows
99 Water Cost/Availability***	3.4%	4.3%	10.7%	7.7%
09 Water Cost/Availability***	2.6	4.7	13.1	7.7
99 Labor Cost/Availability**	12.9%	20.0%	19.9%	23.1%
09 Labor Cost/Availability***	14.1	23.5	20.5	22.2
99 Urban Encroachment***	10.5%	5.1%	1.6%	2.6%
09 Urban Encroachment***	11.9	6.7	5.7	3.4
99 Cost to Support Family**	6.2%	3.1%	1.6%	0.9%
09 Cost to Support Family*	4.6	4.3	1.6	---
09 Impending Retirement*	19.5%	14.1%	13.1%	12.8%
N	**497**	**255**	**122**	**117**

Level of significance of difference of means: * Ten percent level, ** Five percent level, *** One percent level

The descriptions about the respondents provided above will help inform which variables might be important in analyzing the horizon problem.

5.4.2. Descriptive and Inferential Statistics Related to Horizon Problem

Two questions in particular were designed in the survey to analyze the horizon problem in Fonterra (question 5 and question 6). These questions test H_{1B}, H_2, and H_{4B}. Two other questions indirectly evaluate the horizon problem by looking at the respondent's preference for investment in a value-added business that would pay back over a longer period through an increased share price (question 4 and question 10). These questions test hypotheses H_{4C}.

The analysis of the respondent's attitudes regarding investment preferences resulted in developing a response variable, Y, which was restricted to a small number of ordinal values. Members were asked to respond to several statements regarding their investment preferences by indicating on a scale of one to seven their level of agreement or disagreement.

The first statement requests respondents to indicate their attitude about whether it is worth the effort to understand their cooperative investment (question 5). This question evaluates whether the "hassle" horizon problem exists by testing hypotheses 2 and 4B. About 63% of the respondents answered 1 or 2 indicating it *is* worth their effort to understand their investment (Table 5.191). About 17% percent of the respondents perceived it is *not* worth the effort to understand their investment.

The statement regarding whether it is worth the member's effort to understand his investment has a negative significant relationship with size of dairy operation, value the lender places on shares and change in milk production growth (Table 5.192). In addition, the statement has a negative relationship with the variable comparing the cooperative and on-farm return on investment (question 25) and years to relinquish control. The statement has a positive significant relationship with age and complex investment and rising share constraints.

Table 5.191 Frequency Table of Respondent's Preference to "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment"

Response to Survey Question 5		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Disagree	376	37.7	38.1	38.1
2		247	24.8	25.1	63.2
3		63	6.3	6.4	69.6
4	Doesn't Matter	57	5.7	5.8	75.4
5		69	6.9	7.0	82.4
6		93	9.3	9.4	91.8
7	Strongly Agree	81	8.1	8.2	100.0
	Total	986	98.9	100.0	
	Missing	11	1.1		
N		**997**	100.0		

The succession plan variable is not correlated with the attitude weather the investment is worth understanding so hypothesis 2B is not supported. Neither the size of

Table 5.192 Nonparametric Correlations with Statement "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment"

Not Worth Effort to Understand Investment	KG MS produced	Milking Cows	Milk growth last 5 years	Milk growth next 5 years	Return
Kendall's tau b Coefficient	-.081***	-.077***	-.101***	-.093***	-.130***
Sig. (2-tailed)	.001	.001	.000	.000	.000
N	**973**	**980**	**951**	**958**	**948**
Not Worth Effort to Understand Investment	Lender Value	Age	Years to Relinquish	Complexity constraint	Rising share constraint
Kendall's tau b Coefficient	-.113***	.071***	-.062**	.089***	.140***
Sig. (2-tailed)	.000	.005	.015	.002	.000
N	**936**	**979**	**962**	**986**	**986**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

dairy operation nor years to relinquish control have significant difference of means for the statement about whether it is worth the member's effort to understand his investment. Therefore, the results for these variables will not be shown.

The cross tabulation of growth of milk production in last five years with statement about cooperative investment being worth understanding is statistically significant. Respondents who increased milk production in the last five years by more than 30% tend

Table 5.193 "It is Not Worth the Effort of trying to Understand the Composition of My Fonterra Investment" by Growth in Milk Production in last 5 years

	Growth in Milk Production in **last** 5 years						
Worth Effort to Understand Investment	Decreased	Stayed Same	Increased 1-10%	Increased 11-20%	Increased 21-30%	Increased 31-40%	Increased > 40%
Is Worth - 1	32.5%	23.7%	34.9%	39.9%	41.7%	47.5%	46.3%
2	27.5	28.1	26.8	23.7	25.9	26.2	22.0
3	---	10.5	8.1	4.5	6.5	4.9	4.9
4	15.0	6.1	5.1	4.5	4.3	4.9	5.5
5	2.5	12.3	6.8	6.6	8.6	4.9	5.5
6	7.5	7.9	10.2	15.7	7.2	6.6	5.5
Not Worth - 7	15.0	11.4	8.1	5.1	5.8	4.9	10.4
N	**40**	**114**	**235**	**198**	**139**	**61**	**164**

Cramer's V statistic: .101, Sig. 0.010; χ^2 statistic: 58.497 (d.f.=36), Asym. Sig. 0.010

toward their cooperative investment being worth the effort to understand (Table 5.193). A higher percent of the respondents who decreased milk production in the last five years tend toward their cooperative investment not being worth the effort to understand.

The member's milk production growth in the last five years indicated significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.194).

The variances of the groups are not equal since the Levene statistic (1.91, sig 0.077) is significant at the ten percent level. Post hoc tests are computed to compare each

Table 5.194 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" by Milk Production Growth in last 5 years

Milk Production Growth in Last 5 Years	Mean	N	Std. Deviation
Decreased	3.10	40	2.240
Stayed Same	3.25	114	2.072
Increased 1-10%	2.85	235	2.048
Increased 11-20%	2.81	198	2.085
Increased 21-30%	2.57	139	1.930
Increased 31-40%	2.33	61	1.841
Increased >40%	2.60	164	2.089
Total	**2.78**	**951**	**2.052**

group of respondents based on milk production growth in the last five years. Since the variances of the groups are not similar (Levene's test above) and sample sizes for each group are unequal, Games-Howell test is used. Comparison of the means indicate that respondents who stayed the same size in the last five years were more likely to perceive it is not worth the effort to understand their investment compared to respondents who increased milk production 31-40%. This weakly supports hypothesis 2A since the level of patronage is highly correlated with growth.

Table 5.195 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" vs. Milk Production Growth in last 5 years Games-Howell test

Dependent Variable: Not Worth Effort to Understand Investment					
Games-Howell test	(I) Milk Prod last 5 years	(J) Milk Prod last 5 years	Mean Difference (I-J)	Std. Error	Sig.
	Stayed Same	Decreased	.146	.404	1.000
		Increased 1-10%	.395	.236	.634
		Increased 11-20%	.432	.244	.569
		Increased 21-30%	.677	.254	.111
		Increased 31-40%	.918**	.305	.048
		Increased > 40%	.658	.254	.144

Level of significance Games-Howell test: ** Five percent level, *** One percent level

The cross tabulation of age with statement about cooperative investment being worth understanding is statistically significant. Older members tend toward their cooperative investment not being worth effort to understand (Table 5.196). Younger members tend toward the investment being worth the effort to understand.

Table 5.196 "It is Not Worth the Effort of trying to Understand the Composition of My Fonterra Investment" by Respondent's Age

Worth Effort to Understand Investment	Respondent's Age						
	Younger than 40	41-45	46-50	51-55	56-60	61-65	Older than 65
Is Worth - 1	37.7%	41.8%	40.5%	43.7%	39.7%	34.2%	26.5%
2	27.0	26.6	27.5	20.3	21.9	28.8	25.2
3	5.7	6.3	7.8	7.6	8.9	2.7	4.6
4	6.6	4.4	5.3	7.0	3.4	3.6	10.7
5	7.4	8.2	3.9	3.8	9.6	9.0	8.4
6	10.7	8.2	3.9	7.6	9.6	12.6	15.3
Not Worth - 7	4.9	4.4	11.1	10.1	6.8	9.0	9.2
N	**122**	**158**	**153**	**158**	**146**	**111**	**131**

Cramer's V statistic: .093, Sig. 0.051; χ^2 statistic: 50.905 (d.f.=36), Asym. Sig. 0.051

The respondent's age indicated significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.197).

Table 5.197 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" by Respondent's Age

Respondent's Age	Mean	N	Std. Deviation
Younger than 40	2.70	122	1.957
41 - 45	2.53	158	1.888
46 - 50	2.61	153	2.027
51 - 55	2.70	158	2.101
56 - 60	2.77	146	2.040
61 - 65	2.98	111	2.162
Older than 65	3.31	131	2.131
Total	**2.78**	**979**	**2.049**

The variances of the age groups are not equal since the Levene statistic (2.37, sig 0.028) is significant at the five percent level. Post hoc tests are computed to compare each group of respondents based on age. Since the variances of the age groups are not similar (Levene's test above) and sample sizes for each group are unequal, Games-Howell test is used. Comparison of the means indicate the respondents older than 65 were more likely to perceive it is not worth the effort to understand their investment compared to respondents between ages of 41 and 50 (Table 5.198). Since age and years to relinquish are negatively correlated, this weakly supports hypothesis 4B, which states

Table 5.198 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" vs. Age using Games-Howell test

Dependent Variable: Not Worth Effort to Understand Investment					
Games-Howell test	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	Sig.
	Older than 65	Younger than 40	.608	.257	.218
		41 - 45	.781**	.239	.021
		46 - 50	.705*	.248	.071
		51 - 55	.610	.250	.186
		56 - 60	.539	.251	.330
		61 - 65	.331	.277	.896

Level of significance Games-Howell test: *Ten percent level; ** Five percent level, *** One percent level

the years until retirement will be negatively associated with preference for no further cooperative investment.

Respondent's who can borrow against the majority of their Fonterra investment (question 8) has a significantly different means for the statement about whether it is worth the member's effort to understand their investment (Table 5.199) compared to respondents who do not know the percent of their investment the lender will loan.

Table 5.199 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" by Lender Value for Investment

Lender Value for Investment	Mean	N	Std. Deviation
Don't Know	2.94	521	2.025
0 – 45%	3.14	29	2.295
46 – 90%	2.65	148	2.063
> 90%	2.43	238	2.005
Total	**2.77**	**936**	**2.044**

The variances of the groups are approximately equal since the Levene statistic (1.57, sig 0.195) is not significant. Therefore, the one-way analysis of variance is reliable. The F-statistic from the ANOVA for lender value is significant so one or more of the differences of means is significantly different from the other means ($F(3, 932) = 3.945$, $p<.05$).

Table 5.200 ANOVA Table for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" vs. Lender Value

ANOVA					
Not Worth Effort to Understand Investment	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	49.00	3	16.33	3.945	.008***
Within Groups	3858.62	932	4.14		
Total	**3907.61**	**935**			

Level of significance F-Test: ** Five percent level, *** One percent level

Post hoc tests are computed using the Hochberg's GT2 test to compare each group of respondents based on lender value since the variances of the groups are similar and sample sizes for each group are different. Comparison of the means indicate respondents who can borrow against the majority of their shares will tend toward the investment being worth understanding compared to members who do not know the value the lender will loan (Table 5.201). This supports hypothesis 2C which states that inability to borrow against the cooperative investment will be positively associated with preference for no further investment in the cooperative.

Table 5.201 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" vs. Lender Value using Hochberg's GT2

Dependent Variable: Not Worth Effort to Understand Investment					
Hochberg GT2 test	(I) Lender value	(J) Lender value	Mean Difference (I-J)	Std. Error	Sig.
	> 90%	Don't Know	-.512***	.159	.008
		0 – 45%	-.709	.400	.380
		46 – 90%	-.220	.213	.884

Level of significance Hochberg GT2 test: ** Five percent level, *** One percent level

The cross tabulation of comparison of on-farm and Fonterra return with statement about cooperative investment being worth understanding is statistically significant. In Table 5.202, respondents who perceived their on-farm return or the Fonterra total shareholder return was greater tend toward their investment being worth the effort to understand compared to the respondents who did not know or seldom think about the returns.

The comparison of on-farm return and Fonterra total shareholder return indicate significant difference of means for the statement about whether it is worth the member's effort to understand their investment (Table 5.203).

Table 5.202 "It is Not Worth the Effort of trying to Understand the Composition of My Fonterra Investment" by Comparison of On-Farm Return and Fonterra Total Shareholder Return

	Comparison of On-Farm Return and Fonterra TSR			
Worth Effort to Understand Investment	Don't Know	Seldom think about it	On-Farm Return	Fonterra TSR
Is Worth - 1	28.7%	26.8%	46.2%	47.3%
2	25.6	28.5	26.4	21.2
3	10.8	7.1	4.2	4.9
4	8.2	7.5	4.9	4.0
5	8.7	10.5	3.8	5.3
6	9.7	10.0	8.0	10.2
Not Worth - 7	8.2	9.6	6.6	7.1
N	**195**	**239**	**288**	**226**

Cramer's V statistic: .135, Approx. Sig. 0.000; χ^2 statistic: 51.632 (d.f.=18), Asym. Sig. 0.000

Table 5.203 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" by Comparison of On-Farm Return and Fonterra Return

Comparison of On-Farm Return and Fonterra Return	Mean	N	Std. Deviation
Don't Know	3.05	195	2.011
Seldom Think about it	3.15	239	2.071
On-Farm Return	2.44	288	1.946
Fonterra TSR	2.58	226	2.060
Total	**2.78**	**948**	**2.039**

The variances of the groups are not equal since the Levene statistic (2.79, sig 0.039) is significant at the five percent level. Post hoc tests are computed using Games-Howell test to compare each group of respondents based on the return. Comparison of the means indicate respondents whose on-farm return is greater than Fonterra TSR are more likely to perceive it is worth the effort to understand their investment compared to respondents who do not know which return is greater or seldom think about it.

Table 5.204 Multiple Comparisons for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" vs. Comparison of Cooperative and Farm Return using Games-Howell test

Dependent Variable: Not Worth Effort to Understand Investment					
Games-Howell test	(I) Comparison of returns	(J) Comparison of Return	Mean Difference (I-J)	Std. Error	Sig.
	On-Farm Return	Don't Know	-.605***	.184	.006
		Seldom Think	-.710***	.176	.000
		Fonterra TSR	-.134	.179	.876

Level of significance Games-Howell test: ** Five percent level, *** One percent level

Respondents indicating a constraint from rising share prices had significant relationship with the statement about whether the cooperative investment is worth understanding (Table 5.205). Respondents who limited their milk production growth due to rising share prices tended toward their investment not being worth the effort to understand. The variances of the groups are not equal since the Levene statistic (21.46, sig 0.000) is highly significant. Therefore, the one-way analysis of variance is not reliable.

Table 5.205 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" by Rising Share Price Constraint

Rising Share Constraint	Mean	N	Std. Deviation
Yes	3.31	268	2.201
No	2.61	718	1.972
Total	**2.80**	**986**	**2.059**

Respondents indicating a constraint from complexity of Fonterra investment had a significant relationship with the statement about whether the cooperative investment is worth understanding (Table 5.206). The mean for respondents indicating a constraint from complexity of Fonterra investment was significantly higher compared to other respondents. The variances of the groups are not equal since the Levene statistic (6.49,

sig 0.011) is highly significant. Therefore, the one-way analysis of variance is not reliable.

Table 5.206 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" by Complexity of Fonterra Investment Constraint

Complexity of Fonterra Investment Constraint	Mean	N	Std. Deviation
Yes	3.55	62	2.259
No	2.75	924	2.036
Total	**2.80**	**986**	**2.059**

The second statement requests respondents to indicate their preference for the fair value share price set along the valuer's range (question 6). This question helps to analyze whether the "wait-to-receive" horizon problem exists by testing hypothesis 1B. About ten percent of the respondents answered 6 or 7 indicating they prefer the upper end of the valuer's range (Table 5.207). About twenty-two percent answered 1 or 2 indicating they prefer the lower end of the valuer's range. Almost half the respondents preferred the

Table 5.207 Frequency Table of Fonterra Respondent's Preference to "I would Most Prefer the Board Set the Share Price at 1=Lower End, 4=Middle, 7=Upper End of Valuer's Range"

Response to Survey Question 7		Frequency	Percent	Valid Percent	Cumulative Percent
	Don't Know	40	4.0	4.1	4.1
	Indifferent	21	2.1	2.1	6.2
1	Lower End	150	15.0	15.3	21.5
2		66	6.6	6.7	28.2
3		75	7.5	7.6	35.8
4	Middle	444	44.5	45.2	81.1
5		90	9.0	9.2	90.2
6		53	5.3	5.4	95.6
7	Upper End	43	4.3	4.4	100.0
	Total	982	98.5	100.0	
	Missing	15	1.5		
N		**997**	100.0		

cooperative set the share price at the middle of the range. The median respondent answered 4, indicating the middle of the range.

The statement regarding the member preference for price of fair value share has a positive significant relationship with age, the variable comparing the cooperative and on-farm return on investment and the value lender places on Fonterra shares (Table 5.208). The statement has a negative significant relationship with the rising share constraint and constraint from complexity of Fonterra investment.

Table 5.208 Nonparametric Correlations with Fonterra Statement "I would Most Prefer the Board Set the Share Price at 1=Lower End, 4=Middle, 7=Upper End of Valuer's Range"

Preference for Share Price	Age	Return	Lender Value	1999 Rising Share Constraint	1999 Complexity Constraint
Kendall's tau b	.079***	.056**	.066**	-.189***	-.067**
Sig. (2-tailed)	.002	.036	.016	.000	.020
N	**976**	**947**	**936**	**982**	**982**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

The variables age, lender value and complexity constraint do not have significant chi-square statistics and more than 20% of the expected values are less than five. These variables also do not have significant differences of means. Therefore, hypothesis 1B, which states that the number of years until retirement will be negatively associated with a preference for higher share price, is not supported.

Cross tabulation of comparison of on-farm and Fonterra return with statement about fair value shares is statistically significant. In Table 5.209, respondents who did not know which return is greater or seldom think about the returns tend toward not having an opinion for the share price set by Fonterra. However, respondents do not have significant difference of means regarding the statement about fair value share price for on-farm return and Fonterra total shareholder return variable. Post hoc test do not

indicate any significantly different means for the variable comparing on-farm return and Fonterra return.

Table 5.209 "I would Most Prefer the Board Set the Share Price at 1=Lower End, 4=Middle, 7=Upper End of Valuer's Range" by Comparison of On-Farm Return and Fonterra Total Shareholder Return

	Comparison of On-Farm Return and Fonterra TSR			
Preference for Share Price	Don't Know	Seldom think about it	On-Farm Return	Fonterra TSR
Don't Know	10.1%	2.9%	2.8%	0.9%
Indifferent	1.5	3.3	1.4	2.2
Lower End - 1	12.6	15.1	16.6	15.0
2	5.1	8.8	4.9	8.8
3	9.1	8.8	8.1	5.7
Middle - 4	44.4	43.1	46.3	45.0
5	8.6	9.2	9.9	8.8
6	3.0	5.4	5.3	7.9
Upper End - 7	5.6	3.3	4.6	4.8
N	**198**	**239**	**283**	**227**

Cramer's V statistic: .124, Approx. Sig. 0.008; χ^2 statistic: 43.636 (d.f.=24), Asym. Sig. 0.008

Cross tabulation of rising share constraint with statement about fair value shares is statistically significant. In Table 5.210, a higher percent of respondents who limited their milk production due to rising share prices prefer the board set the share price at the lower

Table 5.210 "I would Most Prefer the Board Set the Share Price at 1=Lower End, 4=Middle, 7=Upper End of Valuer's Range" by Existence of Rising Fonterra Share Price Constraint

Preference for Share Price	Existence of Rising Fonterra Share Price Constraint	
	Yes	No
Don't Know	5.2%	3.6%
Indifferent	1.1	2.5
Lower End - 1	30.0	9.8
2	9.7	5.6
3	7.5	7.7
Middle - 4	33.0	49.8
5	7.5	9.8
6	2.2	6.6
Upper End - 7	3.7	4.6
N	**267**	**715**

Cramer's V statistic: .286, Approx. Sig. 0.000; χ^2 statistic: 80.144 (d.f.=8), Asym. Sig. 0.000

end of the range. A higher percent of the respondents who did not face the rising share price constraint prefer the middle of the range.

Respondents who limited their milk production growth due to rising share prices tended to prefer the Board set the share price at the lower end of the range (Table 5.211). The variances of the groups are not equal since the Levene statistic (19.50, sig 0.000) is highly significant. Therefore, the one-way analysis of variance is not reliable.

Table 5.211 Means for "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" by Rising Share Price Constraint

Rising Share Constraint	Mean	N	Std. Deviation
Yes	2.76	267	1.903
No	3.60	715	1.765
Total	**3.37**	**982**	**1.842**

The third and fourth statements requests respondents to indicate their preference for cooperative investment in the core commodity processor (Ingredients) versus the value added business (New Zealand Milk) (question 4 and 10). These questions helps to test the hypotheses whether the "residual short-term" horizon problem exists by testing hypotheses 4C. If the "short-term residual" horizon problem exists, one would expect a variation in preference for investment, especially if the member cannot capture the capitalized value of their investment. About one-third of the respondents answered 1 or 2 indicating they prefer investment in New Zealand Milk (Table 5.212). About fourteen percent answered 6 or 7 indicating they prefer investment in Ingredients, the commodity processor. The median respondent answered four, indicating he is indifferent to investment in the commodity processor and the value-added business.

Table 5.212 Frequency Table of Fonterra Respondent's Preference to "I would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk"

Response to Survey Question 10		Frequency	Percent	Valid Percent	Cumulative Percent
1	Strongly Disagree	122	12.2	12.6	12.6
2		191	19.2	19.8	32.4
3		155	15.5	16.0	48.4
4	Indifferent	275	27.6	28.5	76.9
5		88	8.8	9.1	86.0
6		101	10.1	10.5	96.5
7	Strongly Agree	34	3.4	3.5	100.0
	Total	966	96.9	100.0	
	Missing	31	3.1		
N		**997**	100.0		

The statement regarding the member preference for cooperative investment in commodity vs. value-added business has a positive significant relationship with years as a member and the variable evaluating whether the investment is worth understanding (Table 5.213). The statement has a negative significant relationship with the years to relinquish control, the variable comparing the cooperative and on-farm return on investment, and the categorical variable for cooperative investment.

Table 5.213 Nonparametric Correlations with Fonterra Statement "I Would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk"

Preference for Cooperative Investment (likert)	Years as Member	Years to Relinquish	Worth Effort Understand Investment	Return	Cooperative Investment Preference
Kendall's tau b	.054**	-.056**	.127***	-.062**	-.209***
Sig. (2-tailed)	.027	.028	.000	.020	.000
N	**893**	**941**	**960**	**932**	**901**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

The variables indicating the number of years to relinquish control and the number of years as a member do not have significant chi-square statistics at the ten percent level and do not have significant differences of means. Therefore, hypothesis 4C, which states

that the number of years until retirement will be negatively associated with preference for investment in technologies that pay back over more years, is not supported.

Cross tabulation of comparison of on-farm and Fonterra return with statement about fair value shares is statistically significant. In Table 5.214, respondents who

Table 5.214 "I Would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk" by Comparison of On-Farm Return and Fonterra Total Shareholder Return

Preference for Cooperative Investment	Comparison of On-Farm Return and Fonterra TSR			
	Don't Know	Seldom think about it	On-Farm Return	Fonterra TSR
NZM - 1	12.2	9.0	15.4	14.0
2	13.8	17.9	22.1	24.8
3	12.8	17.9	15.4	17.6
Indifferent - 4	38.8	37.2	20.4	19.8
5	10.2	6.8	10.4	8.1
6	9.2	8.1	12.5	12.6
Ingredients - 7	3.1	3.0	3.9	3.2
N	**196**	**234**	**280**	**222**

Cramer's V statistic: .129, Approx. Sig. 0.000; χ^2 statistic: 46.350 (d.f.=18), Asym. Sig. 0.000

indicate either the on-farm return or Fonterra return is greater tend toward preference for New Zealand Milk. However, respondents do not have significant difference of means for the statement about cooperative investment preference. Post hoc test do not indicate any significantly different means for the variable comparing on-farm return and Fonterra return.

The cross tabulation of statement about cooperative investment being worth understanding with preference for cooperative investment in commodity versus value-added is statistically significant. In Table 5.215, respondents who perceived their investment is not worth understanding tend toward preference for Ingredients. Respondents who perceived their investment is worth understanding tend toward preference for New Zealand Milk.

Table 5.215 "I Would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk" by "It is Not Worth the Effort of trying to Understand the Composition of My Fonterra Investment"

	Worth Effort to Understand Investment						
Preference for Cooperative Investment	1 – Is Worth	2	3	4	5	6	7 – Not Worth
NZM - 1	20.3%	6.9%	4.9%	5.6%	9.0%	7.6%	14.5%
2	22.2	25.7	11.5	7.4	14.9	20.7	9.2
3	12.6	20.0	27.9	18.5	9.0	18.5	13.2
Indifferent - 4	23.8	26.5	32.8	44.4	38.8	29.3	31.6
5	7.4	9.8	13.1	9.3	16.4	6.5	7.9
6	10.1	9.4	8.2	11.1	10.4	13.0	11.8
Ingredients- 7	3.6	1.6	1.6	3.7	1.5	4.3	11.8
N	**365**	**245**	**61**	**54**	**67**	**92**	**76**

Cramer's V statistic: .132, Approx. Sig. 0.000; χ^2 statistic: 99.626 (d.f.=36), Asym. Sig. 0.000

The variable indicating whether the Fonterra investment is worth understanding has significant difference of means for the preference for cooperative investment in value-added versus commodity (Table 5.216).

Table 5.216 Means for "I Would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk" by "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment"

Worth Effort to Understand Investment	Mean	N	Std. Deviation
Is Worth - 1	3.21	365	1.736
2	3.41	245	1.462
3	3.69	61	1.311
4	3.93	54	1.372
5	3.76	67	1.478
6	3.63	92	1.602
Not Worth - 7	3.92	76	1.860
Total	**3.47**	**960**	**1.622**

The variances of the groups are not equal since the Levene statistic (5.51, sig 0.000) is highly significant. Post hoc tests are computed using Games-Howell test to compare each group of respondents based whether it is worth the effort to understand the investment. Comparison of the means indicate respondents who believes their

investment is not worth understanding tend toward preference for Ingredients compared to respondents who believe their investment is worth understanding.

Table 5.217 Multiple Comparisons for "I Would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk" vs. "It is Not Worth the Effort of trying to Understand the Composition of my Fonterra Investment" using Games-Howell test

Dependent Variable: Preference for Cooperative Investment in NZM versus Ingredients					
Games-Howell test	(I) Worth Effort	(J) Worth Effort	Mean Difference (I-J)	Std. Error	Sig.
	Is Worth - 1	2	-.207	.130	.691
		3	-.483	.191	.160
		4	-.720**	.208	.014
		5	-.556*	.202	.097
		6	-.425	.190	.283
		Not Worth - 7	-.716**	.232	.040

Level of significance Games-Howell test: *Ten percent level, **Five percent level, *** One percent level

The cross tabulation of comparison of categorical preference for cooperative investment with likert scale of statement about preference for cooperative investment is statistically significant. In Table 5.218, respondents who prefer New Zealand Milk in the categorical variable also tend toward cooperative investment in New Zealand Milk in the

Table 5.218 "I would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk" by Categorical Preference for Fonterra Cooperative Investment

Preference for Cooperative Investment	Categorical Preference for Cooperative Investment			
	Don't Know	No further Investment	Ingredients	New Zealand Milk
NZM - 1	2.9%	3.7%	6.3%	15.6%
2	2.9	14.8	12.5	23.1
3	11.8	7.4	1.6	19.6
Indifferent - 4	70.6	46.9	23.4	21.4
5	7.4	7.4	15.6	8.7
6	4.4	11.1	29.7	9.0
Ingredients - 7	0.0	8.6	10.9	2.6
N	**68**	**81**	**64**	**688**

Cramer's V statistic: .249, Approx. Sig. 0.000; χ^2 statistic: 167.045 (d.f.=18), Asym. Sig. 0.000

likert scale variable. Respondents who prefer Ingredients in the categorical variable tend toward preference for cooperative investment in Ingredients in the likert scale variable. This result is expected since the two questions were testing a similar concept.

The variances of the groups are not equal since the Levene statistic (20.38, sig 0.000) is highly significant. Post hoc tests computed using the Games-Howell test compare each group of respondents based on the categorical preference for cooperative investment. Respondents who prefer cooperative investment in New Zealand Milk score lower on the likert scale indicating preference for investment in New Zealand Milk.

Table 5.219 Multiple Comparisons for "I would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk" vs. Categorical Preference for Fonterra Cooperative Investment using Games-Howell test

Dependent Variable: Preference for Cooperative Investment (Likert Scale)					
Games-Howell test	(I) Preference for Investment	(J) Preference for Investment	Mean Difference (I-J)	Std. Error	Sig.
	New Zealand Milk	Don't Know	-.676***	.122	.000
		None	-.853***	.180	.000
		Ingredients	-1.404***	.227	.000

Level of significance Games-Howell test: ** Five percent level, *** One percent level

Question 4 requests respondents to circle their preference for cooperative investment in commodity processor, value added business, no further investment or indicate they do not know. About seventy-six percent of the respondents prefer cooperative investment in the value added business, New Zealand Milk and seven percent prefer investment in the commodity processor, Ingredients (Table 5.220). About nine percent of the respondents prefer that the cooperative makes no further investment and about eight percent do not know which strategy the cooperative should adopt. The median respondent answered preference for further cooperative investment in New Zealand Milk.

Table 5.220 Frequency Table of Respondent's Preference to Investment Strategy Fonterra should Adopt

Response to Survey Question 4	Frequency	Percent	Valid Percent	Cumulative Percent
Don't Know	71	7.1	7.7	7.7
No Further Investment	83	8.3	9.0	16.7
Ingredients	65	6.5	7.0	23.7
New Zealand Milk	705	70.7	76.3	100.0
Total	924	92.7	100.0	
Missing	73	7.3		
N	**997**	100.0		

The preference for cooperative investment in commodity vs. value-added business has a positive significant relationship with years to relinquish control, value lender places on Fonterra shares and land cost constraint (Table 5.221). The statement has a negative significant relationship with the complex investment and rising share price constraint.

Table 5.221 Nonparametric Correlations with Preference for Fonterra Cooperative Investment in Ingredients vs. New Zealand Milk

Preference for Cooperative Investment (categorical)	Years to Relinquish	Lender Value	Complex Investment Constraint	Rising Share Price Constraint	Land Cost Constraint
Kendall's tau b	.062**	.068**	-.062**	-.149***	.071**
Sig. (2-tailed)	.030	.025	.050	.000	.025
N	**901**	**879**	**924**	**924**	**924**

Level of significance correlation Coefficient: ** Five percent level, *** One percent level

The cross tabulation of years to relinquish control with preference for cooperative investment is statistically significant at the five percent level. In Table 5.222, respondents who have relatively shorter time to relinquish control tend toward no further cooperative investment. Respondents who have relatively longer time before they relinquish control tend toward preference for New Zealand Milk, or the value-added business. This weakly supports hypothesis 4C.

Table 5.222 Preference for Fonterra Cooperative Investment by Years to Relinquish Control

	Years to Relinquish Control					
Preference for Cooperative Investment	Don't Know	Already Relinquish	< 5 years	6 – 10 years	11 – 15 years	15 – 20 years
Don't Know	10.7%	9.1%	6.8%	7.4%	7.4%	6.7%
None	13.0	15.2	10.6	5.2	6.5	2.2
Ingredients	5.6	3.0	5.7	8.7	6.5	13.5
New Zealand Milk	70.6	72.7	76.9	78.7	79.6	77.5
N	**177**	**33**	**264**	**230**	**108**	**89**

Cramer's V statistic: .099, Approx. Sig. 0.035; χ^2 statistic: 26.313 (d.f.=15), Asym. Sig. 0.035

The strong preference for investment in value-added business, which may pay back over a number of years, indicates the "residual short-term" horizon problem may not exist in Fonterra. This could reflect the ability of members to capture a capitalized value of their investment through the fair value shares, which can be sold to Fonterra at any time.

Additional multivariate data analysis will be used in the next section to further test whether the horizon problem exists in Fonterra.

5.4.3. Factor Analysis of Fonterra Survey

Factor analysis indicates a set of common underlying dimensions among the variables in a data set. A principal components factor analysis was conducted on the data from the Fonterra survey. Since the determinant of the correlation matrix (.107) is greater than the necessary value .00001, multicollinearity is not a problem for this data. The Bartlett's test of sphericity is highly significant (p<0.001) and therefore the factor analysis is appropriate. The Kaiser-Meyer-Olkin measure of sampling adequacy (.648) indicates the patterns of correlations between variables are mediocre, so the factor analysis should provide reliable factors. Only the variable indicating the member's

preference for investment in value-added business versus commodity has an individual KMO value less than 0.5.

Using the criterion to accept factors with eigen values greater than one, ten factors are retained for interpretation, which explain 53.6% of the total variance. Figure 5.11 indicates that either six or ten factors should be retained. Reducing the number of factors to six reduces the determinant and the overall KMO, so the ten factors will be retained (Table 5.223).

Figure 5.11 Scree Plot for Principal Component Analysis of Fonterra Survey

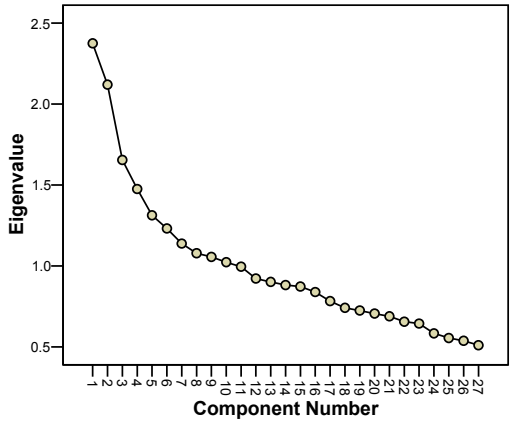


Table 5.223 Eigen Values Greater than one and Total Variance Explained with Principal Component Analysis for Fonterra Survey

	Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
Component	Total	Percent of Variance	Cumulative Percent	Total	Percent of Variance	Cumulative Percent
1	2.375	8.795	8.80	1.977	7.321	7.32
2	2.120	7.850	16.65	1.709	6.328	13.65
3	1.654	6.127	22.77	1.600	5.927	19.58
4	1.475	5.463	28.24	1.497	5.544	25.12
5	1.313	4.862	33.10	1.445	5.354	30.47
6	1.231	4.560	37.66	1.411	5.228	35.70
7	1.138	4.214	41.87	1.330	4.926	40.63
8	1.078	3.993	45.87	1.195	4.427	45.05
9	1.056	3.910	49.78	1.157	4.285	49.34
10	1.023	3.789	53.56	1.141	4.225	53.56

Table 5.224 indicates the statistical significant factor loadings for the orthogonal rotated component matrix of the Fonterra survey. Four variables have a significant factor loading for the first rotated principal component and explain seven percent of the total variation. Figure 5.12 to Figure 5.14 illustrate the factor loadings for the principal components.

Table 5.224 Loading Factors of Rotated Principal Components for Fonterra Survey

	Rotated Principal Component							
Variable	1	2	3	4	5	6	7	9
Change in dairy production last 5 years	**.697**							
Change in dairy production next 5 years	**.684**							
Size dairy operation in kg/ms	**.566**							
Years to relinquish	**.325**							
Falling payout constraint		**.635**						
Rising input cost constraint		**.596**						
Capacity to service debt constraint		**.539**						
Rising share price constraint			**.757**					
Complexity of investment constraint			**.688**					
Range to set Fair Value Share			**-.383**					
Land cost/availability constraint				**.764**				
No constraints				**-.610**				
Urban encroachment constraint				**.555**				
Lack of off-farm employment constraint					**.716**			
Cost to support family constraint					**.625**			
Herd cost constraint					**.421**			
Water cost/availability constraint						**.672**		
Region north or South						**.614**		
Labor cost/availability constraint						**.431**		
Environmental regulation constraint						**.349**		
Farm return greater than cooperative							**.643**	
Lender value on Fonterra shares							**.638**	
Preference for cooperative investment								**.812**
Worth effort to understand investment								**.395**

Figure 5.12 Rotated PCA1 and PCA2 for Fonterra Survey

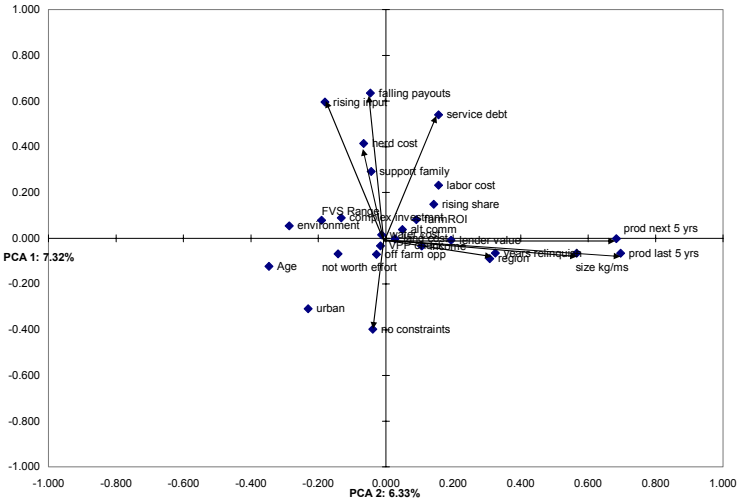


Figure 5.13 Rotated PCA3 and PCA4 for Fonterra Survey

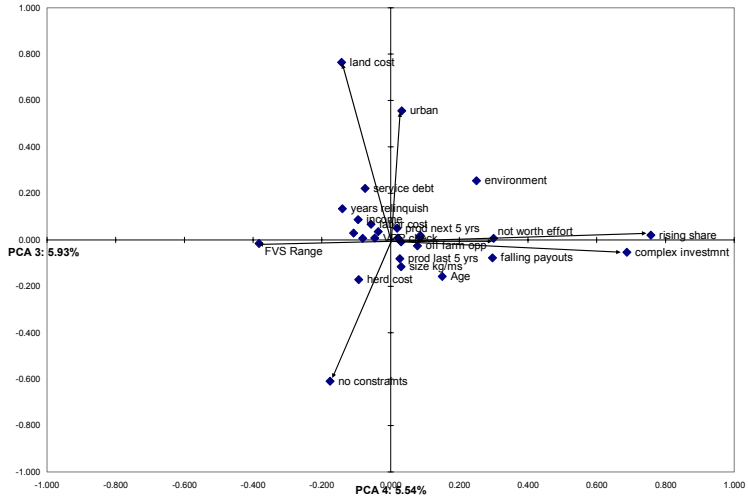


Figure 5.14 Rotated PCA7 and PCA9 for Fonterra Survey

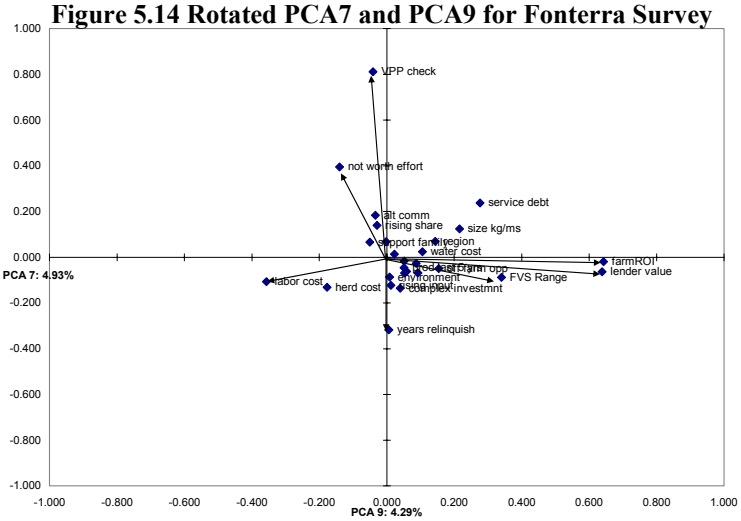


Figure 5.12 illustrates that size of dairy operation, and years to relinquish are positively correlated with each other and with the first principal component. Respondents with high milk production growth will typically be the members with more years before they relinquish control. These members also tend to be from the South Island.

Several constraints to milk production growth are highly correlated with the second principal component, which explains about 6.3% of the total variation in the data. Respondents who are constrained by input costs and herd costs are likely to be constrained by low milk prices. If the member is constrained by high input costs and low commodity prices, he may be constrained by the capacity to service debt to continue farming.

The third principal component in Figure 5.13 explains about six percent of the total variation in the data. Three variables have a statistical significant factor loading for the third principal component, which represent factors related to Fonterra. Members who indicate a rising share price constraint and complex investment constraint are likely to prefer the board set the share price at the lower end of the range.

The fourth principal component explains about 5.5% of the total variation in the data in which three variables are statistically significant. The land cost constraint and the urban encroachment constraint are positively correlated with each other and negatively correlated with no constraints. The cost of land might be higher near urban areas.

The seventh principal component in Figure 5.14 explains about five percent of the total variation in which two variables are statistically significant. Members who indicate

the on-farm return is greater than the cooperative return are also likely to capture a higher percent of the market value of their shares from the bank or lender.

The ninth principal component explains about 4.29% percent of the total variation in which three variables are statistically significant. The ninth principal component indicates the member's preference for commodity processor versus value-added business. Members who prefer investment in Ingredients are likely to have fewer years to relinquish control of their farm, which supports hypothesis 4C. These members are also likely to believe their investment is not worth understanding which supports hypothesis 4B.

In summary, the factor analysis only supports the hypothesis 4B and 4C. The other questions related to the horizon problem did not have high factor scores for the principal components. Therefore, the marketing cooperative design in Fonterra, which allows the members to sell their shares for a fair value share price, may reduce the impact of the horizon problem since the members capture an appreciated value of the delivery rights. The next section analyzes the survey data with ordinal probit regression.

5.4.4. Probit Regression Results of Fonterra Survey

To test hypotheses 1b, 2 and 4, ordinal probit regression model is used when the dependent variable involves an answer using a seven point LIKERT scale. The independent variables can be grouped into categories:

1. Succession Plans: the number of years before the member plans to relinquish control over the farm (question 22); the member's plan for the farm after relinquish control (question 23) and age (question 7)

2. Growth: the ability for the member to borrow against his cooperative investment (question 8); milk production growth in the last five years (question 17); constraints for milk production growth in the last five years (question 19) and comparison of return at cooperative level versus farm level (question 25)
3. Description of the Member: the type of dairy farmer in terms of life cycle (question 21) and the level of household income from farm versus non-farm sources (question 24)
4. Description of Member in terms of milk delivery: the island the member farms (derived question 9); and the kg of milk solids deliver to Fonterra (question 15)

All nominal variables listed above were coded as dummy variables with the exception of the milk delivered to Fonterra. The ordinal variables were transformed using the terza transformation described in Chapter 4. Ordinal probit regression with a forward selection option was run in SPSS 12.0 for Windows. To identify the model correctly, at least one of the dummy indicators was removed for each variable.

To evaluate hypothesis 2 and 4, the dependent variable is the respondent's answer to whether their investment is worth understanding with 1=is worth and 7=not worth. The χ^2 statistic for the regression model in Table 5.225 is highly significant so the null

Table 5.225 Ordinal probit Regression Model Fitting Information for "It is Not Worth the Effort of trying to Understand the Composition of My Fonterra Investment"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	2,579.49				
Final	2,502.59	76.91	15	.000***	.090

N: 849; Level of significance χ^2- Test: ** Five percent level, *** One percent level

hypothesis that all coefficients for the independent variables are equal to zero is rejected, however, the model explains about nine percent of the total variation.

The results for the ordinal probit regression model for the variable indicating whether the cooperative investment is worth understanding are shown in Table 5.226. The variable indicating the level of member patronage (milk solids delivered to Fonterra) was not significant in the model. However, the number of milk solids produced is correlated with the member's growth in the next five years. Members who plan to increase their milk production tend to perceive it is worth their effort to understand their

Table 5.226 Coefficients for Regression Model, Dependent Variable: "It is Not Worth the Effort of trying to Understand the Composition of My Fonterra Investment"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Not Worth Effort to Understand = 1	.067	.149	.205	.651
Not Worth Effort to Understand = 2	.773	.151	26.349	.000***
Not Worth Effort to Understand = 3	.955	.151	39.839	.000***
Not Worth Effort to Understand = 4	1.134	.152	55.525	.000***
Not Worth Effort to Understand = 5	1.394	.154	81.913	.000***
Not Worth Effort to Understand = 6	1.892	.160	139.627	.000***
Location				
Relinquish don't know	.109	.150	.525	.469
Already relinquished control	.101	.226	.200	.655
Relinquish < 5 years	.241	.141	2.923	.087*
Relinquish 5-10 years	.148	.142	1.083	.298
Relinquish 10-15 years	-.011	.163	.005	.946
Don't know Farm vs. coop return	.176	.115	2.326	.127
Seldom think about farm vs. coop return	.275	.109	6.306	.012**
On-Farm return greater than coop	-.150	.104	2.099	.147
Change dairy production next five years	-.130	.040	10.307	.001***
Household income from non-farm sources	.060	.048	1.528	.216
Value lender places on shares	-.085	.046	3.339	.068*
Maintain ownership/family will farm	.118	.076	2.375	.123
Rising share price constraint	.372	.087	18.235	.000***
Better return alternative commodity constraint	-.336	.155	4.725	.030**
Falling payout constraint	.152	.088	2.978	.084*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

cooperative investment. This supports hypothesis 2A at the one percent significance level.

Respondents who are able to borrow a greater percent of the market value of their Fonterra shares tend toward perceiving their investment is worth understanding. This supports hypothesis 2C at the ten percent level, which suggests the inability to borrow against their cooperative investment will be positively associated with preference for no further investment in the cooperative.

Respondents who plan to relinquish control in less than five years tend toward perceiving the investment is not worth understanding when compared to respondents who plan to relinquish control in more than fifteen years. However, the coefficient on the variable for already relinquished control is not significant. Therefore, model has inconclusive results for hypothesis 4B, which suggests that members closer to retirement will perceive it not worth their effort to understand their investment.

The succession variables were not statistically significant in the model, so hypothesis 2B cannot be rejected. Respondents who limited their milk production growth due to rising share prices tend toward perceiving the cooperative investment is not worth understanding.

Hypothesis 1B can be evaluated with the dependent variable being the respondent's preference for the fair value share price with 1=lower end of range and 7=upper end of range. The respondents who indicated indifferent or did not have an opinion were removed from the model specification. The χ^2 statistic for the regression model in Table 5.227 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model explains about 12.5% of the total variation in preference for share price.

Table 5.227 Ordinal probit Regression Model Fitting Fonterra Information for "I would Most Prefer the Board Set the Share Price at 1=Lower End, 4=Middle, 7=Upper End of Range"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	2,530.55				
Final	2,427.95	102.60	19	.000***	.125

N: 805; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for Fonterra fair value share price are shown in Table 5.228. The coefficient on the age variable is significant at the ten percent level, which indicates older members tend toward a higher share price. The coefficient on the five to ten years until relinquish control is statistically significant at the one percent level, however the coefficients on fewer than five years to relinquish control is not statistically significant. Respondents with five to ten years until relinquishing control tend toward a preference for a lower share price compared to respondents plan to relinquish control in more than fifteen years. Therefore, the results regarding the share price preference are inconclusive with respect to hypothesis 1B.

Members who constrained dairy production due to a rising share price tend to prefer the lower share price. This might indicate that these members want to increase their herd size but cannot due to the high share price. In addition, respondents who increased milk production tend toward preference for lower share price.

The variable indicating member's ability to borrow against their cooperative shares was statistically significant meaning that respondents can borrow a greater percent of the market value of their shares prefer a higher share price. Sharemilkers tend toward preference for a lower share price so they can increase dairy production.

Table 5.228 Fonterra Coefficients for Ordinal probit Regression Model, Dependent Variable: "I would Most Prefer the Board Set the Share Price at 1=Lower End, 4=Middle, 7=Upper End of Range"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Fair Value Share Preference = 1	-1.491	.140	113.126	.000***
Fair Value Share Preference = 2	-1.207	.138	76.734	.000***
Fair Value Share Preference = 3	-.942	.136	47.848	.000***
Fair Value Share Preference = 4	.443	.134	10.882	.001***
Fair Value Share Preference = 5	.913	.138	43.947	.000***
Fair Value Share Preference = 6	1.350	.146	85.862	.000***
Location				
Relinquish don't know	-.192	.154	1.554	.213
Already relinquished control	-.329	.232	2.020	.155
Relinquish < 5 years	-.180	.148	1.476	.224
Relinquish 5-10 years	-.406	.144	7.881	.005***
Relinquish 10-15 years	-.245	.162	2.284	.131
Age	.078	.045	2.950	.086*
Household income from non-farm sources	.063	.049	1.653	.199
Change dairy production last five years	-.060	.043	4.078	.043**
Change dairy production next five years	-.092	.044	4.505	.034**
Value lender places on shares	.077	.045	2.891	.089*
Owner/Sharemilker	-.182	.117	2.413	.120
Sharemilker	-.345	.152	5.141	.023**
Other type of operator	-.345	.123	7.814	.005***
Environmental regulation constraint	.219	.114	3.731	.053*
Herd cost constraint	.311	.193	2.604	.107
Labor cost/availability constraint	.190	.104	3.368	.066*
Rising share price constraint	-.565	.088	41.464	.000***
Urban encroachment constraint	-.273	.149	3.364	.067*
Water cost/availability constraint	-.293	.177	2.747	.097*

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

Research in value-added business will typically take longer to make a profit than short-term investments. Therefore, the preference for cooperative investment in value-added consumer business versus the core commodity business can test the hypothesis 4C which is "fewer years until retirement will be negatively associated with preference for investment in technologies that pay back over more years". The dependent variable is the respondent's preference for cooperative investment with 1=value-added business and

7=core commodity business. The χ^2 statistic for the regression model in Table 5.229 is highly significant so the null hypothesis that all coefficients for the independent variables are equal to zero is rejected. The Nagelkerke R-Square indicates the model only explains about 4.6% of the total variation in preference for cooperative investment.

Table 5.229 Fonterra Ordinal probit Regression Model Fitting Information for "I Would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk"

Model	-2LL	χ^2	df	Sig.	Nagelkerke R Square
Intercept only	2,945.63				
Final	2,904.13	41.50	14	.000***	.046

N: 897; Level of significance χ^2- Test: ** Five percent level, *** One percent level

The ordinal probit regression results for the variable indicating member's preference for cooperative investment are shown in Table 5.230. Two of the coefficients for number of years to relinquish control are statistically significant. Respondents who plan to relinquish control between five and fifteen years tend toward preference for cooperative investment in New Zealand Milk, when compared to respondents who plan to relinquish control in more than fifteen years. Older respondents tend to prefer cooperative investment in Ingredients. This weakly supports hypothesis 4C, although the overall model does not explain even five percent of the variation in the cooperative investment preference.

The negative coefficient on the type of operator variable indicates that an owner with a sharemilker tends toward preference for cooperative investment in New Zealand Milk compared to the owner operators and the sharemilkers. The next section uses cluster analysis to group the respondents in different clusters.

Table 5.230 Fonterra Coefficients for Ordinal probit Regression Model, Dependent Variable: "I Would Prefer the Co-operative Invest in Ingredients Rather than New Zealand Milk"

Variable	Estimate	Std. Error	Wald	Sig
Threshold				
Cooperative Investment Preference = 1	-1.814	.258	49.506	.000***
Cooperative Investment Preference = 2	-1.110	.255	18.954	.000***
Cooperative Investment Preference = 3	-.678	.254	7.129	.008***
Cooperative Investment Preference = 4	.096	.253	.143	.705
Cooperative Investment Preference = 5	.471	.254	3.428	.064*
Cooperative Investment Preference = 6	1.215	.260	21.792	.000***
Location				
Relinquish don't know	-.064	.139	.213	.645
Already relinquished control	-.057	.209	.076	.783
Relinquish < 5 years	-.160	.135	1.406	.236
Relinquish 5-10 years	-.274	.133	4.205	.040**
Relinquish 10-15 years	-.299	.149	4.044	.044**
Age	.094	.041	5.176	.023**
Percent farm revenue from milk in 2004	-.578	.261	4.899	.027**
Owner/Sharemilker	-.257	.104	6.166	.013**
Sharemilker	.026	.128	.040	.841
Other type of operator	-.066	.113	.344	.557
Herd cost constraint	-.277	.159	3.035	.081*
Rising share price constraint	.144	.078	3.429	.064*
Capacity to service debt constraint	.126	.080	2.482	.115
Lack of off-farm opportunity constraint	-1.949	.684	8.124	.004***

Level of significance χ^2 Statistic Test: *Ten percent level, ** Five percent level, *** One percent level

5.4.5. Cluster Analysis of Fonterra Survey

The cluster analysis can separate respondents into similar groups. A hierarchical procedure using a Ward's method algorithm resulted in three or four clusters. The largest percentage increase in clustering coefficient occurs in going from two to one clusters and the next noticeable change occurs in combining four to three clusters (Table 5.231). A lower percentage change occurs in combining five into four clusters.

The four clusters have significantly different means for sixteen variables. The three clusters have significantly different means for seventeen variables. The question about the cooperative investment being worth the effort to understand is highly

Table 5.231 Fonterra Analysis of Agglomeration Coefficient for Hierarchical Cluster Analysis

Number of Clusters	Agglomeration Coefficient	Percent Change in Coefficient to next level	Change in Percent
10	13325.99	2.41	-0.17
9	13646.85	2.58	-0.94
8	13999.27	3.53	0.09
7	14492.75	3.43	-0.24
6	14990.22	3.67	-0.88
5	15540.77	4.55	**-1.76**
4	16248.44	6.32	**-3.19**
3	17274.59	9.51	-0.86
2	18916.63	10.36	**10.36**
1	20876.58	---	---

significant in both clusters. The variables indicating the preference for share price and cooperative investment are also significant in both clusters at the five percent level. Variables with statistically significant means for the three clusters are indicated in Table 5.232.

Respondents in cluster 1 are on average smaller dairy producers who have smaller growth patterns with a higher percent of respondents who do not have a succession plan or a preference regarding cooperative investment. In addition, the majority of the respondents in cluster 1 do not know what value the lender places on their Fonterra shares. Cluster 1 respondents tend to have a preference for lower share price and a lower preference for cooperative investment in New Zealand Milk. They also generate a higher percent of household income from farm sources but have a smaller percent of respondent who perceive farm return is greater than Fonterra return.

Respondents in cluster 2 tend to be older and have a higher percent of household income from non-farm sources and have a succession plan. A higher percent of

Table 5.232 Fonterra Means for Significant Variables for the Two Clusters

	Three Clusters (means)		
Variable	1	2	3
Age	3.9	**4.0**	3.5
Size Dairy Operation kg MS	129,795	148,700	**173,113**
Size Dairy Operation cows	373	426	**486**
Growth Milk last five years	4.04	4.36	**4.61**
Growth Milk next five years	2.90	3.01	**3.37**
Lender Value	0.04	2.24	**6.29**
Household income	1.58	**2.15**	1.79
No succession plan (%)	**18.5**	7.6	9.8
Farm Return Greater (%)	20.2	27.7	**32.5**
Fonterra Return Greater (%)	30.2	23.9	**36.6**
Water Cost constraint (%)	4.7	1.9	**7.7**
Rising Share constraint (%)	29.2	**35.2**	18.0
Service Debt constraint (%)	24.4	22.0	**34.5**
Not worth effort understand	2.12	**5.81**	1.48
Preference for share price	2.87	3.67	**4.14**
Preference for coop inv.	3.36	**3.69**	3.29
No preference for coop investment (%)	**11.7**	4.4	2.6
Coop investment in NZM (%)	72.6	79.9	**82.0**
N	**401**	**159**	**194**

respondents in cluster 2 face the rising share price constraint. They tend toward perceiving their cooperative investment is not worth understanding and tend toward preference for core commodity processor rather than New Zealand Milk. A lower percent of these respondents have water cost constraint or debt constraint.

Respondents in cluster 3 are on average larger dairy producers who have more aggressive growth patterns. This group receives a higher value of their Fonterra shares from the bank. Cluster 3 respondents tend to have a preference for higher share price and a higher preference for cooperative investment in New Zealand Milk. They also have a higher percent of respondents who perceive farm return is greater than Fonterra return and Fonterra return is greater than farm return. A higher percent of respondents in cluster

3 have a debt constraint and water constraint. The respondents in this cluster tend toward perceiving their cooperative investment is worth understanding.

The four clusters group the respondents slightly differently (Table 5.233). Cluster 1 tends to be an older group of respondents who have a higher number of years, on average, before they plan to relinquish control. These respondents typically do know the value of Fonterra shares against which they can borrow. A smaller percent of the respondents in this cluster perceive their on-farm return is greater than the Fonterra return. The members in this cluster tend toward preference for cooperative investment in New Zealand Milk.

Table 5.233 Fonterra Means for Significant Variables for the Four Clusters

	Four Clusters (means)			
Variable	1	2	3	4
Age	4.00	**4.03**	3.91	3.57
Years to Relinquish	**3.85**	3.16	3.10	3.84
Size Dairy Operation kg MS	130,329	103,803	142,277	**177,175**
Size Dairy Operation cows	376	303	406	**498**
Growth Milk last five years	4.06	3.24	**4.86**	4.52
Growth Milk next five years	2.94	2.69	2.94	**3.34**
Lender Value	-0.96	0.91	1.73	**6.14**
Household income	1.68	**2.10**	1.49	1.85
No succession plan (%)	14.6	7.6	**22.1**	11.4
Maintain/Family farm (%)	51.3	**58.7**	46.5	**58.7**
Farm Return Greater (%)	18.9	21.7	22.8	**33.9**
Fonterra Return Greater (%)	32.0	19.6	22.8	**36.6**
Complex Inv. constraint (%)	4.3	7.6	**11.8**	6.7
Rising Share constraint (%)	23.8	26.1	**47.2**	22.4
Service Debt constraint (%)	22.1	19.6	28.3	**33.1**
Not worth effort understand	1.70	**5.95**	5.11	1.52
Preference for share price	3.59	**4.60**	1.58	3.56
Preference for coop inv.	3.28	**4.09**	3.47	3.30
No preference for coop investment (%)	7.1	12.0	**13.4**	4.3
No coop investment (%)	6.4	**14.1**	11.8	5.9
Coop investment in NZM (%)	79.4	69.6	66.9	**80.7**
N	**281**	**92**	**127**	**254**

The second cluster represents the older farmers who have smaller dairy operations and generate a higher percent of household income from non-farm sources. Among the four clusters, the respondents in cluster 2 have the least aggressive milk production growth. The highest percent of these respondents plan to maintain ownership or leave the farm to family who continues farming. The respondents in this cluster tend toward perceiving their cooperative investment is not worth understanding and indicate higher preference toward cooperative investment in Ingredients. In addition, this group has a higher percent of respondents with a preference for no further cooperative investment and tends toward preference of a higher share price. It is likely respondents in cluster 2 face the horizon problem since hypothesis 1B, 2A, 2C, 4B and 4C are supported.

The third cluster represents farmers who have the fewest number of years on average to relinquish control but have a higher percent of members who do not have a succession plan or cooperative investment preference. These respondents increased milk production aggressively in the last five years, but do not plan to grow as fast over the next five years. A higher percent of producers in the third cluster limited their production growth due to rising share prices, which resulted in a preference toward lower share prices. A higher percent of these respondents limited their milk production due to complexity of Fonterra investments, which is reflected in the preference toward the cooperative not being worth the effort to understand.

The fourth cluster represents younger farmers with higher number of years until retirement. These respondents have, on average, larger dairy operations and aggressive growth in the last five years as well as the next five years. About a third of the respondents in this cluster perceive their farm return is greater than Fonterra return, but

another third perceive their Fonterra return is greater than the farm return. A higher percent of respondents in this cluster constrained their growth due to capacity to service debt, yet the respondents can borrow against a high percent of their Fonterra shares. This cluster of respondents tends toward preference for cooperative investment in New Zealand Milk and believes their cooperative investment is worth understanding.

The cluster analysis grouped the respondents based on whether the cooperative investment is worth understanding. In addition, the cluster analysis group respondents based on preference for share price and cooperative investment. Therefore, cluster analysis indicates that the horizon problem may be severe for clusters of members in Fonterra.

5.4.6. Summary

The descriptive and inferential statistics regarding variables related to the horizon problem indicate the attitude toward whether the cooperative investment is worth understanding would be related to age, the value lenders place on Fonterra shares, rising share price constraint and milk production growth in the last five years. The factor analysis also indicates that members who can borrow against their shares tend toward the investment being worth understanding. The ordinal probit regression also indicates the statistical significance of the value lender places on Fonterra shares, milk production growth and rising share price constraint.

Members who plan to increase milk production in the next five years tend toward the investment being worth understanding, which supports hypothesis 2A since production growth has a positive significant relationship with milk delivered. Members who can borrow a greater percent of the market value of their Fonterra shares tend toward

the investment being worth understanding, which supports hypothesis 2C at the ten percent level. Since the coefficient for respondents who relinquish control in less than five years is statistically significant at the ten percent level and the coefficient for respondents who have already relinquished is not statistically significant, the results for 4B are inconclusive. Hypothesis 2B is not supported since the succession plan variable is not significant in the model.

The descriptive and inferential statistics indicate the preference for share price is related to rising share price and complex investment constraint. The factor analysis also indicated that preference for share price could be measured on these factors. In ordinal probit regression, years to relinquish, age, lender value and rising share constraint are statistically significant. Older members tend toward a higher share price than younger members, however, only the coefficient for respondents relinquishing control in five to ten years is significant so the results for hypothesis 1B are inconclusive.

The descriptive and inferential statistics indicate that worth the effort to understand investment variable has a significant relationship with the preference for cooperative investment in commodity versus value-added business. The factor analysis did not indicate any significant relationships with the variable. However, the ordinal probit regression indicates other variables may account for the variation in the model. Older members tend to prefer cooperative investment in the commodity business whereas members who have five to fifteen years before relinquishing control of the farms tend toward preference in value-added business, which weakly supports hypothesis 4C.

The cluster analysis indicates the membership might be separated into three or four clusters. The first separation into clusters identifies an older group with smaller

dairy operation who generates a higher percent of household income from the farm and prefers a lower share price. The second cluster is also older and generates a higher percent of household income from non-farm sources, does not perceive the Fonterra investment is worth understanding and faces a higher rising share price constraint. The third cluster is a younger group with larger dairy operation and growth patterns, a preference for higher share price, preference for cooperative investment in value-added business, and faces a higher debt constraint but can borrow against a higher percent of the Fonterra shares.

The separation of the members into four clusters separated the members more distinctly on whether the investment is worth understanding and the preferences for share prices and cooperative investment preferences. The members who felt the Fonterra investment was not worth understanding were the oldest group with small dairy operation and a higher percent of income from household income. The members who had the lowest preference for cooperative investment in value-added business have the fewest number of years before relinquishing control.

The results from the Fonterra survey have inconclusive evidence the "wait-to-receive" horizon problem exists – results for hypothesis 1B are inconclusive. The results indicate weak evidence that the "hassle" horizon problem exists – hypothesis 2A and 2C are supported with descriptive statistics and weak regression results, and hypothesis 2B is not supported by any technique. The results indicate weak evidence the "short-term residual" horizon problem exists – hypothesis 4B is supported with descriptive statistics, factor analysis, and hypothesis 4C is supported with descriptive statistics and weak regression results.

5.5. Overall Summary of Results

The "wait-to-receive" horizon problem appears to exist in Effingham Equity and West Central since hypothesis 1A and 1B are at least weakly supported (Table 5.234). The "hassle" horizon problem might exist in Effingham Equity, West Central Cooperative, and Fonterra because the multivariate techniques supported at least two of the three hypotheses 2A, 2B, and 2C for each cooperative. However, the "hassle" horizon problem is less evident in Northeast Missouri Grain Processors, since the results only weakly supports one of the hypotheses. The "current obligation" horizon problem might exist in Effingham Equity and West Central since hypothesis 3A is supported, but neither hypothesis 3B hypothesis nor 3C is supported. The "short-term" horizon problem appears to exist in Fonterra and West Central since hypotheses 4A, 4B, and/or 4C are at least weakly supported. The "short-term" horizon problem may not exist in Northeast Missouri Grain Processors since hypothesis 4B is weakly supported and results for hypothesis 4C are inconclusive. The "short-term" horizon problem may exist in Effingham Equity since hypothesis 4B is supported but hypothesis 4A is not supported.

Table 5.234 Summary of Hypotheses for the Four Cooperatives

		Expected Results	Statistical Results
Operational Hypotheses Related to "Wait to Receive" Horizon Problem			
H_{1A}:	The number of years until retirement will be negatively associated with preference for quicker redemption of older equities.	EE and WC: Support	EE: Supported WC: Supported
H_{1B}:	The number of years until retirement will be negatively associated with preference for higher fair value share price.	F: Inconclusive	F: Inconclusive

		Expected Results	Statistical Results
Operational Hypotheses Related to "Hassle" Horizon Problem			
H_{2A}:	The level of member's patronage will be negatively associated with the attitude that the cooperative investment is not worth understanding.	EE and WC: support; F and NMGP: weakly support	EE: Supported WC: Weakly supported NMGP: Weakly supported F: Weakly Supported
H_{2B}:	Plans for family to continue farming will be negatively associated with the attitude that the cooperative investment is not worth understanding.	EE and WC: support to weakly support; F and NMGP: weakly support to not support	EE: Not Supported WC: Not Supported NMGP: Not supported F: Not Supported
H_{2C}:	The inability to borrow against the cooperative investment will be positively associated with the attitude that the cooperative investment is not worth understanding.	EE and WC: support; F and NMGP: weakly support	EE: Weakly Supported WC: Weakly supported NMGP: Not supported F: Weakly Supported
Operational Hypotheses Related to "Current Obligation" Horizon Problem			
H_{3A}:	The constraint from high current cash obligations will be positively associated with preference for higher cash patronage refunds.	EE and WC: support	EE: Weakly Supported WC: Weakly Supported
H_{3B}:	The constraint from high current cash obligations will be positively associated with preference for competitively priced.	EE and WC: weakly support to no support	EE: Not supported WC: Not Supported
H_{3C}:	The inability to borrow against the cooperative investment will be positively associated with preference for higher cash patronage refunds.	EE and WC: weakly support to no support	EE: Not supported WC: Not supported
Operational Hypotheses Related to "Short-term Residual" Horizon Problem			
H_{4A}:	The number of years until retirement will be negatively associated with preference for investments with quick payback.	EE: Weakly support WC: Support	EE: Not supported WC: Weakly supported
H_{4B}:	The number of years until retirement will be negatively associated with preference for no further cooperative investment.	EE and WC: support NMGP: Weakly support to Not support F: Weakly support to Not support	EE: Weakly Supported WC: Weakly supported NMGP: Weakly supported F: Weakly supported
H_{4C}:	Fewer years until retirement will be negatively associated with preference for investment in technologies that pay back over more years.	NMGP: Not support F: Weakly support	NMGP: Inconclusive F: Weakly Supported

EE = Effingham Equity; WC = West Central; NMGP = Northeast MO Grain Processors; F = Fonterra

6. STUDY SUMMARY, POTENTIAL IMPLICATIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

This study addresses the issue of an investment constraint in user-owned organizations called the horizon problem. Scholars have suggested the restrictions on the transferability of residual claimant rights and the restricted liquidity through a secondary market results in a disincentive for user-owners to invest in growth opportunities. However, despite the conceptual and anecdotal arguments supporting the existence of investment constraints, the empirical evidence is scarce and inconclusive. This study attempts to fill part of this void in the literature by investigating the investment horizon problem with multivariate data analysis of survey data collected from the memberships of four user-owned organizations.

This concluding chapter summarizes some of the major issues addressed in this study including the theoretical analysis of the investment horizon problem, the description of the cross sectional data set of four cooperatives and empirical procedures, and the discussion of empirical results. Additionally, the chapter examines the implications of research results to the capital structure in user-owned organizations. The chapter concludes with recommendations for future studies dealing with user-owned organizations.

6.1. Summary of the Study

Chapter 1 introduces the investment horizon problem by discussing the general issue and the arguments supporting the hypothesis that agricultural cooperatives are

financially constrained. Although agricultural cooperatives have been successful in the past, they are facing difficult times with agricultural industrialization and the increasingly concentrated and tightly coordinated food system. Traditional cooperatives in some advanced agricultural countries are adopting non-traditional cooperative organizational structures to adapt to the institutional and competitive environment.

Traditional agricultural cooperatives are unable to acquire sufficient risk capital to finance investment opportunities. The property rights allocation within the traditional cooperative structure does not always provide the necessary incentives for user-owners to invest. Residual claims in traditional agricultural cooperatives are not appreciable, non-transferable and redeemable only at a discounted book value so the members do not have the incentive to contribute risk capital.

Traditional cooperatives have restrictive residual claims since only active members provide equity capital to the cooperative. The number, wealth, and risk bearing capacity of current members limit the acquisition of risk capital in traditional cooperatives. The residual claims are non-transferable which prevents the functioning of a secondary market and leads to the emergence of the portfolio and horizon problems. Cooperatives depend primarily on internally generated capital or patronage-based methods to acquire risk capital, which is redeemable at the discretion of the cooperative's board of directors. Since redeeming equity is a cash outlay of the cooperative, some lenders may not consider the allocated patronage refunds in traditional cooperatives as permanent equity capital, which could result in the cooperatives lacking access to adequate sources of debt capital.

6.1.1. Investment Horizon Problem

Chapter 2 identifies two sets of literature on the horizon problem. The *agent-control* horizon problem in the corporate governance literature occurs when the manager has an incentive to engage in activities that are not in the shareholder's best interest especially if the manager is about to leave the firm. The *investment* horizon problem in a subfield of finance represents a situation where the individual stockholder has a disincentive to contribute to collective growth opportunities when the individual's residual claim on the net income is shorter than the economic life of the underlying asset.

The *investment* horizon problem was first discussed in the context of labor-managed firms and later in the context of user-owned organizations. In labor-managed firms, employees only received claims to the current stream of net earnings while they remained employed by the organization. When a worker has a short time left with the firm, the worker may prefer the organization invest in projects where the truncated stream of discounted future returns exceeds the present value of expenses. The workers may prefer the organization distribute the net earnings to the workers in the form of wages and bonuses and make all investments with borrowed capital.

In the context of user-owned organizations, two subgroups of *investment* horizon problem can be described. The "Furubotn-Pejovich" horizon problem represents the inability to recoup the residual claims on the retained earnings. This is similar to the inability to capture a return of capital or the inability to recover the book value of the member's initial and annual investments made in the organization. Members who reduce their level of patronage relative to their investment might pressure the management to speed up the equity redemption or to pay dividends on capital invested.

The "residual" horizon problem represents the inability to capture the future stream of economic profits. The "residual" horizon problem is similar to inability to capture a return on capital, or the inability to capture the appreciated or market value of capital invested in the organization and future streams of economic profits. Without a transferable right or a secondary market, the member of a user-owned organization cannot capture the future returns from new projects, from increases in the market value due to improved performance nor from the positive impact of intangible assets after leaving the organization. Members with few years remaining with the cooperative might pressure management to finance investments with borrowed capital rather than internal funds or retained equity. The "residual" horizon constraint might be a serious problem if the expected payback horizon of an investment is longer than the membership horizon of the majority of members, if members cannot transfer their residual claims or if no established secondary market exists.

This study identifies through multivariate techniques several variants of the horizon problem in user-owned agricultural organizations. Members who face the "*wait-to-receive*" horizon problem might prefer the cooperative accelerate the redemption of allocated equities. Members who face the "*hassle*" horizon problem might prefer limiting investment in the organization because understanding the capital formation and redemption is too complex. Members who face the "*current obligation*" horizon problem might prefer a higher cash payment in year earned, or less of the equity retained as allocated, if the cost to pay taxes on the residual claims in combination with current working capital obligations is greater than the benefit of further cooperative investment. Members who face the "*short-term residual*" horizon problem might prefer the

cooperative invest in assets from which they cannot extract complete benefit during their membership horizon. Members who face the "*appreciated value*" horizon problem might prefer the cooperative to allocate the appreciated value of the cooperative. If the cooperative does not allocate the appreciated value, the member might prefer the liquidation of the organization. Time and space preclude the analysis of the "*appreciated value*" horizon problem in this study.

6.1.2. Case Study, Sample and Research Design

Chapter 3 begins by summarizing the empirical literature that informs the *investment* horizon problem. Several authors describe the equity redemption plans that cooperatives incorporate and evaluate the after-tax value to the members using simulations, growth models and linear programming techniques. The studies do not consider the member's different horizons with the cooperative. In addition, the studies do not analyze whether the equity redemption plan matches the individual member preferences. This study attempts to fill this void by analyzing the member preferences regarding the cooperative's redemption policy.

Few empirical studies evaluate the member's incentive to invest in user-owned organizations. Iliopoulos developed a structural equation model to identify which property rights characteristics play an important role in affecting the member's incentive to invest. He informed the model with responses for two surveys completed by the cooperative's top management. However, the model did not account for variation in the value of the member investments and did not consider the member's attitudes or investment preferences. Vyn utilized an experimental economic technique to show that the new generation cooperative structure provides members with a stronger incentive to

invest, but it does not indicate if the horizon problem exists in traditional cooperatives. Chaddad and Heckelei use an econometric approach to estimate an investment model that supports the hypothesis that agricultural cooperatives are financially constrained when making investment decisions. However, this approach uses cooperative-level financial data and does not incorporate the impact the investment constraint has on the member's incentive to invest.

In order to analyze to what degree the horizon problem exists in user-owned organizations, this study utilizes both research case studies and a member survey. The multiple case studies help inform the member survey design. The member survey seeks to provide information as to what degree the *investment* horizon problem exists in the selected cooperatives by evaluating the member's investment preferences for the cooperative's equity redemption plan and the member's preferences for future cooperative investment. Research hypotheses were tested using multivariate data techniques described in Chapter 4. Descriptive and inferential statistics provide insights into the possible association and relationships between variables related to the horizon problem. Factor analysis explains the horizon problem variables in terms of the common underlying dimensions or factors. Ordinal probit regression analysis helps identify the impact of the independent variables on the horizon problem variables that have an ordinal scale. Cluster analysis classifies samples of respondents into small and mutually exclusive groups based on similarities among the respondents regarding their investment preferences related to the horizon problem.

The four case studies were conducted in the period from January 2004 and August 2005, through secondary sources and through interviews with the cooperative

management. The data used for testing the hypotheses were collected, in the period from November 2004 through May 2005, through a mail survey of the memberships of four agricultural cooperatives. The criteria to select the organizations for this dissertation were organizational type, payment type, investment method and degree of investor/user benefit which are describe in Section 3.3.2. In addition, the cooperatives were selected based on variability in size of member's farm; variability in lengths of membership horizon; variation in attributes of equity acquisition and redemption policies and variability in intangible assets.

With respect to the organizational type, Effingham Equity and West Central Cooperative are multipurpose grain and farm supply cooperatives whereas Fonterra and Northeast Missouri Grain Processors are marketing cooperatives. All four of the cooperatives participating in the study have a cost of goods sold payment type rather than a pooled payment. With respect to the investment method, West Central Cooperative and Effingham Equity have passive investments through retained patronage refunds whereas Fonterra and Northeast Missouri Grain Processors have pro-active investment. The members in West Central Cooperative and Effingham Equity receive benefits primarily as users through favorable prices, whereas the members in Fonterra and Northeast Missouri Grain Processors receive benefits as investors through dividends and/or appreciation of value of the shares.

Effingham Equity is primarily a farm supply cooperative in southeastern Illinois that sells farm supply products including fertilizer, agricultural chemicals, seed and animal feeds through local retail branch locations. West Central is primarily a grain marketing and soybean-processing cooperative in west central Iowa. Similar to most

traditional agricultural cooperatives, Effingham Equity and West Central Cooperative source equity capital through retained patronage refunds and from non-member business. Both cooperatives also revolve equity capital to the members based on first in, first-out redemption plan and use special equity redemption plans. Effingham Equity redeems the member's equity, at the request of the member, after they reach sixty-five years and retire from farming. West Central redeems one class of the member's equity when they retire from farming. Since there is a time delay between when the member invests in Effingham Equity and West Central Cooperative and when the cooperative redeems the member's equity, the investment is not in proportion to the member's patronage.

Northeast Missouri Grain Processors, a new generation cooperative, invested in NEMO Grain, LLC to build a corn ethanol plant in Macon, Missouri. The ethanol plant produces distillers dried grain with soluble and carbon dioxide in addition to alcohol. During the initial equity drive, producers invested capital in the cooperative by purchasing a delivery right obligating them to deliver a specified amount of corn annually to the ethanol plant. The members can transfer or sell their shares to other corn producers in Missouri according to board policies. The member benefits as an investor through (1) dividends and (2) the appreciated value of the shares. The member also benefits as a user through a (1) reliable access to a market for their corn, (2) premium on share corn delivered, (3) freight allowance for share corn, and (4) at least a 20 cents per bushel increase in the corn basis level (NEMO Grain).

Fonterra is a multinational dairy cooperative in New Zealand that manufactures and markets quality ingredients under the NZMP brand and a wide range of dairy-based consumer and food service branded products. Equity capital is sourced from the

members purchasing fair value shares in proportion to the quantity of milk solids delivered to the milk manufacturing plants. The fair value shares are redeemed immediately by the cooperative if the member reduces the quantity of milk delivered. The members benefit primarily as an investor in the appreciated value of their shares.

The information gathered from the case studies helped inform the member survey design. The member survey includes questions regarding characteristics about the member, his farm operation and growth plans, the member's succession plan, cooperative investment preferences, and equity redemption plan preferences. Chapter 3 concludes with a detailed description of the steps used in developing the multiple case studies and the member surveys.

6.1.3. Summary of Empirical Results

The operational hypotheses specified in Chapter 2 are summarized in Table 6.1. The horizon problem exists when the hypotheses are supported by the multivariate techniques. The empirical results from analyzing the four member surveys with respect to the hypotheses are presented and discussed in Chapter 5. For each cooperative, general demographic information describes the respondent's in terms of age, succession plans, their farm operation, growth plans, and constraints for growth. Then descriptive and inferential statistics describe the various horizon problems and multivariate techniques indicate whether the results support the hypotheses, and in turn, the degree to which the horizon problems exist in the respective organizations.

Table 6.1 Summary of Hypotheses

Main Hypothesis	
H_0:	Members in user-owned organizations have similar investment preferences with respect to equity redemption policies and short-term vs. long-term investments.
Operational Hypotheses Related to "Wait to Receive" Horizon Problem	
H_{1A}:	The number of years until retirement will be negatively associated with the preference for quicker redemption of older equities.
H_{1B}:	The number of years until retirement will be negatively associated with the preference for higher share value price.
Operational Hypotheses Related to "Hassle" Horizon Problem	
H_{2A}:	The level of member's patronage will be negatively associated with the attitude that the cooperative investment is not worth understanding.
H_{2B}:	Plans for family to continue farming will be negatively associated with the attitude that the cooperative investment is not worth understanding.
H_{2C}:	The inability to borrow against the cooperative investment will be positively associated with the attitude that the cooperative investment is not worth understanding.
Operational Hypotheses Related to "Current Obligation" Horizon Problem	
H_{3A}:	The constraint from high current cash obligations will be positively associated with preference for higher cash patronage refunds.
H_{3B}:	The constraint from high current cash obligations will be positively associated with the preference for competitively priced products.
H_{3C}:	The inability to borrow against the cooperative investment will be positively associated with the preference for higher cash patronage refunds.
Operational Hypotheses Related to "Short-Term Residual" Horizon Problem	
H_{4A}:	The number of years until retirement will be negatively associated with the preference for investments with quick payback.
H_{4B}:	The number of years until retirement will be negatively associated with the preference for no further cooperative investment.
H_{4C}:	Fewer years until retirement will be negatively associated with preference for investments that pay back over more years.

The results show that more than one type of horizon problem exists in user-owned agricultural cooperatives. The horizon problem is expressed in at least four ways through the wait-to-receive horizon problem; the hassle horizon problem; the current obligation horizon problem; and the short-term residual horizon problem. Each horizon problem is more important in certain contexts and for different types of cooperatives, which leads to

different implications and policies that cooperatives can implement to ameliorate the horizon problems.

Based on the conceptual framework, the "wait-to-receive" horizon problem is expected to be more prevalent in cooperatives with passive investment where the investment is redeemed over a longer revolving period. Since most cost of goods sold cooperatives have passive investment through patronage refunds, the "wait-to-receive" horizon problem is also likely to be more prevalent in cost of goods sold cooperatives compared to pooled cooperatives where equity acquisition is through a retention program. In addition, many multipurpose Nourse cooperatives generate growth capital internally through patronage refunds, so the "wait-to-receive" horizon problem is likely to be more severe in multipurpose cooperatives compared to marketing cooperatives because it takes longer, on average, for multipurpose cooperatives to revolve the equity to their members.

As expected, the "wait-to-receive" horizon problem exists in both Effingham Equity and West Central. However, the evidence supporting the existence of the "wait-to-receive" horizon problem is stronger for West Central than Effingham Equity. The results indicate that revolving equity within ten to fifteen years of the allocation period has helped to ameliorate the strong preference for quicker redemption in both cooperatives. In addition, Effingham Equity's special redemption plan to redeem all equity at age sixty-five, if the member relinquishes the right to be a member, has helped to ameliorate the preference for quicker redemption among the older members.

The "wait-to-receive" horizon problem is not expected to exist in organizations with pro-active investment since the members receive a benefit primarily as an investor. As expected, the "wait-to-receive" horizon problem does not exist in Fonterra, since the

members receive immediate payment for their shares upon reduction of the amount of milk produced annually. In 2001, Fonterra implemented the fair value shares when the two large New Zealand dairy cooperatives merged with New Zealand Dairy Board.

The "hassle" horizon problem is expected to exist in organizations where the user and investor benefits are not separable, thus making the capital formation process complex to understand. In traditional multipurpose and marketing cooperatives, the members benefit primarily through use, so the "hassle" horizon problem is expected to be more prevalent in traditional cooperatives. The "hassle" horizon problem is also expected to be more prevalent in cooperatives that have passive or quasi-passive investment methods. As the investment method becomes more active, the user and investor benefits are more separable and consequently less complex to understand.

As expected, the evidence shows that the "hassle" horizon problem weakly exists in both Effingham Equity and West Central Cooperative. In Effingham Equity, the hog producers and respondents with high crop input volume are less likely to face the "hassle" horizon problem and perceive their cooperative investment is worth understanding because these members receive a greater benefit from the high level of patronage compared to the low input volume member. In West Central, respondents with more than 2,000 acres and market a smaller percent of grain through the cooperative are more likely to face the "hassle" horizon problem and tend toward the investment not being worth the effort to understand.

Since the benefits as an investor and as a user are separated in Northeast Missouri Grain Processors, a new generation cooperative, the "hassle" horizon problem is not expected to exist, which is confirmed by the results. In the initial meetings about the

equity drive, the corn producer members of Northeast Missouri Grain Processors learned about the complexities of the organization. Therefore, understanding the capital formation in the organization is not considered to be complex which results in the respondents perceiving their investment is worth the effort to understand. The results indicate the factors related to the "hassle" horizon problem are not significant in NMGP.

Since the user and investor benefits in Fonterra are separable, the "hassle" horizon problem is not expected to exist, however the results indicate the "hassle" horizon problem weakly exists in Fonterra. The member's milk production level matches the level of investment, so the member receives a benefit as a user. In addition, the member receives a benefit as an investor through appreciated value of the shares. Although there is a separation between the user and investor benefits, the additional policies regarding fair value shares and peak notes makes the understanding of the cooperative capital formation more complex, which might be the reason the "hassle" horizon problem weakly exists in Fonterra.

The "current obligation" horizon problem is likely to be observed in cost of goods sold cooperatives who pay the minimum percent of allocated equities in cash or in pooled cooperatives that retain a higher percent of the member proceeds. The "current obligation" horizon problem is also likely to be greater in cooperatives with passive or quasi-passive investment methods and in organizations where the members benefit primarily through use. The "current obligation" horizon problem weakly exists in Effingham Equity and West Central Cooperative, as expected, but to a lesser degree than expected. The questions designed to indicate current working capital obligations may need to be framed differently to better analyze the "current obligation" horizon problem.

The "short-term residual" horizon problem is expected to exist in traditional multipurpose cooperatives like Effingham Equity and West Central when the members cannot transfer their shares or cooperative investment. When the member receives benefits only through patronizing the organization, members close to retirement or exit prefer no further investment or prefer investment in assets with a quick payback period. As expected, the "short-term residual" horizon problem exists in Effingham Equity and West Central Cooperative but to a lesser degree than expected. The survey design can be improved to better indicate the member's preference for investments with quick payback.

Since the shares in Fonterra can be redeemed by the cooperative upon exit and appreciate in value, the "short-term residual" horizon problem is not expected to exist in Fonterra. However, the results indicate the "short-term residual" horizon problem weakly exists in Fonterra. Members with fewer years to relinquish control perceive the investment is not worth understanding and therefore prefer no further investment. The difference in the expected and statistical results might be that the member can only redeem their shares when they exit, so as the member nears retirement or exit, there may still be projects they do not prefer to invest in if it pays off after their expected membership horizon.

Since members in Northeast Missouri Grain Processors can sell their shares among other members at an appreciated value, the "short-term residual" horizon problem is expected to not exist in Northeast Missouri Grain Processors which is supported with the results. The members in NMGP can transfer their shares at the discretion of the board so even if the member plans to exit farming, they can capture the future value of the cooperative's investment through the price of the shares.

A summary of the results is shown in Table 6.2. The table provides a typology showing the degree to which the horizon problems exist under which cooperative characteristics. Time, scope and expenses precluded this study from analyzing the existence of the horizon problem categories represented by an NA for Not Applicable.

6.2. Implications for Capital Structure Policy in User-Owned Agricultural Organizations

The analysis of the investment horizon problem, an investment constraint in user-owned agricultural organizations, presented in the previous chapters and the empirical tests of the hypotheses generated several important implications for US agricultural cooperatives. This study shows that subgroups of members within agricultural cooperatives have different preferences for equity redemption policies as well as different preferences for future cooperative investments.

The adoption of an effective equity redemption plan affects the "wait-to-receive" horizon constraint. Traditional cooperatives that generate risk capital through passive investment are affected more by the "wait-to-receive" horizon constraint than new generation cooperatives that generate risk capital primarily with pro-active direct investment. In addition, the "wait-to-receive" horizon constraint is manifested in cooperatives with longer revolving periods and in cooperatives that do not have a policy allowing the full redemption of allocated equities when the member reaches a certain age.

Table 6.2 Results Indicating Degree of Existence of Horizon Problem by Cooperative Characteristics

		Wait-to-Receive	Hassle	Current Obligation	Short-term Residual
Organizational Type	**Multipurpose (Nourse)**	Medium to High	Medium	Low to Medium	Medium to High
	Marketing (Sapiro)	Low to Medium	Low to Medium	NA	Medium
Payment Type	**Cost of Goods Sold**	Medium to High	Medium	Low to Medium	Medium to High
	Pooled	NA	NA	NA	NA
Investment Method	**Pro-Active**	None to Low	Low	Low	Low
	Quasi Passive	NA	NA	NA	NA
	Passive	High	Medium	Medium	High
Degree of Investor/User Benefit	**Investor Benefit**	None to Low	None to Low	NA	Low to Medium
	User Benefit	High	High	Medium to High	Medium to High

Adopting an adaptation to the current equity redemption plan, like the dividend allocation rule, can help to ameliorate the pressures from the "wait-to-receive" horizon problem. The dividend allocation rule, an Internal Revenue Service interpretation of the tax code, requires cooperatives that pay dividends on equity investments to allocate the dividends on a pro rata basis between the patronage and non-patronage income. Under the provisions in the American Jobs Creation Act of 2004, cooperatives can pay dividends on stock entirely out of non-patronage income that allows cooperatives to reduce the tax cost of paying dividends on their equity investments and, at the same time, return more of their margins to patrons as patronage refunds (Frederick, 2005). Some cooperatives are considering using the dividend allocation rule to retain additional capital in the cooperative and ameliorate some of the liquidity issues for those members who want their equity out. The plan would convert the member's stock into a non-voting stock (rather than in cash), which is redeemable upon the member's request at the discretion of the board of directors. The non-voting stock would receive an interest bearing dividend using profits from the non-member business.

Traditional cooperatives that utilize passive or quasi-passive investment methods might have members who experience the "current-obligation" horizon constraint. These members may put pressure on the cooperative to pay a higher percent of allocated equities in cash or to retain a smaller percent as retains. To alleviate the "current obligation" constraint, the cooperative could pay a higher percent of the qualified allocated equities in cash or allocate the equities as non-qualified where the cooperative pays the taxes on the equities and later redeems to the member at the discretion of the board of directors.

Separating the investor benefits from the user benefits helps reduce the complexity of the cooperative's capital formation and therefore helps to ameliorate the "hassle" horizon problem. In some new generation cooperatives, the member receives benefits as an investor through dividends and as a user through a competitive price and access to a market for their commodity. However, in traditional multipurpose cooperatives, the member typically does not receive a benefit as an investor, and therefore may perceive the capital formation of the organization too complex to understand. Members with the higher level of patronage with the cooperative begin to think of their investment as an investor.

The creation of a secondary market for cooperative shares and/or delivery rights provides a mechanism for members to capture the market value of their investment decision by selling their residual claims to the cooperative's future net income. Cooperatives that have a secondary market for the cooperative shares or delivery rights have reduced the impact of the "short-term residual" horizon problem. Members who can capture the market value of their investment decision might be more willing to support investments in intangible assets, such as research and development or brand name development, and tangible assets that have an economic life beyond their membership horizon.

6.3. Recommendations for Future Research

This study concludes with recommendations for future research focusing on user-owned organizations in agriculture. A study of the horizon problem, however comprehensive it may be, cannot discuss, analyze, and empirically test all aspects of the

investment constraint. The following delineates areas in need for future research at both the theoretical and empirical levels:

1. a more thorough investigation of the "appreciated value" horizon problem
2. improvement of the survey design to measure the member's incentive to invest
3. assessment of the relationship between the horizon and portfolio investment constraints
4. development of the solutions used by cooperative managers to ameliorate the five subtypes of the horizon problem

The "appreciated value" horizon problem affects member's investment incentives in cooperatives where the organization's market value is perceived to be greater than the book value. The study of the "appreciated value" horizon problem was beyond the scope of this study due to time and expenses. The case study and survey approach would provide insights into the cooperative characteristics that manifest the "appreciated value" horizon problem.

All subtypes of horizon problem can be informed in greater depth through analysis of additional cooperatives that have passive, quasi-passive and active investment methods. The two organizations with passive investment chosen for this study have a shorter revolving period than the average cost of goods sold cooperative. Increasing the sample of cooperatives with longer revolving periods would generate a richer data set by which more knowledge can be gathered about the "wait-to-receive" horizon problem and the "current obligation" horizon problem.

The analysis of the existence of the investment horizon constraint focused on the association of member characteristics with their "disincentive to invest". Since two of

the organizations analyzed have traditional cooperative structures with passive investment, the members do not actively invest additional capital. This study indicated the members preference to not invest or to request their equity back quicker. Future research could incorporate measures to capture the member's preference to invest additional capital in their organizations if they were provided the opportunity.

The investment horizon problem and the portfolio problem have been analyzed in separate studies. However, both the horizon and the portfolio issues are considered investment constraints in user-owned agricultural cooperatives. An analysis of the interrelationships between the two investment constraints can help improve the ability of user-owned organizations to acquire risk capital. Reducing the horizon problem could lead to a greater portfolio problem if not analyzed carefully.

This study focused on to what degree the investment horizon issue exists in user-owned agricultural cooperatives. The results identified under which cooperative characteristics the different subtypes of horizon problem might exist. Further research can help develop a typology of the solutions that might ameliorate the various subtypes of horizon problem.

APPENDIX 1A EFFINGHAM EQUITY SURVEY

Conducted by:
GICL Team
University of Missouri-Columbia
125C Mumford Hall
Columbia, MO 65211

1. Please INDICATE whether you AGREE or DISAGREE with each statement.
Effingham Equity was ORIGINALLY formed to provide…

	STRONGLY DISAGREE			DON'T KNOW			STRONGLY AGREE
SECURE ACCESS TO MARKET	1	2	3	4	5	6	7
HIGHER COMMODITY PRICES	1	2	3	4	5	6	7
BETTER SERVICES	1	2	3	4	5	6	7
BETTER MARKET INFORMATION	1	2	3	4	5	6	7
COMPETITIVELY PRICED INPUTS	1	2	3	4	5	6	7
OTHER (Any Thoughts) _____	1	2	3	4	5	6	7

2. Please indicate the NUMBER of YEARS for which you have been a MEMBER of EFFINGHAM EQUITY.
_____ YEARS

3. Please INDICATE whether you AGREE or DISAGREE with each statement.
TODAY Effingham Equity EXISTS to provide…

	STRONGLY DISAGREE			DON'T KNOW			STRONGLY AGREE
CONTINUED SECURE MARKET ACCESS	1	2	3	4	5	6	7
HIGHER COMMODITY PRICES than a COMPETITOR	1	2	3	4	5	6	7
BETTER MARKET INFORMATION	1	2	3	4	5	6	7
Needed CROP INPUT SERVICES	1	2	3	4	5	6	7
Needed ANIMAL FEED SERVICES	1	2	3	4	5	6	7
Needed GRAIN MARKETING SERVICES	1	2	3	4	5	6	7
Needed PETROLEUM SERVICES	1	2	3	4	5	6	7
COMMODITY RISK MANAGEMENT	1	2	3	4	5	6	7
COMPETITIVELY PRICED INPUTS	1	2	3	4	5	6	7
HIGHER OVERALL RETURNS than OTHER COMPETITORS	1	2	3	4	5	6	7
OTHER (Any Thoughts) _____	1	2	3	4	5	6	7

4. EFFINGHAM EQUITY primarily provides SERVICES in four BROAD CATEGORIES: (Crop Inputs, Petroleum, Animal Feeds, and Grain Marketing) As you think about your OVERALL FARM STRATEGY for the NEXT FIVE YEARS in which service categories would you MOST PREFER the cooperative invest?
Please circle only one.

During the next 5 years…
A. I MOST PREFER the COOPERATIVE INVEST in ALL SERVICE CATEGORIES (Crop Inputs, Petroleum, Animal Feeds and Grain Marketing).
OR
B. I MOST PREFER the COOPERATIVE INVEST ONLY in those SERVICE CATEGORIES that I can USE ON MY FARM.

Please CIRCLE which SERVICE CATEGORIES:
B1. CROP INPUTS B2. PETROLEUM
B3. ANIMAL FEEDS B4. GRAIN MARKETING
OR
C. NO FURTHER INVESTMENT is REQUIRED to support my on-farm strategy.
OR
D. I really don't know

5. Do you agree with the following statement?
Please circle only one.
"It is NOT WORTH the EFFORT of trying to UNDERSTAND the COMPOSITION of my EFFINGHAM EQUITY INVESTMENT (such as allocated retained earnings, years to redeem, amount to include as income)."
STRONGLY DISAGREE IT DOESN'T MATTER MUCH STRONGLY AGREE
1 2 3 4 5 6 7

6. Which policy would you MOST PREFER the board chooses?
Please circle only one.
I MOST PREFER the board chooses a policy that pays …
A
HIGHER cash PATRONAGE REFUND today and SLOWER REDEMPTION of ALLOCATED RETAINED earnings (1) … SAME as current policy (4) … LOWER cash PATRONAGE REFUND today and QUICKER REDEMPTION of ALLOCATED RETAINED earnings (7)
OR
B. I'm indifferent
OR
C. I really don't know

7. Please CIRCLE the ANSWER that BEST REFLECTS your POINT OF VIEW.
Please circle only one.
The COOPERATIVE should have more UNALLOCATED RETAINED EARNINGS rather than ALLOCATED RETAINED EARNINGS.
STRONGLY DISAGREE IT DOESN'T MATTER MUCH STRONGLY AGREE
1 2 3 4 5 6 7

8. My LENDER VALUES my ALLOCATED RETAINED EARNINGS in EFFINGHAM EQUITY at approximately _____ PERCENTAGE of their MARKET VALUE.
Please circle only one.
What PERCENT of MARKET VALUE?
0 -15% 16 – 30% 31 – 45% 46 – 60% 61 – 75% 76 - 90% 91– 100% Don't Know

9. I PREFER the COOPERATIVE INVEST ONLY in the SERVICE CATEGORIES which REFLECT MY FARM PRODUCTION RATHER than ALL SERVICE CATEGORIES
Please circle only one
STRONGLY DISAGREE INDIFFERENT STRONGLY AGREE
1 2 3 4 5 6 7

10. Please INDICATE your AGE
Less than 40 41 - 45 46 - 50 51 - 55 56 - 60 61 - 65 Over 65

11. Please INDICATE the NUMBER of YEARS you anticipate BEFORE you will RELINQUISH CONTROL OVER your FARM.
Already relinquished control Less than 1 year 1 - 2 years 3 - 5 years 6 - 10 years
11 - 15 years 15 – 20 years Don't know

12. Please CIRCLE which of the following SUCCESSION PLANS you are CONSIDERING for the FARMING OPERATION once you RELINQUISH CONTROL.
A. Maintain Ownership
B. Sell the Farm
C. Bequest the Farm to Family (Your Family will Continue to Farm)
D. Bequest the Farm to Family (Your Family will Not Continue to Farm)
E. Other (Please Specify) _____
F. I don't know.

13. Approximately WHAT PERCENTAGE of your HOUSEHOLD INCOME is DERIVED from NON-FARM SOURCES?
Please circle only one.
0 -10% 11-20% 21-30% 31-40% 41-50% 51-60% >60% Don't Know

14. Please CIRCLE the BRANCH LOCATION where you CONDUCT MOST of your BUSINESS.
Please circle only one.
Alma Altamont Arcola
Dalton City Dietrich Effingham
Farina Gays Lovington
Marshall Montrose Pana
Robinson Stewardson Tonti
West Liberty

15. Please CIRCLE the NUMBER of DIFFERENT COMMODITIES (such as corn, soybeans, hogs, beef cattle, dairy cattle etc) you EXPECT to PRODUCE THIS YEAR from your farming business.
NONE 1 2 3 4 5 6 OR MORE

16. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, hogs, beef cattle, dairy cattle and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE five years ago IN 1999.
MOST important commodity 2ND most important commodity 3RD most important commodity

1999 NAME PERCENTAGE of FARM RETURN

17. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, hogs, beef cattle, dairy cattle and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE today IN 2004.
MOST important commodity 2ND most important commodity 3RD most important commodity
2004 NAME PERCENTAGE of FARM RETURN

18. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, hogs, beef cattle, dairy cattle and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE in five years IN 2009.

MOST important commodity 2ND most important commodity 3RD most important commodity

2009 NAME PERCENTAGE of FARM RETURN

19. Please CIRCLE the TYPE of GRAIN FARMER you are primarily.

A. Owner
B. Crop Share
C. Cash Rent
D. Other (Please Specify) _____
E. Not Applicable – Not a Grain Farmer (Please GO TO QUESTION 27 on PAGE 11)

20. What is the approximate SIZE of your TOTAL CROP OPERATION this year in ACRES? Please circle only one.

Less than 100 acres 100 – 500 acres 501 – 1,000 acres 1,001–1,500 acres 1,501–2,000 acres 2,001–2,500 acres More than 2,500 acres

21. Which would you MOST PREFER the cooperative provide?

Please circle only one.

A. I MOST PREFER the cooperative provide a FULL RANGE of TIMELY DELIVERED CROP INPUT SERVICES.

OR

B. I MOST PREFER the cooperative provide CROP INPUT PRODUCTS that are COMPETITIVELY PRICED.

OR

C. I really don't know

22. Over the LAST FIVE YEARS have you DECREASED or INCREASED your CROPLAND PRODUCTION?

Example: 1999: 1,000 acres. 2004: 1,100 acres. 10% increase.

Please circle only one.

Since 1999….

My CROP production DECREASED
My CROP production is about the SAME
My CROP production INCREASED by about 1 - 10%
My CROP production INCREASED by about 11 - 20%
My CROP production INCREASED by about 21 - 30%
My CROP production INCREASED by about 31 - 40%
My CROP production INCREASED by > 40%
Comment:_____

23. Over the NEXT FIVE YEARS will you DECREASE OR INCREASE your CROPLAND PRODUCTION?

Please circle only one.

By 2009…

My CROP production will DECREASE
My CROP production will be about the SAME
My CROP production will INCREASE by about 1 - 10%
My CROP production will INCREASE by about 11 - 20%
My CROP production will INCREASE by about 21 - 30%
My CROP production will INCREASE by about 31 - 40%
My CROP production will INCREASE by > 40%
Comment:_____

24. What PERCENTAGE of your GRAIN do you MARKET through EFFINGHAM EQUITY?
Please circle only one.
0 -15% 16-30% 31-45% 46-60% 61-75% 76-90% 91-100% NA

25. What PERCENTAGE of your CROP INPUT PRODUCTS/SERVICES do you PURCHASE from EFFINGHAM EQUITY?
Please circle only one
0 -15% 16-30% 31-45% 46-60% 61-75% 76-90% 91-100% NA

26. I PREFER the COOPERATIVE provide a FULL RANGE of CROP INPUT SERVICES RATHER than COMPETITIVELY PRICED CROP INPUT PRODUCTS.
Please circle only one
STRONGLY DISAGREE INDIFFERENT STRONGLY AGREE
1 2 3 4 5 6 7

27. Please CIRCLE the TYPE of LIVESTOCK FARMER you are primarily.
A. Owner
B. Contract Feeder
C. Other (Please Specify) _____
D. Not Applicable – Not a Livestock Farmer (Please GO TO QUESTION 34 on PAGE 13)

28. What was the approximate SIZE of your CATTLE OPERATION in NUMBER OF COWS on your farm at BEGINNING of this YEAR?
Please circle only one.
None 1 – 50 cows 51 – 125 cows 126 – 200 cows 201 – 275 cows
276 – 350 cows More than 350 cows

29. What is the approximate SIZE of your HOG OPERATION in NUMBER of HOGS PRODUCED on YOUR FARM this YEAR?
Please circle only one.
None 1 –500 hogs 501 – 1,000 hogs 1,000–2,000 hogs 2,001–3,000 hogs3,001–4,000 hogs More than 4,000 hogs

30. What PERCENTAGE of your ANIMAL FEED do you PURCHASE from EFFINGHAM EQUITY?
Please circle only one
0 -15% 16-30% 31-45% 46-60% 61-75% 76-90% 91-100% NA

31. What PERCENTAGE of your HOGS do you MARKET through EFFINGHAM EQUITY?
Please circle only one
0 -15% 16-30% 31-45% 46-60% 61-75% 76-90% 91-100% NA

32. Over the LAST FIVE YEARS have you DECREASED or INCREASED the NUMBER of LIVESTOCK that you FEED?
Example: 1999: fed 1000 hogs. 2004: feed 1100 hogs. 10% increase.
Please circle only one.
Since 1999….
Number of Livestock fed DECREASED
Number of Livestock fed is about the SAME.
Number of Livestock fed INCREASED by about 1 - 10%
Number of Livestock fed INCREASED by about 11 - 20%
Number of Livestock fed INCREASED by about 21 - 30%
Number of Livestock fed INCREASED by about 31 - 40%
Number of Livestock fed INCREASED by > 40%
Comment:_____

33. Over the NEXT FIVE YEARS will you DECREASE OR INCREASE the NUMBER of LIVESTOCK that you FEED?
Please circle only one.
By 2009…
Number of Livestock I feed will DECREASE
Number of Livestock I feed will be about the SAME
Number of Livestock I feed will INCREASE by about 1 - 10%
Number of Livestock I feed will INCREASE by about 11 - 20%
Number of Livestock I feed will INCREASE by about 21 - 30%
Number of Livestock I feed will INCREASE by about 31 - 40%
Number of Livestock I feed will INCREASE by > 40%

Comment:_____

34.
Which of following STATEMENTS is CLOSEST to your thinking?
Please circle only one.
A. My EFFINGHAM EQUITY RETURN on INVESTMENT is likely to be LESS than my ON-FARM RETURN on INVESTMENT.
OR
B. My EFFINGHAM EQUITY RETURN on INVESTMENT is likely to be GREATER than my ON-FARM RETURN on INVESTMENT.
OR
C. I seldom think about it.
OR
D. I don't know.

35. When you are thinking about your FARM'S CROPLAND or LIVESTOCK PRODUCTION GROWTH over the LAST FIVE YEARS (1999 – 2004), which of the FOLLOWING FACTORS have CONSTRAINED your ABILITY to GROW?

Please CIRCLE the SEVERELY RESTRICTIVE CONSTRAINTS that have LIMITED your PRODUCTION GROWTH over the LAST FIVE YEARS.
1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Commodity Prices
6. The Complexity Of Effingham Equity Investments
7. A Better Rate Of Return From Producing An Alternative Commodity
8. Environmental Concerns/ Regulation
9. Urban Encroachment / Subdivision Pressures
10. Rising Input Costs (such as fertilizer, seed, insecticide, etc)
11. Land Cost Or Availability
12. Herd Costs
13. Water Costs Or Availability
14. Labor Costs Or Availability
15. Limited Available Time
16. Other (Any Thoughts) _____
Please ADD any COMMENTS you feel to be RELEVANT:

36. When you are thinking about your FARM'S CROPLAND or LIVESTOCK PRODUCTION GROWTH over the NEXT FIVE YEARS (2004 - 2009), which of the FOLLOWING FACTORS are MOST LIKELY to CONSTRAIN your ABILITY TO GROW?

Please CIRCLE the SEVERELY RESTRICTIVE CONSTRAINTS most likely to LIMIT your PRODUCTION GROWTH over the NEXT FIVE YEARS.

1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Commodity Prices
6. The Complexity Of Effingham Equity Investments
7. A Better Rate Of Return From Producing An Alternative Commodity
8. Environmental Concerns/ Regulation
9. Urban Encroachment / Subdivision Pressures
10. Rising Input Costs (such as fertilizer, seed, insecticide, etc)
11. Land Cost Or Availability
12. Herd Costs
13. Water Costs Or Availability
14. Labor Costs Or Availability
15. Limited Available Time
16. Impending Retirement

17. Other (Any Thoughts) _____

PLEASE ADD ANY COMMENTS YOU FEEL TO BE RELEVANT:

THANK YOU FOR YOUR PARTICIPATION!!!

APPENDIX 1B WEST CENTRAL SURVEY

Conducted by:
GICL Team
University of Missouri-Columbia
125C Mumford Hall
Columbia, MO 65211

1. Please INDICATE whether you AGREE or DISAGREE with each statement.
West Central Cooperative was ORIGINALLY formed to provide…

	STRONGLY DISAGREE			DON'T KNOW			STRONGLY AGREE
SECURE ACCESS TO MARKET	1	2	3	4	5	6	7
HIGHER COMMODITY PRICES	1	2	3	4	5	6	7
BETTER SERVICES	1	2	3	4	5	6	7
BETTER MARKET INFORMATION	1	2	3	4	5	6	7
COMPETITIVELY PRICED INPUTS	1	2	3	4	5	6	7
OTHER (Any Thoughts) _____	1	2	3	4	5	6	7

2. Is your farm incorporated? _____ YES _____NO

3. Please indicate the approximate NUMBER of YEARS for which you have been a MEMBER of WEST CENTRAL COOPERATIVE.
_____ YEARS

4. Please INDICATE whether you AGREE or DISAGREE with each statement.
TODAY West Central Cooperative EXISTS to provide…

	STRONGLY DISAGREE			DON'T KNOW			STRONGLY AGREE
CONTINUED SECURE MARKET ACCESS	1	2	3	4	5	6	7
HIGHER COMMODITY PRICES than a COMPETITOR	1	2	3	4	5	6	7
BETTER MARKET INFORMATION	1	2	3	4	5	6	7
Needed AGRONOMY SERVICES	1	2	3	4	5	6	7
Needed ANIMAL FEED SERVICES	1	2	3	4	5	6	7
Needed GRAIN MARKETING SERVICES	1	2	3	4	5	6	7
Needed SOY PROCESSING SERVICES	1	2	3	4	5	6	7
COMMODITY RISK MANAGEMENT	1	2	3	4	5	6	7
COMPETITIVELY PRICED INPUTS	1	2	3	4	5	6	7
HIGHER OVERALL RETURNS than OTHER COMPETITORS	1	2	3	4	5	6	7
OTHER (Any Thoughts) _____	1	2	3	4	5	6	7

5. WEST CENTRAL COOPERATIVE is involved in four MAIN BUSINESS AREAS: (Agronomy, Soy Processing, Animal Feeds, and Grain Marketing)

As you think about your OVERALL FARM STRATEGY for the NEXT FIVE YEARS, in which BUSINESS AREAS would you MOST PREFER the cooperative invest?

Please circle only one.
During the next 5 years…
A. I MOST PREFER the COOPERATIVE INVEST in ALL BUSINESS AREAS (Agronomy, Soy Processing, Animal Feeds, and Grain Marketing).
OR
B. I MOST PREFER the COOPERATIVE INVEST ONLY in those BUSINESS AREAS that I can USE ON MY FARM.
Please CIRCLE which BUSINESS AREAS:
B1. AGRONOMY B2. SOY PROCESSING
B3. ANIMAL FEEDS B4. GRAIN MARKETING

OR
C. NO FURTHER INVESTMENT is REQUIRED to support my on-farm strategy.
OR
D. I really don't know

6. Please CIRCLE the ANSWER that BEST REFLECTS your POINT OF VIEW.
Please circle only one.
West Central Cooperative should have more ….
PREFERRED C STOCK IT DOESN'T MATTER MUCH RETAINED SAVINGS
1 2 3 4 5 6 7

7. Which policy would you MOST PREFER the board chooses?
Please circle only one.
I would MOST PREFER the board chooses a policy that pays …
A. HIGHER cash PAYMENT in YEAR EARNED and SLOWER REDEMPTION of OLD EQUITIES (1) the SAME as current policy (4)
a LOWER cash PAYMENT in YEAR EARNED and QUICKER REDEMPTION of OLD EQUITIES (7)
OR
B. I'm indifferent
OR
C. I really don't know

8. Please CIRCLE the ANSWER that BEST REFLECTS your POINT OF VIEW.
My LENDER ACCEPTS my STOCK in WEST CENTRAL COOPERATIVE as COLLATERAL.
Please circle only one.
STRONGLY DISAGREE DON'T KNOW STRONGLY AGREE Don't have any debt
1 2 3 4 5 6 7 8

9. My LENDER VALUES my STOCK in WEST CENTRAL COOPERATIVE at approximately _____ PERCENT of its MARKET VALUE.
Please circle only one.
0% 1 - 15% 16 - 30% 31 - 45% 46 - 60% 61 - 75% 76 - 90% 91-100% Don't Know NA

10. Please INDICATE whether you AGREE or DISAGREE with the following statement.
Please circle only one.
"It is NOT WORTH the EFFORT of trying to UNDERSTAND the COMPOSITION of my WEST CENTRAL COOPERATIVE INVESTMENT (such as stock, years to redeem, amount to include as income)."
STRONGLY DISAGREE IT DOESN'T MATTER MUCH STRONGLY AGREE
1 2 3 4 5 6 7

11. I MOST PREFER the COOPERATIVE INVEST IN
Please circle only one

A.
ALL BUSINESS AREAS INDIFFERENT ONLY IN BUSINESS AREAS I USE ON MY FARM
1 2 3 4 5 6 7
OR
B. I really don't know

12. Please INDICATE your AGE
Younger than 40 41 - 45 46 - 50 51 - 55 56 - 60 61 - 65 Over 65

13. Please INDICATE the NUMBER of YEARS you anticipate BEFORE you will RELINQUISH CONTROL OVER your FARM.
Already relinquished control Less than 1 year 1 – 2 years 3 – 5 years 6 – 10 years
11 – 15 years More than 15 years Don't know

14. Please CIRCLE which of the following SUCCESSION PLANS you are CONSIDERING for the FARMING OPERATION once you RELINQUISH CONTROL.
A. Maintain Ownership
B. Exit (Sale or Lease to Outside Family)
C. Bequest the Farm to Family (Your Family will Continue to Farm)
D. Bequest the Farm to Family (Your Family will Not Continue to Farm)
E. Other (Please Specify) _____
F. I don't know.

15. Approximately WHAT PERCENT of your HOUSEHOLD INCOME is DERIVED from NON-FARM SOURCES?
Please circle only one.
0 – 10% 11 – 20% 21 – 30% 31 – 40% 41 – 50% 51 – 60% >60%
Don't Know

16. Please CIRCLE the BRANCH LOCATION where you CONDUCT MOST of your BUSINESS.
Please circle only one.
Adair Audubon Beaver Boone
Boxholm Casey Dawson Exira
Gowrie Halbur Jefferson Palm Grove
Paton Ralston Scranton Templeton
Woodward

17. Please CIRCLE which of the FOLLOWING COMMODITIES you EXPECT to PRODUCE THIS YEAR from your farming business
None Corn Soybeans Hogs Beef Cattle Other (please specify _____)

18. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, hogs, beef cattle) and their approximate CONTRIBUTION to YOUR FARM REVENUE six years ago IN 1999.
MOST important commodity 2ND most important commodity 3RD most important commodity

1999 NAME PERCENTAGE of FARM RETURN

19. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, hogs, beef cattle) and their approximate CONTRIBUTION to YOUR FARM REVENUE last year IN 2004.
MOST important commodity 2ND most important commodity 3RD most important commodity

2004 NAME PERCENTAGE of farm RETURN

20. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, hogs, beef cattle) and their approximate CONTRIBUTION to YOUR FARM REVENUE in four years IN 2009.
MOST important commodity 2ND most important commodity 3RD most important commodity
2009 NAME PERCENTAGE of farm RETURN

21. Please CIRCLE the TYPE of GRAIN FARMER you are primarily.
A. Owner
B. Crop Share
C. Cash Rent
D. Other (Please Specify) _____
E. Not Applicable – Not a Grain Farmer (Please GO TO QUESTION 30 on PAGE 13)

22. What is the approximate SIZE of your TOTAL CROP OPERATION this year in ACRES?
Please circle only one.
Less than 500 acres 501 – 1,000 acres 1,001–1,500 acres 1,501–2,000 acres
2,001–2,500 acres 2,500–4,000 acres More than 4,000 acres

23. Over the LAST FIVE YEARS have you DECREASED or INCREASED your CROP PRODUCTION?
Example: 2000: 1,000 acres; 2005: 1,100 acres. 10% increase.
Please circle only one.
Since 2,000….
My CROP production DECREASED
My CROP production is about the SAME
My CROP production INCREASED by about 1 - 10%
My CROP production INCREASED by about 11 - 20%
My CROP production INCREASED by about 21 - 30%
My CROP production INCREASED by about 31 - 40%
My CROP production INCREASED by about 40%+

Comment:_____

24. Over the NEXT FIVE YEARS will you DECREASE OR INCREASE your CROP PRODUCTION?
Please circle only one.
By 2010…
My CROP production will DECREASE
My CROP production will be about the SAME
My CROP production will INCREASE by about 1 - 10%
My CROP production will INCREASE by about 11 - 20%
My CROP production will INCREASE by about 21 - 30%
My CROP production will INCREASE by about 31 - 40%
My CROP production will INCREASE by about 40%+
Comment:_____

25. What PERCENT of your GRAIN do you MARKET through WEST CENTRAL COOPERATIVE?
Please circle only one.
None 1 – 15% 16 – 30% 31 – 45% 46 – 60% 61 – 75% 76 – 90%
91–100% Don't Know

26. I MOST PREFER the COOPERATIVE INVEST in…
Please circle only one

A. A FEW LARGE GRAIN HANDLING FACILITIES (1)
INDIFFERENT (4)
SMALLER GRAIN HANDLING FACILITIES at ALL BRANCHES (7)
OR
B. I really don't know

27. I MOST PREFER the COOPERATIVE PROVIDE…
Please circle only one
A.
A FULL RANGE of AGRONOMY SERVICES (1)
INDIFFERENT(4)
COMPETITIVELY PRICED CROP INPUTS (7)
OR
B. I really don't know

28. What PERCENT of your CROP INPUTS do you PURCHASE from WEST CENTRAL COOPERATIVE?
Please circle only one
None 1 – 15% 16 – 30% 31 – 45% 46 – 60% 61 – 75% 76 – 90%
91–100% Don't Know

29. FUTURE INVESTMENT IN West Central Cooperative's SOY PROCESSING FACILITIES might DEVELOP NEW TECHNOLOGY, expanding the range of West Central Cooperative's co-products and/or reducing the cost of existing production. The aim of this investment would be to increase your current SOYBEAN INCOME (Price and Patronage).

As you think about your OVERALL FARM STRATEGY for the NEXT FIVE YEARS, which of the following INVESTMENT STRATEGIES would you MOST PREFER the cooperative invest?
Please circle only one.
A. I MOST PREFER the COOPERATIVE INVEST in NEW TECHNOLOGY to INCREASE the INCOME of EXISTING SOYBEAN DELIVERIES (1)
INDIFFERENT (4)
EXISTING TECHNOLOGY to INCREASE the VOLUME of soybeans PROCESSED by WEST CENTRAL (7)
OR
B. I PREFER NO FURTHER COOPERATIVE INVESTMENT in SOYBEAN PROCESSING.
OR
C. I really don't know

30. As you think about your OVERALL FARM STRATEGY for the NEXT FIVE YEARS, which of the following STRATEGIES would you MOST PREFER the cooperative pursue?
Please circle only one.

A. I MOST PREFER the COOPERATIVE INVEST in INNOVATIONS or NEW PRODUCTS like BIODIESEL.
OR
B. I MOST PREFER the COOPERATIVE SELL some of the EXISITNG TECHNOLOGY or KNOWLEDGE about current products, like biodiesel.
OR
C. I PREFER NO FURTHER COOPERATIVE INVESTMENT in INNOVATIONS or NEW PRODUCTS.
OR
D. I really don't know

31. As you think about your OVERALL FARM STRATEGY for the NEXT FIVE YEARS, which of the following STRATEGIES would you MOST PREFER the cooperative pursue?
Please circle only one.
I MOST PREFER the COOPERATIVE …
A. INVEST PROPORTIONATELY in the CURRENT BUSINESS UNITS.
OR
B. CONTINUE INVESTING in CURRENT BUSINESS UNITS and INVEST a SMALL AMOUNT in NEW PRODUCTS, like biodiesel.
OR
C. CUT BACK INVESTMENT in CURRENT BUSINESS UNITS and CONCENTRATE the INVESTMENTS in NEW PRODUCTS, like biodiesel.
OR
D. I really don't know

32. Which of following STATEMENTS is CLOSEST to your thinking?
Please circle only one.
My RETURN on EQUITY in WEST CENTRAL COOPERATIVE is likely to be…
A.
LESS than my ON-FARM RETURN (1)
SAME as my ON-FARM RETURN (4)
GREATER than my ON-FARM RETURN (7)
OR
B. I don't know.

33. In my estimation, the MARKET VALUE of WEST CENTRAL WOULD LIKELY be…
Please circle only one.

LOWER than the BOOK VALUE			EQUAL to the BOOK VALUE			HIGHER than the BOOK VALUE
1	2	3	4	5	6	7

34. As a West Central USER and INVESTOR, knowing this is…
Please circle only one.

VERY IMPORTANT			INDIFFERENT		NOT IMPORTANT AT ALL	
1	2	3	4	5	6	7

35. Please indicate your average DAILY HOUSEHOLD USAGE of the INTERNET.
Please circle only one.

None	1–2 hours	3–5 hours	6–8 hours	9–12 hours	13–16 hours	> 16 hours

36. Imagine you have 100 TOTAL POINTS to ALLOCATE to the following FACTORS that might CONSTRAIN CROPLAND PRODUCTION GROWTH.
Over the LAST FIVE YEARS (1999 – 2004), which FACTOR(S) have MOST CONSTRAINED your ABILITY to GROW?

Choose ONLY the FACTORS that you feel to be RELEVANT, and please ALLOCATE the MOST POINTS to the FACTOR that MOST CONSTRAINED YOUR GROWTH.
1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Commodity Prices
6. The Complexity Of West Central Cooperative Investments
7. A Better Rate Of Return From Producing An Alternative Commodity

8. Environmental Concerns/ Regulation
9. Urban Encroachment / Subdivision Pressures
10. Rising Input Costs (such as fertilizer, seed, feed)
11. Land Cost
12. Land Availability
13. Herd Costs
14. Water Costs Or Availability
15. Labor Costs Or Availability
16. Weather/Climate
17. Limited Available Time
18. Impending Retirement
19. Other (please Specify)

20. None of the Above_____
Please ADD any COMMENTS you feel to be RELEVANT:

37. Imagine you have 100 TOTAL POINTS to ALLOCATE to the following FACTORS that might CONSTRAIN CROPLAND PRODUCTION GROWTH.
Over the NEXT FIVE YEARS (2004 – 2009), which FACTOR(S) are MOST LIKELY TO CONSTRAIN your ABILITY to GROW?

Choose ONLY the FACTORS that you feel to be RELEVANT, and please ALLOCATE the MOST POINTS to the FACTOR that is MOST LIKELY TO CONSTRAIN YOUR GROWTH.
1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Commodity Prices
6. The Complexity Of West Central Cooperative Investments
7. A Better Rate Of Return From Producing An Alternative Commodity
8. Environmental Concerns/ Regulation
9. Urban Encroachment / Subdivision Pressures
10. Rising Input Costs (such as fertilizer, seed, feed)
11. Land Cost
12. Land Availability
13. Herd Costs
14. Water Costs Or Availability
15. Labor Costs Or Availability
16. Weather/Climate
17. Limited Available Time
18. Impending Retirement
19. Other (Please Specify) _____
20. None of the Above _____
Please ADD any COMMENTS you feel to be RELEVANT:

THANK YOU FOR YOUR PARTICIPATION!!!

APPENDIX 1C NORTHEAST MISSOURI GRAIN PROCESSORS SURVEY

Conducted by:
GICL Team
University of Missouri-Columbia
127 Mumford Hall
Columbia, MO 65211

1. NORTHEAST MISSOURI GRAIN PROCESSORS, INC (the cooperative) is the DOMINANT EQUITY PROVIDER in NORTHEAST MISSOURI GRAIN, LLC (NEMO).

Please INDICATE whether you AGREE or DISAGREE with each statement.
The COOPERATIVE and NEMO were FORMED to PROVIDE…

	STRONGLY DISAGREE						STRONGLY AGREE
SECURE ACCESS TO MARKET (i.e. to ensure a secure outlet for corn)							
	1	2	3	4	5	6	7
A HIGHER CORN PRICE	1	2	3	4	5	6	7
BETTER SERVICES	1	2	3	4	5	6	7
BETTER MARKET INFORMATION	1	2	3	4	5	6	7
A HIGH RETURN on INVESTMENT into the business							
	1	2	3	4	5	6	7
OTHER (Any Thoughts) _____	1	2	3	4	5	6	7

2. Please INDICATE whether you AGREE or DISAGREE with each statement.
TODAY NEMO and the COOPERATIVE EXIST to PROVIDE…

	STRONGLY DISAGREE						STRONGLY AGREE
CONTINUED SECURE MARKET ACCESS for CORN							
	1	2	3	4	5	6	7
HIGHER CORN PRICES than a COMPETITOR OFFERS							
	1	2	3	4	5	6	7
BETTER MARKET INFORMATION	1	2	3	4	5	6	7
NEEDED OTHER SERVICES	1	2	3	4	5	6	7
COMMODITY RISK MANAGEMENT	1	2	3	4	5	6	7
A HIGH RETURN on CAPITAL INVESTED in the business							
	1	2	3	4	5	6	7
HIGHER OVERALL RETURNS than a OTHER COMPETITORS							
	1	2	3	4	5	6	7
OTHER (Any Thoughts) _____	1	2	3	4	5	6	7

3. I PREFER the COOPERATIVE'S INVESTMENT in NEMO be in NEW TECHNOLOGY, which INCREASES my EXISTING SHARE CORN RETURNS.
Please circle only one.

STRONGLY AGREE		INDIFFERENT				STRONGLY DISAGREE
1	2	3	4	5	6	7

4. My LENDER VALUES my SHARE CORN (DELIVERY RIGHTS) at approximately _____ PERCENTAGE of their MARKET VALUE.
Please circle only one.
What PERCENT of MARKET VALUE?
0 -15% 16 – 30% 31 – 45% 46 – 60% 61 – 75% 76 – 90% 91– 100% Don't Know

5. Do you agree with the following statement?
"It is NOT WORTH the EFFORT of trying to UNDERSTAND the COMPOSITION of MY COOPERATIVE INVESTMENT (such as premium payments, freight allowances and dividends)."
Please circle only one.
STRONGLY DISAGREE IT DOESN'T MATTER MUCH STRONGLY AGREE
1 2 3 4 5 6 7

6. How far is your farm from the NEMO plant?
Please circle only one.
Less than 20 Miles 21 – 40 Miles 41 – 70 Miles More than 70 Miles

7. I PREFER NO FURTHER COOPERATIVE INVESTMENT in NEMO.
STRONGLY AGREE INDIFFERENT STRONGLY DISAGREE
1 2 3 4 5 6 7

8. Please CIRCLE the NUMBER of DIFFERENT COMMODITIES (such as corn, soybeans, beef and so on) YOU EXPECT to PRODUCE THIS YEAR from your farming business.
NONE 1 2 3 4 5 6 OR MORE

9. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, beef, and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE five years ago IN 1999.
MOST important commodity 2ND most important commodity 3RD most important commodity

1999 NAME PERCENTAGE of FARM RETURN

10. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, beef and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE today IN 2004.
MOST important commodity 2ND most important commodity 3RD most important commodity

2004 NAME PERCENTAGE of FARM RETURN

11. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as corn, soybeans, beef and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE in five years IN 2009.
MOST important commodity 2ND most important commodity 3RD most important commodity

2009 NAME PERCENTAGE of FARM RETURN

12. What is the approximate SIZE of your CORN OPERATION in BUSHELS produced THIS YEAR?
_____ BUSHELS

13. Please INDICATE the APPROXIMATE NUMBER of ACRES used to PRODUCE the CORN indicated in the QUESTION ABOVE.
_____ ACRES

14. Over the LAST FIVE YEARS have you DECREASED OR INCREASED your CORN PRODUCTION (bu.)?
Example: 1999: 100,000 bu. 2004: 110,000 bu. A 10% increase.
Please circle only one.
Since 1999…
My CORN production has DECREASED
My CORN production is about the SAME
My CORN production INCREASED by about 1 - 10%
My CORN production INCREASED by about 11 - 20%
My CORN production INCREASED by about 21 - 30%
My CORN production INCREASED by about 31 - 40%
My CORN production INCREASED by > 40%
Comment:_____

15. Over the NEXT FIVE YEARS will you DECREASE OR INCREASE your CORN PRODUCTION (bu.)?
Please circle only one.
By 2009…
My CORN production will DECREASE
My CORN production will be about the SAME
My CORN production will INCREASE by about 1 - 10%
My CORN production will INCREASE by about 11 - 20%
My CORN production will INCREASE by about 21 - 30%
My CORN production will INCREASE by about 31 - 40%
My CORN production will INCREASE by >40%
Comment:_____

16. When you are thinking about your FARM'S CORN PRODUCTION GROWTH over the LAST FIVE YEARS (1999 – 2004), which of the FOLLOWING FACTORS have CONSTRAINED your ABILITY to GROW?

Please CIRCLE the SEVERELY RESTRICTIVE CONSTRAINTS that have LIMITED your CORN PRODUCTION GROWTH over the LAST FIVE YEARS.
1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Corn Price
6. Rising Share Corn Prices
7. The Complexity Of Investing in Northeast Missouri Grain Processors Inc.
8. A Better Rate Of Return From Producing an Alternative Commodity
9. Environmental Concerns/ Regulation
10. Urban Encroachment / Subdivision Pressures
11. Rising Input Costs (such as fertilizer, seed, insecticide, etc)
12. Land Cost Or Availability
13. Water Costs Or Availability
14. Labor Costs Or Availability
15. Limited Available Time
16. Other (Please Specify) _____

Please ADD any COMMENTS you feel to be RELEVANT

17. When you are thinking about your FARM'S CORN PRODUCTION GROWTH over the NEXT FIVE YEARS (2004 - 2009), which of the FOLLOWING FACTORS are MOST LIKELY to CONSTRAIN your ABILITY to GROW?

Please CIRCLE the SEVERELY RESTRICTIVE CONSTRAINTS most likely to LIMIT your CORN PRODUCTION GROWTH over the NEXT FIVE YEARS.

1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Corn Prices
6. Rising Share Corn Prices
7. The Complexity Of Investing In Northeast Missouri Grain Processor Inc.
8. A Better Rate Of Return From Producing An Alternative Commodity
9. Environmental Concerns/ Regulation
10. Urban Encroachment / Subdivision Pressures
11. Rising Input Costs (such as fertilizer, seed and insecticide, etc)
12. Land Cost Or Availability
13. Water Costs Or Availability
14. Labor Costs Or Availability
15. Limited Available Time
16. Impending Retirement
17. Other (Please Specify) _____

Please ADD any COMMENTS you feel to be RELEVANT

18. Please INDICATE your AGE

Less than 40 41 - 45 46 - 50 51 – 55 56 - 60 61 - 65 Over 65

19. Please CIRCLE the TYPE of OPERATOR you are.

A. Owner
B. Crop Share
C. Cash Rent
D. Other (Please Specify) _____

20. Please INDICATE the NUMBER of YEARS you anticipate BEFORE you will RELINQUISH CONTROL over YOUR FARM.

Already relinquished control Less than 1 year 1 - 2 years 3 - 5 years 6- 10 years
11- 15 years 16 –20 years Don't Know

21. Please CIRCLE which of the following SUCCESSION PLANS you are CONSIDERING for the FARMING OPERATION once you RELINQUISH CONTROL.

A. Maintain Ownership
B. Sell the Farm
C. Bequest the Farm to Family (Your Family will Continue to Farm)
D. Bequest the Farm to Family (Your Family will Not Continue to Farm)
E. Other (Please Specify) _____
F. I don't know

22. Your COOPERATIVE RETURN in any year is BROKEN into TWO MAJOR COMPONENTS: (1) the DIVIDEND and (2) the PREMIUM RECEIVED for CORN DELIVERED under DELIVERY CONTRACT (SHARE CORN).

Which of the four FOLLOWING VIEWS is CLOSEST to your thinking?
Please circle only one.

A. My COOPERATIVE RETURN is likely to be LESS than my ON-FARM RETURN.
OR
B. My COOPERATIVE RETURN is likely to be GREATER than my ON-FARM RETURN.
OR
C. I seldom think about it.
OR
D. I don't know.

23. Approximately WHAT PERCENTAGE of your HOUSEHOLD INCOME is DERIVED from NON-FARM SOURCES?
Please circle only one.
0 -10% 11-20% 21-30% 31-40% 41-50% 51-60% >60% Don't Know

24. Approximately WHAT PERCENTAGE of your CORN PRODUCTION, in an average year, do you DELIVER to NEMO to FULFILL YOUR SHARE CORN REQUIREMENTS?
Please circle only one.
0 -15% 16-30% 31-45% 46-60% 61-75% 76-90% 91-100% Don't Know

25. Approximately WHAT PERCENTAGE of your CORN PRODUCTION, in an average year, do you DELIVER to NEMO? (This includes all share corn plus any other corn you sell to NEMO instead of other buyers, such as grain companies, feed mills, seed companies, etc.)
Please circle only one.
0 -15% 16-30% 31-45% 46-60% 61-75% 76-90% 91-100% Don't Know

26. FUTURE INVESTMENT IN NEMO might DEVELOP NEW TECHNOLOGY, expanding the range of NEMO's co-products and/or reducing the cost of existing production. The aim of this investment would be to increase your current SHARE CORN'S (DELIVERY RIGHT) PER-UNIT RETURN.

As you think about your OVERALL FARM STRATEGY for the NEXT FIVE YEARS, which of the following INVESTMENT STRATEGIES would you MOST PREFER the cooperative adopt?
Please circle only one.

A. I PREFER the COOPERATIVE INVEST in NEW TECHNOLOGY to INCREASE the RETURNS on my EXISTING SHARE CORN. This is LIKELY to INCREASE the RE-SALE VALUE of my SHARE CORN (Delivery Right). The new technology would be UNLIKELY to ABSORB ADDITIONAL CORN.
OR
B. I PREFER NO FURTHER COOPERATIVE INVESTMENT in NEMO.
OR
C. I really don't know

THANK YOU FOR YOUR PARTICIPATION!!!

APPENDIX 1D FONTERRA SURVEY

Conducted by:
GICL Team
University of Missouri-Columbia
125C Mumford Hall
Columbia, MO 65211

1. The New Zealand dairy industry has a long history of co-operatives. Originally the industry had many dairy co-operatives, but mergers steadily reduced their numbers until FONTERRA was formed by a MERGER of the NZ DAIRY BOARD, KIWI COOPERATIVE DAIRIES and the NEW ZEALAND DAIRY GROUP.

The 'ORIGINAL DAIRY CO-OPERATIVES' referred to IN THE QUESTION BELOW are those COOPERATIVES PRECEDING FONTERRA.

Please INDICATE whether you AGREE or DISAGREE with each statement.
The ORIGINAL DAIRY CO-OPERATIVES were formed to provide…

	STRONGLY DISAGREE		DON'T KNOW			STRONGLY AGREE
SECURE ACCESS TO MARKET (i.e. to ensure pick-up of a highly perishable product)	1	2	3	4	5	6	7
HIGHER PAYOUTS	1	2	3	4	5	6	7
BETTER SERVICES	1	2	3	4	5	6	7
BETTER MARKET INFORMATION	1	2	3	4	5	6	7
COMPETITIVELY PRICED INPUTS	1	2	3	4	5	6	7
OTHER (please specify) _____	1	2	3	4	5	6	7

2. Please indicate the NUMBER of YEARS you have you been a MEMBER of FONTERRA or a CO-OPERATIVE PRECEDING FONTERA?
_____ YEARS

3. Please indicate whether you AGREE or DISAGREE with each statement.
TODAY Fonterra EXISTS to provide…

	STRONGLY DISAGREE		DON'T KNOW			STRONGLY AGREE
CONTINUED SECURE MARKET ACCESS	1	2	3	4	5	6	7
PAYOUTS that are HIGHER than a NON CO-OPERATIVE would offer	1	2	3	4	5	6	7
BETTER MARKET INFORMATION to members	1	2	3	4	5	6	7
NEEDED OTHER SERVICES	1	2	3	4	5	6	7
COMMODITY and CURRENCY RISK MANAGEMENT	1	2	3	4	5	6	7
COMPETITIVELY PRICED INPUTS	1	2	3	4	5	6	7
OVERALL RETURNS that are HIGHER than a NON CO-OPERATIVE would offer	1	2	3	4	5	6	7
OTHER (please specify) _____	1	2	3	4	5	6	7

4. FONTERRA primarily consists of TWO MAIN BUSINESSES:

• INGREDIENTS is the CORE COMMODITY PROCESSOR.
Ingredients uses the largest percentage of your milk. While Ingredients invests in significant 'value-adding' activities, investment in Ingredients is generally the lowest cost way to absorb increased milk production. Investment in Ingredients is likely to result in a cooperative with a lower share value and lower payout.

• NEW ZEALAND MILK (NZM) is the VALUE ADDED CONSUMER BUSINESS.
Investment in NZM will absorb very little milk production growth, but investment in NZM is likely to result in a cooperative with a higher share value and a higher payout.

As you think about your OVERALL FARM PRODUCTION STRATEGY for the NEXT FIVE YEARS, in which of business would you MOST PREFER the cooperative to invest?
Please circle only one.

A. I MOST PREFER the CO-OPERATIVE INVEST in the INGREDIENTS business, the CORE COMMODITY PROCESSOR, to ABSORB EXPANSION in MY MILK PRODUCTION. This is likely to result in a LOWER PAYOUT and a LOWER SHARE PRICE.

OR

B. I MOST PREFER the CO-OPERATIVE INVEST in the NEW ZEALAND MILK BUSINESS (NZM), the VALUE ADDED BUSINESS, to INCREASE the PAYOUT on MY EXISTING MILK PRODUCTION. This is likely to result in a HIGHER PAYOUT and a HIGHER SHARE PRICE BUT is UNLIKELY to ABSORB VERY MUCH of MY NEW MILK PRODUCTION.

OR
C. NO FURTHER INVESTMENT is REQUIRED to support my on-farm strategy.
OR
D. I really don't know

5. Do you agree with the following statement?
Please circle only one.
It is NOT WORTH the EFFORT of trying to UNDERSTAND the COMPOSITION of MY FONTERRA INVESTMENT (such as shares, peak notes, value added components).

STRONGLY DISAGREE		IT DOESN'T MATTER MUCH			STRONGLY AGREE	
1	2	3	4	5	6	7

6. Currently, the BOARD SETS a FAIR VALUE SHARE (FVS) PRICE to reflect FONTERRA'S MARKET VALUE.
The Board CHOOSES the final FVS price FROM A RANGE provided by a third party valuer.

Which PART OF the FVS RANGE would you MOST PREFER the Board to choose?
Please circle only one.
I would MOST PREFER the Board SET the SHARE PRICE at …

A. the LOWER END of the valuer's range		the MIDDLE of the valuer's range…			the UPPER END	
1	2	3	4	5	6	7

OR
B. I'm indifferent
OR
C. I really don't know

7. Please INDICATE your AGE
Less than 40 41 - 45 46 - 50 51 - 55 56 - 60 61 - 65 Over 65

8. My LENDER VALUES my FONTERRA SHARES at approximately _____ PERCENTAGE of their MARKET VALUE.
Please circle only one.

What PERCENT of MARKET VALUE?
0-15% 16–30% 31–45% 46–60% 61–75% 76-90% 91–100% Don't know

9. Please CIRCLE the REGION to which you DELIVER MOST of YOUR MILK.
Please circle only one.
Auckland Northland
Bay of Plenty Otago
Canterbury Southland
Gisborne Taranaki
Hawke's Bay Tasman
Manawatu – Wanganui Waikato
Marlborough Wellington

10. I would PREFER the CO-OPERATIVE INVEST in INGREDIENTS RATHER than NEW ZEALAND MILK
Please circle only one

STRONGLY DISAGREE INDIFFERENT STRONGLY AGREE
1 2 3 4 5 6 7

11. Please CIRCLE the NUMBER of DIFFERENT COMMODITIES (such as milk, sheep meat, wool, beef cattle, forestry and so on) YOU EXPECT to PRODUCE THIS YEAR from your farming business.
NONE 1 2 3 4 5 6 OR MORE

12. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as milk, sale of livestock, sheep meat and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE five years ago IN 1999.
MOST important commodity 2ND most important commodity 3RD most important commodity

1999 NAME PERCENTAGE of FARM REVENUE

13. Please ESTIMATE your farm's THREE MOST IMPORTANT COMMODITIES (such as milk, sale of livestock, sheep meat and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE today IN 2004.
MOST important commodity 2ND most important commodity 3RD most important commodity

2004 NAME PERCENTAGE of FARM REVENUE

14. Please ESTIMATE your farm's THREE MOST LIKELY IMPORTANT COMMODITIES (such as milk, sale of livestock, sheep meat and so on) and their approximate CONTRIBUTION to YOUR FARM REVENUE in five years IN 2009.
MOST important commodity 2ND most important commodity 3RD most important commodity

2009 NAME PERCENTAGE of FARM REVENUE

15. What is the SIZE of your DAIRY OPERATION THIS YEAR in kilograms of milk solids (KG MS)?
_____ KG MS

16. Please indicate your TOTAL NUMBER of MILKING COWS THIS YEAR
_____ COWS

17. Over the LAST FIVE YEARS have you DECREASED OR INCREASED your PRODUCTION of MILK SOLIDS (KG MS)?
Example: 1999: 100,000 kg ms. 2004: 110,000 kg ms. A 10% increase.
Please circle only one.
Since 1999 …
My production has DECREASED
My production is about the SAME
My production INCREASED by about 1 - 10%
My production INCREASED by about 11 - 20%
My production INCREASED by about 21 - 30%
My production INCREASED by about 31 - 40%
My production INCREASED by about > 40%

Comment:_____

18. Over the NEXT FIVE YEARS will you DECREASE OR INCREASE your PRODUCTION of MILK SOLIDS (KG MS)?
Please circle only one.
By 2009 …
My production will DECREASE
My production will be about the SAME
My production will INCREASE by about 1 - 10%
My production will INCREASE by about 11 - 20%
My production will INCREASE by about 21 - 30%
My production will INCREASE by about 31 - 40%
My production will INCREASE by about > 40%

Comment:_____

19. When you are thinking about your FARM'S MILK SOLIDS PRODUCTION GROWTH over the LAST FIVE YEARS (1999 – 2004), which of the FOLLOWING FACTORS have CONSTRAINED your ABILITY to GROW?

Please CIRCLE the SEVERELY RESTRICTIVE CONSTRAINTS that have LIMITED your MILK SOLIDS PRODUCTION GROWTH over the LAST FIVE YEARS.
1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Payouts
6. The Complexity Of Fonterra Investments
7. A Better Rate Of Return From Producing An Alternative Commodity
8. Environmental Concerns/ Regulation
9. Urban Encroachment / Subdivision Pressures
10. Rising Input Costs

11. Land Cost Or Availability
12. Herd Costs
13. Water Costs Or Availability
14. Labor Costs Or Availability
15. Rising Share Fonterra Prices
16. Other (Please specify) _____

Please ADD any COMMENTS you feel to be RELEVANT:

20. When you are thinking about your FARM'S MILK SOLIDS PRODUCTION GROWTH over the NEXT FIVE YEARS (2004 – 2009) which of the FOLLOWING FACTORS are MOST LIKELY to CONSTRAIN your ABILITY to GROW?

Please CIRCLE the SEVERELY RESTRICTIVE CONSTRAINTS most likely to LIMIT your MILK SOLIDS PRODUCTION GROWTH over the NEXT FIVE YEARS.

1. Lack Of Suitable Off-Farm Employment Opportunities
2. Cost of Supporting Family
3. My Capacity To Service More Debt
4. Management Capacity
5. Falling Payouts
6. The Complexity Of Fonterra Investments
7. A Better Rate Of Return From Producing An Alternative Commodity
8. Environmental Concerns/ Regulation
9. Urban Encroachment / Subdivision Pressures
10. Rising Input Costs
11. Land Cost Or Availability
12. Herd Costs
13. Water Costs Or Availability
14. Labor Costs Or Availability
15. Rising Share Fonterra Prices
16. Impending Retirement
17. Other (Please specify) _____

Please ADD any COMMENTS you feel to be RELEVANT:

21. Please CIRCLE the TYPE of OPERATOR you are primarily.

A. Sharemilker
B. Owner Operator (i.e. You Own and Operate All Assets of the Farm Business)
C. Manager Equity (i.e. You Manage the Business and have an Equity Share in the Business)
D. Contract
E. Salaried Manager
F. Other (Please Specify) _____

22. Please INDICATE the NUMBER of YEARS you anticipate BEFORE you will RELINQUISH CONTROL OVER your FARM.

Already relinquished control Less than 1 year 1 - 2 years 3 - 5 years 6 - 10 years
11- 15 years 16 – 20 years Don't know

23. Please CIRCLE which of the following SUCCESSION PLANS you are CONSIDERING for the FARMING OPERATION once you RELINQUISH CONTROL.

A. Maintain Ownership
B. Sell the Farm
C. Leave the Farm to Family (Your Family will Continue to Farm)
D. Leave the Farm to Family (Your Family will Not Continue to Farm)
E. Other (Please Specify) _____
F. I really don't know

24. Approximately WHAT PERCENTAGE of your HOUSEHOLD INCOME is DERIVED from NON-FARM SOURCES?
Please circle only one.
0 -10% 11-20% 21-30% 31-40% 41-50% 51-60% >60% Don't Know

25. Your FONTERRA PAYOUT in any year is broken into TWO MAJOR COMPONENTS: the VALUE ADDED PAYMENT and the HISTORICAL COMMODITY MILK PRICE for the year.

The VALUE ADDED PAYMENT and the CHANGE in the VALUE OF the FAIR VALUE SHARE make up the TOTAL SHAREHOLDER RETURN (TSR).

The TSR was around 11% for 2004 and was around 17% for 2003.

Which of the following statements is CLOSEST to your thinking?

Please circle only one.

A. My FONTERRA TOTAL SHAREHOLDER RETURN (TSR) is likely to be LESS than my ON-FARM RETURN.
OR
B. My FONTERRA TOTAL SHAREHOLDER RETURN (TSR) is likely to be GREATER than my ON-FARM RETURN.
OR
C. I seldom think about it.
OR
D. I don't know.

THANK YOU FOR YOUR PARTICIPATION!!!

APPENDIX 2 COVER LETTERS FOR MAIL SURVEY

Cover Letter for Effingham Equity Members

November 17, 2004

Dear Member,

Effingham Equity is asking you to participate in the enclosed survey to help better serve your interests in your cooperative.

The survey is being conducted by an independent third party, the University of Missouri, Columbia. It is part of a study to ensure the cooperative system has value in the future and will address the long-term viability and success of agricultural cooperatives. Professor Michael Cook of the University of Missouri is supervising this work.

The survey seeks your views on the cooperative's best investment options to determine how well the cooperative's strategy is aligned with your farm strategy.

Your identity will remain completely anonymous and will be treated with the utmost confidentiality. The university will analyze the survey responses and share the results at an aggregated level with the cooperative.

If you consent to proceed with the written survey, please complete the attached survey and mail it back in the enclosed self-addressed postage paid envelope on or before November 29.

Thank you very much.

Sincerely,

		Michael L. Cook, PhD
Board President	General Manager	Professor
Effingham Equity	Effingham Equity	University of Missouri

Cover Letter for West Central Cooperative Members

April 6, 2005

Dear West Central Cooperative Member,

We would like to ask you to participate in a survey being conducted by the Graduate Institute of Cooperative Leadership (GICL) of the University of Missouri, Columbia. GICL is a cooperative research/executive education institute based in the Department of Agricultural Economics at the University of Missouri. The questionnaire is enclosed.

The survey is part of a study to explore the value of the cooperative system in the future and to address the long-term viability success factors of agricultural cooperatives.

The survey seeks your views to determine how well West Central Cooperative's strategy is aligned with your farm strategy.

Your identity will remain completely anonymous and will be treated with the utmost confidentiality. The university will analyze the survey responses and share the results at an aggregated level with West Central Cooperative.

The survey should take between 20 and 30 minutes to complete. We appreciate your responding to the survey. Please return your completed survey in the enclosed business reply envelope to the University of Missouri on or before April 22.

Thank you very much.

Sincerely,

_____

Michael L. Cook
Professor in Agricultural Economics

Cover Letter for Northeast Missouri Grain Processors, Inc Members

December 2, 2004

Dear Northeast Missouri Grain Processors, Inc Member,

We would like to ask you to participate in a survey being conducted by the Graduate Institute of Cooperative Leadership (GICL) of the University of Missouri, Columbia. GICL is a leading US based cooperative research/executive education institute. The questionnaire is attached.

The survey is part of a study to ensure the cooperative system has value in the future and will address the long-term viability and success of agricultural cooperatives. The survey is part of a comparative study of capital structure issues of cooperatives across various countries.

The survey seeks your views on your cooperative's (Northeast Missouri Grain Processors, Inc) best investment options to determine how well the cooperative's strategy is aligned with your farm strategy.

Your identity will remain completely anonymous and will be treated with the utmost confidentiality. When results are analyzed, all responses will be aggregated.

The survey should take less than 20 minutes to complete. We appreciate your responding to the survey. Please return your completed survey in the enclosed business reply envelope to the University of Missouri on or before December 13.

The survey was not commissioned by NEMO LLC or the Cooperative. The study is being conducted independently of NEMO LLC and the Cooperative. NEMO LLC and the Cooperative are, however, aware of the study.

If you would like to receive a summary of the results, please attach your email address.

Thank you very much.

Sincerely,

_____

Michael L. Cook, PhD
Professor
University of Missouri

Cover Letter for Fonterra Members

Dear Reader,

We would like to ask you to participate in a survey being conducted by the Graduate Institute of Cooperative Leadership (GICL) of the University of Missouri, Columbia, USA. GICL is a leading US based cooperative research/executive education institute. The questionnaire is attached.

If you are not a Fonterra supplier, please ignore this request.

The survey is part of a comparative study of capital structure issues of co-operatives across various countries.

The survey seeks YOUR views on YOUR cooperative's best investment options and how these options relate to YOUR plans for YOUR farm business.

Your identity will remain completely anonymous. When results are analyzed, all responses will be aggregated.

The survey should take less than 20 minutes to complete. We appreciate your responding to the survey. Your responses, once received by Dairy Exporter, will be forwarded unopened to the University of Missouri.

If you are a Fonterra supplier, we appreciate that the Shareholders Council and Dexcel will have recently surveyed you. However, the attached questionnaire focuses more specifically on issues of capital structure and is being conducted independently of Fonterra or the Shareholders Council. Fonterra and the Shareholders Council are, however, aware of the study.

If you would like to receive a summary of the results, please attach your email address.

_____

Michael Cook, PhD
Professor
University of Missouri

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